BRITISH CHEMICAL ABSTRACTS

A., I.—General, Physical, and Inorganic Chemistry

MAY, 1937.

Calculation of terms for the ionised hydrogen molecule. E. Hellmig (Z. Physik, 1937, **104**, 694—710).—The Wentzel–Brillouin–Kramers method of phase-integrals is applied to the calculation of the Rydberg corrections for the more highly excited states of H_2^+. H. C. G.

Structure of H_α and D_α. W. V. Houston (Physical Rev., 1937, [ii], **51**, 446—449).—A Fourier series method of analysis of the interferometer pattern due to a group of spectral lines is described and illustrated by application to two plates of H_α and D_α. N. M. B.

Interferometer wave-lengths of certain lines in the secondary spectrum of D_2 and HD. N. A. Kent and R. G. Lacount (Physical Rev., 1937, [ii], **51**, 241—242).—Intensities and λλ ±0·0003 A. are tabulated for 24 lines of D_2 and 14 lines of HD in the range 4860—5800 A. N. M. B.

Presence of molecular hydrogen in sun-spots. II. G. Piccardi (Atti R. Accad. Lincei, 1936, [vi], **24**, 286—288; cf. this vol., 158).—The literature of the subject is reviewed. O. J. W.

Double excitation losses in helium. W. Swift and R. Whiddington (Proc. Leeds Phil. Soc., 1937, **3**, 262—264; cf. A., 1935, 799).—Accurate re-measurement gives for the energy loss of the more intense $(1s)^2$—$(2s2p)$ line and the weaker unassigned line the vals. 59·73±0·01 and 63·25±0·02 volts, respectively. N. M. B.

Angular distribution in the helium double excitation. S. B. Coles and R. Whiddington (Proc. Leeds Phil. Soc., 1937, **3**, 257—261; cf. Priestley, A., 1935, 799).—The variation of probability of excitation of double excitation with energy change of impacting electrons is determined and compared with that of the $2 \times (2P)$ collision process. The max. probability is in the region 700—800 volts. Angular distribution curves for $(2s2p)^1P$ and 3^1P excitation are discussed; they show qual. agreement with theory at 400 volts. N. M. B.

Spectroscopic study of the magnetron discharge. O. Luhr and F. J. Studer (Physical Rev., 1937, [ii], **51**, 306—310; cf. A., 1936, 397).—In order to investigate the efficiency of the magnetron discharge in producing higher ionisation states, a study of the spectra of He, H, N, and Hg for the range 7000—2000 A., using a discharge between a W filament and a Ni cylinder over a wide range of voltage, current, and gas pressure, is reported. Higher members of the series in the He I and He II spectrum were intensified, and lines of the N II, N III, N IV, and Hg II spectra were identified. N. M. B.

Excitation of light by impact between lithium ions and helium atoms: conservation of spin. W. Maurer (Z. Physik, 1937, **104**, 658—665).—Impact of Li ions on He atoms gives He I lines, He II (λ 4686 A.), and Li II (λ 5485 A.) in addition to strong Li I lines. The Li I lines are due to the discharge of Li^+ in the gas with simultaneous emission from the Li atoms. L. G. G.

Zeeman effect of N II. J. B. Green and H. N. Maxwell (Physical Rev., 1937, [ii], **51**, 243—245).—Using He as residual gas with a small N_2 impurity, the Zeeman effect was studied at field strengths of about 36,000 gauss. Data for λλ, classifications, Zeeman patterns, and g vals. are tabulated for 47 lines. A few exceptions in which g vals. are not LS are considered. N. M. B.

Influence of pressure on the excitation function of bands of the ionised nitrogen molecule. R. Bernard (Compt. rend., 1937, **204**, 488—490).—The effect of the exciting potential E and the pressure p on the production of N_2^+ bands has been investigated. The true max. of the excitation function, at $E = 48$ volts, was observed using low p vals.; when p is such that the mean free path of the electrons is of the order of the electrode dimensions, the apparent max. occurs at $E =$ approx. 130 volts, owing to multiple collisions. A. J. E. W.

Nitrogen in the spectra of comets. J. Dufay (Compt. rend., 1937, **204**, 744—746).—N_2^+ bands, and bands in the second positive and Vegard–Kaplan systems of N_2, have been observed. The mechanism of their emission is discussed. A. J. E. W.

Fine structure in the $^3\Sigma$ ground state of the oxygen molecule, and the rotational intensity distribution in the atmospheric oxygen band. R. Schlapp (Physical Rev., 1937, [ii], **51**, 342—345).—The formula developed by Kramers and by Hebb (cf. A., 1936, 655) is compared with experimental data, and parameter vals. are corr. The corr. formula is co-ordinated with observed fine structure and intensity measurements. N. M. B.

Absorption of liquid oxygen. P. Tulipano (Nuovo Cim., 1935, [ii], **12**, 418—422; Chem. Zentr., 1936, i, 2689).—Absorption bands were observed at λλ 6300, 5780, 5314, 4800, 4458, 3793, and 3611 A. The corresponding vals. of the absorption coeff. were 0·226, 0·274, 0·074, 0·084, 0·028, 0·054, and 0·214. H. J. E.

Absorption of liquid oxygen. A. Carrelli Nuovo Cim., 1935, [ii], **12**, 423—425; Chem. Zentr., 1936, i, 2689—2690; cf. preceding abstract).—Absorption data indicate the formation of the mol. O_2–O_2 by polarisation forces. H. J. E.

Effect of excited gas on the processes in the cathode region of the glow discharge. E. Reichrudel and G. Spivak (Physikal. Z. Sovietunion, 1936, **10**, 121—141).—The effect of excited atoms on the cathode drop in Ne + A, and the distribution of such atoms in the cathode region, have been investigated. A. J. M.

Relative *f*-values for lines of Fe I. D. H. Menzel and L. Goldberg (Astrophys J., 1937, **85**, 40—41).—Recently-published vals. (*ibid.*, 1935, **82**, 377) must be corr. for a wt. factor. L. S. T.

Term scheme of the diatomic selenium molecule. H. Cordes (Naturwiss., 1937, **25**, 219—220).—The term scheme of Se_2, analogous to that of S_2, is given. The dissociation energy of Se_2 is 3·0±0·1 volts (69·2±2·3 kg.-cal. per g.-mol.). Te_2 has a similar term scheme and term combinations to Se_2 and has a dissociation energy of approx. 2·4 volts (55 kg.-cal. per g.-mol.). A. J. M.

$^3P^0$—^3P-term combination in the arc spectrum of cerium. S. Frisch (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 287—288).—A configuration of the normal state of Ce in accordance with the conclusions of Albertson (A., 1935, 556) is deduced from the structure of a group of five lines observed by Paul (A., 1936, 262) in the absorption spectrum of Ce. O. D. S.

Modification of spectral lines by very close collisions. W. M. Preston (Physical Rev., 1937, [ii], **51**, 298—306).—A study of the spectra of Hg, Cd, and Tl, when a few cm. pressure of a rare gas is added to a discharge through the vapour of the metal, indicates that bands of the type reported by Oldenberg (cf. A., 1929, 860) on the short-λ side of the resonance line Hg 2536·7 occur with all metal lines, and with a total relative intensity of the same order of magnitude. N. M. B.

Normal cathode [voltage] drop at single-crystal surfaces with different orientations. I. H. Kurzke (Z. Physik, 1937, **104**, 735—743).—Surfaces of single crystals were used as cathode in discharge tubes containing A. The cathode voltage drop varies with the orientation at the crystal surface. For a single Bi crystal the difference between the (111) and the $(11\bar{1})$ planes was 3—4 volts. H. C. G.

Theory of widening of spectral lines of a series by a foreign gas. C. Reinsberg (Naturwiss., 1937, **25**, 172).—The widening of the principal series lines in the spectra of the alkali metals by addition of foreign gases (He etc.) observed by Füchtbauer *et al.* (A., 1935, 136) is explained on the basis of quantum mechanics. A. J. M.

Passage of the Zeeman effect into the Paschen–Back effect of hyperfine structure in the polarisation of resonance radiations. P. Soleillet (Compt. rend., 1937, **204**, 570—571).—Theoretical. A. J. E. W.

Production of auroral and night-sky light. S. Chapman (Phil. Mag., 1937, [vii], **23**, 657—665).—An alternative theory is developed and discussed in relation to available data and theory. N. M. B.

Fluorescence phenomena and central intensity in Fraunhofer lines. A. Pannekoek (Month. Not. Roy. Astron. Soc., 1935, **95**, 725—732; Chem. Zentr., 1936, i, 2691). H. J. E.

Asymmetric Zeeman effect patterns in a complex spectrum. J. E. Mack and O. Laporte (Physical Rev., 1937, [ii], **51**, 291—292).—Theoretical. N. M. B.

Analysis of Röntgen-ray absorption into photo-absorption and Compton scattering. H. Küstner and H. Trübestein (Ann. Physik, 1937, [v], **28**, 385—408).—An equation enabling *X*-ray absorption by substances from light elements to be analysed quantitatively into photo-absorption and Compton scattering and absorption is derived. The whole absorption curve can be calc. from single measurements in each of the long-, medium-, and short-wave regions. Using the filter difference method, and monochromatic radiation 20 times as strong as before, results agreeing with calculations to ±3% were obtained. Mass absorption coeffs. for H_2O, triolein, blood, and muscle were measured from 0·1 A. to 1·7 A. and the coeffs. for C, N, H, and O calc. The relation $F(\lambda)$ between air ionisation and incident Röntgen energy is calc. and agrees with data available down to 0·35 A. to ±5%. At shorter λλ calculations indicate a min. for $F(\lambda)$ at 0·12 A. and a max. at 0·05 A. H. C. G.

K-Slope of [elements] $_{13}$Al to $_{74}$W. H. Rindfleisch (Ann. Physik., 1937, [v], **28**, 409—437).—The ratio of the mass absorption coeff. on the short-wave side (μ_k/ρ) to that on the long-wave side (μ_l/ρ) of the *K*-edge was measured for 8 elements by the filter difference method of Küstner. The characteristic secondary radiation of the absorbing material has a negligible effect on results, but holes in the filters used may have serious effects. The quantities μ_k/ρ, μ_l/ρ, their difference, and their quotient may be expressed as functions of λ or at. no. of the form $k.\lambda^s$ or $K.Z^t$ where k, K, s, and t are consts. and Z is at. no. H. C. G.

Theory of photo-electric absorption for *X*-rays and γ-rays. H. Hall (Rev. Mod. Physics, 1936, **8**, 358—397).—Mathematical. Non-relativistic theory leads to vals. of the mass absorption coeffs. for the *K* and *L* electronic shells of the elements consistent with experimental data. Relativistic effects are considered and the photo-electric disintegration of the deuteron is discussed. J. G. A. G.

Problems of atmospheric physics. E. V. Appleton (J. Soc. Arts, 1937, **85**, 299—307, 321—330, 338—346).—Lectures.

Thermionic emission into dielectric liquids. E. B. Baker and H. A. Boltz (Physical Rev., 1937, [ii], **51**, 275—282).—Thermionic emission at room temp. for cathodes in contact with PhMe distilled with Na in a N_2 atm. in a special combined electrode chamber and still is investigated. The current–voltage relation obeys a modified Schottky vac. law of the form $I = I_0 e^{[\epsilon(\epsilon FD)^{\frac{1}{2}}/kT]}$, where I is the current, F the field, and D the dielectric const. of the liquid. The effects of adsorbed H_2 and O_2, surface irregularities, and work function are discussed. The formation of an insol. wax, similar to that found in oil- or paper-insulated cables, due to electron bombardment is reported. N. M. B.

Emission from thoriated tungsten and thoriated molybdenum. I. Thoriated tungsten. E. Brüche and H. Mahl (Z. tech. Physik, 1935, **16**, 623—627; Chem. Zeutr., 1936, i, 2704).—Th diffuses through the W lattice only at discrete points, which are not necessarily at the grain boundaries. H. J. E.

Photo-electric work functions of the 211 and 310 planes of tungsten. C. E. Mendenhall and C. F. De Voe (Physical Rev., 1937, [ii], **51**, 346—349).—The W crystal was outgassed for about 4 months and flashed at 2200° for 7 sec. once per min. for 1500 hr. The work functions of the 211 and 310 planes, determined by Fowler's method, were 4·50 and 4·35 volts, respectively. N. M. B.

Study of the surplus heating of a cathode in a magnetron. I. M. Vigdortschik (Physikal. Z. Sovietunion, 1936, **10**, 634—648).—In a one-plate magnetron increases of plate current and filament temp. occur for certain vals. of magnetic field. The first " flash " is supposed due to ionic bombardment of the cathode, and the second to the ionisation of W vapour at high temp. A. E. M.

Classical dynamics of the electron. Theory of first functions and the characteristic moment of the electron. B. Kwal (Compt. rend., 1937, **204**, 560—562).—Mathematical. A. J. E. W.

Space-charge equation for electrons with initial velocity. II. W. Kleen and H. Rothe (Z. Physik, 1937, **104**, 711—723; cf. A., 1936, 1439).—Mathematical. H. C. G.

Equations of motion of electrons in gases. J. S. Townsend (Phil. Mag., 1937, [vii], **23**, 481—486; cf. A., 1936, 1052).—The distribution of the energies of the electrons is considered. J. G. A. G.

Motions of electrons in magnetic fields and alternating electric fields. L. G. H. Huxley (Phil. Mag., 1937, [vii], **23**, 442—464).—Mathematical. J. G. A. G.

Motions of electrons in a gas in the presence of variable electric fields and a constant magnetic field. V. A. Bailey (Phil. Mag., 1937, [vii], **23**, 774—791).—Mathematical. N. M. B.

Dependence of secondary electron emission of various metals on the angle of incidence of the primary cathode rays. H. O. Müller (Z. Physik, 1937, **104**, 475—486).—Secondary electron emission from Ni, Al, Mo, W, Cu, and C, supported on a rotatable plate in a cathode-ray tube, is measured by means of an auxiliary anode. The no. of secondary electrons, s, is given approx. by $s = B/\cos\alpha$, where B is a const. and α the angle of incidence. L. G. G.

Shot effects of secondary electron currents. L. J. Hayner (Physics, 1935, **6**, 323—333).—Secondary emission and primary impact are simultaneous within 10^{-6} sec. Ch. Abs. (*e*)

Scattering of cathode rays of medium velocity in gases. A. Becker and E. Kipphan (Ann. Physik, 1937, [v], **28**, 465—506).—The distribution of intensity of cathode rays in 16 gases at different pressures (0—1 atm.), using an incident parallel beam (20—80 kv.), was determined, and equations governing the scattering were derived. A. J. M.

Double scattering of rapid electrons. H. Richter (Ann. Physik, 1937, [v], **28**, 533—554).—Investigations of the polarisation of electron waves have been made by observation of the double 90° scattering of electron beams at two metal foils used as mirrors. With Au there was some single nuclear scattering, agreeing with Rutherford's scattering law. No polarisation for scattering at Al, or at thin Au foils, was detected when the potential was 20—120 kv. The results do not agree with Mott's theory, which requires a marked polarisation effect for double 90° scattering at Au at the higher potentials, and no effect for Al. A. J. M.

Primary ionisation in helium and hydrogen. E. J. Williams (Proc. Camb. Phil. Soc., 1937, **33**, 179—182).—Theoretical. The departure of He from being H-like is sufficient to explain the equality of the primary ionisations of He and H_2 by cosmic-ray electrons described by Cosyns (A., 1936, 1315). The ionisation of H_2 by electrons is approx. in agreement with theory at electron energies of 8×10^4 and 5×10^8 e.v., but differs at energy of 65×10^4 e.v. O. D. S.

Ionisation and dissociation of polyatomic molecules by electron impact. I. Methane. L. G. Smith (Physical Rev., 1937, [ii], **51**, 263—275).—From a mass-spectrographic study of products of ionisation by low-speed electrons, the following positive ions in CH_4 and their appearance potentials in volts are reported: CH_4^+ 13·1±0·4; CH_3^+ 14·4±0·4; CH_2^+ 15·7±0·5, 22·9±0·8; CH^+ 23·3±0·6; C^+ 26·7±0·7; H^+ 22·7±0·5, 29·4±0·6; H_2^+ 27·9±0·5, and H_3^+ 25·3±1·0. Negative ions observed were CH_2', CH', C', and H'. Three independent calc. vals. for the heat of dissociation of CH_4, leading to upper limits for the heat of sublimation of C 141±14, 131±16, and 139±21 kg.-cal., are consistent with available data (cf. Lozier, A., 1934, 1159; Goldfinger, A., 1936, 1454). Calc. ionisation potential upper limits are: CH_3 9·9, CH_2 12·0, and CH 11·7 or 16·2 volts. Appearance potentials are interpreted. N. M. B.

Ionisation by ionic impact. II. A. Rostagni (Ric. sci. Prog. tecn., 1935, [ii], **6**, 268—269; Chem. Zentr., 1934, i, 2905; cf. A., 1936, 539, 1312).—Effect collision radii for the ionisation of He and Ne by He^+ and Ne^+ are recorded up to velocities of 1000 volts. J. S. A.

Discharge of alkali ions through various gases. F. Wolf (Ann. Physik, 1937, [v], **28**, 438—444).—A continuation of work already noted (this vol., 3). L. G. G.

Ionic mobility of gaseous ions in carbon dioxide at high pressures. C. B. Madsen (Kong. dansk. Viden. Selsk., mat.-fys. Medd., 1936, **13**, No. 14, 15 pp.; Chem. Zentr., 1936, i, 2701—2702).—At 15—50 atm. two groups of positive and one group of negative ions were observed. H. J. E.

Recent advances in the methods of investigation of atomic and ionic rays. R. Ritschl (Physikal. Z., 1937, **38**, 141—157).—A review.
A. J. M.

Accommodation coefficient of positive ions on the surface of a probe electrode. N. Morgulis (Physikal. Z. Sovietunion, 1936, **10**, 565—566).—Molthan's experiments are criticised (cf. A., 1936, 263).
H. J. E.

Sign of the magnetic moment of the ^{39}K nucleus. H. C. Torrey (Physical Rev., 1937, [ii], **51**, 501—508).—A method based on non-adiabatic transitions in an at. beam (cf. Rabi, A., 1936, 404) is developed. A beam of normal alkali atoms is split in a weak inhomogeneous magnetic field, transitions are then induced among the component magnetic levels, and strong field analysis of a selected state identifies the quantum nos. and gives the sign of the moment. The nuclear magnetic moment of ^{39}K is positive, contrary to the result of Jackson (A., 1936, 397), and that of ^{23}Na is positive.
N. M. B.

At. wt. of carbon. II. G. P. Baxter and A. H. Hale (J. Amer. Chem. Soc., 1937, **59**, 506—509; cf. A., 1936, 540).—The val. 12·010 is obtained from combustion determinations with chrysene, $C_6H_3Ph_3$, and anthracene.
E. S. H.

Isotopic constitution of neodymium. A. J. Dempster (Physical Rev., 1937, [ii], **51**, 289).—Analysis of ions from a spark between Nd electrodes shows that the masses 148 and 150 previously reported (cf. Proc. Amer. Phil. Soc., 1935, **75**, 735) belong to Nd, as suggested by Aston (cf. A., 1936, 657).
N. M. B.

Production of weighable quantities of the strontium isotope 87 as transformation product of rubidium from a Canadian mica. O. Hahn, F. Strassmann, and E. Walling (Naturwiss., 1937, **25**, 189).—A mica from Manitoba, rich in Rb but poor in alkaline earths, yielded $SrCO_3$ containing 99% of ^{87}Sr. This has been formed, in agreement with Mattauch's rule, by the radioactive disintegration of ^{87}Rb. From the Rb content of the mica, and an estimate of its geological age, the provisional val. for the half-life of the mixed element is 2×10^{11} years.
A. J. M.

The ^{87}Rb–^{87}Sr pair and the isobar rule. J. Mattauch (Naturwiss., 1937, **25**, 189—191).—The isotopic constitution of the Sr obtained by Hahn *et al.* (cf. preceding abstract) was determined by the double-focussing mass spectrograph. The Sr consists of 99·97% of ^{87}Sr with at. wt. 86·94. The formation of ^{87}Sr by the β-disintegration of ^{87}Rb is in accordance with the rule that stable isobars of neighbouring elements cannot exist.
A. J. M.

Stable isobars. D. R. Inglis and L. A. Young (Physical Rev., 1937, [ii], **51**, 525—526).—Mathematical. Deductions due to Wigner (cf. this vol., 110) are simplified and extended.
N. M. B.

Packing fractions of ^{86}Sr and ^{87}Sr by the doublet method. J. Mattauch (Naturwiss., 1937, **25**, 170—171).—The packing fractions of ^{86}Sr and ^{87}Sr were found by comparison with the SiF_3 line at 87. The difference in packing fraction is 9·0 for ($^{29}SiF_3$–^{86}Sr) and 8·5 for ($^{30}SiF_3$–^{87}Sr). Using the data of Pollard *et al.* (A., 1936, 920) for the mass of ^{30}Si, the packing fraction of ^{87}Sr is $-8·7 \pm 0·3$ and its mass is $86·924_3 \pm 0·004$. From the data of Aston for ^{29}Si and ^{19}F, the packing fraction of ^{86}Sr is $-9·0 \pm 0·5$ and its mass is $85·922_6 \pm 0·004$.
A. J. M.

Ionisation of gases by high-energy β-particles. F. T. Rogers, jun. (Physical Rev., 1937, [ii], **51**, 528).—A more precise equation for the no. of ions of a gas formed by β-particles in a cm. length of its path is given and illustrated for H_2, N_2, O_2, and Ne.
N. M. B.

Relations in β-ray transformations and the neutrino theory. H. O. W. Richardson (Nature, 1937, **139**, 505—506).—The application of the Fermi and the Konopinski–Uhlenbeck formulæ is discussed. A combination of the two is necessary to give the shape of β-ray spectrum for Ra-*E* or for radio-P, ^{32}P.
L. S. T.

Structure of a β-ray line by semicircular focussing. K. T. Li (Proc. Camb. Phil. Soc., 1937, **33**, 164—178).—Theoretical. The distribution of a homogeneous group of electrons by semicircular magnetic focussing is calc. for plane and cylindrical sources. The dependence of max. intensity on the radius of curvature of the path of the electrons is investigated. Results are confirmed by experiment.
O. D. S.

β-Radioactivity and nuclear forces. I. Tamm (Physikal. Z. Sovietunion, 1936, **10**, 567—604).—A generalised form of Fermi's theory of β-decay is developed and applied to the interaction of protons and neutrons. Results are in agreement with the shapes of β-spectra and account for the correlation between the lifetime of β-radioactive isotopes and the max. energy of electrons and positrons emitted by them. Forces between neutrons and protons in the nucleus can be explained only by the introduction of two arbitrary consts. into the equations and a quant. correlation between nuclear forces and β-decay appears at present impossible.
H. C. G.

Coincidence measurements on β- and γ-rays from Ra-*C*. W. Bothe and H. Maier-Leibnitz (Z. Physik, 1937, **104**, 604—612).—Coupling occurs between nuclear β-radiation and γ-radiation from Ra-*C*. Conclusions are reached as to the term scheme of the transformed Ra-*C* nucleus.
L. G. G.

Value of absorption coefficient of hard γ-rays of radium in beryllium. J. Starkiewicz (Acta phys. polon, 1935, **4**, 79—84; Chem. Zentr., 1936, i, 2893—2894).—The absorption coeff., and the effective diameter of the electron and of the Be nucleus for the γ-radiation of Ra-*B* + *C* are evaluated. The val. found corresponds with $\lambda = 6·4$ X.
J. S. A.

β- and γ-Radiation of Ra-*C*″. S. Devons and G. J. Neary (Proc. Camb. Phil. Soc., 1937, **33**, 154—163).—Measurements were made of the absorption of β- and γ-rays from Ra-*C*″. The range in Al of β-rays corresponds with an energy limit of $(1·95 \pm 0·15) \times 10^6$ e.v. The absorption coeff. of γ-rays in Cu corresponds with a fairly homogeneous radiation of energy $(5 \pm 1) \times 10^6$ e.v. The total energy of the disintegration is equal, within the limits of error, to that estimated by Rutherford *et. al.* (A., 1933, 443). O. D. S.

Ionisation of air by γ-rays as a function of pressure and collecting field. II. I. S. Bowen and E. F. Cox (Physical Rev., 1937, [ii], **51**, 232—234; cf. A., 1932, 895).—Measurements reported by Clay (Physica, 1935, **2**, 825) of γ-ray ionisation currents in air at high pressures are largely modified by vol. recombination at collecting fields < about 400 volts per cm. The Jaffé theory of columnar ionisation does not fully explain observed data. N. M. B.

Ionisation of gamma rays in air at high pressure at various temperatures. J. Clay, H. J. Stammer, and M. van Tijn (Physica, 1937, **4**, 216—220).—Data for γ-ray ionisation currents in air at 1—152 atm./20—50° are recorded. The saturation current is independent of temp. H. J. E.

Refraction of neutrons. G. N. Lewis and P. W. Schutz (Physical Rev., 1937, [ii], **51**, 369).—A marked decrease in activity of a Ag target bombarded by neutrons passing through a paraffin collimator tube when the inner edge of the tube is bevelled indicates that the lower inner edge of the tube acts as a prism and suggests the use of a paraffin lens for focussing neutron beams. N. M. B.

Interaction of fast neutrons with lead. G. E. Gibson, G. T. Seaborg, and D. C. Grahame (Physical Rev., 1937, [ii], **51**, 370).—Experiments on a direct interaction of fast neutrons with extra-nuclear electrons reported by Kikuchi (cf. this vol., 4) indicate an explanation on the supposition that the fast neutrons excite γ-rays in the Pb shielding the counter. N. M. B.

Neutron optics. G. N. Lewis (Physical Rev., 1937, [ii], **51**, 371; cf. this vol., 6).—The problem of obtaining optical effects in a neutron beam is discussed. The importance of coherence, measured by the max. difference in path between two parts of a divided beam still permitting interference, is examined. N. M. B.

Magnetic moment of the neutron. P. N. Powers, H. G. Beyer, and J. R. Dunning (Physical Rev., 1937, [ii], **51**, 371—372; cf. this vol., 107).—Further experiments, in which neutrons were directed normally through magnetised Fe plates, in order to observe directly the effect of the magnetic moment of the neutron and magnetic scattering, are described. The existence of magnetic interaction with magnetised materials arising from neutron magnetic moment is indicated. N. M. B.

Neutron emission of beryllium on bombardment with H, D, and He. R. Döpel (Z. Physik, 1937, **104**, 666—671).—Neutron emission and the mechanism of disruption of Be by bombardment with positive rays of H, D, and He with energies up to 200 kv. were investigated. The interaction $^{9}_{4}\text{Be} + ^{1}_{1}\text{H}$ gives no neutrons; nothing definite could be obtained from $^{9}_{4}\text{Be} + ^{2}_{1}\text{D}$ owing to the possibility of the interaction $^{2}_{1}\text{D} + ^{2}_{1}\text{D} \rightarrow ^{3}_{2}\text{He} + ^{1}_{0}n$. Neutron emission from the process $^{9}_{4}\text{Be} + ^{4}_{2}\text{He} \rightarrow ^{12}_{6}\text{C} + ^{1}_{0}n$ was just detectable at 200 kv. H. C. G.

Resonance of tungsten nuclei for the capture of single neutrons and the form of active resonance levels. R. Jaeckel (Z. Physik, 1937, **104**, 762—778).—W has a resonance level at which non-thermal neutrons having an energy of 9±4 volts are selectively absorbed. The max. absorption coeff., K_0, was found to be 35 cm.^{2} per g. and that for thermal neutrons 0·1 cm.^{2} per g. H. C. G.

γ-Rays excited by capture of neutrons. J. H. E. Griffiths and L. Szilard (Nature, 1937, **139**, 323—324).—A method for observing the capture radiation emitted by slow neutron absorbers is described. Using that of Cd as an indicator of neutron intensity, the absorption cross-section of slow neutrons has been determined for Cl, Co, Rh, Ag, Cd, Ir, Au, and Hg. The γ-ray effect per captured neutron has been compared for these elements and for Sm, Gd, and In, and although the at. wts. vary from 35 to 200, the effects are approx. equal. 7 quanta are probably emitted from Cd per captured neutron. The intense neutron absorption of Cl is probably due to radiative capture which leads to a Cl isotope of long half-life period which has not yet been detected. The view that Y has a large capture cross-section for slow neutrons and must therefore transform into an undetected radioactive isotope is not supported. Ba also shows a capture cross-section $\ll$ that previously reported. B shows a γ-ray effect approx. 0·05 that of Cd. L. S. T.

γ-Ray excitation by fast neutrons. H. Aoki (Nature, 1937, **139**, 372—373).—Relative cross-sections of 41 elements for γ-ray excitation by 2·4 m.e.v. neutrons are plotted against at. no. L. S. T.

Interaction of neutron with deuteron. S. Kikuchi, H. Aoki, and E. Takeda (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, **31**, 195—204; cf. A., 1936, 541).—No excitation of γ-rays was detected on bombarding D_2O with slow or fast neutrons. Contrary to the results of Dunning (A., 1935, 1186), the efficiency of D_2O in slowing down neutrons was <1/27 of that of H_2O. H. J. E.

Scattering of photo-neutrons by protons. A. Leipunski, L. Rosenkevitsch, and D. Timoshuk (Physikal. Z. Sovietunion, 1936, **10**, 625—633).—The mean free path in paraffin of neutrons obtained by the action of γ-rays from Ra and its products on Be is 1·5±0·4 cm., and on D is slightly >1 cm. Results agree with the Fermi–Wigner theory if the mean free path of neutrons having thermal velocities in paraffin depends mainly on scattering by bound protons. H. C. G.

Resonance levels of neutrons in silver nuclei. C. Y. Chao and C. Y. Fu (Nature, 1937, **139**, 325). L. S. T.

Diffusion of slow neutrons in hydrogenous media. C. H. Westcott (Proc. Camb. Phil. Soc., 1937, **33**, 122—136).—Theoretical. The space distribution of slow neutrons is calc. by the application of diffusion laws to their motion. Calc. distribution is compared with that observed by Bjerge and Westcott (A., 1935, 1186) and the total absorption cross-section of the H_2O mol. is calc. to be 6 × 10^{-25}

sq. cm. Results indicate that absorption is mainly due to H atoms. O. D. S.

Absorbability in cadmium of neutrons slowed down in water and boric acid solutions. C. H. Westcott (Proc. Camb. Phil. Soc., 1937, **33**, 137—139).—The absorption by Cd of neutrons slowed down by different thicknesses of H_2O and of aq. solution of H_3BO_3 has been measured. Results are in agreement with Westcott's theory of the distribution of neutrons (cf. preceding abstract), and indicate that practically all neutrons of groups *A* and *B* have energies $>$ the max. energy of neutrons in group *C*. O. D. S.

Absorption of slow neutrons. E. Fermi and E. Amaldi (Ric. sci. Prog. tecn., 1935, [ii], **6**, 443—447; Chem. Zentr., 1936, i, 2687; cf. this vol., 161).—Data for absorption by Rh, Ag, Cd, In, Ir, Au, and Hg are given. H. J. E.

Selector of velocity of slow neutrons. E. Segrè (Atti R. Accad. Lincei, 1936, [vi], **24**, 282—286; cf. A., 1936, 264).—A more detailed account of the theory of the method previously described. O. J. W.

Nuclear transformation of boron by slow neutrons. O. Haxel (Z. Physik, 1937, **104**, 540—548).—Absorption of slow neutrons by B gives rise to 2 α-particles and a Li particle group, the latter traceable to an excited ${}^{7}Li$ nucleus. The intermediately formed ${}^{11}B$ nucleus has a life period $<1/30$ sec. L. G. G.

Emission of positrons. K. Shinohara (Sci. Papers Inst. Phys. Chem. Res., Tokyo, 1937, **31**, 174—186).—The nos. of natural positrons from Ra-*C* and Th-*B* + *C* were, respectively, $4{\cdot}7 \times 10^{-4}$ and $4{\cdot}2 \times 10^{-4}$ times the nos. of electrons emitted from the same sources. The nos. of positrons from a thick piece of Pb by pair production by γ-rays were 1·0 and 2·2 times the nos. of positrons from the Ra-*C* and Th-*B* + *C* sources, respectively. H. J. E.

Production of artificial α-rays by resonance. E. Wilhelmy (Naturwiss., 1937, **25**, 173—174).—The transformation ${}^{14}_{7}N(n, \alpha){}_{5}^{11}B$ was investigated with a N_2-filled ionisation chamber in conjunction with an amplifier and recording oscillograph. The distribution of α-particles and nuclei with the total energy of the two is obtained. Four max. are found in the curve, which are due to excited states of ${}^{15}N$ formed intermediately. A. J. M.

Excitation of a lithium atom by collision with a slow α-particle. J. W. Frame (Proc. Camb. Phil. Soc., 1937, **33**, 115—121).—Mathematical. The cross-section for excitation is calc. according to the theory of Mott (A., 1931, 1349). Vals. at low α-particle velocities are $\ll$ those calc. by Born's method of approximation. O. D. S.

Artificial radioactivity. K. Loskit (Eesti Rohut., 1935, 311—313; Chem. Zentr., 1936, i, 2499—2500).—A summary and review. H. J. E.

Detection of artificial radioactivity in a photographic emulsion. T. Takeuchi and T. Inai (Proc. Phys.-Math. Soc. Japan, 1935, **17**, 319—320).—Tracks due to α- and induced radioactive particles formed by neutron bombardment are found in photographic emulsions. Ch. Abs. (*e*)

Further atomic transmutations by means of γ-rays. W. Bothe and W. Gentner (Naturwiss., 1937, **25**, 191; cf. this vol., 162).—Further transmutations have been brought about by means of intensive γ-rays from Li. Zn gave ${}^{63}Zn$ (?) (38 min.); Ga, ${}^{70}Ga$ (20 min.) and ${}^{68}Ga$ (1 hr.); In, ${}^{112}In$ or ${}^{114}In$ (1 min.); Te, ${}^{127}Te$ or ${}^{129}Te$ (1 hr.); Ta, ${}^{180}Ta$ (14 min.). Mo gave a nucleus as yet unidentified (17 min.) (half-life periods in parentheses). A. J. M.

Apparatus for high-velocity corpuscular rays and transmutation experiments therewith. W. Bothe and W. Gentner (Z. Physik, 1937, **104**, 685—693).—An apparatus for the production of positive rays with energies up to 500 kv. is described. γ-Ray intensity–voltage curves for bombardment of F (CaF_2), Li, and B with protons were obtained. H. C. G.

Energy and absorption of the γ-radiation from ${}^{7}Li + {}^{1}H$. L. A. Delsasso, W. A. Fowler, and C. C. Lauritsen (Physical Rev., 1937, [ii], **51**, 391—399).—A study of the pairs ejected from foils in a Wilson chamber gives more reliable information on high-energy γ-radiation than is obtained from recoil electrons (cf. A., 1935, 1186), and shows that the γ-radiation from ${}^{7}Li + {}^{1}H$ consists of a line at $17{\cdot}1 \pm 0{\cdot}5$ m.e.v. of relative intensity 0·75 and probably one or more lines at about 14 m.e.v. of relative intensity 0·25. No radiation is found over 2—10 m.e.v. Electron and energy distributions agree with theory. An improved method of measuring absorption coeffs. for radiation >3 m.e.v. is described. Data can be interpreted by assuming that the proton is captured by the ${}^{7}Li$ nucleus producing a ${}^{8}Be$ nucleus in an odd state, and this may drop to the ground state with emission of 17 m.e.v. radiation. N. M. B.

γ-Radiation from fluorine bombarded with protons. L. A. Delsasso, W. A. Fowler, and C. C. Lauritsen (Physical Rev., 1937, [ii], **51**, 527).—Investigations previously reported (cf. preceding abstract) are extended to ${}^{19}F + {}^{1}H$. A thick target was bombarded with 0·75 m.e.v. protons. The energy distribution of pairs and single electrons is plotted and indicates a single line at $6{\cdot}0 \pm 0{\cdot}2$ m.e.v. The resonance level at 0·328 m.e.v. is discussed. The suggested reaction is ${}^{19}F + {}^{1}H \rightarrow ({}^{20}Ne)' \xrightarrow{\gamma} ({}^{20}Ne)'' \rightarrow {}^{16}O + {}^{4}He$. N. M. B.

Resonance process in the disintegration of boron by protons. J. H. Williams, W. H. Wells, J. T. Tate, and E. L. Hill (Physical Rev., 1937, [ii], **51**, 434—438; cf. A., 1936, 1045).—An investigation of the efficiency of the two processes of production of α-particles from B as a function of the energy of the bombarding protons shows an irregularity in the curve for one of the processes indicating a resonance with peak at 180 kv. Theory is discussed and abs. yields for thick B targets at various energies are given. N. M. B.

Radioactivity induced in silver by neutrons. G. Gueben (Ann. Soc. Sci. Bruxelles, 1937, **57**, 22—24; cf. this vol., 107).—Ag foils were subjected to the

action of neutrons for various times with and without the interposition of paraffin. For short exposures (10 sec.—2 min.) without paraffin, radio-Rh with half-life 46±4 sec. was obtained by the reaction ${}^{x}_{47}\mathrm{Ag} + {}^{1}_{0}n = {}^{x-3}_{45}\mathrm{Rh} + {}^{4}_{2}\mathrm{He}$. The half-life of the element obtained by the use of slower neutrons (with paraffin) was 31±3 sec. For longer exposures (>15 min.) a radio-Ag with half-life 2·5 min. and one with half-life 50 sec. were obtained without paraffin, and one with half-life 30 sec. was produced with paraffin. Radio-Ag is produced by the reaction ${}^{x}_{47}\mathrm{Ag} + {}^{1}_{0}n = {}^{x+1}_{47}\mathrm{Ag}$.
A. J. M.

Induced radioactivity of calcium. H. Walke (Physical Rev., 1937, [ii], **51**, 439—445).—Radioactivities induced in Ca by bombardment with high-energy deuterons, α-particles, and neutrons are reported. After irradiation by deuterons, the active samples were separated chemically into fractions containing Sc, Ca, and K. Most of the activity was found in the Sc ppt., the decay curve giving three components with half-lives 53±3 min., 4·0±0·1 hr., and 52±2 hr.; the thick target yields, calc. for infinite duration of bombardment, are 5·4 × 10^{7}, and 3 × 10^{8} deuterons per active atom; the periods are probably associated with ^{44}Sc, ^{43}Sc, and ^{41}Sc, respectively. The active Ca is due to ^{45}Ca of half-life 2·4±0·2 hr., and thick target yield 9·0 × 10^{8} deuterons per active atom. The yield of ^{43}Sc is one active atom for 2 × 10^{5} α-particles. ^{45}Ca has also been produced by activating Ca with slow neutrons and by bombarding Ti with fast neutrons. The 16-hr. period previously reported (cf. Hevesy, A., 1935, 678) was probably due to Mg or Na impurities and not to ^{42}K.
N. M. B.

Negative protons in cosmic radiations. H. J. Bhabha (Nature, 1937, **139**, 415—416).—Benedetti's results (Physical Rev., 1934, **45**, 214) lead to the view that either negative protons or some other negatively charged particles hitherto unknown are present in appreciable numbers in cosmic radiation.
L. S. T.

Dependence of energy of bundles of cosmic rays on angle. K. Schmeiser (Naturwiss., 1937, **25**, 173).—The existence of particles with high penetrating power when ultra-radiation is passed through a C filter (Hilgert *et al.*, A., 1936, 658) is due not to any special property of C but to the divergence angle between the particles in the bundle. This has been confirmed using Pb as the secondary radiator.
A. J. M.

Absolute intensity of ionisation by cosmic radiation at sea level. J. Clay and H. F. Jongen (Physica, 1937, **4**, 245—255).—The ionisation in air ∝ the pressure (1—38 atm.). The abs. ionisation for air at 1 atm. was 1·10±0·04 ions per c.c. per sec.
H. J. E.

Multiplicative showers. J. F. Carlson and J. R. Oppenheimer (Physical Rev., 1937, [ii], **51**, 220—231).—Mathematical. The following topics are examined: quantum formulæ for pair production and radiation for cosmic-ray energies; diffusion equations for the equilibrium of electrons and γ-rays and their solution to give distribution data; effect of ionisation losses on the shower and low-energy radiation expected.
N. M. B.

Hoffmann collisions and multiplication of rays. J. Boggild and A. Karkov (Naturwiss., 1937, **25**, 158; cf. A., 1936, 1315).—Hoffmann collisions produced from Pb were passed on to Al as adsorbent, and the effect of bringing more Pb under the Al was examined.
A. J. M.

Secondary effects of cosmic rays in free air and underground. P. Auger and (Mme.) G. Meyer (Compt. rend., 1937, **204**, 572—573; cf. A., 1936, 1174).—The effect of the thickness of a Pb screen on the frequency of secondary cosmic showers produced in it has been investigated. Results obtained above and below ground level are compared and discussed.
A. J. E. W.

Geiger–Müller counter measurements of cosmic-ray intensities in the stratosphere. W. F. G. Swann, G. L. Locher, and W. E. Danforth (Physical Rev., 1937, [ii], **51**, 389—390).—A report of data obtained in three recent stratosphere balloon flights.
N. M. B.

Nature of the soft component of cosmic radiation. C. G. Montgomery and D. D. Montgomery (Physical Rev., 1937, [ii], **51**, 217—219).—Calculations show that the primary corpuscles which lose energy according to Swann's theory (cf. this vol., 109) are probably protons.
N. M. B.

Absorption of cosmic rays in rock-salt. S. Ziemecki (Acta phys. polon., 1935, **4**, 183—193; Chem. Zentr., 1936, **1**, 2895—2896).—Absorption coeffs. are recorded, and the significance of the measurement is discussed.
J. S. A.

Electronic periodic table. C. H. D. Clark (Proc. Leeds Phil. Soc., 1937, **3**, 281—292).—A table is presented, giving the electron configurations of atoms, excluding those of the rare earths, in their ground states by means of their positions in the table. The electrons are divided into three groups, and the nature and no. of electrons in these determine the periods and groups of the older table. Ten chemical propositions are interpreted in terms of the groups. At. spectral theory and chemical properties, as expressed by the table, are correlated.
N. M. B.

Atomic nucleus. V. A. Plotnikov (Mem. Inst. Chem. Ukrain. Acad. Sci., 1936, **3**, 463—470).—Theoretical.
R. T.

So-called "earth rays." W. Frenzel (Umschau Wiss. Tech., 1935, **39**, 995—997; Chem. Zentr., 1936, i, 2896).—Biological effects of a hypothetical earth radiation are discussed.
J. S. A.

Secondary electrons of the neutrino. M. Wolfke (Acta phys. polon., 1935, **4**, 177—182; Chem. Zentr., 1936, i, 2892).—The energy distribution of the secondary electron emission of Ra-*E* is displaced considerably towards high energies, as compared with the β-radiation, in agreement with the conception of the liberation of secondary electrons by head-on collision with neutrinos.
J. S. A.

Collision between light quanta and free electrons. D. Hacman (Bul. Fac. Ştiinte Cernauţi, 1935, **9**, 360—375; Chem. Zentr., 1936, i, 3081).—By the intersection of a beam of visible light with a stream of slow electrons in vac., the predicted Compton effect has been qualitatively confirmed. J. S. A.

Fermi's theory of the β-disintegration. M. Fierz (Z. Physik, 1937, **104**, 553—565).—Mathematical. J. G. G.

Energy and impact principles of collisions between particles resulting in radiation and pair formation. W. Braunbek (Z. Physik, 1937, **104**, 619—637).—Mathematical. L. G. G.

Virial theorem in nuclear problems. E. L. Hill (Physical Rev., 1937, [ii], **51**, 370—371; cf. A., 1936, 919).—Mathematical. The extension of the virial theorem to include exchange forces is reported. N. M. B.

Transformations of elements in the interior of stars. I. C. F. von Weizsäcker (Physikal. Z., 1937, **38**, 176—191).—It is assumed that the energy of stars is maintained by the building up of elements from H_2. This hypothesis is supported by the fact that many stars contain large amounts of H_2. The lighter elements can be built up directly from H_2, whilst the heavier ones can be formed by the action of neutrons on the lighter nuclei. The source of neutrons is largely D, the reaction being ${}^2_1D + {}^2_1D = {}^3_2He + {}^1_0n$. The nuclear reactions occurring within the star depend largely on the properties of the nucleus of mass 5. Cycles of transformations occur, such as ${}^4_2He + {}^1_1H = {}^5_3Li$; ${}^5_3Li = {}^5_2He + \beta$; ${}^5_2He + {}^1_1H = {}^4_2He + {}^2_1D$. The ${}^4_2He$ maintains the cycle, and the ${}^2_1D$ acts as a source of neutrons, as above. The factors deciding the production of the heavier nuclei by neutron collision are considered, and the theory is applied to the explanation of the frequency of occurrence of the various elements in stars. A. J. M.

Isobars. V. A. Plotnikov (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 189—191).—Theoretical. The formation of all known isobars can be explained by the action of two alternative intranuclear processes: 4 neutrons = α-particle + 2 electrons and 2 neutrons = deuteron + electron, the electrons being subsequently ejected. O. D. S.

Energy exchange of helium, neon, and argon atoms with a metal surface. G. Zacharjin and G. Spivak (Physikal. Z. Sovietunion, 1936, **10**, 495—509).—Data for the accommodation coeffs. at 300—650° abs. of He, Ne, and A on clean W, and on W pretreated with N_2, O_2, and H_2, are recorded. H. J. E.

Interaction in heavy atomic nuclei. H. Euler (Naturwiss., 1937, **25**, 201).—Assuming the same force between two protons or two neutrons as between a proton and a neutron the binding energy of heavy at. nuclei can be calc. The Thomas–Fermi approximation is improved. A. J. M.

Intermediate nucleus in the disintegrative synthesis of atomic nuclei: disintegration in steps. W. D. Harkins (Proc. Nat. Acad. Sci., 1937, **23**, 120—131).—A detailed discussion of the postulates of a theory previously presented (cf. this vol., 109). N. M. B.

Emergence of low energy protons from nuclei. E. Pollard (Physical Rev., 1937, [ii], **51**, 291).—Calculations indicate that the escape of low-energy protons from the composite nucleus in transmutations induced by α-particles (cf. this vol., 108) must be due to abnormally low proton barriers or to the composite nucleus containing the final product element and the proton having a finite lifetime long enough to allow the proton to leak through the barrier (cf. Harkins, *ibid.*, 109). N. M. B.

Resonance effects in nuclear processes. H. A. Bethe and G. Placzek (Physical Rev., 1937, [ii], **51**, 450—484; cf. Breit, A., 1936, 658).—Mathematical. A general theory is developed and is applied to slow and fast neutrons, charged particles, and phenomena produced by γ-rays. N. M. B.

Magnitude of the new nuclear forces. H. Volz (Naturwiss., 1937, **25**, 200—201).—The ratios and magnitudes of the Majorana, Wigner, Heisenberg, and Bartlett forces are derived. A. J. M.

Approximately relativistic equations for nuclear particles. G. Breit (Physical Rev., 1937, [ii], **51**, 248—262).—Mathematical. A complete relativistic theory of nuclear forces involves reference to the electron–neutrino field. Equations relativistically invariant for transformations involving low velocities are examined. N. M. B.

Generalisations of the β-transformation theory. G. Gamow and E. Teller (Physical Rev., 1937, [ii], **51**, 289; cf. Konopinski, A., 1935, 1048).—In the emission of an electron in a β-transformation process, the possibility, in addition to the emission of a neutrino, of the emission of a pair of electrons ($n \rightarrow n + e^+ + e^-$ or $p \rightarrow p + e^+ + e^-$) and of a pair of neutrinos ($n \rightarrow n + \nu + \nu$ or $p \rightarrow p + \nu + \nu$) is discussed. N. M. B.

Determination of *h*/*e* from the short wave-length limit of the continuous *X*-ray spectrum. J. Du Mond and V. Bollman (Physical Rev., 1937, [ii], **51**, 400—429).—Two precision determinations of the short-λ limits of the continuous *X*-ray spectrum in the regions 10,000 and 20,000 volts, respectively, by the method of isochromats under very steady applied voltage are described in detail. The val. obtained for h/e, assuming the ruled grating λλ of *X*-rays to be correct, is $1{\cdot}3762 \pm 0{\cdot}0003 \times 10^{-17}$, and for $e/h^{\frac{3}{4}}$, without this assumption, $2{\cdot}0720 \pm 0{\cdot}0004 \times 10^{10}$ (cf. Kirkpatrick, A., 1934, 586). N. M. B.

Quantum limit of the continuous spectrum. P. Kirkpatrick and P. A. Ross (Physical Rev., 1937, [ii], **51**, 529; cf. A., 1934, 586).—A feature in the isochromats as reported by Du Mond (see preceding abstract) is discussed. N. M. B.

Cosmological constants. P. A. M. Dirac (Nature, 1937, **139**, 323). L. S. T.

Spontaneous disintegration of photons. M. Bronstein (Physikal. Z. Sovietunion, 1936, **10**, 686—688).—From the fact that the relative λ shift, $d\lambda/\lambda$, towards the red observed in the spectra of spiral nebulæ is const. throughout the spectrum, it is shown that the spontaneous disintegration of photons postulated by Halpern and Heitler is impossible. H. C. G.

Impulse moments in L. de Broglie's theory of the photon. J. Géhéniau (Compt. rend., 1937, **204**, 665—668).—Mathematical. A. J. E. W.

Equations of the photon. J. Roubaud-Valette (Compt. rend., 1937, **204**, 747—749).—Mathematical. A. J. E. W.

Relations between the polarisation of a photon and the spins of the constituent corpuscles. J. Roubaud-Valette (Compt. rend., 1937, **204**, 483—485).—Mathematical. A. J. E. W.

Electronic photon. J. J. Placinteanu (Compt. rend., 1937, **204**, 485—487; cf. A., 1936, 660; this vol., 110).—Mathematical. A. J. E. W.

Neutrino theory of light. II. M. Born and N. S. N. Nath (Proc. Indian Acad. Sci., 1936, **4**, A, 611—620; cf. A., 1936, 774).—Mathematical. J. W. S.

Spherical symmetry of self-consistent atomic fields. A. F. Stevenson (Physical Rev., 1937, [ii], **51**, 285—287).—Mathematical. N. M. B.

Kinetic energy of nuclei in the Hartree model. H. A. Bethe and M. E. Rose (Physical Rev., 1937, [ii], **51**, 283—285).—Mathematical. The separation of the kinetic energy of the centre of gravity from the total kinetic energy of the nucleus for calculations of nuclear energy levels by the Hartree method is discussed. N. M. B.

Equations for the Dirac electron in general relativity. H. Yamamoto (Japan. J. Physics, 1936, **11**, 35—65).—Mathematical. A. J. M.

Modern values of the atomic constants e and h. R. Ladenburg (Ann. Physik, 1937, [v], **28**, 458—464).—A review of recent determinations of e and h. The best val. of e is $4{\cdot}803 \times 10^{-10}$ e.s.u. Use of this val. in (1) Bohr's formula for the Rydberg const. and (2) calculations based on determinations of the limiting frequency of the continuous X-ray spectrum leads to $h = 6{\cdot}627 \times 10^{-27}$ and $6{\cdot}609 \times 10^{-27}$ erg per sec., respectively. This latter discrepancy, far outside the probable errors of either method, is unexplained. L. G. G.

Methods of estimation of nuclear statistics. T. Sexl (Naturwiss., 1937, **25**, 153—156).—The estimation of nuclear statistics from variation of intensity of the band spectra of diat. mols., the sp. rotation heat of a gas, and the scattering of similar particles (*e.g.*, nuclei by nuclei) is discussed. A. J. M.

Relativistic wave functions in the continuous spectrum for the Coulomb field. M. E. Rose (Physical Rev., 1937, [ii], **51**, 484—485).—Mathematical. The continuous spectrum solutions, in the form of series and integral representations and the asymptotic behaviour at large distances, of the Dirac wave equation are given. N. M. B.

Quantum equations in cosmological spaces. A. H. Taub (Physical Rev., 1937, [ii], **51**, 512—525).—Mathematical. The Dirac equations for a free electron in a cosmological space are solved by separation of variables and deductions are developed. N. M. B.

Waves and corpuscles in quantum physics. A. Landé (Science, 1937, **85**, 210—213). L. S. T.

Calculation of constants for band spectra. C. H. D. Clark (Nature, 1937, **139**, 508—509).—An empirical formula connecting the fundamental vibration frequencies of di-atoms that belong to symmetrical mol. groups is discussed. L. S. T.

Relation between the variations of intensity of solar ultra-violet radiation, measured at ground level, and the pollution of the lower atmosphere. L. Herman and (Mlle.) F. Bernstein (Compt. rend., 1937, **204**, 708—710).—Parallelism between the annual variation of the intensity of solar radiation in the neighbourhood of 3200 A., and the pollution of the lower atm., indicates that absorption of these λλ is chiefly due to dust and smoke particles. A. J. E. W.

Molecular excitation potentials of water vapour. N. Thorley and R. Whiddington (Proc. Leeds Phil. Soc., 1937, **3**, 265—269).—Measurement of the electron impact spectrum in H_2O vapour gives excitation potentials of 7·60, 10·15, and 13·55 volts, and a faint ionisation potential at 16·75 volts. The first ionisation potential, estimated from photometer traces, is 12·35 volts. Correlation of results with ultra-violet absorption spectra and excitation interpretation are discussed. N. M. B.

Absorption spectrum as a test for free radicals. O. Oldenberg (J. Physical Chem., 1937, **41**, 293—297).—A discussion of the effects of concn. and impurities on the problem of recognising OH and H radicals by their absorption spectra. F. R. G.

Limiting curve for dissociation based on band spectra. R. Schmid and L. Gerö (Z. Physik., 1937, **104**, 724—734).—Consideration of the relationship between the predissociation limit of the CO spectrum at 11·06 volts and mol. vibrational, rotational, and transitional energy leads to a "limiting curve of dissociation." The properties of this curve are discussed. H. C. G.

Perturbations in the band spectra of CS, CO^+, and N_2. L. Gerö (Math. nat. Anz. ung. Akad. Wiss., 1935, **53**, 331—351; Chem. Zentr., 1936, i, 2693). H. J. E.

Emission of CO^+ bands from the head of the Peltier comet (1936, *a*). J. Dufay, (Mlle.) M. Bloch, and J. Ellsworth (Compt. rend., 1937, **204**, 663—665).—14 band systems in the range 3790—5000 A., ascribed to CO^+, were observed. Their occurrence is discussed. A. J. E. W.

New absorption system of cyanogen gas in the near ultra-violet. System I. S. C. Woo and T. K. Liu (J. Chem. Physics, 1937, **5**, 161—165).—Two main progressions of bands with frequency differences 2050 cm.$^{-1}$ and 895 cm.$^{-1}$ are reported in a new system of bands found between 3020 and 2400 A. with an absorbing path of 3 m. at 2 atm. The structure of the mol. in the excited state, its normal frequencies and symmetry properties are discussed. W. R. A.

Band spectra of ionised halogen hydrides. II. Hydrogen chloride and deuterium chloride. F. Norling (Z. Physik, 1937, **104**, 638—652; cf. A., 1935, 913).—The ultra-violet bands of HCl and DCl were photographed with a dispersion of 0·95 A. per

mm. A modification of the hollow-cathode discharge tube was used. Discharge conditions for max. definition of the weaker bands are discussed. Results are employed to calculate accurate mol. consts.
H. C. G.

Absorption spectrum of chlorine trioxide and chlorine hexoxide. C. F. GOODEVE and F. D. RICHARDSON (Trans. Faraday Soc., 1937, **33**, 453—457).—ClO_3 absorbs in the ultra-violet region with a threshold at about 3500 A. and two max. at 2760 and 2000 A., respectively. Liquid Cl_2O_6 absorbs strongly from 6000 to $<$2200 A. J. W. S.

Band spectrum of magnesium hydride. A. GUNTSCH (Z. Physik, 1937, **104**, 584—591).—Seven bands in the $^2\Pi-^2\Sigma$-system of Mg hydride have been measured and in part analysed. Rotation and nuclear oscillation consts. have been determined and thence accurate ρ^2 vals. for Mg deuteride calc. Λ-separation consts. for the hydride were calc. and compared with those of the deuteride. A new band, arising from a $^2\Sigma-^2\Pi$ transition, was found at λ 4400.
H. C. G.

$^1\Sigma^*-^1\Sigma$ Band system of ionised cadmium deuteride. R. V. ZUMSTEIN, J. W. GABEL, and R. E. MCKAY (Physical Rev., 1937, [ii], **51**, 238—240).—Data and analyses for eight bands of the system in the range $\lambda\lambda$ 2630—2280 are tabulated. The electronic isotope displacement relative to Cd^+H is probably 4·4 cm.$^{-1}$ N. M. B.

Excitation of CuCl bands by fluorescence in cuprous chloride vapour. J. TERRIEN (Compt. rend., 1937, **204**, 565—567; cf. A., 1935, 681).—The CuCl bands are excited by light of λ $<$2370 A., the intensity of the bands increasing towards the violet with lower exciting $\lambda\lambda$. The fluorescence is probably due to the reaction $Cu_2Cl_2 + h\nu \rightarrow CuCl + (CuCl)^*$. A. J. E. W.

Excitation by resonance of the fundamental doublet of copper in cuprous chloride vapour. J. TERRIEN (Compt., rend., 1937, **204**, 679—682).—The fluorescence spectrum of Cu_2Cl_2 vapour, excited by ultra-violet radiation, contains CuCl bands (cf. preceding abstract) and the 3248–3274 A. doublet of Cu. The emission of the latter is due to resonance of Cu atoms produced by photo-dissociation of Cu_2Cl_2.
A. J. E. W.

Band spectra of SbF and BiF. G. D. ROCHESTER (Physical Rev., 1937, [ii], **51**, 486—490).—Data and analyses for new band spectra of SbF and BiF excited by active N are tabulated. The 2000—5500 A. SbF spectrum gives three groups of bands, 3600—5200, 2600—2700, and 2200—2430 A. BiF gives three systems of bands, 3050—3250, 2650—2850, and 2250—2350 A., degraded to shorter $\lambda\lambda$ and forming a triplet system with wide multiplet separations (7330 and 4800 cm.$^{-1}$). Vibrational consts. for two systems of the SbF bands are calc. N. M. B.

Spectra of neutral and ionised boron hydride. G. M. ALMY and R. B. HORSFALL, jun. (Physical Rev., 1937, [ii], **51**, 491—500; cf. Thunberg, A., 1936, 920).—Wave nos. and quantum assignments are tabulated for the $^1\Pi \rightarrow {}^1\Sigma$ and $^3\Sigma \rightarrow {}^3\Pi$ systems of BH and a new system $^2\Pi \rightarrow {}^2\Sigma$ due to BH^+. The first has been extended to include the (2, 2) band, and the calc. heat of dissociation of the normal state is 3·60±0·05 e.v. The fine multiplet structure of the second system has been resolved; the (0, 0) head is at λ 3694. The third system is analogous to the green bands of the isoelectronic mol. BeH; the (0, 0) head is at λ 3766. Theory and the calculation of consts. are discussed. N. M. B.

Molecular emission spectra of metallic salts. P. MESNAGE (Compt. rend., 1937, **204**, 761—763; cf. A., 1935, 1051, 1187).—The spectra of $MnCl_2$, $FeBr_2$, and FeI_2 are described, and $\lambda\lambda$ of the principal bands given. A. J. E. W.

2700 A. absorption bands of chlorine compounds in aqueous solution. A. TOURNAIRE (Rev. Opt. théor. instr., 1935, **14**, 436—442; Chem. Zentr., 1936, i, 2694).—Aq. LiCl, NaCl, $BeCl_2$, $CaCl_2$, $MgCl_2$, $SrCl_2$, and $BaCl_2$ have an absorption band at 2800—2600 A. (max. 2700). That for LiCl is independent of temp. (20—100°) but is intensified by adding HCl. Br and I compounds have weaker bands at $\lambda\lambda$ 3000 and 3500 A., respectively, as well as bands in the far ultra-violet. H. J. E.

Variation of absorption spectra of substances in solution, and subsidiary valency as the cause of it. G. SCHEIBE (Angew. Chem., 1937, **50**, 212—219).—The widening of absorption spectra of substances when dissolved in different solvents is discussed with reference to the van der Waals forces between solute and solvent. The effect of these forces in causing polymerisation is considered.
A. J. M.

Third absorption bands of co-ordination compounds. III. Configuration of $[Codg'_2NH_3Cl]$. New type of optically active complex radicals. R. TSUCHIDA and M. KOBAYASHI (Bull. Chem. Soc. Japan, 1937, **12**, 83—85; cf. this vol., 110).—A third absorption band at $\nu = 121 \times 10^{13}$ has been found in aq. solutions of $[Codg'_2NH_3Cl]$ (dg' = dimethylglyoxime anion). Consequently a *trans* configuration is now assigned to the compound, which thus represents a new type of complex resolvable by asymmetric adsorption on quartz powder. F. L. U.

Energy states of solids with particular reference to the energy states of $Nd_2(SO_4)_3,8H_2O$. F. H. SPEDDING, H. F. HAMLIN, and G. C. NUTTING (J. Chem. Physics, 1937, **5**, 191—198).—The absorption spectrum of $Nd_2(SO_4)_3,8H_2O$ crystals has been photographed at 20°, 78°, 169°, and 298° abs. The observed multiplets are modified by the electrical field of the crystal lattice. They are not in accord with vals. of Penney and Schlapp (A., 1932, 985) calc. from paramagnetic susceptibility data. Revised methods of interpreting the measurements of Gorter and de Haas are suggested. W. R. A.

Absorption of acetone solution in the short-wave ultra-violet. H. MOHLER (Helv. Chim. Acta, 1937, **20**, 285—287).—Observations on $COMe_2$ in hexane confirm the results of Ley and Arends (A., 1931, 408). The band at 187 mμ has fine structure.
E. S. H.

Ultra-violet absorption spectra of iodoform and of other tri-iodides in solution. R. H. Potterill and O. J. Walker (Trans. Faraday Soc., 1937, **33**, 363—371).—The absorption spectra of CHI_3 and of $CMeI_3$ in EtOH and in *cyclo*hexane solution over the range 2000—4000 A. are very similar to one another, but differ from the I_3' absorption spectrum. The absorption spectra of PI_3, AsI_3, and SbI_3 in *cyclo*hexane have also been measured. Nearly all mols. containing 3 or 4 I atoms linked to a central atom have two absorption bands in the region 2800—4000 A, but their max. vary with the nature of the central atom. J. W. S.

Ultra-violet absorption spectra of the molecules $CH_3{\cdot}NH_2$, $CD_3{\cdot}NH_2$, $CH_3{\cdot}ND_2$, and $CD_3{\cdot}ND_2$. T. Förster and J. C. Jungers (Physikal. Z., 1937, **38**, 140—141).—The frequencies of bands in the ultra-violet absorption spectra of the above mols. may be expressed by $\nu = n_1\omega_1 + n_2\omega_2$ where ω_1 and ω_2 are the fundamental frequencies, and n_1 and n_2 are integers. The vals. of ω_1 and ω_2 (in cm.$^{-1}$) are, for NH_2Me 668 and 1015, for $NH_2{\cdot}CD_3$ 610 and 871, for $ND_2{\cdot}CD_3$ 500 and 823, and for ND_2Me, 516 and approx. 1000, respectively. A. J. M.

Spectrochemical study of colours derived from quinoneimine. T. Uémura and M. Abé (Bull. Chem. Soc. Japan, 1937, **12**, 59—70; cf. A., 1935, 913).—Absorption curves have been determined over the range λ 2500 to 6000 A. for solutions of $NH{:}C_6H_4{:}O$ (I) and $NH{:}C_6H_4{:}NH$ (II), and of derivatives formed by substituting Me, Cl, Ph, $NH_2{\cdot}C_6H_4$, $NMe_2{\cdot}C_6H_4$, and $NHPh{\cdot}C_6H_4$ in the NH of (I), and Me, Cl, Ph, and $C_6H_3Me{\cdot}OH$ in one or both NH groups of (II). The effect of the various substituents on the absorption of the parent substances is described. F. L. U.

Spectrochemistry of nitrogenous substances. Absorption and structure of amides and imino ethers. (Mlle.) Ramart-Lucas and M. Grunfeld (Bull. Soc. chim., 1937, [v], **4**, 478—481).—Comparison of the ultra-violet absorption spectra of mono- and di-substituted arylamides has not given information on the structure of these compounds. E. S. H.

Fluorescence of *cyclo*hexane. S. M. Mitra (Phil. Mag., 1937, [vii], **23**, 558—562).—Two bands are observed using Hg light, one intense in the ultra-violet λλ 3342—2650 A., max. 2900 A., due to fluorescence of *cyclo*hexane; the other weak in the blue-violet, max. λ 4000 A., due to a photodecomp. product. F. J. L.

Chemical war materials. IV. Absorption of ββ'-dichlorodiethyl sulphide in the short-wave ultra-violet. H. Mohler (Helv. Chim. Acta, 1937, **20**, 287—288; cf. A., 1936, 545).—Solutions of $(CH_2Cl{\cdot}CH_2)_2S$ in hexane and in EtOH have absorption bands at 202 and 180 mμ. E. S. H.

Absorption spectra of certain hydronaphthalenes. W. Kemula and B. L. Dunicz (Rocz. Chem., 1937, **17**, 36—41).—Morton's results (A., 1934, 941) for 1 : 2- and 1 : 4-di- (I) and 1 : 2 : 3 : 4-tetra-hydronaphthalene (II) are on the whole confirmed, except that new bands at λ 258·5 have been found for (I) and (II), and that the bands at λ 283 and 287 mμ, found by Morton for (II), are due to presence of $C_{10}H_8$ in the (II). R. T.

Absorption and deformation of valency angles in the case of phenylhydrazones. (Mme.) Ramart-Lucas, J. Hoch, and M. Martynoff (Bull. Soc. chim., 1937, [v], **4**, 481—499).—The absorption spectra of several phenylhydrazones, methylphenylhydrazones, and aminoanils have been determined. All the hydrazones studied have the structures usually ascribed to them; if isomerides are formed they can exist only in small proportions. Variations of absorption with the no. and nature of radicals bound directly to the $C{:}N{\cdot}N{\cdot}CH$ group are ascribed to deformation of valency angles or rearrangement of electrons. E. S. H.

Absorption of R_1–R_1 systems. I. Spectra of cholestenone, cholestenoneoxime, mesityl oxide, pulegone, and carvone. H. Mohler (Helv. Chim. Acta, 1937, **20**, 289—293).—Absorption spectra for solutions in hexane and in EtOH have been determined. E. S. H.

Ultra-violet absorption of binary liquid mixtures. X. System benzene–heptane. M. Pestemer and T. Langer (Monatsh., 1937, **70**, 20—25; cf. A., 1935, 428).—Measurements on 8 mixtures indicate that Beer's law is obeyed at low, but not at high, $[C_6H_6]$ in these mixtures. J. W. S.

Re-emission of visible light and the coloration by ultra-violet light of certain crystals. J. H. Hibben (Physical Rev., 1937, [ii], **51**, 530).—Large MgO crystals under ultra-violet radiation, particularly Hg 2536 A., become deep purple. On removing the source, decolorisation begins, very rapidly initially, but at a rate decreasing as a function of time. There is simultaneous emission of light in the visible and into the near infra-red. The rate of re-emission is markedly increased at higher temp., or by irradiation of the coloured crystal by Hg 4358 A. The phenomenon is attributed to a type of electron migration and recombination. N. M. B.

Absorption of ionic crystals in the ultra-violet. E. G. Schneider and H. M. O'Bryan (Physical Rev., 1937, [ii], **51**, 293—298; cf. Hilsch, A., 1930, 395).—Absorption curves for <1600 A., were obtained for alkali halides in the form of films of approx. 0·05 μ thickness distilled on to LiF plates 1 mm. thick which are transparent to 1050 A. Additional bands below 1600 A. of widths 0·3—1·3 e.v. were found. Results are in agreement with calculations (cf. Hippel, this vol., 8). Mg, Ca, Ba, Zn, Cu, and Ag halides show only a series of sharp absorption edges with continuous absorption towards shorter λλ. N. M. B.

Theory of coloured crystals. D. Blochinzev (Physikal. Z. Sovietunion, 1936, **10**, 431—441).—Theoretical. H. J. E.

Binding of excess of potassium in potassium halide crystals. O. Stasiw (Nachr. Ges. Wiss. Göttingen, Math.-phys. Kl., 1936, **2**, 1—7; Chem. Zentr., 1936, i, 2699).—Migration of excess of K atoms into alkali halide crystals containing Tl produces new absorption centres. H. J. E.

Velocity of exchange of protons and deuterons between water molecules. K. Wirtz (Z. Physik, 1937, **104**, 613—618).—The transmission of a 50% mixture of H_2O and D_2O at 1·7 μ was measured as soon after mixing as possible (20 sec.). No change was observed on keeping. At this λ transmissions of H_2O, D_2O, and 50% mixture are in the ratios 13 : 36 : 17·5, respectively. All exchange reactions take place in <20 sec. H. C. G.

Reflecting power of H_2O, HDO, and D_2O in the infra-red spectrum. F. Matossi and H. Bluschke (Z. Physik, 1937, **104**, 580—583).—Measurements were made with a recording spectrograph and max. were found at 3·18 μ and 6·4 μ for H_2O, 4·18 μ and 8·6 μ for D_2O, and at 3·18 μ, 4·18 μ, and 7·25 μ for HDO. Results are discussed in relation to theory. H. C. G.

Absorption of liquid water between 2·5 μ and 6·5 μ. E. Ganz (Ann. Physik, 1937, [v], 28, 445—457).—The bands of liquid water at 3 μ, 4·7 μ, and 6 μ have been investigated between 17° and 84°. Changes of λ from lower to higher temp. are approx. −0·02 μ, +0·16 μ, and +0·04 μ, respectively, for the three bands. The 4·7 μ band is considered to be due to water complexes, but its intensity is not much reduced even at 84°. Solutions of $MgCl_2$, KI, and $NaClO_4$ (~ 10*N*) were examined and the 4·7 μ band showed the greatest changes. A. E. M.

Position of the CH bands of halogenated derivatives of saturated hydrocarbons, and the electric moment of their molecules. P. Barchewitz (Compt. rend., 1937, **204**, 677—679; cf. A., 1927, 918; 1933, 1228).—The displacement of the CH bands depends on the disposition and magnitude of the electric moments of the individual bonds in the mol.; it is not directly related to the total moment of the mol., and is not a mass effect. A. J. E. W.

Deformation vibration of the acetylene molecule. W. H. J. Childs and H. A. Jahn (Z. Physik, 1937, **104**, 804—806).—A criticism of Mecke and Ziegler (A., 1936, 1444). L. G. G.

Infra-red absorption of the hydrogen halides in organic solvents. D. Williams (Physical Rev., 1937, [ii], **51**, 288; cf. this vol., 8).—The solubility of HBr and HI in PhCl, $PhNO_2$, and *m*-$C_6H_4Me{\cdot}NO_2$ is very slight, but the fundamental frequencies appear to be lower than in the gas. In C_6H_6 solution the fundamental bands of HBr and HI appear at 3·9 and 4·5 μ, respectively. In all cases the absorption coeff. of the dissolved gas was > that of the free gas. The absorption of HCl was more intense than that of HBr or HI. In Et_2O solutions of HCl, HBr, and HI the solute bands were absent (cf. West, this vol., 112). N. M. B.

Infra-red absorption of liquid and gaseous 1 : 4-dioxan between 1·4 and 14·0 μ. D. S. McKinney, C. E. Leberknight, and J. C. Warner (J. Amer. Chem. Soc., 1937, **59**, 481—484).—Investigation of the spectra shows little change in passing from liquid to gas, although there is a slight displacement in the direction of higher frequencies. E. S. H.

Infra-red bands in the 3 μ region. J. J. Fox and A. E. Martin (Nature, 1937, **139**, 507).—PhOH, $CH_2Ph{\cdot}OH$, $CHPh_2{\cdot}OH$, and $CPh_3{\cdot}OH$ in CCl_4 give an intense OH band in the region 2·76 μ with the association band at 2·87—2·97 μ, λ increasing with the intensity of the band. Replacement of H by Ph in $CH_2Ph{\cdot}OH$ appears to suppress intermol. association. L. S. T.

Influence of molecule association on infra-red absorption. A. Maione (Nuovo Cim., 1935, [ii], **12**, 441—443; Chem. Zentr., 1936, i, 2695).—The 3 μ absorption band of EtOH increases in intensity in C_6H_6 solution to a max. at approx. 70% of C_6H_6. H. J. E.

Infra-red spectrum of proteins. F. Vlès and E. Heintz (Compt. rend., 1937, **204**, 567—569; cf. A., 1935, 1053; 1936, 268).—The infra-red absorption curve of serum-albumin agrees well with that predicted from the absorption of the seven chief constituent NH_2-acids. This result is discussed in relation to the structure of proteins. A. J. E. W.

Infra-red absorption spectra of four Grignard solutions. W. B. Plum (J. Chem. Physics, 1937, **5**, 172—178).—Four typical Grignard compounds in Et_2O solution and 8 related substances have been investigated between 1·0 and 13 μ. All compounds containing Mg appear to have 4 characteristic frequencies; their origin is discussed. W. R. A.

Raman spectrum of ice-like (γ) and low-melting asbestos-like (β) form of sulphur trioxide. H. Gerding and N. F. Moerman (Z. physikal. Chem., 1937, **B**, **35**, 216—222; cf. A., 1936, 922).—The β-form probably consists chiefly of chains in which each S atom is singly linked with two O atoms forming part of the chain and doubly linked with two other O, the structure being similar to that of CrO_3 (cf. A., 1931, 789). R. C.

Raman spectrum of sulphur trioxide. H. Gerding, W. J. Nijveld, and G. J. Muller (Z. physikal. Chem., 1937, **B**, **35**, 193—215).—Gaseous SO_3 has a single Raman frequency, 1069 $cm.^{-1}$ The Raman spectrum of the liquid shows it to be a mixture of single mols. and polymerised mols., probably S_3O_9. With rise in temp. equilibrium is shifted in favour of the single mols. (cf. A., 1936, 922). The SO_3 mol. has a plane structure. R. C.

Raman spectra of water, aqueous solutions, and ice. J. H. Hibben (J. Chem. Physics, 1937, **5**, 166—172).—Raman spectra of water at 28° and 88°, ice, and aq. solutions of NaOH, $Ba(OH)_2$, LiCl, KBr, $MgCl_2$, and crystals of $MgCl_2,6H_2O$ and $CdSO_4,8/3H_2O$ have been investigated with particular reference to the low-frequency Raman shifts of the H_2O spectrum. These frequencies can be explained only on the basis of intermol. interaction and this explanation is further justified by consideration of the changes in intensity with temp. The existence of certain doubtful lines has been confirmed. W. R. A.

Depolarisation of Raman lines and structure of chlorate, bromate, and iodate ions. S. T. Shen, Y. T. Yao, and T. Y. Wu (Physical Rev., 1937, [ii], **51**, 235—238).—Spectra are examined under high dispersion for the solutions, and the degree of depolarisation is measured. The strong ClO_3 930 cm.$^{-1}$ line and the IO_3 800 cm.$^{-1}$ line in solutions each consist of two lines. The presence of four lines for each ion and the measured data indicate that the ions have a pyramidal structure (cf. Slater, A., 1931, 1113). Valency force consts. are calc. N. M. B.

Raman spectrum and structure of the metaborate ion. J. R. Nielsen and N. E. Ward (J. Chem. Physics, 1937, **5**, 201).—Examination of the Raman spectrum of aq. solutions of Na metaborate failed to confirm the existence of certain lines reported by Ghosh and Das (A., 1932, 675) which led these authors to conclude that the metaborate ion was triat. and non-linear. The presence of a single Raman frequency indicates that the ion is triat. BO_2^-, symmetrical and linear, and this frequency corresponds with the totally symmetrical vibration. Approx. vals. of the force const. and of the asymmetrical longitudinal vibration are given. Possible electronic structures are reviewed. The plane ring structure $(B_2O_6)^{-3}$, proposed by Zachariasen, is ruled out. W. R. A.

Werner complexes. Raman spectrum of four- and six-coordinate compounds. J. P. Mathieu (Compt. rend., 1937, **204**, 682—683).—Data for $[Pt(NH_3)_4]Cl_2$, $[Pt\,en_2]Cl_2$, $[Rh(NH_3)_6]Cl_3$, and $[M\,en_3]Cl_4$ (M = Pt, Rh, or Ir) are recorded and discussed. Planar and tetrahedral structures for 4-coordinate bivalent Pt cannot be distinguished by Raman spectra. A. J. E. W.

Raman spectra of molecular compounds. II. Elimination of "degeneracies" of normal vibration frequencies by angular symmetry deformations in intermolecular interaction. G. Briegleb and W. Lauppe (Z. physikal. Chem., 1937, B, **35**, 42—59; cf. A., 1936, 781).—Intermol. van der Waals forces may alter the symmetry of the mols. on which they act, and if these contain no rotatable groups the valency angles may be modified, resulting in a change in the no. of Raman-active normal vibration frequencies. Solutions of $SnCl_4$ in MeOH and Et_2O exhibit additional Raman frequencies, which are interpreted as normal vibration frequencies of $SnCl_4$ deformed by compound formation with the solvent, the symmetry changing possibly from T^d to C_3^v. In the Raman spectrum of the compound of $AlCl_3$ with Et_2O the normal vibration frequencies of pure Et_2O are changed, suggesting an alteration in the symmetry and state of linking of the Et_2O by the $AlCl_3$. R. C.

Scattering of light at the surface of separation of two liquids. F. Barichanskaja (Physikal. Z. Sovietunion, 1936, **10**, 666—672).—This is studied in $PhOH-H_2O$ and $Pr^{\beta}CO_2H-H_2O$ mixtures at temp. passing through the point of complete miscibility with light of λ 4000—6000 A. The intensity of light scattered at the interface $\propto 1/\lambda^2$. L. G. G.

Influence of temperature on the combination spectrum of carbon tetrachloride in the liquid and gaseous states. S. A. Ucholin (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 270—272; cf. A., 1936, 1445).—Preliminary. The Raman spectrum of CCl_4 has been investigated from 50° to 250° for the liquid and to 270° and pressures up to 25 atm. for the gas. At high temp. the intensity of second- and third-order lines is of the same order of magnitude as that of first-order lines. The effect of temp. on the intensity and breadth of first-order lines is described. O. D. S.

Raman spectra of oxonium compounds. M. Wolkenstein and J. K. Syrkin (Nature, 1937, **139**, 288—289).—Comparison of the Raman spectra of Me_2O and equimol. mixtures of Me_2O and HCl shows the absence of new lines in Me_2O,HCl and does not support the view that the valency of O in the oxonium mol. is increased. The linking between the ether O and HCl is of a type intermediate between the chemical and the van der Waals forces, with a distance of the order of 1·3 A. between O and H. There is no change in the spectra of Et_2O,HCl compared with those of Et_2O. At 253° abs., dissociation of Me_2O,HCl is insignificant. L. S. T.

Raman spectra of ethylenic compounds of the general formula CHEt:CHR. Comparison with the compounds CH_2:CHR and CHMe:CHR. (Mlle.) B. Gredy (Bull. Soc. chim., 1937, [v], **4**, 415—422).—Data for the series CHEt:CHR (where R = Me, Et, C_5H_{11}, $CH_2{\cdot}OAc$, $CH_2{\cdot}OH$, CH_2Br, CH_2Cl, CHO, Br, or Ph) have been determined. Comparison with published data for the series CH_2:CHR and CHMe:CHR shows that, if the compounds are classed by decreasing frequency of the ethylenic linking, the order of the radicals R is the same in the three series. E. S. H.

Raman effect of gaseous methyl- and dimethyl-acetylenes. G. Glockler and F. T. Wall (Physical Rev., 1937, [ii], **51**, 529—530).—C_2HMe at 2·75 atm. gave Raman lines 930, 2142, and 2941, and C_2Me_2 at 1 atm. gave one line 2938 cm.$^{-1}$ Gas frequencies are compared with those for the liquids and vals. in each case are in satisfactory agreement with calculation (cf. A., 1935, 146). N. M. B.

Spectra of the di-substituted acetylenes and of the mustard oils. R. M. Badger (J. Chem. Physics, 1937, **5**, 178—180).—The observed splitting into two components of the Raman lines associated with the $C{\equiv}C$ frequency in acetylenes and with the $C{=}N$ frequency in mustard oils is explained in terms of a Fermi resonance interaction between the fundamental frequency (ν) of these linkings and the overtone of a certain other vibration approx. $\frac{1}{2}$ or $\frac{1}{3}$ of ν. Possible vals. of this second frequency are considered. W. R. A.

Oscillations of the carbon chain in the benzene molecule. P. Donzelot and J. Barriol (Compt. rend., 1937, **204**, 581—582).—Theoretical. λλ of lines in the Raman spectra of C_6H_6 and *cyclo*hexane are calc. A. J. E. W.

Scattered spectra of polymorphous and isomorphous crystals. M. Vuks (Acta Physicochim. U.R.S.S., 1937, **6**, 11—24).—Previous work on the scattered spectra of α- (I) and β-p-$C_6H_4Cl_2$ (II) (A., 1936, 547) has been extended to the study of p-$C_6H_4Br_2$ and p-C_6H_4ClBr. Comparison of the spectra shows these last two to be isomorphous with (I). The differences observed between (I) and (II), and between all the crystals and their respective liquids, are attributable to vibrations peculiar to the mol. lattice. The latter frequencies increase with lowering of temp., in conformity with the resulting changes in vol. and elasticity. Slight differences in the true Raman spectra are observed in the transition (I) → (II). The Raman spectrum of liquid (I) or (II) is unchanged between 60° and 165°. F. L. U.

Raman effect. LXIV. *cyclo*Pentane- and *cyclo*butane-carboxylic acids and derivatives. K. W. F. Kohlrausch and R. Skrabal (Monatsh., 1937, **70**, 44—53).—Data are recorded for the acids and their Me, Et, Pr$^{\alpha}$, Pr$^{\beta}$, and Bu$^{\gamma}$ esters and chlorides. J. W. S.

Raman effect. LXII. Heterocyclic six-membered rings. L. Kahovec and K. W. F. Kohlrausch (Z. physikal. Chem., 1937, **B**, **35**, 29—41).—The Raman spectra of $(CH_2)_5O$, α-trioxymethylene, paraldehyde, and piperazine have been determined. R. C.

Raman effect of some oximinoketones. M. Milone (Atti V Congr. Naz. Chim., 1936, **1**, 402—403).—The Raman spectra of solutions of 8 oximinoketones contain lines characteristic of the C:N, the C:C, and the C:O linkings. This confirms the existence of the tautomeric equilibrium, R·CO·CH:N·OH ⇌ OH·CR:C:N·OH. O. J. W.

Optical investigation of some Indian oils. III. Intensity of the scattered light. C. V. Jogarao (Proc. Indian Acad. Sci., 1936, **4**, **A**, 621—624; cf. B., 1937, 152).—The intensities of the light scattered transversely by dust-free castor, olive, coconut, groundnut, and gingelly oils have been measured by means of the rotating-sector photometer. The results for olive and castor oils are in accord with the vals. calc. from the compressibility, *n*, and depolarisation. It is concluded that the light scattered by the oils is mol. in origin. J. W. S.

Raman spectra of crystal powders. III. Exchange reactions: NH_4Cl and D_2O. R. Ananthakrishnan (Proc. Indian Acad. Sci., 1937, **5**, **A**, 175—184).—The Raman spectra of ND_4Cl, NHD_3Cl, and NH_2D_2Cl, obtained by exchange reactions, are recorded and compared with that of NH_4Cl. After crystallisation from the D_2O–H_2O mixture remaining from the exchange reaction, $SrCl_2$ shows Raman frequencies not present in $SrCl_2,6H_2O$. J. W. S.

Excitation of Raman spectra with the aid of "optical catalysers." R. V. L. Hartley (Nature, 1937, **139**, 329).—Theoretical. L. S. T.

Optics of white mists. I. Scattering of light as a function of the relation between the particle radius and wave-length. I. D. Gurevitsch and T. I. Veitzer (J. Phys. Chem. Russ., 1936, **8**, 653—664).—Moist fumes of SO_3 and λλ 455, 510, and 610 mμ were used. The intensity I of the scattered light is max. when $2\pi\rho/\lambda = 2{\cdot}9$—$3{\cdot}1$ (ρ radius of the particle, λ wave-length in the air). At a const. ρ $I \propto \lambda^n$; at $\rho = 1{\cdot}8\times10^{-5}$ cm. n is 4·5—6·0, whilst at $\rho = 3{\cdot}6\times10^{-5}$ cm. it is 1·4—2·2. J. J. B.

Emission of a radiation by the eggs of *Discoglossus* during development.—See A., III, 132.

Dependence of luminescence on physical structure in zinc borate compounds. D. H. Kabakjian (Physical Rev., 1937, [ii], **51**, 365—368).—The prep. of luminescent ZnB_2O_4 compounds, mutually convertible by physical means into vitreous or cryst. form, is described, and the dependence of luminescence on physical structure is investigated. The vitreous → granular change increases the luminescence many times. The compounds can be made luminescent without the addition of an activator, but the presence of the latter results in a condensation of the emission bands and an increase in their λ. N. M. B.

Visible luminescence of pure liquids under the influence of hard β-rays. P. A. Tscherenkov (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 101—105; cf. A., 1934, 938).—The luminescence induced in liquids by β-rays has the same characteristics as that produced by γ-rays. For a no. of liquids the intensity of luminescence is inversely ∝ the d of the liquid and independent of n. O. D. S.

Angular distribution of the intensity of the luminescence excited in pure liquids by γ-rays. P. A. Tscherenkov (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 105—108).—The intensity of the luminescence excited in H_2O is max. at an angle of 30° to the direction of the primary beam. O. D. S.

Coherent visible radiation of fast electrons passing through matter. I. Frank and I. Tamm (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 109—114; cf. preceding abstract).—Mathematical. A theory in agreement with the results of Tscherenkov is developed on the hypothesis that the visible luminescence is due to radiation by electrons moving uniformly with velocity > the velocity of light in the medium. O. D. S.

Resolution and interpretation of the luminescent spectra of some solids at low temperatures. J. Ewles (Proc. Leeds Phil. Soc., 1937, **3**, 277—280).—Resolution has been effected of the broad band luminescent spectra at liquid air temp. of certain solids requiring the presence of a trace of impurity. Data and interpretations are tabulated for CaO–Bi and indicate that the luminescence is derived from an atom or ion of the parent lattice still associated with the lattice. A theory of phosphorescence based on the experimental ubiquity of the metastable levels is proposed. N. M. B.

Fluorescence of the bivalent rare earths. K. Przibram (Nature, 1937, **139**, 329; cf. A., 1935, 282).—After exposure to Ra rays, $CaSO_4$ containing approx. 10^{-3} of Tm gives a brilliant red fluorescence in ultra-violet light at liquid air temp. L. S. T.

Fluorescence of fluorite. V. Fluorescence of europium dichloride and alkali halide–europium phosphors. K. Przibram (Sitzungsber. Akad. Wiss. Wien, 1935, [*iia*], **144**, 141—149; Chem. Zentr., 1936, i, 2898—2899).—Pure $EuCl_2$ shows a fluorescence band in the blue, corresponding with the blue fluorite bands, a sharp band at 6900 A., and a diffuse red band resembling that of fluorite. The fluorite fluorescence is thus probably attributable to Eu (II). On crystallising $EuCl_3$ with Na halides (except NaF), the product shows the blue fluorescence band after irradiation with Ra, or after heating, due to the reduction of Eu to a bivalent complex. 10^{-9} g. of Eu in NaCl may be detected. Afterglow and thermoluminescence phenomena are described. J. S. A.

Excitation of coloured gelatin phosphors. P. Frölich and Z. Gyulai (Z. Physik, 1937, **104**, 549—552).—Gelatin coloured with various dyes (notably rhodulin-orange *N*) shows a greatly increased phosphorescence after long previous irradiation with white light. The effect reaches a sharp max. at dye concns. of the order of 10^{-3} g. of dye per g. of dry gelatin. The effect disappears on warming the gelatin to its m.p. H. C. G.

Change of photo-voltaic effect with the time of illumination. G. Athanasiu (Bul. Fac. Ştiinţe Cernauţi, 1935, **8**, 316—326; Chem. Zentr., 1936, i, 2705).—With sufficiently intense radiation in a galvanic chain such as Hg–Hg_2I_2 the voltage reaches a const. max. in several min. H. J. E.

Metallic photo-resistance. Q. Majorana (Nuovo Cim., 1935, [ii], **12**, 409—417; Chem. Zentr., 1936, i, 2704). H. J. E.

Photo-electric and other optical measurements with silver, zinc, and fuchsin. H. Hlučka (Z. Physik, 1937, **104**, 653—657).—Recent work on photo-electric effects, surface reflexion of polarised light, and other optical properties of Zn, Ag, and fuchsin is correlated and summarised. H. C. G.

Secondary emission of an oxygen–cæsium electrode. P. V. Timofeev and A. I. Pĭatnitzki (Physikal. Z. Sovietunion, 1936, **10**, 518—530).—The dependence of the secondary emission on the thickness of the Ag_2O film in the substrate, on the nature of the supporting metal (Ag, Ni, Cu, Mo, W), and on the proportion of free Cs, was studied. H. J. E.

Ionisation and dissociation of molecules by electron impact. W. Bleakney, E. U. Condon, and L. G. Smith (J. Physical Chem., 1937, **41**, 197—208).—The ionisation potentials recorded by the mass spectrograph (A., 1932, 788) for the positive ions produced by electron impact in CH_4 have been measured and equations representing the formation of the ions are suggested. Published data for H_2, C_2H_2, and $(CN)_2$ are discussed. F. R. G.

Passage of current through thin aluminium oxide layers in discharge tubes. H. Kessel (Z. tech. Physik, 1935, **16**, 506—508; Chem. Zentr., 1936, i, 2705).—The conductivity of an Al_2O_3 layer produced electrolytically depends on the composition of the layer. Conductivity data for various films are given. H. J. E.

Effect of CCl_4 vapour on the dielectric strength of air. M. T. Rodine and R. G. Herb (Physical Rev., 1937, [ii], **51**, 508—511).—Curves for data obtained over 15—75 lb. per sq. in. air pressure are given: at 25° and 15 lb. pressure the dielectric strengths of the mixtures relative to pure air were 1·25—1·80 for 5—100% saturation with CCl_4. At higher pressures the % increase relative to pure air is < at 15 lb. N. M. B.

[Dielectric losses at frequencies of 1—5 × 10^8 Hz.] L. Rohde (Z. tech. Physik, 1935, **16**, 637—639; Chem. Zentr., 1936, i, 2509—2510). Measurements are described and data for 12 media are tabulated. H. J. E.

Effect of temperature on the dipole conductivity of alcohols. W. Hackel (Physikal. Z., 1937, **38**, 195—199).—The dipole conductivity of EtOH, $Pr^{\alpha}OH$, and $Bu^{\alpha}OH$ was determined at 20—40°. The relationship between the relaxation time (t') determined from the transition wave-length λ_s, n, and the dielectric const., and the relaxation time (t) calc. from the mol. vol. and viscosity is $t' = at - b$ (a and b const.). A. J. M.

Dipole moment of sulphur trioxide. A. Smits, N. F. Moerman, and J. C. Pathuis (Z. physikal. Chem., 1937, **B**, **35**, 60—68).—The dipole moment of SO_3 vapour is zero, showing that the mol. has a plane configuration, and that polymerisation in the liquid and solid state is not due to dipole association. R. C.

Dielectric constant of liquid sulphur trioxide. A. Smits and N. F. Moerman (Rec. trav. chim., 1937, **56**, 169—173).—The dielectric const., ε, of liquid SO_3 has been measured between 12° and 28° and that of the ice-like form of the solid between 12° and the triple point (16·85°). The ε–temp. curve is not discontinuous at the m.p., from which it is inferred that the polymerised mols. present in the liquid and the solid are $(SO_3)_3$, which have zero dipole moment and apparently a plane configuration. R. C.

Dipole moments of some aliphatic aldehydes. J. R. Partington and D. I. Coomber (Nature, 1937, **139**, 510).—The moments of MeCHO, EtCHO, $Bu^{\alpha}CHO$, and $Bu^{\beta}CHO$ in C_6H_6 at 20° are 2·49, 2·54, 2·57, and 2·60 × 10^{-18}, respectively. L. S. T.

Dipole moment and structure of pyrones. 2 : 6-Dimethyl-γ-pyrone, xanthone, and coumarin. M. A. G. Rau (Proc. Indian Acad. Sci., 1936, **4**, A., 687—697).—The dipole moments have been determined in C_6H_6 solution and at 10°, 20°, 30°, and 40°. The vals. for 20° are 2 : 6-dimethyl-γ-pyrone 4·48, xanthone 2·93, and coumarin 4·51, all × 10^{-18} e.s.u. The high vals. are attributed to resonance between unexcited states of low moment and excited states of high moment, the lower val. for xanthone being due to the greater no. of unexcited parent states in the latter. J. W. S.

Dipole moment and structure of some cyclic anhydrides: phthalic, succinic, and citraconic anhydrides. M. A. G. Rau and N. Anantarayanan (Proc. Indian Acad. Sci., 1937, **5**, A., 185—192).—The dipole moments at 20° of phthalic and citraconic anhydrides in C_6H_6 solution, and of succinic anhydride in dioxan solution, are 5·25, 4·27, and 4·20 (all × 10^{-18}) e.s.u., respectively. The vals. are very high compared with the corresponding imides, and are interpreted as due to a strong resonance structure which reverses the normal direction of moment expected from vectorial addition. J. W. S.

Accurate representation of the refractivity and density of distilled water as a function of tem-

perature. L. W. Tilton and J. K. Taylor (J. Res. Nat. Bur. Stand., 1937, 18, 205—214).—The applicability of an equation of the type $n_t - n_{20} = \{B(t-20)^3 + A(t-20)^2 + C(t-20)\}/\{(t+D) \times 10^7\}$ to the temp. variation of n for a given λ has been statistically examined. A similar equation has been fitted to Chappuis' vals. for d for H_2O, and a revised table is given. A. J. E. W.

Refractive index of water for 8—24 cm. electromagnetic waves. T. T. Goldsmith, jun. (Physical Rev., 1937, [ii], 51, 245—247).—λλ were measured in air and H_2O for continuous waves produced by magnetron and positive grid oscillators. A decrease in n with increasing frequency indicates a start of the drop towards the infra-red val. N. M. B.

Refractive index of heavy ammonia and heavy hydrogen chloride in the visible. O. E. Frivold, O. Hassel, and S. Rustad (Physikal. Z., 1937, 38, 191—195; cf. A., 1936, 1322).—n for NH_3 and HCl, measured by an interferometer method, for λλ between 4358·3 and 6562·9 A. are slightly $> n$ for ND_3 and DCl. A. J. M.

Geometrical properties of the carbon tetrahedron, and the exaltation of *MR* of certain diolefines. V. S. Gutiria (J. Gen. Chem. Russ., 1937, 7, 212—218).—Theoretical. R. T.

Refractive indices and dispersions of gases and vapours. Substituted methanes and ethane, *cyclo*propane, ethylene oxide, and benzene. K. L. Ramaswamy (Proc. Indian Acad. Sci., 1936, 4, **A**, 675—686).—The refractive indices (n) of MeF, MeCl, MeBr, MeI, EtCl, CH_2Cl_2, $CHCl_3$, CCl_4, NH_2Me, *cyclo*propane, Me_2O, C_6H_6, MeOH, $COMe_2$, MeCN, and Me_2O have been measured for λλ 6440, 5462, 5087, 4801, and 4360 A., and for different pressures, the dispersions and compressibilities of the gases being calc. n has also been measured for liquid C_6H_6, CCl_4, $CHCl_3$, CH_2Cl_2, MeCN, MeI, MeOH, and $COMe_2$ at 5462 and 4360 A. Both the mol. refractivities and mol. dispersions are slightly higher for the vapours than for the corresponding liquids. The vals. of the electronic polarisation are calc. and compared with the dielectric polarisations (cf. A., 1936, 1182), the at. polarisations being calc. J. W. S.

Maxwell effect in some organic liquids. A. B. Rao (Proc. Indian Acad. Sci., 1937, 5, **A**, 124—127).—$C_7H_{15}\cdot OH$ and $C_8H_{17}\cdot OH$ show a Maxwell const. in accord with that calc. from the Raman–Krishnan theory, but the vals. for $C_6H_{13}\cdot CO_2H$ and $C_8H_{17}\cdot CO_2H$ are $\gg$ the calc. vals. This is attributed to mol. association. The val. for NH_2Ph is in accord with theory, whilst that for $PhNO_2$ is too high. J. W. S.

Magneto-optical dispersion of organic liquids in the ultra-violet region of the spectrum. X. Magneto-optical dispersion of *iso*amyl acetate, methyl *iso*valerate, and acetone. (Miss) B. P. M. Walters and E. J. Evans (Phil. Mag., 1937, [vii], 23, 791—806; cf. this vol., 13).—Data for the three liquids are tabulated, and equations for n and for magneto-optical dispersion $n\delta$, where δ is Verdet's const., are deduced. N. M. B.

Kerr effect of nitrobenzene in benzene. H. Friedrich (Physikal. Z., 1937, 38, 139).—The Kerr effect has been studied for $PhNO_2$ in C_6H_6 at concns. from 0 to 100 mol.-%. The val. of the Kerr const. in the solution is compared with the vals. obtained for $PhNO_2$ in the vapour state, thus giving a measure of the hindrance to rotation of the mols. in the liquid. The curve of E/kT (E = energy of mols.) against mol. fraction of $PhNO_2$ is not linear. A. J. M.

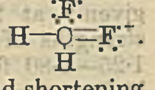
Molecular symmetry of thiophen. I. G. B. Bonino (Atti R. Accad. Lincei, 1936, [vi], 24, 288—294).—A detailed account of work already noted (this vol., 10). O. J. W.

Maximum valency of elements and atomic structure. X. Chemical linkages in complex ammoniates. B. Ormont (Acta Physicochim. U.R.S.S., 1937, 6, 115—130; cf. this vol., 66).—The quantum characteristic of the valency electrons of the central atom and the steric factor are used as a basis for the classification of complex ammoniates. The NH_4 ion is not considered to have the form of a tetragonal pyramid. F. L. U.

Dithio-salts of copper. L. Cambi and C. Coriselli (Gazzetta, 1936, 66, 779—784).—The relative stability, magnetic behaviour, and structure of the Cu salts of dithiocarbamic and dithiocarboxylic acids are discussed. The prep. of the salts is described. O. J. W.

Resonance in carbamide and its derivatives. I. Diamagnetics. A. Clow (Trans. Faraday Soc., 1937, 33, 381—388).—The diamagnetic susceptibilities of $CO(NH_2)_2$ and of 18 of its derivatives indicate that the structure changes from a resonating "zwitter-ion" in $CO(NH_2)_2$ through an amino-imino structure in $NH_2\cdot CO\cdot NHMe$, $NH_2\cdot CO\cdot NH\cdot CH_2\cdot OH$, $NH_2\cdot CO\cdot NHEt$, $NH_2\cdot CO\cdot NHPr$ and $NH_2\cdot CO\cdot NHPh$ to a carbamide structure in a tetra-substituted mol. A $\mathrm{C}\vdots\vdots\mathrm{N}$ group in the mol. resonates between $\mathrm{C}\vdots\vdots\ddot{\mathrm{N}}\colon$ and $\mathrm{C}\colon\underset{\cdot\cdot}{\ddot{\mathrm{N}}}\colon^{-}$. J. W. S.

Constitution of cyanogen halides. E. Oliveri-Mandalà and L. Irrera (Atti V Congr. Naz. Chim., 1936, 2, 423—426).—Since CNBr and CNI react with HN_3 to give the 5-halogenotetrazoles it is probable that these cyanogen halides have the N≡C—X structure, and not the carbylamine or tricyclic structures. CNCl reacts in a different manner with HN_3, but the product has not been identified. O. J. W.

Structures of the chlorofluoromethanes and the effect of bond type on chemical reactivity. L. O. Brockway (J. Physical Chem., 1937, 41, 185—195).—Vals. of the C–F distance obtained by the electron diffraction method (A., 1935, 18) are recorded. In agreement with the greater stability observed by Henne and Midgley (A., 1936, 961), the linking is shorter in the chlorofluoromethanes than in MeF. A marked shortening for those compounds containing CF_n (n = 2, 3, or 4) is attributed to a 10% contribution by resonance structures such as  $\mathrm{H{-}\underset{H}{\overset{:\ddot{F}:^{-}}{C}}{=}\ddot{F}\colon^{-}}$. A similar theory does not explain the bond shortening in SiF_4 and PF_3. F. R. G.

Molecular structure and van der Waals forces. E. Mack, jun. (J. Physical Chem., 1937, **41**, 221—231).—The author's theory of the structure of crystals (A., 1932, 904) is interpreted on the basis of van der Waals forces, and is used to explain the physical properties of solids. F. R. G.

Investigations of molecular structure of organic compounds. G. B. Kistiakowsky (J. Physical Chem., 1937, **41**, 175—183).—Methods of calculating resonance energies involve so many approximations that only qual. agreement with experimental bond energies can be expected. A comparison of heats of hydrogenation of certain unsaturated compounds, however, shows good agreement. F. R. G.

Quantum theory of valency. S. Dushman and F. Seitz (J. Physical Chem., 1937, **41**, 233—248).—A review of the literature dealing with the cohesive energy of matter, from which it is concluded that electrostatic forces alone are involved. F. R. G.

Evaluation of certain integrals occurring in studies of molecular structure. C. A. Coulson (Proc. Camb. Phil. Soc., 1937, **33**, 104—110; cf. Coolidge, A., 1933, 10). O. D. S.

Criterion of maximum overlapping of wave functions. C. A. Coulson (Proc. Camb. Phil. Soc., 1937, **33**, 111—114).—The validity of the criterion developed by Pauling and Slater (cf. A., 1931, 1356) is discussed and is shown to be limited. O. D. S.

Low electronic states of simple heteropolar diatomic molecules. III. Hydrogen and univalent metal halides. R. S. Mulliken (Physical Rev., 1937, [ii], **51**, 310—332; cf. this vol., 66).—Theoretical. N. M. B.

Dissociation of N_2^+. R. K. Asundi and R. Samuel (Nature, 1937, **139**, 375).—A discussion of the correlation of the ground level and the second excited level of the mol. N_2^+, which shows that an unpaired electron weakens a chemical linking even if it is in a bonding orbital. The general identification of non-premoted with bonding and of premoted with antibonding electrons is contradicted. L. S. T.

Theory of the electronic energy levels of simple hydrides. J. R. Stehn (J. Chem. Physics, 1937, **5**, 186—191).—Mathematical. A simplified form of the Heitler–London theory is applied to the energy levels of BH, CH, NH, OH, and FH. The energies of certain unobserved states are predicted. W. R. A.

Mass-spectrograph determination of nuclear binding energies. J. Mattauch (Naturwiss., 1937, **25**, 156—158).—The use of a double-focussing mass spectrograph (A., 1934, 1086) for the direct determination of isotopic masses is described, particularly with regard to the determination of the mass difference of doublets. Twelve different doublets ($^{12}C^1H_3$—^{15}N) were investigated. The advantage of the apparatus is that no calibration of the dispersion scale by means of a pair of lines of which the mass difference has been determined by another method is necessary. A. J. M.

Stability of molecular and ionic lattices of hydrogen halides and alkali halides. T. Neugebauer (Z. physikal. Chem., 1937, B, **35**, 129—138).—The various components of the lattice energy of a hypothetical HCl ionic crystal have been calc. The results show that it is the polarisation energy, E, which is responsible for the H halides being diat. gases whilst the alkali halides are ionic crystals. E can be large only if the cation is a proton. If the cation is not a proton, then owing to the Fermi repulsion of the charge clouds the polarisation energy set free in mol. formation cannot overcompensate the electrostatic energy gain in the formation of an ionic lattice. Hydrides in which H is the anion crystallise in ionic lattices owing to the Fermi repulsion. R. C.

Bond moment and electronegativity. C. P. Smyth (J. Physical Chem., 1937, **41**, 209—219).—Dipole moments of non-C bonds are alone consistent with Pauling's electronegativity scale, which should be used in considering reactivity, since potential energy may arise from compensating charge shifts not measured by the bond moments. The moment of C–H is calc. by Mulliken's equation (A., 1935, 1306) as 0·3D whereas Pauling's scale requires 0·7D. F. R. G.

Electronic structure of methane. C. A. Coulson (Trans. Faraday Soc., 1937, **33**, 388—398).—The method of mol. orbitals is applied to a study of the ground state and some excited levels of CH_4. Assuming effective nuclear charges, 0·9e on each H-nucleus and 1·72e on the C-nucleus yields the correct binding energy and fair accord with the crit. potentials. J. W. S.

Free rotation of the C–C linking in ethane and butadiene. E. Bartholomé and J. Karweil (Naturwiss., 1937, **25**, 172—173).—The infra-red spectrum of butadiene (I) contains an unsplit band at 520 cm.$^{-1}$ indicating that at least 90% of the mols. exist in a form which is rotation-symmetrical. This can only be the case if the two vinyl radicals can rotate freely. The hindrance to free rotation in (I) is due to the attraction of H atoms, the interaction of the more distant CH_2 not being effective. It follows that the rotation in C_2H_6 must be more restricted than in (I), about 50% of the mols. having free rotation. This agrees with the work of Eucken *et al.* (A., 1934, 20) and Bartholomé *et al.* (A., 1935, 1189), but not with that of Howard (this vol., 112). A. J. M.

Intrinsic values of C–C and C–H linkings in hydrocarbons. M. Brutzcus (Compt. rend., 1937, **204**, 490—492).—A general equation is developed for calculating the sum of the intrinsic bond energies of a hydrocarbon from the heat of combustion. Deduced vals. for the C–C and C–H linkings in aliphatic hydrocarbons are 223·5 and 167·7 kg.-cal., respectively. A. J. E. W.

Calculation of fundamental plane modes of vibration of the molecules C_2H_4, C_2D_4, and $C_2D_2H_2$. A. Verleysen and C. Manneback (Ann. Soc. Sci. Bruxelles, 1937, **57**, 31—38; cf. A., 1936, 1324; this vol., 67).—Diagrams of the modes of vibration of the above mols. corresponding with the various frequencies are given. A. J. M.

Potential constants of tetrachloroethylene. J. Duchesne (Nature, 1937, **139**, 288).—Calc. vals. of the forces linking different at. groupings in C_2Cl_4 are at variance with the ordinary chemical conception of its structure. L. S. T.

Force constants and structure. J. W. Linnett and H. W. Thompson (Nature, 1937, **139**, 509—510).—Structural problems, such as resonance, can be studied in certain cases from calculations of the force consts. of linkings from known vibration frequencies. Structures of C_2Cl_4 and CNCl are thus discussed. L. S. T.

Group theory and vibrations of polyatomic molecules. (Miss) J. E. Rosenthal and G. M. Murphy (Rev. Mod. Physics, 1936, **8**, 317—346).—Mathematical. The derivation of the no. and types of fundamental vibration frequencies of mols., and their evaluation, are discussed (cf. A., 1933, 339; 1934, 946). Selection rules for Raman and infra-red frequencies are given (cf. A., 1933, 553). J. G. A. G.

Substitution reactions of substituted benzenes. E. Hückel (Z. physikal. Chem., 1937, **B**, **35**, 163—192).—Theoretical. A crit. examination of the theory previously advanced (A., 1931, 1356) and that of Wheland and Pauling (A., 1936, 14) has shown that as yet no satisfactory calculation of the perturbation of the charge distribution in aromatic mols. caused by substituents has been achieved. It is uncertain whether either theory is generally valid. The influence of the polarisability effect on substitution appears to be hypothetical. R. C.

Molecular constitution of naphthalene. G. B. Bonino (Gazzetta, 1936, **66**, 827—843).—From a consideration of the data of Raman and infra-red spectra the most probable configuration of the fundamental level of $C_{10}H_8$ appears to be symmetrical of the D_{2h} type. Quantum-mechanical discussion shows that the formula of Willstätter and Waser (A., 1912, i, 17) represents not the fundamental but the first excited level of $C_{10}H_8$. O. J. W.

Exchange of energy and matter at bounding surfaces. A. Eucken (Naturwiss., 1937, **25**, 209—218).—A review of work on transference of energy and matter at solid–gas interfaces, dealing particularly with the condensation of vapours on cooled surfaces. A. J. M.

Theory of the liquid state. H. Eyring and J. Hirschfelder (J. Physical Chem., 1937, **41**, 249—257).—Coeffs. of thermal expansion and compressibility calc. from the relation between the free and actual vol. of liquids are, with certain exceptions, in agreement with observed vals. F. R. G.

Theory of metallic binding. IV. P. Gombas (Z. Physik, 1937, **104**, 592—603; cf. A., 1936, 925).—Calculations based on earlier experimental work show that for Ca, Sr, and Ba, the lattice energies and the compressibilities are $\propto$ $1/R$ and R^4, respectively, where R = radius of elementary ionic sphere in the equilibrium position. Applicability to the cases of Cu, Ag, Au, Zn, Cd, and Hg is discussed. L. G. G.

Vibrations of a face-centred cubic lattice. C. Strachan (Phil. Mag., 1937, [vii], **23**, 590—597).—Mathematical. F. J. L.

Some properties of the vibrational spectrum of a lattice. M. Blackman (Proc. Camb. Phil. Soc., 1937, **33**, 94—103; cf. A., 1935, 573).—Mathematical. O. D. S.

Internuclear distance in Te_2. M. L. Huggins (J. Chem. Physics, 1937, **5**, 201).—The internuclear distance, 2·59 A., deduced from electron diffraction results agrees better with the val. calc. by Huggins' semi-empirical formula than with that calc. from the rotational band spectrum consts. W. R. A.

Atomic radii from parachor data and from electron-diffraction data. N. S. Bayliss (J. Amer. Chem. Soc., 1937, **59**, 444—447).—Revised at. parachor consts. have been calc. from published data. Assuming that at. parachors are a measure of at. vol. and that the vol. of the C atom is that of a sphere of radius 0·77 A., it is found that one parachor unit = 0·210 A.^{3} Bond radii for quadrivalent atoms and packing radii for univalent atoms, calc. from this relation, are in good agreement with existing data. E. S. H.

Ionisation and pressure during the explosion of solid explosives. M. Sąsiadek (Z. Physik, 1937, **104**, 566—579).—An apparatus is described for the simultaneous recording of pressure–time and ionisation–time curves during the explosion of black and smokeless powders and K, Cu, and Ag picrates in a closed chamber. Results indicate that the ionisation (I) is due to a chemical reaction and not to the high temp. of combustion and is related to the time (t) by $I = ct^2$ where c is const. H. C. G.

Investigation of free electrons in metals with the aid of X-rays. P. Debye (Physikal. Z., 1937, **38**, 161—165).—A review of the theory of a method for determining the no. of conductivity electrons in a metal from observations of the variation with scattering angle of the intensity of the incoherent scattered radiation from the metal when irradiated with X-rays. A. J. M.

Scattering of X-rays at the conductivity electrons of beryllium. W. Scharwächter (Physikal. Z., 1937, **38**, 165—176).—The method of Debye for determining the no. of conductivity electrons in a metal (see preceding abstract) was applied to Be. Experiment indicates that the two electrons in the (2, 0) state are free. A. J. M.

Debye–Scherrer exposures of liquid helium. W. H. Keesom and K. W. Taconis (Physica, 1937, **4**, 256; cf. this vol., 117).—Measurements with He I are corr. H. J. E.

Energy measurement of X-rays. I, II. E. Császár (Math. nat. Anz. ung. Akad. Wiss., 1935, 52, 1—35; Chem. Zentr., 1936, i, 2502).—An instrument is described in which the X-rays are absorbed by a Pb–W alloy and the resulting temp. rise is measured with a Ag–Te thermoelement. H. J. E.

Variation in brightness along Kossel lines. M. von Laue (Ann. Physik, 1937, [v], **28**, 528—532). A. J. M.

Formation of new nuclei in crystallisation. I. Dependence of the time of incubation on the deformation and heating conditions. M. O. Kornfeld (J. Exp. Theor. Phys. U.S.S.R., 1935, **5**, 556—562).—Al wires tempered at 410° were deformed by tension and allowed to recrystallise at 300°. The rate of nuclei formation in samples deformed 4·5—7·0% increased more rapidly than linearly with time and deformation. CH. ABS. (*e*)

Fifty years of general theory of crystal structure. W. NOWACKI (Ann. Guebhard-Séverine, 1936, **12**, 120—139).—A review.

Nature of ordinary ice. N. J. SELJAKOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 183—186; cf. A., 1936, 1326).—β-Ice is unstable and changes to the α-modification on grinding and pressing. The units of the lattices of α- and β-ice are approx. equal: c/a 1·60±0·02, c 7·34±0·04 A., and a 4·52±0·03 A. The probable no. of mols. in unit lattice of both forms is 4. O. D. S.

Structure of some aqueous solutions of electrolytes. V. I. DANILOV (Physikal. Z. Sovietunion, 1936, **10**, 673—685).—The influence of various dissolved ions (Li^+, Na^+, Cl^-) on the structure of H_2O is studied by means of photomicrograms from *X*-ray diffraction patterns. Results are discussed in the light of Bernal and Fowler's theories. L. G. G.

Crystal structure and molecular symmetry of solid hydrogen peroxide. G. NATTA and R. RIGAMONTI (Gazzetta, 1936, **66**, 762—772).—*X*-Ray measurements at liquid-air temp. give a tetragonal structure for solid H_2O_2, with 4 mols. per unit cell; a 4·02, c 8·02 A., V 129 A.^{3}, $d_{\text{calc.}}$ 1·73; most probable space-group, D_4^4 or D_8^8. It is probable that all the 4 atoms of the mol. are not co-planar. The existence of the compound $H_2O_2,2H_2O$ is confirmed. No solid solutions are formed between H_2O_2 and H_2O or between H_2O_2 and $H_2O_2,2H_2O$. O. J. W.

Structure of potassium tetroxide. V. KASATOTSCHKIN and V. KOTOV (J. Phys. Chem. Russ., 1936, **8**, 620).—*X*-Ray analysis shows that KO_2 has a tetragonal side-centered lattice of the CaC_2 type; a 5·70, c 6·72 A.; the cell contains 4 K and 8 O. Distance of closest approach of two O 1·28 A. The structure is analogous to those of SiO_2 and BaO_2; the correct formula is thus KO_2 and not K_2O_4. E. R.

Rotation of anionic polyhedra in cubic crystal lattices. III. Nitrates. C. FINBAK and O. HASSEL (Z. physikal. Chem., 1937, **B**, **35**, 25—28; cf. A., 1936, 783).—The lattice consts. of the high-temp. cubic forms of Tl, Rb, NH_4, and Cs nitrates increase in this order. This anomalous sequence may be explained by supposing that the spatial "rotation" of the anion is due to the rotational motion being perturbed by the cations. R. C.

Relations between $AlPO_4$ and SiO_2 and between aluminophosphoric acids and silicic acids. V. CAGLIOTI (Atti V Congr. Naz. Chim., 1936, **1**, 310—320).—*X*-Ray investigations show that pptd. $AlPO_4$ is amorphous. When heated for ½ hr. under fused NaCl it crystallises in a pseudo-tetragonal phase, which is probably rhombic with 4 mols. per unit cell, a 7·137, c 6·845, $d_{\text{calc.}} = d_{\text{obs.}} = 2{\cdot}31$. It is isomorphous with crystobalite, in which the Si–Si linking is equiv. to Al–P. Certain natural phosphates of Al are chemically similar to silicic acids. Wavellite has a rhombic structure, a 9·7, b 17·4, c 7·07 A., 4 mols. per unit cell. O. J. W.

***X*-Ray determination of structure of $MgNi_2$.** F. LAVES and H. WITTE (Metallwirts., 1935, **14**, 1002; Chem. Zentr., 1936, i, 3091).—Contrary to Bachmetev's views, the space-groups D_{3h}^1, D_{3h}^3, or D_{3h}^4 are possible for the $MgNi_2$ structure. J. S. A.

Basic salts. XVI. Constitution of solid basic salts of bivalent metals. III. Basic cobalt nitrates. W. FEITKNECHT (Helv. Chim. Acta, 1937, **20**, 177—188; cf. A., 1936, 1080).—The crystal structures of the green- and rose-coloured basic Co nitrates have been determined by *X*-ray analysis. The former possesses a double- and the latter a single-plane lattice. E. S. H.

Position of the sillimanite–mullite problem. W. EITEL (Ber. deut. keram. Ges., 1937, **18**, 2—11).—Mullite is now regarded as derived from sillimanite by regular replacement of 4 Si by 4 Al among 4 unit cells, with the corresponding adjustment of the O ions, thus producing a "defect lattice" (Strock, A., 1936, 1325). G. H. C.

Scattering of *X*-rays by gaseous alcohols, and limits of applicability of scattering method to [determination of structure of] light molecules. R. RAMSAUER (Z. physikal. Chem., 1937, **B**, **35**, 139—162).—From measurements of the scattering by aliphatic alcohol vapours the val. 1·46 A. has been obtained for the distance C—O. The results show that in Pr$^{\beta}$OH, Pr$^{\alpha}$OH, Bu$^{\alpha}$OH, and Bu$^{\beta}$OH there are attractive forces between the OH and Me groups, indicating that in the aliphatic C·H linking the H is negative. Pr$^{\alpha}$OH seems to be a mixture of two rotation isomerides, whilst Bu$^{\alpha}$OH has a ring-like deformed structure. Where the mol. contains light atoms the scattering method does not permit the determination of all the interat. distances. R. C.

Crystal structure of trioxymethylene. N. F. MOERMAN (Rec. trav. chim., 1937, **56**, 161—166).—The solid consists of $(CH_2O)_3$ mols., in which the C and O form a six-membered ring with an "armchair" form. The space-group is C_{3v}^6. R. C.

Isotope effect in hydrogen and hydroxyl linkings. J. M. ROBERTSON and A. R. UBBELOHDE (Nature, 1937, **139**, 504—505).—In $D_2C_2O_4,2D_2O$, m.p. 95·9—97·5°, a 6·149, c 12·074, β 106·65°, there is a small expansion of the spacings of certain crystal planes compared with $H_2C_2O_4,2H_2O$, which reaches a max. near the direction of the H linking. This effect throws light on the mechanism of the H linking. L. S. T.

Structure of isatin.—See A., II, 166.

***X*-Ray investigation of crystals of *o*-nitrodiphenylamine.** M. PRASAD and J. SHANKER (J. Indian Chem. Soc., 1937, **13**, 663—669).—The crystals belong to the orthombic bipyramidal class and to the space-group Q_h^{11}. It is concluded that the two rings are in planes parallel to each other and that a plane of symmetry passes through the centres of the N atoms. D. C. J.

Crystal orientation in tooth-enamel.—See A., III, 118.

Investigation of structure of rubber by electron diffraction. K. I. Krulov (J. Exp. Theor. Phys. U.S.S.R., 1935, 5, 524—533).—Electronographs of rubber show more detail than do *X*-ray pictures. The elementary cell of rubber is orthorhombic with *a* 12·3, *b* 8·3, and *c* 8·1 A. Chloroprene (I) rubber even when unstretched gives a point-interference diagram indicating 8 (I) nuclei per elementary cell with *a* 10·93 and *b* 8·23 and 3 amorphous rings with identity periods 2·23, 1·47, and 1·18 A. Duprene gives a multiple electronograph. Ch. Abs. (*p*)

Constitution of inorganic rubber. A. M. de Ficquelmont (Compt. rend., 1937, **204**, 689—692).—"Inorg. rubber," $(PNCl_2)_n$, probably consists of a skeleton of high polymeric mols., the interstices of which contain smaller mols. (n = 3—4). The properties are discussed on this basis. The hard product obtained on slow heating to 500° is probably highly polymeric. A. J. E. W.

Highly polymerised compounds. CLI, CLII. Röntgenography and morphology of cellulose. I. *X*-Ray determination of structure of macromolecular lattice of native cellulose. II. Crystalline and ultracrystalline fibrillar structure of cellulose. E. Sauter (Z. physikal. Chem., 1937, B, **35**, 83—116, 117—128).—I. Using the conical film method (A., 1936, 782) and an improved *X*-ray camera 42 new layer-line reflexions have been observed with native cellulose. Mark and Meyer's model for the unit cell of cellulose cannot be reconciled with the new data. A new model, with the periods of identity *a* 10·8, *c* 11·8, *b* 10·4 A., β 85°, is suggested. The cellobiose residue in the cellulose lattice has the symmetry C_1; the two planes of the pyranose ring do not lie parallel one above the other, but their projections on the base form a fairly large acute angle with each other.

II. In the fibre diagram of native cellulose there can be observed, under favourable conditions, not only the diagram of the crystal lattice but also a line-lattice diagram. It is inferred that lattice perturbations are particularly numerous, and that the fibre has, not a micellar structure as supposed by Mark and Meyer, but an ultracryst. fibrillar structure. This structure accounts satisfactorily for the physical properties of the fibre. R. C.

Constitution of the crystallised part of cellulose. VI. Positions of atoms in the new spatial model of cellulose. K. H. Meyer and L. Misch (Helv. Chim. Acta, 1937, **20**, 232—244).—In the model, derived from *X*-ray data, two cellobiose chains are represented, parallel to axis *b* and in opposite directions. E. S. H.

***X*-Ray studies of wood, lignin, and wood-cellulose.** P. Nilakantan (Proc. Indian Acad. Sci., 1937, **5**, A., 166—174).—In the annual ring of the heartwood of teak there is almost perfect micellar orientation with respect to fibre axis in the brown compact layer, but this decreases towards the least compact layer in the ring. Extraction of the wood with solvents, treatment with KOH, and chlorination change the relative orientation of the micelles, but the wood lattice persists. There is no change of lattice when wood swells in H_2O, the phenomenon being intermicellar. Lignin shows diffuse scattering, confirming its amorphous character. J. W. S.

Diffraction of *X*-rays at very small angles by celluloses and rayons. G. L. Clark and E. A. Parker (Science, 1937, **85**, 203—204).—Diagrams of the diffraction effects of native ramie, mercerised ramie dried under tension, and regenerated cellulose rayons are reproduced and discussed. L. S. T.

Electron diffraction patterns obtained from thin crystalline films. V. A. Kolpinski (Physikal. Z. Sovietunion, 1936, **10**, 484—494).—A discussion of the effects of various degrees of orientation on the electron diffraction patterns from thin NaCl films. H. J. E.

Extra spots in electron diffraction patterns. V. A. Kolpinski (Physikal. Z. Sovietunion, 1936, **10**, 563—564).—Bruck's data for Ag, Ni, and Au (A., 1936, 784) are accounted for by Finch and Wilman's explanation (*ibid.*, 414). H. J. E.

Structure of thin metallic films. S. Ramaswamy (Proc. Indian Acad. Sci., 1936, **4**, A, 656—660; cf. A., 1935, 288).—Films of Au and Ag, formed by evaporation in a vac., which are thin enough to scatter light give electron diffraction patterns corresponding with an amorphous structure. Thicker films, with metallic reflexion and high electrical conductivity, give patterns corresponding with a polycryst. structure. J. W. S.

Structure and electrical conductivity of thin films of indium. V. E. Cosslett (Proc. Physical Soc., 1937, **49**, 121—133).—The high resistance and negative temp. coeff. of thin films of In and other metals prepared under certain conditions are not due to the existence of an amorphous form of the metal (cf. Lovell, A., 1936, 665). An investigation of In by electron diffraction shows that the lattice of freshly deposited films corresponds in form with that of the bulk metal, but has a spacing 0·7% > by *X*-rays. For slowly deposited films and exposure to air the spacing increases and axial ratio decreases up to room temp.; finally a film showing a cubic In lattice with spacing 3·4% > for the bulk metal is obtained. This change is accompanied by slow oxidation, the oxide lattice being 0·6% > indicated by *X*-ray vals. The high resistance is probably due to sorption of residual gas, and the negative temp. coeff. to desorption and resorption. The change in lattice consts. is attributed to the action of gas within the lattice, possibly intermediate stages in oxide formation. N. M. B.

Nature of polish. G. I. Finch (Trans. Faraday Soc., 1937, **33**, 425—430).—The phenomena of surface flow and of halo electron diffraction patterns exhibited by polished metal surfaces are inconclusive in deciding whether such surfaces are amorphous or cryst. The ability of metallic polish to dissolve metal crystals, and the fact that the temp. of flow is limited by the m.p. of the metal, strongly support the view of the amorphous state of both surface flow and polish. Polishing results in flow on calcite single-crystal surfaces, the polish layer being cryst. and integral in structure with the crystal when the surface is a cleavage plane or at a narrow angle to such plane, but affords halo patterns when the surface is steeply inclined to all cleavage planes. Heating causes gradual replacement of the halo pattern by the single-crystal pattern. This, in conjunction with the behaviour of SiC crystals (this vol., 119), suggests that the polish layer on a surface remote from a cleavage plane is amorphous, the surface flow being of vitreous or liquid-like material, whilst the cryst. structure formed on the cleavage plane is due to recrystallisation under the influence of the underlying crystal. J. W. S.

Structure of polished metal surfaces. S. DOBINSKI (Phil. Mag., 1937, [vii], **23**, 397—408).—Electron diffraction patterns show that when Al, Fe, Ni, Cu, Ag, Cd, Sn, Au, Pb, and Bi are polished in absence of air and other oxidising media, the surface and adjacent layers are amorphous, consisting of close-packed metal atoms, the distance of nearest approach being equal to that found in the cryst. structure of the metal in question. Surfaces polished in air have oxide films thicker than the usual protective oxide layer. J. G. A. G.

Structural investigations of roughness and size of nuclei by electron interference. W. PAPSDORF (Ann. Physik, 1937, [v], **28**, 555—568).—Electron interference photographs obtained by transmission and reflexion with Ag films deposited in vac. on mica, collodion, glass, quartz, and rock-salt were investigated. For Ag on mica, transmission diagrams showed only straight lines instead of sharp interference rings. Reflexion diagrams gave interference rings increasing in width with decreasing thickness of film. The smoothness of the surfaces decreased in the order quartz, glass, mica, rock-salt, collodion. No interference max. could be obtained from the surfaces of liquid Hg, films of Ga on collodion, and freshly deposited Se films, though crystals formed in the Se films after 1 hr. Reflexion diagrams obtained with thin films of long-chain hydrocarbons on glass or metal showed in some cases, in addition to the layer line due to the single mols., a sharp "powder" diagram, attributed to small, ordered "heaps" of crystals projecting from the film. A. J. M.

Molecular structure of silicobromoform. J. WOUTERS, M. DE HEMPTINNE, and P. CAPRON (Ann. Soc. Sci. Bruxelles, 1937, **57**, 25—30).—Electron diffraction experiments with $SiHBr_3$ give 3·63 A. for the Br–Br distance. The Si–Br distance is 2·19±0·05 A. The Si atoms are therefore not in the plane of the Br atoms. The $SiBr_3$ group is tetrahedral, the angle BrSiBr being 110±2·5°. A. J. M.

Effect of heat-treatment on tribo-electric properties of quartz and of metals. P. A. MAINSTONE (Phil. Mag., 1937, [vii], **23**, 620—628).—Changes in the tribo-electric properties of quartz and of metals, after heating, are due to modifications of the quartz surface, brought about by residual gases and vapours in the apparatus, and not, as previously stated (cf. A., 1935, 435), to change of the metal surface. F. J. L.

Tribo-electric properties of a quartz–nickel interface between 120° and —78°. P. A MAINSTONE (Phil. Mag., 1937, [vii], **23**, 702—708).—The frictional charges produced on a Ni surface by a quartz rubber at 120°, 15°, and —78° in air and H_2 are in increasing order of magnitude at the three respective temp. at 60 and 5 cm. gas pressure. At 1 and 10^{-4} mm. the charges are irregular and unrelated to temp. Results are discussed in relation to data for amounts of gases absorbed by Ni. N. M. B.

Sharpness of the magnetic Curie point. N. F. MOTT and H. H. POTTER (Nature, 1937, **139**, 411).—A discussion. L. S. T.

Exchange interaction in magnetic crystals. W. OPECHOWSKI (Physica, 1937, **4**, 181—199).—Theoretical. H. J. E.

Magneto-striction in degenerate electron gas. D. V. GOGATE (Phil. Mag., 1937, [vii], **23**, 487—490).—Mathematical. J. G. A. G.

Influence of elastic tension on magneto-striction. B. K. GIRENCHIN (Physikal. Z. Sovietunion, 1936, **10**, 689—693).—The effect of tension on the magneto-striction and magnetisation of samples of Ni wire was investigated. The experimental results agree with theory. A. E. M.

Magneto-resistance effect in single crystals of cadmium. C. J. MILNER (Proc. Camb. Phil. Soc., 1937, **33**, 145—153).—The variation of resistance of single crystals of Cd with external magnetic field up to 26 kilogauss was measured for different orientations of the crystal axis and of the direction of the magnetic field. The "crit. field" determined from the linear portion of the curve of resistance against magnetic field was of the same order as for polycryst. Cd and appears to depend on the orientation of the crystal with respect to the current and to the magnetic field. Results do not agree with the theory of Kapitza (A., 1929, 632). O. D. S.

Rate of spread of magnetisation. F. D. MIROSCHNITSCHENKO (Physikal. Z. Sovietunion, 1936, **10**, 540—562).—An apparatus is described. Measurements with an alloy containing Fe 85, Ni 15% are recorded. H. J. E.

Ideal magnetisation of a crystal of iron. S. PROCOPIU (Ann. Sci. Univ. Jassy, 1935, **20**, 83—85).—The permeability of Fe has been studied in an alternating field superimposed on a const. field. R. S. B.

Determination of ferromagnetic properties of metals in the high-frequency region. (Wire bridge method.) G. POTAPENKO and R. SÄNGER (Z. Physik, 1937, **104**, 779—803).—A method is described for measuring permeability of small quantities of metals at frequencies from 10^8 to 10^{10}, by means of resonance curves obtained from a Lecher wire system of which the metal under examination forms one bridge. L. G. G.

Discontinuities of magnetisation in an alternating field. Explanation of multiple frequencies appearing during "ferro-resonance." S. PROCOPIU and G. VASILIU (Compt. rend., 1937, **204**, 673—674; cf. A., 1932, 327, 987).—The magnetisation effects occurring in an Fe or Ni wire carrying

a.c. have been investigated. Pronounced discontinuities occur at the max. of each half-cycle.
A. J. E. W.

Dispersion curves of the reflecting powers of natural tellurides. R. Martin (Compt. rend., 1937, **204**, 598—599).—Previous results (A., 1933, 369) have been extended, using an improved method, and λλ between 4400 and 7200 A. A. J. E. W.

Optical properties of thin metallic films. P. Rouard (Ann. Physique, 1937, [xi], 7, 291—384).—Films of Au, Ag, and Pt of thickness 0—40 mμ were deposited on glass by cathodic projection in anthracene vapour, and thicknesses (d) were determined optically and gravimetrically. Reflexion factors R were studied as a function of d, in the case of $d < 10$ mμ by comparison of R for the deposited film with that of glass, and for greater vals. of d by the Fabry–Buisson apparatus. The variation of phase undergone by a luminous wave for reflexion in the transparent medium (mica or glass) was determined for different λλ in the visible region for d 0—20 mμ. For Ag or Au on glass, R has a min. val. varying with λ as d increases over 0—10 mμ; the min. val. of R is 0·002 when λ is 5461 A. For reflexion in air, curves for R show an inflexion, sharp for Au and less so for Ag. These changes are accompanied by colour effects. Results support the view that the properties of the metal in bulk differ from those of the film. Optical consts. corresponding with the data obtained are calc., and the relation of results to accepted formulæ and theory is examined. N. M. B.

Optical reflectivity of metals in the superconducting state. E. Hirschlaff (Proc. Camb. Phil. Soc., 1937, **33**, 140—144; cf. Kronig, A., 1936, 147).—The reflectivities of Pb and Ta at temp. below their respective transition points to the superconducting state are changed by $<0.5\%$ on destroying the super-conductivity by a magnetic field.
O. D. S.

Lattice distance and refractive index in crystals of bismuth and antimony. E. Rosa (Nuovo Cim., 1935, [ii], **12**, 448—454; Chem. Zentr., 1936, i, 2699).—The distances of the (111) planes in Bi and Sb crystals were 3·957 and 3·754 A., respectively. μ for the Fe and Cu K-radiation was 10^{-5}—10^{-6}.
H. J. E.

Effect of orientation on stresses in single crystals and of random orientation on strength of polycrystalline aggregates. H. L. Cox and D. G. Sopwith (Proc. Physical Soc., 1937, **49**, 134—151).—A method of tabulating resolved shear stresses for any type of slip system is described. Data and diagrams, as functions of orientation, are given for various planes of Al and Fe. Elastic failure of polycryst. specimens is discussed. N. M. B.

Glide in metal single crystals. E. N. da C. Andrade and R. Roscoe (Proc. Physical Soc., 1937, **49**, 152—177).—A method of producing single crystals of Cd and Pb which are not affected by annealing and show great regularity of mechanical behaviour is described. Data on rate of glide, crit. shear stress, hardening and recovery, and spacing of glide planes are given and discussed. It is suggested that the mechanism of permanent hardening is mainly a rotation of crystallites in the lamellæ. A simple recording extensometer is described. N. M. B.

Kinetics of plastic deformation of crystals. M. Kornfeld (Physikal. Z. Sovietunion, 1936, **10**, 605—617).—The elongation of single crystals of Al is studied with loads varying between $\sim$100 and 5000 g. per sq. mm. over a temp. range of 15—600°.
L. G. G.

Calculation of torsional modulus of quasi-isotropic polycrystalline aggregates from single crystal constants. W. Boas (Helv. phys. Acta, 1935, **8**, 674—681; Chem. Zentr., 1936, i, 3089).—By making allowance for the mutual interaction of crystallites, the calc. torsional moduli of aggregates of cubic and hexagonal crystals give fair agreement with experimental vals. in the case of Al, Cu, Ag, Au, α-brass, α-Fe, Mg, Zn, and Cd. J. S. A.

Dynamical method for the measurement of Young's modulus for imperfectly elastic metals, and the application of the method to nickel and some of its alloys. R. M. Davies and I. H. Thomas (Phil. Mag., 1937, [vii], **23**, 361—397).—There is generally a parallelism between the changes of Young's modulus and electrical resistance produced by annealing. J. G. A. G.

Elastic properties of selenium. K. H. Meyer and J. F. Sievers (Naturwiss., 1937, **25**, 171).—Amorphous Se heated to 70° becomes elastic, behaving like plastic S. If threads of elastic Se are rapidly stretched and allowed to contract at room temp. they solidify, but the elastic properties are restored on warming to 72°. Se possesses the necessary chain-like crystal structure required in a substance which exhibits this property. A. J. M.

Influence of artificial damaging of the surface on the strength of rock-salt [crystals]. M. V. Classen-Nekludova (Physikal. Z. Sovietunion, 1936, **10**, 442—461).—H_2O can penetrate into a NaCl crystal and render it plastic. This property is not destroyed by washing with EtOH and drying in vac. Scratching, grinding, or polishing of the dehydrated surface restores the crystal to its initial brittle condition. H. J. E.

Influence of the increase of solidity in plastic flow on the strength of rock-salt treated with water. M. V. Classen-Nekludova (Physikal. Z. Sovietunion, 1936, **10**, 462—483; cf. preceding abstract).—The tensile strength of dried NaCl in the [100] and [111] directions is determined by the plastic flow resulting from the action of the H_2O. Data are recorded. H. J. E.

Photo-electric elasticity limit of photochemically coloured rock-salt crystals. M. N. Podaschevski and A. M. Polonski (Physikal. Z. Sovietunion, 1936, **10**, 531—539).—The elastic limit of NaCl coloured by exposure to ultra-violet light was determined from the photo-electric effect. In most cases no limit was observed up to or near the breaking point. Very much lower elastic limits were observed in crystals coloured by X-rays (cf. A., 1935, 1452).
H. J. E.

Lattice theory of alkaline-earth carbonates. IV. Elasticity constants of calcite. B. Y. Oke

(Proc. Indian Acad. Sci., 1936, **4**, A, 667—674; cf. A., 1936, 1185; this vol., 67).—The electrostatic parts of the elasticity consts. c_{11}, c_{22}, and c^0_{33} are calc. Formulæ are derived for the repulsive components of these consts., and applying the experimental val. for c_{11} a val. is calc. for c^0_{33} which is in accord with experiment. J. W. S.

Wrong methods for establishing non-existence of polymorphy. A. L. T. Moesveld (Proc. K. Akad. Wetensch. Amsterdam, 1937, **40**, 155—164).—The conclusion that in any particular case enantiotropy does not exist cannot be reached from absence of discontinuities in physical property–temp. curves. *X*-Ray analysis can prove but not disprove polymorphy, since fine powdering frequently leads to transformation. The importance of retardation of transformation is pointed out. This often leads to smoothness of graphs of physical properties, such as the electrical conductivity–temp. curve for Sn at −78° to 99°, in spite of the transition point at 13·2°. J. W. S.

Resistometric method of determining electrothermic homogeneous effect and the influence of gaseous ions. C. Benedicks, C. W. Borgmann, and P. Sederholm (Ark. Mat. Astron. Fysik, 1935, A, **25**, No. 9, 28 pp.; Chem. Zentr., 1936, i, 3095).—An experimental method of determining the above effect of metal ions in air at low pressures is described. In the case of Pt a pressure-dependent effect due to included gaseous ions is superimposed on the effect of pure gas-free Pt. J. S. A.

Resistance of univalent metals. E. L. Peterson and L. W. Nordheim (Physical Rev., 1937, [ii], **51**, 355—364).—Mathematical. An attempt at a quant. estimate of resistivity, based on the present theory of the metallic state, is reported. N. M. B.

Properties of metals at very low temperatures. L. Landau and I. Pomerantschusk (Physikal. Z. Sovietunion, 1936, **10**, 649—665).—The resistance of a metal at low temp., T (abs.), is $\alpha T^2 + \beta T^5$, α and β being consts. This relation holds for Pt up to 20° abs. For the thermo-electromotive force at low temp. a relation is derived which agrees with the Thomson–Onsager equation. A. E. M.

Electrical conductivity of thin films of the alkali metals spontaneously deposited on glass surfaces. A. C. B. Lovell (Proc. Physical Soc., 1937, **49**, 89—94).—The conductivity of invisible films of thickness of the order of monat. layers, deposited in vac., was investigated as a function of deposition time and surface temp. The resistivity decreases in the order K, Rb, Cs. N. M. B.

Effect of magnetic fields on persistent currents in superconducting single crystals of tin. E. F. Burton and K. C. Mann (Nature, 1937, **139**, 325—326). L. S. T.

Superconductivity of lanthanum. K. Mendelssohn and J. G. Daunt (Nature, 1937, **139**, 473—474).—The transition point in zero field of La containing 1% of Fe, and traces of C, Si, Al, and Mg, lies at 4·71° abs. L. S. T.

Magnetic properties of zinc–iron alloys. M. Fallot (Ann. Physique, 1937, [xi], **7**, 420—428; cf. A., 1936, 1328).—The alloys were prepared by fusion under pressure in an atm. of N_2 for a concn. range 0—17% Zn. The Curie point temp. fell rapidly by 6° per at.-% of added Zn. Ferromagnetic moments decreased with increasing Zn concn. Results indicate a variation of the moment of the Fe atoms due to the replacement of adjacent atoms by Zn. N. M. B.

Ferromagnetism of ammonium iron alum. N. Kürti, P. Lainé, and F. Simon (Compt. rend., 1937, **204**, 675—677; cf. A., 1936, 786).—The variation of the remanent magnetism with temp., near 0° abs., has been investigated. Hysteresis curves are given and discussed. The Curie point is at 0·03° abs. A. J. E. W.

Magnetic susceptibilities of the ammonium halides. A. Dinsdale and F. A. Long (Proc. Leeds Phil. Soc., 1937, **3**, 270—276).—Data are tabulated and plotted for measurements for NH_4Cl, NH_4Br, and NH_4I from −180° to above the transition temp. from CsCl to NaCl structure, at which the change in environment of the ions may lead to susceptibility increase. At room temp. $\chi_M \times 10^6$ for NH_4Cl, NH_4Br, and NH_4I are 36·2, 46·2, and 64·1, respectively. N. M. B.

Magneto-chemical investigations. XXV. Molecular magnitude of hyposulphurous acid. L. Klemm (Z. anorg. Chem., 1937, **231**, 136—137).—Na hyposulphite (95% purity) has been found to be diamagnetic. The formula $Na_2S_2O_4$ is thus confirmed. F. L. U.

Magnetic anisotropy of $Cs_2[CoCl_4]$. K. S. Krishnan and A. Mookherji (Physical Rev., 1937, [ii], **51**, 528).—The magnetic anisotropy of the crystal is <5%, in agreement with the predictions of Van Vleck's theory (cf. A., 1932, 985). N. M. B.

Variable magnetic moments of cobaltous compounds. E. D. P. Barkworth and S. Sugden (Nature, 1937, **139**, 374—375).—A marked difference in the magnetic moments of the violet and the blue forms of bispyridylcobaltous chloride is reported and discussed in relation to the structure of the two forms. L. S. T.

Magnetic susceptibility of metallic cerium and praseodymium. L. F. Vereschtschagin, L. V. Schubnikov, and B. G. Lasarev (Physikal. Z. Sovietunion, 1936, **10**, 618—624; cf. this vol., 122).—No dependence of χ on the field strength was found for Pr, vals. of χ being determined from 14·6° to 296° abs. The variation of $1/\chi$ with T is a straight line, contrary to Trombe's findings. The previous results for Ce are discussed and extended. J. J. F.

Magnetic properties of the rare metals. F. Trombe (Ann. Physique, 1937, [xi], **7**, 385—419).—An investigation of the variation of magnetisation with temp. and field showed that La has a very weak paramagnetism decreasing with rise of temp., and Ce is paramagnetic, with complex properties at low temp. and the apparent existence of two reversible magnetic states. Nd is paramagnetic and obeys the Weiss law from room temp. to 109° abs.; the moment is 17·8 Weiss magnetons, approximating to that of the salts, 17·9, and to the calc. val. 18·0 for Nd^{+++}. The Curie point is at 10° abs. Gd salts are strongly paramagnetic, and obey the Weiss law. Gd containing $<0.03\%$ Fe is intensely ferromagnetic at low temp.; the Curie point is at 16°. At 0° abs. the sp. magnetisation, 253·5, is > that of Fe, 221·7; the corresponding at. moment is 35·4. Above the Curie point Gd is paramagnetic and obeys the Weiss law from 90° to 366°. The calc. moment is 39·28, approximating to that of Gd_2O_3, 39·25, and to the calc. val. 39·26 for Gd^{+++}. Ferromagnetism has not previously been observed outside the Fe group. N. M. B.

Absorption of sound by crystals at high temperatures. A. S. Kompaneietz (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 267—270).—Mathematical. O. D. S.

Measurements with ultrasonics on the velocity and absorption of sound at ordinary and at low temperatures. A. van Itterbeek and P. Mariëns (Physica, 1937, **4**, 207—215).—Measurements of velocity and absorption are recorded for O_2, N_2, and H_2 at 90° and 289° abs. and various pressures. The velocity in O_2 was uninfluenced by a magnetic field perpendicular to the direction of propagation. The absorption was decreased. H. J. E.

Influence of temperature on the absorption of ultrasonic waves in benzene and carbon tetrachloride. P. Bashulin (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 273—274; cf. A., 1936, 555).—At frequency 11,470 kHz. the coeff. of absorption α of C_6H_6 increases linearly with temp. from 18° to 80°, increasing by 50% in the range studied. α of CCl_4 rises sharply near the b.p., but after prolonged boiling of the liquid falls to a val. little > that at 20°. The rise is ascribed to the presence of gas bubbles.

O. D. S.

Suspended matter in sound fields. O. Brandt, H. Freund, and E. Hiedemann (Z. Physik, 1937, **104**, 511—533).—The relation between suspended particles, their size, and the motion of the surrounding medium under the influence of sound waves is discussed. High-speed photomicrography is employed to elucidate certain aspects of acoustic coagulation. H. C. G.

Latent heat of evaporation of liquid helium. (A) J. Satterly. (B) J. N. Friend (Nature, 1937, **139**, 472, 472—473).—(A) Experimental data do not agree at all with the val. calc. from Friend's equation (this vol., 122).

(B) A reply. Since the equation applies to many substances, liquid He is assumed to be abnormal.

L. S. T.

Physical properties of solid and liquid helium. J. Satterly (Rev. Mod. Physics, 1936, **8**, 347—357).—A summary. J. G. A. G.

Structure, heat content, and special properties of active substances. XIV. Heat content of different crystallised modifications of zinc hydroxide. XV. Active zinc oxide and stability of zinc hydroxide. R. Fricke and K. Meyring (Z. anorg. Chem., 1937, **230**, 357—365, 366—374).—XIV. The heat contents of 4 cryst. modifications of $Zn(OH)_2$ have similar vals.; that of a specimen of $Zn(OH)_2$ amorphous on *X*-ray examination is about 3 kg.-cal. higher, thus fixing a lower limit for the heat of crystallisation of amorphous $Zn(OH)_2$.

XV. The heat content of active ZnO may be 1 kg.-cal. > that of the inactive oxide, but the difference depends on the method of prep. and the nature of the original material. *X*-Ray examination confirms that the greater heat content is associated with lattice distortion. E. S. H.

Specific heat of cobalt chloride at high temperatures. A. N. Krestovnikov and G. A. Karetnikov (J. Gen. Chem. Russ., 1937, **7**, 6—8).—The sp. heat of $CoCl_2$ at 0—700° is expressed by $0{\cdot}1460 + 1{\cdot}0698 \times 10^{-4}t + 1{\cdot}069 \times 10^{-8}t$. R. T.

Heat capacities of molybdenite and pyrites at low temperatures. C. T. Anderson (J. Amer. Chem. Soc., 1937, **59**, 486—487).—Heat capacities of FeS_2 and MoS_2 from about 56° to 300° abs. have been determined. The corresponding entropies are 12·7 and 15·1. E. S. H.

Heat capacities of chromium, chromic oxide, chromous chloride, and chromic chloride at low temperatures. C. T. Anderson (J. Amer. Chem. Soc., 1937, **59**, 488—491).—Heat-capacity data are recorded for Cr (56—291° abs.), Cr_2O_3 (56—336° abs.), $CrCl_2$ (44—296° abs.), and $CrCl_3$ (54—297° abs.). The corresponding entropies are 5·68, 19·4, 27·4, and 28·2. E. S. H.

Heat capacity of carbon disulphide from 15° to 300° abs. Entropy and heat of fusion of carbon disulphide. O. L. I. Brown and G. G. Manov (J. Amer. Chem. Soc., 1937, **59**, 500—502).—Heat-capacity data are recorded. CS_2 has m.p. 161·11° abs., heat of fusion 1049·0 g.-cal. per mol. The calc. entropy of the ideal gas at 319·35° abs. is 57·48± 0·5 e.u., which agrees with the val. calc. from spectroscopic data. The entropy of liquid CS_2 at 298·1° abs. is 36·10 e.u. E. S. H.

Relation between heat of vaporisation and surface tension. G. L. Starobinetz and V. P. Romisch (J. Gen. Chem. Russ., 1937, **7**, 151—161).—The expression $\log L/\gamma = -286a + 146{\cdot}3b + 286{\cdot}6c + 588{\cdot}9d + 151{\cdot}5e + 26f + 3{\cdot}7g + 295{\cdot}1h - 140{\cdot}6i$, where L = latent heat of vaporisation, γ = surface tension, a, b, c, d, e, f, g, h, and i are the no. of C atoms, H atoms, C:C and C⋮C linkings, halogen atoms, OH groups, ethereal O atoms, CO groups, and N atoms, respectively, is shown to hold for a no. of org. compounds. The expression serves for the calculation of *L* for liquids and azeotropic mixtures, and of the heat of expansion of liquids. R. T.

Study of liquids. N. Barbulescu (Bull. Soc. Stiintę Cluj, 1936, **8**, 462—476).—Theoretical. Formulæ are deduced to show a no. of relationships between various physical consts. of pure liquids. Vals. of the internal heat of vaporisation at the b.p., Walden's const., mol. diameters, and sp. attraction are calc. from the formulæ. Longinescu's rule (A., 1903, ii, 531) is derived theoretically, and it is shown that the sp. attraction (A) of a mol. is related to that (a) of the component atoms by the formula $A^2 = n_1a_1^2 + n_2a_2^2 + \ldots$, where n_1, n_2 . . . are the no. of the respective atoms. The degree of association of a liquid is given by $\sqrt{n'}/\sqrt{n}$, where n and n' are respectively the theoretical no. of atoms and the no. calc. by Longinescu's formula. F. L. U.

Thermodynamic temperature scale below 1° abs. N. Kürti, P. Lainé, and F. Simon (Compt. rend., 1937, **204**, 754—756; cf. A., 1935, 1096).—Experiments on the adiabatic demagnetisation of Fe NH_4 alum are described. T^*–T, c–T, and S–T curves are given for temp. up to 0·15° abs., T^* being a temp. on an arbitrary scale obtained by extrapolation of the Curie law. A. J. E. W.

Temperature interconversion tables (° C. $\rightleftharpoons$ ° F.) and m.p. of the chemical elements. Anon. (Nat. Bur. Stand., Misc. Publ., M 126, 1937, 4 pp.).

Numerical factor in the discontinuous law of Curie points and m.p. R. Forrer (Ann. Physique, 1937, [xi], **7**, 429—458; cf. A., 1936, 928).—A study of available data on Curie points, m.p., and transformations shows that the law $T = F\sqrt{N}$ previously reported (cf. A., 1935, 1305) can be amplified by expressing $F = F_1 \pm m\tau$, where $F_1 =$ 301°, $\tau = 14°$, and m is an integer. The factors F form a series, the discontinuity of which is shown in various phenomena: the two m.p. of ICl, the ferro- and para-magnetic Curie points, and the max. and min. of m.p. and Curie points which appear in the phase diagrams of alloys. N. M. B.

Relationships between the m.p., b.p., and critical magnitudes and the number of carbon atoms in homologous series. J. H. C. Merckel (Proc. K. Akad. Wetensch. Amsterdam, 1937, **40**, 164—173).—Empirical equations have been derived connecting the m.p., b.p., crit. temp., and crit. pressures of n-paraffins with the length of the C-chain. J. W. S.

Density curve and rectilinear diameter of krypton. E. Mathias, C. A. Crommelin, and J. J. Meihuizen (Compt. rend., 1937, **204**, 630—633).—Vals. of d for the liquid and vapour are given for 13 temp. between 125° and 209° abs. At temp. $>$190° abs. the diameter is slightly convex towards the temp. axis. $d_c = 0{\cdot}9085$. The crit. coeff. = 3·443. A. J. E. W.

Specific volumes of heavy water and its ice at the freezing point. T. Takeuchi and T. Inai (Japan. J. Physics, 1936, **11**, 67—68).—The difference of the sp. vol. of D_2O and its ice has been determined. The max. d of D_2O (99·2%) is at 11·4°. The velocity of ultrasonic waves of frequency 5×10^6 in D_2O was found to be 1370 and 1381 m. per sec. at 13° and 20°, respectively. A. J. M.

Vapour pressure of liquid nitrogen below one atmosphere, and of solid nitrogen β. B.p. and triple point of nitrogen. W. H. Keesom and A. Bijl (Proc. K. Akad. Wetensch. Amsterdam, 1937, **40**, 235—236).—The v.p. of solid N_2 β and of liquid N_2 have been determined between 53° and 78° abs. and empirical equations representing them deduced. The calc. b.p. is $77{\cdot}35_7$° abs. The triple point pressure and temp. are 9·401 cm. and $63{\cdot}15_0$° abs., respectively. The v.-p. data are in accord with calorimetric data. J. W. S.

Vapour pressures of metals. A. Eucken (Metallwirts., 1936, **15**, 27—32, 63—68; Chem. Zentr., 1936, i, 2513—2514).—A crit. review of methods and data. H. J. E.

Internal changes in the system sulphur trioxide. II. A. Smits and N. F. Moerman (Z. physikal. Chem., 1937, B, **35**, 69—81; cf. A., 1936, 788).—The v.-p. curves of pure β-SO_3 and the liquid, both in internal equilibrium, have been determined. The triple point is at 31·5° and 375·5 mm. The supposed colloidal form of SO_3 (A., 1901, ii, 650) consists of molten SO_3 containing a small quantity of α-SO_3 in suspension. The heat of sublimation of β-SO_3 is −13·5 and the heat of vaporisation of the liquid −10·6 kg.-cal. per mol. By partial distillation of β-SO_3 the internal equilibrium may be disturbed and a residue of low v.p. obtained. The heat of dissolution in 83·5% H_2SO_4 of β-SO_3 depends on the temp. at which the latter has solidified. For preps. which have solidified below 26° the val. is almost equal to that of the heat of dissolution of the liquid. The system SO_3 is most conveniently regarded as pseudoquaternary. R. C.

Vapour tension of saturated and unsaturated gaseous hydrocarbons at low temperatures. R. Delaplace (Compt. rend., 1937, **204**, 493—495).—V.p. in the range 0—150 mm. and −120° to −196° are tabulated for C_2H_6, C_3H_8, n- and *iso*-C_4H_{10}, C_2H_4, C_3H_6, Δ^α- and *iso*-C_4H_8, and C_2H_2. A. J. E. W.

Measurement of Thomson effect. R. Delacrausaz (Mém. Soc. Vaudoise Sci. nat., **5**, 1—58; Chem. Zentr., 1936, i, 2907).—A new experimental method is described. J. S. A.

Condensation coefficients of various substances. T. Alty (Nature, 1937, **139**, 374).—The condensation coeff., *i.e.*, the no. of gas mols. condensing on a surface per sec./total no. incident on the surface, has been determined for the vapours of I, $C_{10}H_8$, camphor, and BzOH at the surfaces of their respective crystals. Substances the mols. of which have a zero dipole moment have a coeff. of unity, whilst those with large dipole moments have coeffs. $\ll$1. L. S. T.

Atomic theory of compressibility. J. A. Wasastjerna (Soc. Sci. fenn., Comm. phys.-math., 1935, **8**, No. 8, 1—15; Chem. Zentr., 1936, i, 2712).—Theoretical. H. J. E.

Viscosity of air by the rotating-cylinder method. G. Kellström (Phil. Mag., 1937, [vii], **23**, 313—338; cf. A., 1935, 1455).—Details are given of results already published. Additional data lead to the vals.: $\eta_{20°} = (18201 \pm 27) \times 10^{-8}$, $\eta_{23°} = (18349 \pm 27) \times 10^{-8}$, and $e = (4{\cdot}818 \pm 0{\cdot}011) \times 10^{-10}$ e.s.u. J. G. A. G.

Viscosity of vinyl acetate. D. O. White and A. C. Cuthbertson (Canad. J. Res., 1937, **15**, B, 7—12).—The viscosity of monomeric vinyl acetate at 0—60° is given by $\eta = 1{\cdot}521/(90 + t)^{1{\cdot}25}$. The characteristic frequency calc. from the ratio between latent heat of evaporation and heat of cohesion is $2{\cdot}17 \times 10^{12}$. J. W. S.

Oiliness of liquids. III. Kinetic friction coefficients. J. Sameshima and M. Miyake (Bull. Chem. Soc. Japan, 1937, **12**, 96—103; cf. this vol., 130).—Kinetic friction coeffs. (μ_k) have been measured between polished steel surfaces moving at 19·6 cm. per sec. relative velocity. Boundary lubrication with the following liquids was employed: *n*-paraffins C_6—C_9; saturated monohydric alcohols C_1—C_9; saturated *n*-monobasic acids C_5—C_9; and H_2O. With the hydrocarbons a min. val. of μ_k is given by C_7H_{16}. Alcohols and acids show an approx. linear decrease of μ_k with increasing no. of C atoms. EtOH–H_2O mixtures give a smooth curve without max. or min. F. L. U.

Influence of a magnetic field on viscosity of liquids. M. P. Volarovitsch and D. M. Tolstoi (J. Phys. Chem. Russ., 1936, **8**, 619—620).—A magnetic field of 28 kilogauss has only a slight influence on the viscosity of liquids; the max. changes observed were 3·5% (aq. $FeCl_3$) and 3·8% (aq. $CoCl_2$). E. R.

Influence of an electric field on the viscosity of pure liquids and colloidal solutions. Y. Björnståhl and K. O. Snellman (Kolloid-Z., 1937, **78**, 258—272).—Alternating fields of 25—500 cycles up to 40 kv. per cm. do not affect the viscosity (η) of C_6H_{14}, C_6H_6, or PhMe. That of PhCl is increased, the effect decreasing with increasing frequency (n). With $PhNO_2$ η decreases at first with increasing voltage and passes through a min., the effect increasing with increasing n. The η of $PhNO_2$ dissolved in C_6H_{14} increases, whilst that of polystyrene in C_6H_6 decreases, with increase of applied potential. Metal sols in C_6H_6 show varying behaviour depending on n and on the presence or absence of protecting colloid. The results are discussed theoretically. F. L. U.

Equation of diffusion. P. S. Epstein (Proc. Nat. Acad. Sci., 1937, **23**, 94—98).—Mathematical. The anomalous asymmetry of Kolmogrov's equations (Math. Ann., 1931, **104**, 415) is examined in relation to other forms of the diffusion equation of physics. N. M. B.

Theory of diffusion in fast streaming vapours. D. MacGillavry (Trans. Faraday Soc., 1937, **33**, 433—439).—A new diffusion chamber, designed for the concn. of H isotopes, is described, in which the gas is diffused in fast-moving Hg vapour. The theory is discussed, the proper boundary conditions are determined, and equations describing the diffusion are derived. J. W. S.

Infra-red absorption spectra of liquid mixtures. W. Gordy (J. Amer. Chem. Soc., 1937, **59**, 464—466).—In mixtures of NH_2Ph with $COMe_2$, EtOAc, HCO_2Et, MeCN, or Pr^{β}_2O, the NH vibrational band of NH_2Ph is displaced towards shorter λ and its intensity increased, but with CCl_4–NH_2Ph mixtures the band remains fixed. Other NH_2Ph bands remain approx. fixed for all the mixtures. The CO band of $COMe_2$, EtOAc, and HCO_2Et in the mixtures is displaced towards longer λ and its intensity is increased. The changes indicate association of the liquids through dipole interaction. E. S. H.

Possible formation of hydrogen bonds in liquid mixtures. W. Gordy (J. Chem. Physics, 1937, **5**, 202).—A reply to the suggestion made by Buswell *et al.* (this vol., 110) that in liquid mixtures in which a H bond is formed the OH band should be shifted to longer $\lambda\lambda$. W. R. A.

Refractometric detection in a mixed aqueous solution of magnesium and calcium chlorides of a compound of higher order, not identical with tachydrite. G. Spacu and E. Popper (Z. physikal. Chem., 1937, B, **35**, 223—235).—Above 21° the deviation of the sp. refractivity of the mixed solution from additivity is a max. when $MgCl_2$ and $CaCl_2$ are present in equimol. proportions. Below 21° there is no evidence of compound formation. R. C.

Viscosity of binary systems. P. B. Ganguly and S. K. Chakrabertty (Z. anorg. Chem., 1937, **231**, 304—312).—Data for C_6H_6 solutions of menthol, BzOH, MeOH, thymol, phenetole, linalool, $C_{10}H_8$, AcOH, acetophenoneoxime (I), $PhNO_2$, $COMe_2$, and $CH_2Ph{\cdot}OH$ are recorded. In associated systems the η of solution and solvent (η and η_1) are connected by $\log \eta/\eta_1 \cdot A^{2/3} = k_1x_2/A + k_2$, where k_1 and k_2 are consts., x_2 the mol. fraction of solute, and A the ratio of the normal to the observed f.p. lowering for the solution. For the approx. ideal solutions [*e.g.*, MeOH or (I) in C_6H_6] the data agree with $\log \eta/\eta_1 = k_1x_2 + k_2$. H. J. E.

Viscosity and b.p. of aqueous solutions of HCN. M. A. Opichtina and O. I. Frost (J. Gen. Chem. Russ., 1936, **6**, 1778—1783).—The η of aq. HCN falls with increasing [HCN]. Liquidus–vapour and b.p. curves are recorded for the system. R. T.

Dielectric constant, density, and refraction of ternary systems. S. Mitlo (Kolloid. Shurn., 1936, **2**, 845—854).—Vals. are recorded for the system H_2O–EtOH–Et_2O. Large deviations from additivity are observed in those mixtures which readily coagulate Fe_2O_3 hydrosols. J. J. B.

Diffusion velocity of solid metals in relation to the lattice constants and the m.p. N. F. Laschko and B. T. Petrenko (J. Phys. Chem. Russ., 1936, **8**, 597—599).—Recently established relations between the diffusion coeffs. of solid metals and the lattice consts. or m.p. are explained statistically. Diffusion is assumed to occur by atoms jumping from one lattice point to the next one when the vibration has reached a certain amplitude. E. R.

***X*-Ray investigation of pure iron–nickel alloys. II. Thermal expansion of some further alloys.** E. A. Owen and E. L. Yates (Proc. Physical Soc., 1937, **49**, 178—188; cf. this vol., 127).—The lattice parameters of Fe–Ni alloys containing 41·1, 32·2, and 24·2 wt.-% Ni, respectively, have been measured at 10—600° after careful heat-treatment, and curves for the variation of the coeff. of thermal expansion with temp. obtained. In the 24·2% alloy the thermal expansion of both the α and γ components was measured, and the form of the expansion curve for a rod of the alloy, which shows a contraction at $\alpha \rightarrow \gamma$ phase transformation, is thereby explained. Vals. for the lattice parameters of the pure α and γ phases at different temp. are given. The coeff. of expansion of the body-centred α phase is approx. $8{\cdot}2 \times 10^{-6}$ at 0° and $14{\cdot}0 \times 10^{-6}$ at 200°, and that of the face-centred γ and γ' phases is $17{\cdot}5 \times 10^{-6}$ for 0—630°. N. M. B.

Lattice spacing of iron–nickel alloys. A. J. Bradley and A. H. Jay (Phil. Mag., 1937, [vii], **23**, 545—557).—The lattice spacing of Fe-rich, body-centred cubic alloys (0—5·7 at.-% Ni) increases from 2·8605 to 2·8644 A., then falls and remains const. at 2·8635 A. in the two-phase region (5·7—28 at.-% Ni). The lattice spacing of the face-centred alloy (28—100 at.-% Ni) increases to a max. (3·5741—3·5878 A.) at 38 at.-% Ni and then falls linearly to 3·5412 A. at 79 at.-% Ni, where there is a discontinuity, and thence linearly to 3·5168 A., the spacing for pure Ni. The composition at the discontinuity corresponds with that of permalloy. The above results were obtained from slowly cooled alloys; quenching produces (in general) higher and erratic results. F. J. L.

Hardness and electrical conductivity of the aluminium–tin system. M. I. Zamotorin (Trans. Leningrad Ind. Inst., 1936, No. 4, 23—25).—Hardness and electrical conductivity measurements afford evidence of limited solubility in the solid state. At room temp. Al dissolves about 2% Sn, and Sn <0·5% Al. A. J. K.

Solid solutions of indium and lead. N. V. Ageev and V. A. Ageeva (Trans. Leningrad Ind. Inst., 1936, No. 4, 26—31).—Thermal and *X*-ray data are used in the construction of a modified diagram. A. J. K.

Paramagnetism in the system sodium–mercury. W. Franke and H. Katz (Z. anorg. Chem., 1937, **231**, 63—65; cf. A., 1934, 241).—The susceptibility (χ) of Na amalgams has been measured at 20°. The at. χ of Na is const. $= 15 \times 10^{-6}$ between Na 21 and 90%, in which range the compounds Na$_3$Hg and Na$_5$Hg are included. It is inferred that Na is dissolved in Hg similarly to Tl in Hg or Na in liquid NH$_3$, and not chiefly in the form of atoms. F. L. U.

Precipitation-hardening in the system copper–indium and its modification by nickel and cadmium. F. Weibke and I. Pleger (Z. anorg. Chem., 1937, **231**, 197—216; cf. A., 1935, 22).—Cu–In alloys (In 12·8 and 15·2%) quenched at 0° from 650° show pptn.-hardening. The hardness is increased fourfold by annealing at 300° for 100 hr. The accompanying changes have been studied by *X*-ray analysis and microscopic examination. Within certain limits Ni or Cd can be substituted for a part of the In, the solubility of which in Cu is depressed by both metals. *X*-Ray and thermal data are given for the systems Cu–Ni–In and Cu–Cd–In over a limited range. F. L. U.

Alloys. W. L. Bragg (J. Soc. Arts, 1937, **85**, 430—447).—A lecture.

Theory of transition of metallic mixed phases. IV. Separation of disordered mixed phases. G. Borelius (Ann. Physik, 1937, [v], **28**, 507—519).—An expression previously derived (A., 1936, 24) for the free energy of mixed phases with disordered distribution of atoms is applied to the calculation of the zero-point energy of binary alloy systems in which both components have the same lattice structure, and can form only mixed crystals with that structure, and disordered mixed phases. The relation between composition and zero-point energy can be derived from the form of the limiting solubility curve and this is carried out for the system Au–Pt. The modification of the theory for systems in which the components have small mutual solubilities (*e.g.*, Cu–Ag) is given. The free energy–composition curve for a series of alloys shows inflexions where the mixing gap occurs, indicating the instability of the single phases. The delay in breakdown of the homogeneous phase is connected with the shape of the free energy curve. The hysteresis shown by the breakdown of the homogeneous phase with falling temp. and its re-formation as the temp. rises is discussed. A. J. M.

Hysteresis between the decomposition and re-formation of a homogeneous metallic phase. C. H. Johansson and O. Hagsten (Ann. Physik, 1937, [v], **28**, 520—527).—The variation of electrical resistance of a Pt–Au alloy, containing 30 at.-% Au, with temp. and with time after suitable pre-treatment has been examined. The decomp. of the homogeneous phase takes place much more slowly than its re-formation. The velocity of decomp., which is small just below the limiting temp. (954°), increases as the temp. falls to 560°. A. J. M.

Systems with an upper critical triple point. R. V. Mertzlin (J. Gen. Chem. Russ., 1936, **6**, 1828—1840).—The system H$_2$O–PhOH–C$_5$H$_5$N exhibits an upper triple stratification point, at 143·5° (H$_2$O 57, C$_5$H$_5$N 18·4, PhOH 24·6%). R. T.

Two rules concerning the solubility of gases and crude data on the solubility of krypton. F. Körösy (Trans. Faraday Soc., 1937, **33**, 416—425).—The empirical formula $\log \gamma_M = A + BT_c$ (T_c = crit. temp., γ_M = gas dissolved in 1 mol. of solvent/gas concn. in gas phase) represents approx. the solubility of different gases in a given solvent. The val. of *B* varies little with the solvent, its variation indicating departures from Just's law. The temp. coeff. at const. pressure is positive for gases with T_c <180° abs. and negative for others. It is, however, always negative for solutions in H$_2$O. The temp. coeff. at const. vol. is always negative. The solubility of Kr has been determined at room temp. with an accuracy of ±5%. J. W. S.

Solubility of salts and salt mixtures in water at temperatures above 100°. I. A. Benrath, F. Gjedebo, B. Schiffers, and H. Wunderlich (Z. anorg. Chem., 1937, **231**, 285—297).—Solubility data between 100° and 500° have been determined directly in sealed tubes for nitrates, halides, and sulphates and for KClO$_3$, KBrO$_3$, KIO$_3$, and KClO$_4$, which are characterised by complete miscibility of solution and melt. Data are also recorded for CdCl$_2$, CdBr$_2$, and CdI$_2$, where compound formation occurs, and for HgI$_2$, PbBr$_2$, PbCl$_2$, PbI$_2$, Tl$_2$SO$_4$, TlCl, and TlBr, where the miscibility is partial. H. J. E.

Solubility of sodium cyanide in water. O. I. Frost (J. Gen. Chem. Russ., 1936, **6**, 1910—1912).—Solubility data are recorded for the range −26·4° to 35°. The solid phases are ice and NaCN,2H$_2$O. R. T.

Silica and silicate solubilities. A. C. Titus (J. Ind. Hyg., 1937, **19**, 138—145).—Ultrafiltered suspensions of various materials containing SiO_2 show a true solubility of 0·05 mg. of SiO_2 per 100 c.c. of H_2O at 38°; much higher vals., found in the literature, are due to the presence of colloidal SiO_2. Blood serum normally contains about 1 mg. of SiO_2 per 100 c.c.; this val. is not appreciably altered by prolonged treatment with SiO_2 suspensions. F. A. A.

Sorption of mercury vapour by iodised charcoal. II. V. A. Piankov (J. Gen. Chem. Russ., 1937, **7**, 198—201).—The effects of varying rate of flow of gas, [Hg], thickness of layer of sorbent, and temp. have been studied. R. T.

Properties of activated sugar charcoal coated with various substances. I. Liberation of acid and alkali by the action of neutral salts in relation to surface charge. H. K. Acharya (J. Indian Chem. Soc., 1936, **13**, 723—734).—Treatment of sugar charcoal, activated in air at 600°, and weakly negatively charged in H_2O, with long-chain fatty acids and aromatic acids increases the negative charge. With 0·0001*M*-electrolytes the negativity decreases in the order K>Na>Li>Rb>Sr>Ba, due to the apparent replacement of H ions in the adsorbed layer: the p_H of the electrolyte solutions is proportionately lowered. Mercaptans, ketones, and aldehydes behave similarly. Treatment with aromatic amines alters the surface oxide, the negativity being initially decreased and then considerably increased by the action of electrolytes; this is attributed to the preferential adsorption of anions. J. S. A.

Temperature coefficient of adsorption from solutions. I. V. P. Mischin and A. N. Karpov. **II.** V. P. Mischin and E. E. Polotschanskaja (Kolloid. Shurn., 1936, **2**, 305—315, 317—322).—I. In equilibrium the attraction of a solute by the adsorbent and that by the solvent counter-balance each other; when the solvent attraction, *i.e.*, the solubility, decreases with rising temp. the adsorption must increase. In agreement with this theory the adsorption of Ca glycerophosphate and of $(PrCO_2)_2Ca$ from H_2O by charcoal rises between 0° and 75°.

II. $(CHPr_2{\cdot}CO_2)_2Ca$ is adsorbed more strongly at 50° and 75° than at 0°. J. J. B.

Heat of adsorption of oxygen on charcoal at low surface concentrations. M. J. Marshall and A. S. MacInnes (Canad. J. Res., **15**, B, 75—79).—The adsorption of O_2 on activated charcoal, over a low temp. range, was measured by means of an improved ice calorimeter and charcoal bulb, the O_2 being introduced into the middle of the adsorbing mass. At zero concn., a heat of adsorption of 129 kg.-cal. per mol. of O_2 was found, falling to 72 kg.-cal. at 6·0 micromols. per g. The initial heats of adsorption obtained by this technique are > those previously found, since more uniform adsorption is obtained, and heat loss was prevented. The val. of 129 kg.-cal. per mol. of O_2 is > the heat of formation of CO_2 from C, and it is considered that complexes corresponding with compounds containing C and O in ratios unknown in the normal state may exist initially and give rise to high heats of adsorption at very low O_2 concns. S. G. S.

Technique of measuring adsorption of potassium by soils. I. N. Antipov-Karataiev and T. F. Antipova-Karataieva (Kolloid. Shurn., 1935, **1**, 481—494).—Calculation of H_2O adsorbed by soils by measuring the negative adsorption of sugar from its aq. solutions is impossible in presence of electrolytes as sugar is adsorbed relatively more strongly than H_2O. The adsorption of KCl can be measured only by analysing the soil before and after the adsorption. Data are recorded and discussed. J. J. B.

Adsorptive properties of synthetic resins. S. S. Bhatnagar, A. N. Kapur, and M. L. Puri (J. Indian Chem. Soc., 1937, **13**, 679—688).—Synthetic resins show considerable adsorptive powers from solution. The adsorption can be represented by the Freundlich isotherm. A variety of solvents and solutes has been used and certain qual. deductions made relative to the factors which determine the extent of adsorption. The resins are compared with C and SiO_2. D. C. J.

Sweating of soda and potash rosin soaps and their surface tension. I. N. N. Godbole and P. D. Srivastava (Kolloid-Z., 1937, **78**, 348—353; cf. A., 1936, 793).—Absorption of H_2O from saturated air by rosin soaps is greatest for those containing 1% of free alkali, less for neutral soaps, and least for those with 1% of free rosin. Na soaps are more hygroscopic when made from rosin of Indian origin than from that of American. The surface tension of 0·1% solutions is lowest when free alkali is present. F. L. U.

Surface tension of *N*-chloroacetanilide–salt–water mixtures. J. W. Belton (Trans. Faraday Soc., 1937, **33**, 440—448).—The surface tension (σ) of aq. NaCl, KCl, LiCl, $CaCl_2$, $BaCl_2$, and $MgSO_4$ is lowered in presence of NPhClAc. For alkali chlorides $d\sigma \propto$ the salt concn. (c). At const. [NPhClAc] the adsorption (Γ)–c curve is nearly parallel to that for pure salt solutions, but for $CaCl_2$ and $BaCl_2$ Γ falls more rapidly with increasing c than with the salt alone. The presence of sucrose decreases the H_2O-adsorption. The adsorption of NPhClAc at the surface of the ternary solutions is calc. and the structure of the surface layer discussed. J. W. S.

Buffer phenomena in the domain of surface tension. V. K. Sementschenko, A. F. Gratscheva, and E. A. Davidovskaja (Kolloid. Shurn., 1935, **1**, 367—383).—γ of the ternary systems H_2O–$C_5H_{11}{\cdot}OH$–NaBr and $(CH_2{\cdot}OH)_2$–$C_5H_{11}{\cdot}OH$–NaBr was measured at 15°, and that of the system H_2O–$Bu^{\alpha}OH$–NaBr between 0° and 80°. Many of the γ–C curves at a const. M (C = concn. of the alcohol, M that of NaBr) intersect at a point ("buffer point") where γ is independent of M. For the solution 4*N*-NaBr + 0·011*N*-$Bu^{\alpha}OH$ γ is independent of temp. J. J. B.

Interfacial tensions of mixtures of organic liquids in presence of emulsifiers. A. G. Nasini, C. Rossi, and P. della Santa (Atti V Congr. Naz. Chim., 1936, **1**, 410—422; cf. A., 1934, 1169).—Measurements have been made of the interfacial tension, σ, for mixtures of C_6H_6– and PhMe–amyl acetate, C_6H_6–PhMe, $PhNO_2$–CCl_4, and of C_6H_6–

vaseline oil against H_2O and against dil. solutions of NaOH and of Na lauryl sulphate. The deviations from linearity in the σ-composition curves are discussed. O. J. W.

Potentials at the interface of two liquid phases. VI. K. Karczewski (Rocz. Chem., 1937, **17**, 9—10). Potentials at the interface between *iso*-C_5H_{11}·OH and 0·00001—1·0*M*-MX in aq. solution (M = Na, K; X = Cl, Br, I, CNS) are recorded. R. T.

Surface activity and adsorbability of amino-acids. VIII. T. Ito (J. Agric. Chem. Soc. Japan, 1937, **13**, 172—176; cf. A., 1936, 677).—$Pr^{\alpha}CO_2Na$, $Bu^{\beta}CO_2Na$, and Na hexoate have only a slight reducing effect on the γ of H_2O, and in each case γ is const. over a p_H range of 8 to 13. *n*-Amylamine and *iso*hexylamine are surface active and reduce γ to 0·98 and 0·96, respectively. *n*-Butyric and *iso*valeric ions are only weakly adsorbed by C, whilst the *n*-hexoic ion is readily absorbed. The salts of the two amines with fatty acids are more strongly adsorbed. J. N. A.

Surface phenomena and mechanical properties of dispersed phases. B. V. Iljin (Kolloid. Shurn., 1935, **1**, 317—326).—A review (cf. A., 1935, 141). J. J. B.

Property of the surface of silver. N. Kameyama and S. Kikuchi (J. Soc. Chem. Ind. Japan, 1937, **40**, 17—18B).—Consideration of free energy changes shows that a thin layer of Ag (assumed to have zero free energy) immersed in a solution of halide, cannot take part in the reaction $Ag(s) + Cl^- + H_2O = AgCl(s) + OH^- + \frac{1}{2}H_2$, in the absence of O_2, unless the activity of the $(OH)^-$ ion is $<10^{-18}$; this is contrary to experimental observations, indicating that the surface Ag atoms are much more reactive than the interior ones. R. C. M.

Leidenfrost protective vapour layer in evaporation *in vacuo*. G. Schmid and H. Speidel (Z. Electrochem., 1937, **43**, 187—192).—The stability or the vapour layer, as measured by the depth of immersion of heated metal on the surface of H_2O, has been examined at low pressures and for various temp. of H_2O and metal. When the temp. are fixed, the stability increases with rise of pressure to a max. val. and then decreases. This max. val. increases with rise in H_2O temp. to a max. val. and then decreases. The greatest stability occurs when the H_2O temp. is 26—30° and the metal temp. 80—100°. The thickness of the vapour layer is calc. from measurements of its electrical capacity. The results obtained can be expressed by the formula $d = 1·45 \times 10^7 \times \lambda(t_m - t_s)/p(t_s - t_w)$, where d is the thickness in μ, p is the pressure in mm. Hg, t_m and t_w are the temp. of the metal and H_2O, respectively, t_s is the b.p. of H_2O at p, and λ is the thermal conductivity of H_2O vapour at t_s expressed in g.-cal. per cm. sec. degree. C. R. H.

Solvent action of the bound water of soil. A. Kotukov (Kolloid. Shurn., 1936, **2**, 297—303).—Positive and negative adsorption of $Ca(NO_3)_2$ and $CaCl_2$ by chernozem has been measured. J. J. B.

Ultramicroscopical examination of mixed films. F. M. Fowkes, R. J. Myers, and W. D. Harkins (J. Amer. Chem. Soc., 1937, **59**, 593—595).—Films consisting of a mixture of excess of paraffin oil with fatty acids exhibit oil lenses having an average diameter 1—2 μ. When the mixture contains ≯0·3 part of paraffin to 1 part of fatty acid, no lenses appear until the film is compressed to a certain crit. pressure, when lenses (diameter <1 μ) appear suddenly. The variation of the crit. conditions with film composition, film pressure, and rate of compression has been determined. The appearance of the lenses does not cause a discontinuity in the pressure–area curves. E. S. H.

Molecular interaction in monolayers. I. Complexes between large molecules. II. Action of hæmolytic and agglutinating agents on lipoprotein monolayers. J. H. Schulman and E. K. Rideal (Proc. Roy. Soc., 1937, B, **122**, 29—45, 46—57).—I. Consideration of the effects produced when sol. adsorbable substances are injected into the liquid underlying insol. films suggests that two distinct types of equimol. complex formation occur: (*a*) when the association is between the polar groups of the two species of mol., (*b*) when association is the result of mutual attraction between the non-polar portions (" penetration "). The stability of the complexes towards compression varies widely; in some cases it is ≫ that of either component. Experiments on the inhibition of hæmolysis due to the formation of such complexes are described.

II. A mixed film of gliadin (I) + 20% of cholesterol (II) at p_H 7·2 sets to a gel under compression; on further compression it liquefies again and takes on the properties of a film of (II) with the expulsion of (I); this action is reversible. Tannic or gallic acid injected beneath a film of (I) is adsorbed, gallic acid only slowly. Na oleate injected beneath a film of (I) rapidly disperses it; injected beneath a gallic acid-treated film of (I), slow dispersion occurs. With a tannic acid-treated film, penetration, but no dispersion, takes place, probably owing to the formation of macromols. The processes of lysis, agglutination, and sensitisation of red cells are discussed in relation to these results. F. A. A.

Influence of electrolyte content of the medium on properties of completely spread protein films. G. J. Philippi (Biochem. J., 1937, **31**, 513—520).—The surface occupied by protein films depends on the p_H and the electrolyte content of the medium, whilst variations of the potential drop across the films are independent of their states of compression. For areas of 1·0—2·0 sq. m. per mg. the film pressure depends on the p_H of the medium. P. G. M.

Membrane permeability. I. Measurement of the permeability of membranes to solutes. E. J. Hartung, F. H. C. Kelly, and J. Wertheim (Trans. Faraday Soc., 1937, **33**, 398—405).—An apparatus for the accurate measurement of rates of diffusion of solutes through membranes, in which a const. concn. gradient is maintained across the membrane, is described. J. W. S.

Analysis of heterocapillary systems in non-swelling bodies. A. V. Dumanski and M. S. Ostrikov (Kolloid. Shurn., 1936, **2**, 727—736).—If a long vertical tube is filled with sand, and its lower end dipped in H_2O, the % of H_2O on different levels of the tube measures the distribution of capillaries with different pore sizes. The capillary rise may be reduced by a counter-pressure. J. J. B.

Structure of semi-permeable membranes of inorganic salts. S. Fordham and J. T. Tyson (J.C.S., 1937, 483—487).—Semi-permeable membranes of the ferrocyanides, hydroxides, silicates, and tannates of Cu, Fe^{III}, and Pb were prepared (*a*) by pptn. of dil. aq. solutions of the appropriate salts and mounting on Ni or Pt gauze, (*b*) by an electrolytic method in collodion films, and (*c*) by pptn. in gelatin films. The structures of the films, as indicated by electron diffraction data, appear to be independent of the method of prep. The membranes all consist of films of gels, whether the unit is amorphous or cryst. Ferrocyanide membranes are cryst., the average size being 100—150 A. but the ultramicroscope reveals the presence of particles 1000—4000 A. in length, and it is suggested that the smaller crystals unite the larger particles, giving the membrane mechanical strength. The correlation between permeability and pore size obtained by microscopic methods is therefore fortuitous. Hydroxide membranes are also cryst., but the tannates are amorphous. " Silicate " membranes are found to consist largely of mixtures of gels of cryst. metallic hydroxides and amorphous silicic acid. Pb silicate, however, is cryst. The following new crystal structures are given: $Cu_2[Fe(CN)_6]$, simple cubic, a 4·97$_8$ A.; $Pb_2[Fe(CN)_6]$, simple cubic, a 8·28 A.; $Pb(OH)_2$, close-packed hexagonal, a 5·26, c 14·7 A.; $Fe(OH)_3$, face-centred cubic, a 5·70 A. The results favour an adsorption theory of permeability. A. J. M.

Calibration of diffusion membranes and calculation of molecular volumes from diffusion coefficients. M. L. Anson and J. H. Northrop (J. Gen. Physiol., 1937, **20**, 575—588).—The calibration of diffusion membranes with NaCl, KCl, and HCl is described, and it is shown that the membrane method gives correct diffusion coeffs. The mol. vols. calc. from diffusion coeffs. are > those calc. from osmotic pressure and sedimentation data. These high vals. may be due both to hydration and to the non-spherical shape of the mols. An outline is given of the nature of the information which may be obtained from diffusion measurements. E. A. H. R.

Gas models. U. P. Lely (Ned. Tijds. Natuurk., 1935, **20**, 241—250; Chem. Zentr., 1936, i, 2677).—A model illustrating kinetic and osmotic phenomena is described. H. J. E.

Osmotic pressure and gas pressure. K. H. Meyer (Z. Elektrochem., 1937, **43**, 148—152).—Theoretical. The osmotic pressure of N_1 mols. in an ideal mixture with N_0 mols. is shown to be equiv. to the gas pressure of N_1 mols. in a vol. containing free space equiv. to N_0 mols. C. R. H.

Apparent molecular volumes of non-electrolytes in solution. B. Pesce (Atti V Congr. Naz. Chim., 1936, **2**, 439—441).—The mol. vols. of $C_{10}H_8$ in C_6H_6 and of $CO(NH_2)_2$ in H_2O increase linearly with c and not with $\sqrt{c}$ (cf. A., 1935, 162). O. J. W.

Apparent molecular refraction of non-electrolytes in solution: carbamide in water. B. Pesce (Atti V Congr. Naz. Chim., 1936, **2**, 441—443).—The apparent mol. refraction of $CO(NH_2)_2$ in H_2O is a linear function of the concn., as with electrolytes (cf. A., 1932, 804). It is probable that $CO(NH_2)_2$ is associated in H_2O and that the association increases with the concn. This is supported by f.-p. data. O. J. W.

Rotatory power of alkaline solutions of sucrose. K. Smolenski and W. Kozlowski (Bull. Assoc. Chim. Sucr., 1936, **53**, 837—850).—The lowering of the $[\alpha]_D$ of sucrose in solutions containing NaOH is quantitatively accounted for by formation of Na_1 and Na_2 sucrates (B., 1935, 1064). Assuming 3×10^{-13} and 3×10^{-14} as the dissociation consts. for the first and second stages of ionisation of sucrose, the mol. rotations (g.-mol. per litre) calc. for the sucrate′ and sucrate″ ions, respectively, are 20·6° and 18·4°, compared with 22·6° for undissociated sucrose. The equilibrium is determined by the p_H of the solution. The first stage of dissociation begins at p_H 10 and the second at p_H 11·5. Below p_H 12·5 the predominant form is sucrose, between p_H 12·5 and 13·5 sucrate′ (max. 60% at p_H 13), and beyond p_H 13·5 sucrate″. J. H. L.

Specific heats of aqueous sucrose solutions at 20° and 25° and the apparent molal heat capacity of non-electrolytes. F. T. Gucker, jun., and F. D. Ayres (J. Amer. Chem. Soc., 1937, **59**, 447—452).—The apparent mol. heat capacity of sucrose is not const.; it increases with concn., although less than does that of a uni-univalent strong electrolyte. It is more nearly a linear function of concn. than of concn.$^{\frac{1}{2}}$; the change with concn. decreases with rising temp. Its limiting val. at low concn. increases more rapidly with temp. than does the same property of most electrolytes. E. S. H.

Modifications in the spectra of aqueous solutions of phenylpyruvic acid as a function of p_H and time. J. Boe and (Mlle.) M. Gex (Compt. rend., 1937, **204**, 770—772; cf. A., 1936, 1048).—The spectral variations are said to indicate the existence of five possible forms of the acid. A. J. E. W.

Infra-red absorption of dilute solutions of HCl and HBr. C. E. Leberknight and J. A. Ord (Physical Rev., 1937, [ii], **51**, 430—433; cf. West, A., 1936, 545).—Solutions in C_6H_6, PhCl, CCl_4, and $SnCl_4$ show a single absorption band except in the case of $SnCl_4$, which shows a double band for HCl and a single band for HBr in the position of one of the HCl bands; this is attributed to the formation of H_2SnCl_6, the free and combined HCl giving two bands, and to the liberation of free HCl by HBr from $SnCl_4$ giving only the HCl band. It would seem that the dissolved mols. can be treated as damped simple harmonic oscillators, and damping consts. and force consts. are calc. The force consts. are < the vals. for the mol. in the vapour state. The ratio of the force consts. HCl/HBr in the solvents is approx. 1·32, which is the ratio of the dipole moments HCl/HBr in the vapour state. The ratio of the half-widths of the bands for the two mols. is approx. 1·32. Vals.

of the Einstein coeff. of absorption and of the coeff. in the electric moment equation are calc. N. M. B.

Apparent molecular volumes of strong electrolytes in concentrated solutions. B. Pesce (Atti V Congr. Naz. Chim., 1936, 2, 436—438; cf. A., 1935, 1066).—The apparent mol. vol. increases linearly with $\sqrt{c}$ up to the vals. of c (mols. per litre) shown in parentheses: K_2CO_3 (2·2), $Sr(NO_3)_2$ (5), $NaNO_2$ (8·3), KCNS (7·29). O. J. W.

Apparent equivalent refraction of calcium and strontium nitrates in aqueous solutions. B. Pesce (Atti V Congr. Naz. Chim., 1936, 2, 443—445; cf. A., 1932, 804).—The apparent equiv. refraction of $Ca(NO_3)_2$ and of $Sr(NO_3)_2$ decreases linearly with the concn. The data are discussed in relation to Fajans' theory. O. J. W.

Equivalent refraction of strong electrolytes in aqueous solution. B. Pesce (Atti V Congr. Naz. Chim., 1936, 2, 459—463).—The equiv. refractions of K_2CO_3, $MnSO_4$, and $NaNO_2$ increase linearly with the concn. From the data the calc. ionic refractivities are: $\frac{1}{2}Mn^{\cdot\cdot}$ 0·67, NO_2' 9·28, $\frac{1}{2}CO_3''$ 6·09. O. J. W.

Viscosity of aqueous solutions of electrolytes as a function of the concentration. V. Sodium chloride. G. Jones and S. M. Christian (J. Amer. Chem. Soc., 1937, 59, 484—486; cf. A., 1936, 678).—Vals. of d and η for aq. NaCl (0·002—2N) have been determined at 0—25°. The concn. function for d can be expressed by the Root equation and for η by the Jones and Dole equation. E. S. H.

Study, by Quincke's method, of the magnetism of ferric chloride solutions. I. M. Aumeras and M. Mounic (Bull. Soc. chim., 1937, [v], 4, 523—536).—The variation with time of the coeffs. of susceptibility of aq. $FeCl_3$ (0·125—23 g. per litre) has been determined. The coeff. decreases progressively, reaching an equilibrium state which depends on the temp. and concn. The mechanism of slow hydrolysis is discussed. E. S. H.

Apparent volumes and thermal expansions of salts in glycol and methyl alcohol. R. E. Gibson and J. F. Kincaid (J. Amer. Chem. Soc., 1937, 59, 579—584).—Sp. vols. and expansion coeffs. at 25° have been determined for NaI, NaBr, KI, and LiBr in glycol and for LiBr and NaI in MeOH. Comparison of data for LiBr in H_2O, glycol, and MeOH indicates that LiBr influences the structure of H_2O by promoting the tetrahedral arrangement of the mols. The apparent mol. expansibilities of the salts in glycol and MeOH are negative and increase with the concn. of salt (unlike aq. solutions), agreeing with the predictions of the interionic attraction theory and the effective pressure hypothesis. Comparison with the behaviour of the salts in H_2O indicates that structural changes in H_2O are important factors determining the thermal expansion of aq. solutions. E. S. H.

Size of smoke particles suspended in air. O. Te-Tchao (Compt. rend., 1937, 204, 852—854).—The val. of the particle radius, calc. from its concn. and the wt. of substance burned, is $2·59 \times 10^{-5}$ cm., in agreement with vals. calc. by other methods. A. J. E. W.

Optical scattering by colloidal suspensions and emulsions. S. R. Rao and N. Muthuswami (J. Annamalai Univ., 1937, 6, 107—120).—The scattering of light (λ 5462 A.) by colloidal suspensions of S and As_2S_3 and by emulsions of C_6H_6, PhMe, $PhNO_2$, and NH_2Ph with H_2O has been studied with the incident beam unpolarised, and vertically and horizontally polarised. Krishnan's rule (A., 1935, 1075) is valid for the solid suspensions but not for the emulsions. Evidence of asymmetry was obtained in the case of all the particles, including those of the emulsions. F. L. U.

Depolarisation of light which traverses suspensions and colloids in relation to the radius of the particles. N. Calinicenco (Ann. Sci. Univ. Jassy, 1935, 20, 353—369).—For suspensions of $CaCO_3$ and H_3BO_3 in petrol and V_2O_5 in H_2O the angle of depolarisation is $\propto$ the radius of the particles, the proportionality factor decreasing in the order given. The min. radius at which depolarisation can be observed is $<0·001$ mm. for $CaCO_3$ and H_3BO_3, and 0·005 mm. for V_2O_5. R. S. B.

New friction law, its experimental test, and its application to the friction of mineral dispersoids. B. Derjaguin and V. Lazarev (Kolloid. Shurn., 1935, 1, 293—301).—Coulomb's law of external friction is supplemented by an adhesion term. The new formula is tested by measuring adhesion of powdered talc, quartzite, and graphite to glass, Fe, and brass plates. J. J. B.

Influence of light on the formation of different modifications of colloidal sulphur of Raffo. I. Markevitsch and M. Kolomitzeva (Kolloid. Shurn., 1936, 2, 323—325).—The amount of colloidal S and of S which cannot be peptised by hot H_2O is less when the reaction $H_2SO_4 + Na_2S_2O_3 \rightarrow S$ is carried out in the arc light. J. J. B.

Constitution of highly purified sulphide sols. I. As_2S_3 sol. W. Pauli and A. Laub (Kolloid-Z., 1937, 78, 295—306).—In As_2S_3 sols purified by electrodecantation the $[H^{\cdot}]$ calc. from the results of conductometric titration is > that given by the conductivity, whereas the converse is true of the liquid separated from a coagulum obtained by freezing the sol. This coagulum has the composition As_2S_3, and retains adsorbed stabilising groups from which $H^{\cdot}$ is liberated by treatment with $Ba^{\cdot\cdot}$. Both the original sol and the intermicellar liquid are shown by conductometric titration and by analysis to contain H_3AsO_4 and a salt, probably $H_2(AsO)AsO_4$, which are formed by oxidation of the S-containing stabilising complex. S is absent from the intermicellar liquid. On boiling the sols, H_2S is evolved and some cryst. As_2S_3 is pptd. The coagulating effects of electrolytes are essentially the same as with unpurified sols. F. L. U.

Refraction of light by colloidal solutions. III. α- and β-stannic acid sols. A. S. Menon (Kolloid-Z., 1937, 78, 272—277; cf. this vol., 182).—Light refracted by sols of α-stannic acid is almost completely polarised at right angles to the incident beam. The intensity follows Rayleigh's law. The particles are spherical and of a size corresponding with the wave-length of the light used. Sols of β-stannic acid contain much larger non-spherical particles. The refracted light is incompletely polarised at right angles and the intensity does not follow Rayleigh's law. The observed differences are attributed to the difference in particle size. F. L. U.

Constitution and chemical-colloidal properties of the higher fatty acids. L. Szegö and L. Malatesta (Atti V Congr. Naz. Chim., 1936, **2**, 569—577; cf., B., 1935, 159).—The surface tension and detergent power of aq. solutions of the Na salts of the following acids have been measured by methods previously described: oleic, ricinoleic, stearic and its 2-, 10-, and 12-OH-derivatives, cetylmalonic, and hexadecane-αω-dicarboxylic acids. The introduction of a second hydrophilic group into the C chain decreases the capillary properties of the soap, the decrease becoming larger with increased separation of the two active groups. The mols. containing two hydrophilic groups are oriented parallel to the surface in the case of these soap solutions. O. J. W.

Osmotic pressure of colloidal solutions. W. Haller (Kolloid-Z., 1937, **78**, 341—343; cf. A., 1931, 1230).—A formula for the osmotic pressure of lyophilic colloids is derived. "Swelling pressure" is regarded as the escaping tendency of loosely coiled thread-like mols., parts of which are in serpentine thermal agitation. F. L. U.

Sign of charge of calcium carbonate and its relations to its formation and to the composition of the equilibrium solution. V. M. Gortikov and I. G. Ostapenko (Kolloid. Shurn., 1935, **1**, 303—315).—The electro-osmosis of aq. solutions through various samples of $CaCO_3$ has been examined. Pure $CaCO_3$, $CaCO_3$ pptd. by an excess of Na_2CO_3, natural calcite, and natural aragonite are positive in H_2O; $CaCO_3$ pptd. by a deficient amount of Na_2CO_3 and tuff are negative in H_2O. CO_2 makes $CaCO_3$ more positive, Na_2SO_4 makes it more negative. J. J. B.

Colloidal solution of oxy-dimercuriammonium iodide. G. Rossi and G. Scandellari (Atti V Congr. Naz. Chim., 1936, **2**, 522—527).—The compound $(Hg_2O)NH_2I$, said to be formed when Nessler's reagent is added to a solution of an NH_4 salt, remains in colloidal suspension when an excess of the reagent is used, and when the concn. of the compound is $\ngtr 0{\cdot}103\%$. More conc. suspensions can be obtained by the addition of gelatin (cf. A., 1934, 614). O. J. W.

Colloidal systems of three liquid components. II. Benzene–water–methyl alcohol and carbon tetrachloride–water–methyl alcohol. N. Sata and Y. Niwase (Bull. Chem. Soc. Japan, 1937, **12**, 86—95).—Results similar to those obtained with C_6H_6–H_2O–EtOH (A., 1935, 1459) are recorded for the above systems, but the range of appearance of the blue opalescence is more restricted with MeOH. The opalescence is independent of the *d* of either liquid layer, and apparently requires a symmetrical H_2O-insol. component (*e.g.*, C_6H_6 or CCl_4, but not C_5H_{12} or C_6H_{14}) for its production. F. L. U.

Stabilisation of suspensions and adsorption layers in disperse systems. XVI. Dispersity and stabilisation of soot suspensions in hydrocarbons. P. M. Chomikovski (Kolloid. Shurn., 1936, **2**, 737—747).—The wetting of soot by PhMe and H_2O, and the dispersity of suspensions in PhMe + paraffin oil + oleic acid have been examined. J. J. B.

Stabilisation of aërohydrosol by oil-like substances. V. I. Saitschuk and O. G. Narskich (Kolloid. Shurn., 1936, **2**, 841—844).—H_2O mist is stabilised by petroleum > oleic acid > cottonseed oil. J. J. B.

Formation of artificial mist on condensation nuclei. V. I. Saitschuk and O. G. Narskich (Kolloid. Shurn., 1936, **2**, 801—806).—The stability of H_2O mist produced by chemical nuclei rises in the series $N_2O < HCl < NO_2 < P_2O_5 < SO_3$. Chemical nuclei may give rise to artificial clouds in the atm. J. J. B.

Influence of non-electrolytes on stability of sulphur sols. I. Markevitsch and M. Kolesova (Kolloid. Shurn., 1936, **2**, 327—331).—Coagulative power rises in the series $Pr^aOH < EtOH <$ *sec.*-$BuOH < Bu^aOH < C_5H_{11}{\cdot}OH < MeOH < Et_2O$. J. J. B.

Surface salting out of surface-active substances by electrolytes and the stability of foams. N. F. Jermolenko and N. A. Abramtschuk (J. Phys. Chem. Russ., 1936, **8**, 587—596).—The stability of foams produced in protein solutions in presence of varying quantities of NaCl, K_2SO_4, $FeCl_3$, and KCNS has been investigated. The increase in stability with increased concn. of the electrolyte is explained as due to the "surface salting out" effect, as assumed by Sementschenko. In KCNS solution, the stabilisation is followed by an opposite effect at higher concns. This is due to the liquefying effect of KCNS on protein gels and semi-solid surface films. E. R

Coagulation of colloids. XV. Gold sol coagulation. S. S. Joshi and N. H. Rao (J. Indian Chem. Soc., 1936, **13**, 755—759).—Measurements of η and n during the coagulation process show that changes in η are discontinuous in the slow region, and cannot be correlated with the changes in colour. J. S. A.

Influence of ultrasonic waves on colloid solubility of metal hydroxides. II. N. Sata and S. Watanabe (Kolloid-Z., 1937, **78**, 277—284; cf. A., 1935, 1320).—In $Fe(OH)_3$ prepared from $FeCl_3$ and aq. NH_3 the $NH_4^{\cdot}$ ions have a coagulating and the Cl' ions a peptising action. During purification by hot H_2O appreciable quantities of $NH_4^{\cdot}$ are washed out, whereas no Cl' is detectable. Very highly purified $Fe(OH)_3$ undergoes spontaneous peptisation owing to the absence of $NH_4^{\cdot}$, and when peptised in presence of HCl does not follow the solid-phase rule, but appears to undergo mol. dissolution. F. L. U.

Theory of rapid and slow coagulation. P. N. Pavlov (Kolloid-Z., 1937, **78**, 307—310).—Assuming that the particles of a sol are surrounded by liquid envelopes of approx. const. thickness, and that cohesion occurs when these envelopes come into contact, it is shown that the velocity coeff. of rapid coagulation must increase with decreasing radius (r) of the particles. This assumption receives support from data which show that Smoluchowski's "*A*" (radius of sphere of attraction) shows an increasing divergence from $2r$ as r becomes smaller. For slow coagulation the proportionality factor ε in Smoluchowski's formula is put $= e^{-\zeta F/RT}$, where ζ is the electrokinetic potential of the partly discharged particles. The modified formula is in harmony with published data for benzopurpurin. F. L. U.

Kinetics of peptisation. II. Rate of peptisation of lyophobic ferric oxide. A. von Buzágh and F. Han (Kolloid-Z., 1937, 78, 284—295; cf. A., 1928, 237).—The peptisation of anhyd. lyophobic Fe_2O_3 in H_2O and in dil. HCl has been studied at 0°, 25°, 50°, and 95°. In contrast to lyophilic $Fe(OH)_3$, no autocatalytic effect is observed. The quantity of Fe_2O_3 peptised either increases parabolically with time, or passes through a max. In presence of HCl the rate is unimol., and with increasing [HCl] passes through a max. Mechanical agitation exerts a coagulating effect, which results, in the case of H_2O, in the appearance of the "max." type of curve, and in the case of HCl, in a lowering of the velocity const. Rise of temp. increases both the rate of peptisation and that of mechanical coagulation. In practice there is an optimal rate of stirring. F. L. U.

Relation between peptisation of a precipitate and its electrokinetic potential. S. G. Chaudhury and J. Sen-Gupta (J. Indian Chem. Soc., 1937, 13, 670—678).—The cataphoretic velocities of pptd. metallic ferrocyanides and sulphides have been studied during peptisation. The potential increases during peptisation. The sign of the charge depends on the concn. and is not always determined by that of the constituent ion present in excess at the time of pptn. D. C. J.

Coagulation and peptisation of humic acid by phosphates. I. K. K. Apuschkin (Kolloid. Shurn., 1935, 1, 495—506).—Humic acid extracted from peat by aq. NH_3 is pptd. by HCl, HNO_3, H_2SO_4, and H_3PO_4 at the same p_H. The coagulative power of cations is in the order $Ca > Mg > K > NH_4$. J. J. B.

Influence of adsorbed bases on the formation of structures in clay suspensions. G. V. Larin (J. Phys. Chem. Russ., 1936, 8, 790).—Plastic clays containing various amounts of $Na^{\cdot}$, $Mg^{\cdot\cdot}$, and $Ca^{\cdot\cdot}$ were prepared, and the thixotropy, viscosity, and particle size of the respective suspensions examined. Gelation tendency, anomaly of viscosity, and dispersity are max. at the same $Na^{\cdot}$ content. $Mg^{\cdot\cdot}$ and $Ca^{\cdot\cdot}$ decrease the dispersity. J. J. B.

Structural viscosity and properties of solutions of cellulose esters. II. Influence of salt content of cellulose nitrate on viscosity of concentrated colloidal solutions. Z. A. Rogovin and M. Schlachover (J. Gen. Chem. Russ., 1936, 6, 1749—1756).—The sp. η of 2% Et_2O–EtOH solutions of cellulose nitrate (I) is unaffected, and that of 16% solutions is greatly increased, by $Ca(OH)_2$, the increment increasing with the $Ca(OH)_2$ content of the (I) and the [EtOH] of the solution. The effect in other solvents rises in the order $MeOH < COMe_2 < C_5H_{11}{\cdot}OAc$. The val. of η falls to a min. 5—10 min. after adding HCl to 16% (I) in Et_2O–EtOH, and then gradually rises during the following 10 days. The action of $Ba(OH)_2$ is analogous to that of $Ca(OH)_2$. R. T.

Solubility and swelling of cellulose and its derivatives. I. E. Guth and S. Rogovin (Kolloid. Shurn., 1936, 2, 863—873).—Theoretical. J. J. B.

Electrochemical nature of cellulose solutions. (Mme.) A. Dobry (Compt. rend., 1937, 204, 861—863).—Solutions of cellulose di- and tri-nitrate and di- and tri-acetate in $COMe_2$ showed weak but measurable electrical conductivity. This is probably due to a feebly ionised group in the mol. A. J. E. W.

Double mobility of some non-Newtonian fluids with particular reference to cellulose nitrate sols. A. de Waele and G. Dinnis (Physics, 1936, 7, 426—431).—The ratio of the mobility at high shearing stresses to that at low stresses may be very great for certain "medium-" and "high-η" nitrocottons but is not necessarily $\propto$ the "η" as usually accepted. Mixtures of high- and low-η nitrocottons may show similar η under low shear (with the falling ball) but under high shear may be very different in η. The high-stress mobility determines the solvent demand of the sol for such operations as spraying or brushing whereas the η at low stresses indicates the characteristics expected after application. D. F. T.

Osmotic pressure of gum arabic. III. Ionisation of sodium, calcium, and acid gums. H. B. Oakley (Trans. Faraday Soc., 1937, 33, 372—381; cf. A., 1935, 297; 1936, 1200).—The slope of the osmotic pressure–concn. curves for Na- and acid-gums increases sharply below a concn. of 0·25%. This may be explained by dissociation of the gum particle. The apparent ionisation passes through a min., attributable to change of activity and subsequent increase of ionisation due to the overlapping of the atmospheres of "gegenions." The osmotic activity of the $H^{\cdot}$ ions of the acid gum is $\ll$ the corresponding electrochemical activity up to 6% concn. J. W. S.

Heat capacity of bound water. A. Kotukov (Kolloid. Shurn., 1936, 2, 293—296).—The sp. heat of dry gum arabic is 0·30 g.-cal. per g. The sp. heat of H_2O in aq. gum solutions is $<$ that of free H_2O. J. J. B.

Action of alkalis on araban.—See A., II, 179.

Susceptibility of particles of hydrophobic organic materials in hydrosols and suspensions to change of size and shape. R. Degkwitz, G. Cadenbach, and H. Lapp (Kolloid-Z., 1937, 78, 311—324).—The size and form of particles of many cryst. org. substances insol. in H_2O are strongly influenced by foreign substances present in the H_2O. Hydrosols formed in presence of enough H_2O-miscible solvent to impart to the dispersed material an appreciable solubility usually contain anisotropic particles, and addition of such solvent to an isotropic sol converts it into an anisotropic one. A similar change can be effected by addition of colloids of the soap type, but not by proteins or gum arabic. Examples are afforded by lecithin, cholesterol (I), $C_6H_2I_3{\cdot}OH$, *o*-$Hg(C_6H_4{\cdot}CO_2H)_2$, Sudan-blue, Sudan III (II), and

Sudan-red. (I) can be obtained as an isotropic hydrosol, or as rods, platelets, or filaments of thickness $< 1\ \mu$ and up to 4 mm. long, by suitably varying the conditions, whilst (II) can be obtained as needles, the length of which may be varied at will between 5 and 30 μ by addition of suitable quantities of C_5H_5N. F. L. U.

Hydrophilic colloids. II. Hydration energy. Hydration in solutions of sucrose and sodium sulphate: M. V. Tschapek, A. A. Mosgovoi, and G. N. Tretiakov (Kolloid. Shurn., 1935, 1, 399—416).—The net sorption (m) and heat of sorption (q) of H_2O from aq. solutions of EtOH, sucrose, and Na_2SO_4 by starch, agar, peat, chernozem, and SiO_2 gel have been measured. The results show that q increases with m in EtOH solution; in sucrose and Na_2SO_4 solutions m decreases with increasing concn., but q remains almost const. The "bound" H_2O seems to be present in two different forms. J. J. B.

Colloid optics. I. Scattering of light by protein solutions. II. Scattering of light by silicic acid sols and gels. K. S. Ramaiah (Proc. Indian Acad. Sci., 1937, 5, A, 128—137, 138—147).—I. The depolarisation and intensity of the light scattered by gelatin, casein, and albumin solutions have been measured simultaneously, and with unpolarised, horizontally polarised, and vertically polarised incident beams. The intensity is a max. and the depolarisation a min. at the isoelectric point. Ageing and changes of concn. at low concn. have little effect. Similarities in optical properties between proteins at the isoelectric point and binary liquid mixtures at the crit. solution temp. are pointed out. The phenomena, however, are not analogous.

II. The intensity and depolarisation of the light scattered by colloidal SiO_2 show that there is a continuous increase in micellar size during sol–gel transformation, and that this continues slowly after formation of a rigid gel. Where gel formation does not occur, micellar growth is arrested at an intermediate stage. The intensity of scattering is an index of micellar growth only in the later stages of the sol–gel transformation. Micellar size and therefore scattering intensity for alkaline sols and gels is $>$ for acid systems of the same concn. In slow-setting systems the micelles have almost complete spherical symmetry at a stage immediately prior to gel-formation, but later it decreases, due either to orientation of the micelles or to loose chain-formation. In rapid-setting systems the micelles have less symmetry, probably owing to their rapid growth. J. W. S.

Mechanically labile and stable structure viscosity in gelatin sols. W. Ostwald and W. W. Stuart (Kolloid-Z., 1937, 78, 324—338).—Previous work on the viscosity (η) of gelatin sols is reviewed. Such sols exhibit two kinds of structure η (S.V.), one of which is labile and sensitive to mechanical treatment. For purposes of measurement with a capillary viscosimeter, the effects of labile S.V. can be eliminated by carrying out two successive series of measurements, the first beginning with the highest pressure, and the second with the lowest. The latter series reveals permanent S.V., to which the de Waele–Ostwald formula is strictly applicable. Addition of H_2SO_4 in low concn. destroys only the labile S.V., whilst KCl at concns. $>1{\cdot}5M$ destroys both kinds. The factors responsible for both types of S.V. are discussed. F. L. U.

Influence of hydrogen-ion concentration on properties of gelatin. J. H. C. Merckel (Kolloid-Z., 1937, 78, 339—341; cf. this vol., 133).—The m.p. of a 10% gelatin jelly rises with increase of p_H from 3 to 5, and then attains a const. val., which is lowered by addition of NaCl, NaBr, NaI, and NaCNS in increasing order. The swelling of gelatin increases with change of p_H much more rapidly on the alkaline than on the acid side of the isoelectric point. F. L. U.

Behaviour of peptides in aqueous solutions. M. Frankel (Biochem. J., 1937, 31, 491—499).—Refractometric and cryoscopic measurements give no evidence of association with peptides containing wholly or in part non-associating NH_2-acids, such as *dl*-alanyl-*dl*-alanine, *dl*-alanylglycine, etc., whilst peptides which contain only associating NH_2-acids (*e.g.* glycyl-*dl*-phenylalanine) are themselves associated. P. G. M.

Mol. wt. of proteins. G. Vanzetti (Atti V Congr. Naz. Chim., 1936, 2, 578—598).—A review of methods used in determining the mol. wt. of proteins, and of the classification of proteins according to their degree of dispersion. O. J. W.

Physical chemistry of the proteins. XIV. Amphoteric properties of hæmoglobin. E. J. Cohn, A. A. Green, and M. H. Blanchard (J. Amer. Chem. Soc., 1937, 59, 509—517).—E.m.f. measurements of systems containing carboxyhæmoglobin and NaOH or HCl have been made with the H_2 electrode. The calc. acid- and base-combining capacities are 148×10^{-5} and 113×10^{-5} mol. per g., respectively. With mol. wt. 66,700, hæmoglobin thus has 174 dissociable groups, of which $\not>75$ dipole pairs can exist at the isoelectric point. Approx. one half the dissociable groups are derived from the NH group of histidine, the guanidine nucleus of arginine, and the ε-NH_2 group of lysine. The p_H at which the free groups dissociate is discussed. E. S. H.

Recent methods and devices for p_H measurement as aids to colloid chemistry. A. Kufferath (Kolloid-Z., 1937, 79, 103—107).—A review.

Chemical equilibria of reactions between hydrocarbons. IX. Equilibrium coefficients of the reaction of polymerisation of *iso*butylene. R. K. Dobronravov and A. V. Frost (J. Gen. Chem. Russ., 1936, 6, 1796—1800).—The equilibrium coeffs. for *iso*butylene $\rightleftharpoons$ di*iso*butylene have been determined at 168—313°. R. T.

Equilibria of reactions between hydrocarbons. X. Equilibrium between *n*-butylenes and *iso*butylene. E. K. Serebrjakova and A. V. Frost (J. Gen. Chem. Russ., 1937, 7, 122—130).—The equilibrium const. for the reaction Δ^{α}- + Δ^{β}-$C_4H_8 \rightleftharpoons$ *iso*-C_4H_8, at 265—426°, in presence of fireclay–H_3PO_4 catalyst, is given by $\log K = 304/T - 0{\cdot}528 \pm 0{\cdot}020$.

The equilibrium mixture at 300° contains 50% of *iso*-C_4H_8, the content of which falls with rising temp. R. T.

Equilibrium constants of the reaction of hydration of propylene to *iso*propyl alcohol. E. K. Remiz and A. V. Frost (J. Gen. Chem. Russ., 1937, 7, 65—70).—The equilibrium const. for the reaction $C_3H_6 + H_2O \rightleftharpoons Pr^{\beta}OH$ is given by $\log K = 1890/T - 5{\cdot}697$. At 100° and 760 mm. the max. yield of $Pr^{\beta}OH$ is 9·8%. R. T.

Thermodynamics of the etherification of some alcohols. G. Semerano (Gazzetta, 1936, 66, 749—753).—The formula found previously (cf. A., 1936, 796) for the variation with pressure of the equilibrium const. of the reaction $2EtOH \rightleftharpoons Et_2O + H_2O$ is of the same type as that derived by Gillespie and Beattie (cf. A., 1930, 1508). O. J. W.

Second dissociation constant of carbonic acid. Y. Kauko and A. K. Airola (Suomen Kem., 1937, **10**, B, 7).—Vals. recorded are $K_2 \times 10^{11} = 3{\cdot}19$ at 0°, 5·73 at 25°, and 7·35 at 38°. M. H. M. A.

Potentiometric researches on fumaric, maleic, and succinic acids. E. Cattelain and G. Couchet (Bull. Soc. chim., 1937, [v], **4**, 499—502).—The dissociation consts. of the acids are: fumaric $6{\cdot}2 \times 10^{-4}$, maleic $4{\cdot}39 \times 10^{-3}$, succinic $5{\cdot}3 \times 10^{-5}$. E. S. H.

Configuration of *cyclo*hexane and methyl*cyclo*hexane rings. A. I. Vogel and W. L. German (Chem. and Ind., 1937, 220).—Determination of the thermodynamic primary and secondary dissociation consts. of *cyclo*hexane-, 3- and 4-methyl*cyclo*hexane-1 : 1-diacetic acids confirms the view that the rings are identical in configuration. J. S. A.

Normal acidity potential of thiazole-5-carboxylic acid. H. Erlenmeyer, A. Epprecht, and H. von Meyenburg (Helv. Chim. Acta, 1937, **20**, 310—312).—Recorded vals. of normal acidity potential ($\varepsilon_{ac.}$) and dissociation const. (K) are: nicotinic acid, $\varepsilon_{ac.}$ −279·4 mv., K $1{\cdot}58 \times 10^{-5}$; thiazole-5-carboxylic acid, $\varepsilon_{ac.}$ −166·4 mv., K $1{\cdot}497 \times 10^{-3}$; 4-methylthiazole-5-carboxylic acid, $\varepsilon_{ac.}$ −207·5 mv., K $2{\cdot}72 \times 10^{-4}$. E. S. H.

Relative acid strengths in normal butyl alcohol. R. B. Mason and M. Kilpatrick (J. Amer. Chem. Soc., 1937, **59**, 572—578).—The dissociation consts. of bromocresol-green, BzOH, AcOH, *o*-$C_6H_4Cl{\cdot}CO_2H$, piperidinium ion, $NEt_4^{\cdot}$, *o*-toluic acid, bromophenol-blue, *m*-$NO_2{\cdot}C_6H_4{\cdot}CO_2H$, $CH_2Cl{\cdot}CO_2H$, $CN{\cdot}CH_2{\cdot}CO_2H$, $CHCl_2{\cdot}CO_2H$, azobenzenedimethylammonium ion, $CCl_3{\cdot}CO_2H$, $NH_3Ph^{\cdot}$, benzeneazodiphenylammonium ion, and picric acid in $Bu^{\alpha}OH$ at 25° have been determined. E. S. H.

Calculation, by additivity, of the degree of hydrolysis of ferric chloride solutions, with the aid of their magnetic susceptibility coefficients. M. Auméras and M. Mounic (Bull. Soc. chim., 1937, [v], **4**, 536—540).—On the basis of the law of additivity for aq. salt solutions a relation is derived, which permits the calculation of the degree of hydrolysis of salts from susceptibility coeffs. Results obtained for aq. $FeCl_3$ are in good agreement with published data derived by other methods. E. S. H.

Hydrogen-ion concentration and the formation of copper complexes. K. J. Murata (J. Washington Acad. Sci., 1937, **27**, 101—105).—The behaviour of the alkali salts of the Cu complexes in the case of glycollic, tartaric, and citric acids indicates that a stepwise dissociation of the OH groups of the acids occurs, and that two different complexes are formed which are stable over a definite p_H range. J. W. S.

p_H of aqueous cobaltammine complexes and their absorption spectra. III. Aqueous solutions of complexes containing the nitrite radical. H. Suéda (Bull. Chem. Soc. Japan, 1937, **12**, 71—82; cf. A., 1935, 579, 703).—The ultra-violet absorption of aq. solutions of 14 complex cobaltammine salts containing 1—6 NO_2 radicals has been studied at varying p_H vals. Compounds in which H_2O is attached to the central atom show a variation of absorption in the region p_H 8·5, whereas others do not. Addition of alkali does not affect the spectrum if NO_2 and H_2O are both present in the complex. F. L. U.

Two-shell ferrocyanide complex compounds. H. Brintzinger and F. Jahn (Z. anorg. Chem., 1937, **231**, 281—284; cf. this vol., 81).—Ionic wt. determinations have been derived from observations on the dialysis of 0·5*M* solutions of $K_4[Fe(CN)_6]$ containing $[Co\,en_6]^{6+}$, $[Co_2\,pn_6]^{6+}$, $[Cr\,en_3]^{3+}$, $[Cr\,pn_3]^{3+}$, and $[Cr_3(C_2H_3O_2)_6(OH)_2]^{1+}$ (en and pn = ethylene- and propylene-diamine, respectively). In each case two-shell complexes appear to be formed (*e.g.* $[[Cr\,en_3][Fe(CN)_6]_4]^{13-}$). H. J. E.

Partial precipitation of cobalt by ammonia in excess and the formation of cobaltoammine ions. M. Chatelet (Compt. rend., 1937, **204**, 764—766).—The nature of the equilibria between $Co^{\cdot\cdot}$, NH_3, $[Co(NH_3)]^{\cdot\cdot}$, and $[Co(NH_3)_3]^{\cdot\cdot}$ (cf. A., 1936, 797) is not affected by the concn. of NH_4Cl present. Suppression of pptn. of $Co^{\cdot\cdot}$ by added NH_4Cl is not entirely due to alteration of the $[H^{\cdot}]$. A. J. E. W.

Behaviour of beryllium chloride and beryllium fluoride in aqueous solutions. M. Prytz (Z. anorg. Chem., 1937, **231**, 238—248).—Measurements of the Cl′ activity in aq. $BeCl_2 + KCl$ afford no evidence of complex formation by $BeCl_2$. Potentiometric and conductometric titrations of aq. BeF_2 and aq. $BeCl_2$ with aq. NaOH show the behaviour of BeF_2 to be abnormal, in that the first additions of NaOH form a sparingly sol. double salt, no hydroxide being pptd. The titration curves are described. H. J. E.

Combination of fatty acids with nitrogen bases. III. Mol. wt., surface tensions, viscosities, and conductivities in benzene of the system: piperidine–propionic acid. E. B. R. Prideaux and R. N. Coleman (J.C.S., 1937, 462—465; cf. A., 1936, 1449; this vol., 126).—For solutions containing acid + base (25%) in C_6H_6 (75%) d_4^{25} and γ show max. at or near the composition of the salt. The *d*-composition curve lies slightly, and the γ-composition curve considerably, below the calc. curves. The conductivity (κ and Λ) of piperidine propionate increases initially on addition of C_6H_6, attains a max. with about 60% of salt, afterwards

diminishing rapidly and becoming of the same order as for the solvent when 75% of C_6H_6 is present. η diminishes with addition of C_6H_6 and approaches the val. for the solvent when 75% has been added. The product $\Lambda\eta$ falls rapidly and continuously with increasing proportion of C_6H_6, indicating a rapid decrease in the ionised part of the salt. In conjunction with cryoscopic data, the results show that with addition of C_6H_6 there is a progressive and finally complete formation of undissociated mols. or double ion-pairs.
J. W. S.

Liquid ammonia as a protophilic solvent. A. I. SCHATTENSTEIN (J. Phys. Chem. Russ., 1936, **8**, 613—618).—The increase in strength of weak acids by dissolution in liquid NH_3 is illustrated by reference to (*a*) the catalytic activity of various compounds in the ammonolysis of santonin (cf. A., 1936, 1075), showing that even glucose behaves as an acid in liquid NH_3, and (*b*) the behaviour of acid–base indicators, showing the shift in the p_H at which change of colour is observed, and (*c*) the existence of indicators not known as such in aq. solutions. E. R.

Determination of activity coefficients from the potentials of concentration cells with transference. III. Potassium chloride. IV. Calcium chloride. T. SHEDLOVSKY and D. A. MACINNES (J. Amer. Chem. Soc., 1937, **59**, 503—506; cf. A., 1936, 1463).—Activity coeffs. of KCl ($0{\cdot}005$—$3{\cdot}00M$) and $CaCl_2$ ($0{\cdot}002$—$0{\cdot}1M$) at 25° have been determined from the e.m.f. of concn. cells with transference. For KCl ($\ngtr 0{\cdot}2M$) and $CaCl_2$ ($\ngtr 0{\cdot}03M$) the Debye–Hückel equation $-\log f_r = \alpha\sqrt{C}/(1+\beta\sqrt{C})$ holds. The relation $-\log f_r = [0{\cdot}5056\sqrt{C}/(1+1{\cdot}50\sqrt{C})] - 0{\cdot}0365 \log C$ holds for KCl up to $3{\cdot}00M$ and $-\log f_r = [1{\cdot}7515\sqrt{C}/(1+2{\cdot}814\sqrt{C})] - 0{\cdot}147C$ for $CaCl_2$ up to $0{\cdot}1M$. E. S. H.

Thermodynamics of aqueous potassium hydroxide solutions from electromotive force measurements. H. S. HARNED and M. A. COOK (J. Amer. Chem. Soc., 1937, **59**, 496—500).—The activity coeff., relative partial mol. heat content, and relative partial mol. heat capacity have been calc. from e.m.f. measurements of the cell $H_2|KOH\ (0{\cdot}1$—$4M)|K_rHg|KOH\ (0{\cdot}05M)|H_2$ at 5° intervals from 0° to 35°. E. S. H.

Relations between the energy and entropy of dissolution and their significance. R. P. BELL (Trans. Faraday Soc., 1937, **33**, 496—501).—Existing data for the solubility of gases indicate that there is a linear relation between the energy and entropy of dissolution of different solutes in the same solvent. This result is discussed with reference to the regularities found by Evans and Polanyi (A., 1936, 1204) for solutions of solids. J. W. S.

Entropy of water from the third law of thermodynamics. Dissociation pressure and calorimetric heat of the reaction $Mg(OH)_2 = MgO + H_2O$. Heat capacities of magnesium hydroxide and oxide from 20° to 300° abs. W. F. GIAUQUE and R. C. ARCHIBALD (J. Amer. Chem. Soc., 1937, **59**, 561—569).—The heat capacity of MgO prepared by decomp. of $Mg(OH)_2$ at 300—350° is > that of MgO which has been fused. The dissociation pressure of $Mg(OH)_2$–MgO has been determined at 463·1° and 485·0° abs. The heat of dissolution of 1 mol. of $Mg(OH)_2$ in 10,500 c.c. of *M*-HCl is 26,763 g.-cal. at 25°; that of 1 mol. of MgO in 10,500 c.c. of *M*-HCl + 1 mol. of H_2O is 36,498 g.-cal. at 25°. The calc. heat of dissociation of 1 mol. of $Mg(OH)_2$ to give MgO and liquid H_2O is 9738 g.-cal. after correcting for the partial mol. heat content of H_2O in the solution. From the above data and the third law of thermodynamics the mol. entropy of gaseous H_2O at 485·0°, 463·1°, and 298·1° abs. is calc. as 49·11, 48·65, and 45·10 g.-cal. per degree, respectively; these vals. agree with those obtained from spectroscopic data. The free energy of dissociation of $Mg(OH)_2$ is 9297 g.-cal. per mol. E. S. H.

Survey of the most important types of thermodynamic processes arising from changes in work capacity, *A* (= *U* − *S*). E. LANGE (Z. Elektrochem., 1937, **43**, 158—174).—Theoretical.
C. R. H.

Application of thermodynamics to "phase changes" extending over a finite temperature range. A. J. RUTGERS and S. A. WOUTHUYSEN (Physica, 1937, **4**, 235—244).—Theoretical.
H. J. E.

Measurement of affinity and the expression for the maximum work. R. PIONTELLI (Gazzetta, 1936, **66**, 785—787).—A criticism of a paper by Banchetti (A., 1936, 1207). O. J. W.

Roozeboom and partial pressure curve methods of graphically representing liquid–vapour equilibria. E. JÄNECKE (Z. Elektrochem., 1937, **43**, 198—200).—The principles underlying the two methods are discussed and compared. The Roozeboom method is considered to represent equilibrium conditions more easily and accurately.
C. R. H.

Binary system $FeO–Al_2O_3$. A. B. M'INTOSH, J. R. RAIT, and R. HAY (J. Roy. Tech. Coll., 1937, **4**, 72—76).—Thermal and microscopic data are recorded. Evidence has been obtained for the compounds $3FeO,Al_2O_3$ (I) and FeO,Al_2O_3 (II). (I) is formed from (II) and FeO at 1225°. C. R. H.

Influence of the impurities silica, alumina, and magnesia on the m.p. of calcium carbide. C. AALL (Compt. rend., 1937, **204**, 779—780).—M.p. depressions are given for additions up to 1·5% MgO, 3% SiO_2, and 5% Al_2O_3. For MgO and Al_2O_3 the depression reaches a max. val. and then decreases, owing to formation of a fusible aluminate.
A. J. E. W.

Magneto-chemical investigations. XXIV. Thermomagnetic study of transformations in the troilite–pyrrhotine field of the iron–sulphur system. H. HARALDSEN (Z. anorg. Chem., 1937, **231**, 78—96).—General agreement is found between transition temps. in the system Fe–S as indicated by magnetic susceptibility measurements and those indicated by thermal analysis (cf. A., 1935, 928). The boundary of the troilite phase on the Fe side is at $FeS_{1{\cdot}00}$. The transition from paramagnetic troilite mixed crystals to ferromagnetic pyrrhotine mixed crystals occurs at $FeS_{1{\cdot}10}$ and between room temp. and 275°. F. L. U.

"Dichlorotitaniumhexachlorosulphate." G. P. Lutschinski (J. Gen. Chem. Russ., 1937, 7, 207—211).—The m.p. diagram of the system $TiCl_4$–SO_2Cl_2 indicates the formation of the *compound* $TiCl_4,2SO_2Cl_2$, m.p. 43·75°. R. T.

Solubility studies in the systems: benzene–*p*-nitrotoluene and benzene–*o*-nitrotoluene. H. D. Crockford and E. C. Powell, jun. (J. Elisha Mitchell Sci. Soc., 1935, **51**, 143—146).—Data are recorded. The eutectic temp. are −7·2° and −33·3°, respectively. Ch. Abs. (*e*)

Thermal investigations of binary mixtures. III. Mixtures of *p*-nitroaniline with *p*-dibromobenzene, aniline, and dimethylaniline. A. I. Lichatscheva (J. Phys. Chem. Russ., 1936, 8, 761—766).—$p\text{-}NO_2{\cdot}C_6H_4{\cdot}NH_2$ (I) forms an unstable 2 : 1 compound with $p\text{-}C_6H_4Br_2$ and shows a eutectic at 84° and 2·3% (I). The eutectic formed with NH_2Ph is at −10° and 5·3% (I), whilst that formed with $NPhMe_2$ is at −1·5° and 2·1% (I). J. J. B.

Salt hydrates and deuterates. I. Dissociation pressures of certain deuterates. J. Bell (J.C.S., 1937, 459—461).—The dissociation pressures of $CuSO_4,5D_2O$, $Na_2SO_4,10D_2O$, $MgSO_4,7D_2O$, $SrCl_2,6D_2O$, $CoCl_2,6D_2O$, $NiCl_2,6D_2O$, and $NaBr,2D_2O$ have been measured at 20—50°, and the transition points of most of these salts determined. With the exception of $Na_2SO_4,10D_2O$, all the transition points are < for the corresponding hydrates. J. W. S.

Dissociation of a solid under inert gas pressure. A. J. Perkins (J. Chem. Physics, 1937, 5, 180—185).—The mol. fraction of NH_3 in equilibrium with $BaCl_2,8NH_3$ at 32° has been measured in the presence of various inert gases under different pressures. The simple application of the Poynting relation gives in all cases too low a val. for the mol. fraction. A new equation for the chemical potential of a component of a gaseous mixture has been derived which agrees with observation. The equation applies to the vapour of a dissociating solid in the presence of other gaseous substances. W. R. A.

Ternary system: water–potassium chloride–potassium chlorate. J. Fleck (Bull. Soc. chim., 1937, [v], 4, 558—560).—Data for 0—50° are recorded. The only solid phases are the pure components. E. S. H.

Ternary systems $KClO_3$–K_2SO_4–H_2O and $NaClO_3$–Na_2SO_4–H_2O. J. E. Ricci and N. S. Yanick (J. Amer. Chem. Soc., 1937, **59**, 491—496).—Solubility data for the system $KClO_3$–K_2SO_4–H_2O at 15°, 25°, and 45° are recorded. Double salts are not formed. The system $NaClO_3$–Na_2SO_4–H_2O has been studied at 15°, 25°, 45°, and 75°. $NaClO_3,3Na_2SO_4$ is formed at 25° and above; it has a short range of stable existence, but persists in metastable equilibrium over a considerable concn. range. E. S. H.

Equilibria in the system $BeCl_2$–HCl–H_2O. B. N. Lejkina and A. V. Novoselova (J. Gen. Chem. Russ., 1937, 7, 241—248).—The solid phase separating from aq. $BeCl_2$ is a solid solution of BeO in $BeCl_2,4H_2O$. Solubility data are recorded for the system $BeCl_2$–HCl–H_2O, at 0—30°; the solid phases are $BeCl_2,2$ and $4H_2O$. R. T.

Equilibrium diagram of the ternary system Na_2SiO_3–$PbSiO_3$–SiO_2. K. A. Krakau, E. J. Muchin, and M. S. Heinrich (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 281—285).—The following *compounds* are indicated: $Na_2O,2PbO,4SiO_2$, m.p. (incongruent) 635°; $Na_2O,3PbO,6SiO_2$, two forms with transition temp. 540°, m.p. of form stable at high temp. 717°; $Na_2O,2PbO,3SiO_2$, m.p. 615°; $Na_2O,3PbO,7SiO_2$, m.p. (incongruent) 725°; $3Na_2O,3PbO,11SiO_2$, m.p. (incongruent) 645°. The equilibrium diagram is divided into nine crystallisation fields. O. D. S.

Main types of ternary phase diagrams with iron, carbon, and any third element as components. H. Eggers (Z. anorg. Chem., 1937, **231**, 34—53).—The various systems are described and illustrated by diagrams of space models. F. L. U.

System water–sodium theobromine–sodium salicylate. E. Crepaz (Atti V Congr. Naz. Chim., 1936, **1**, 352—358).—This system shows three invariant points at 20°. The *compounds* $2C_7H_5O_3Na,C_7H_7N_4O_2Na$ and $3C_7H_5O_3Na,C_7H_7N_4O_2Na,5H_2O$ exist. Diuretin is probably a mixture of the anhyd. form of the latter compound with Na theobromine. O. J. W.

Thermal analysis of organic substances. III. Application of method to ternary systems without mixed crystals. R. N. M. A. Malotaux and J. Straub (Rec. trav. chim., 1937, **56**, 263—279; cf. B., 1934, 354).—The m.-p. diagram of the system $(CH_2Ph)_2$–$COPh_2$–$p\text{-}C_6H_4Me{\cdot}NO_2$ has been determined. No solid solutions or compounds are formed. R. C.

Equilibrium $PbCl_2 + Sn \rightleftharpoons SnCl_2 + Pb$ in melts. W. Jander and H. Striebich (Z. Elektrochem., 1937, **43**, 193—197).—Previous data are criticised. The equilibrium has been re-examined at 550° in an improved apparatus which enables both phases to be easily and cleanly separated at the experimental temp. The law of mass action is not obeyed and various explanations of the discrepancies are offered. C. R. H.

Equilibrium in the system calcium cyanamide–sodium chloride. M. S. Maximenko and J. I. Izrailovitsch (Chimstr., 1935, 7, 411—413).—The equilibria $CaCN_2 + C \rightleftharpoons Ca(CN)_2$ and $Ca(CN)_2 + 2NaCl \rightleftharpoons CaCl_2 + 2NaCN$ have been studied with commercial black cyanide at 480—1520°. The cyanide is completely decomposed at 480—850°. The cooling must therefore be rapid in this temp. range. The decomp. products are $CaCN_2 + C$, the $CaCN_2$ reacting with C to form CaC_2 and N_2. Formation of $Ca(CN)_2$ begins at 900—950°. Above 1400° irreversible decomp of $Ca(CN)_2$ into the elements begins. Ch. Abs. (*e*)

Application of the thaw–melt method to inorganic systems. II. A. Benrath and E. Hitzbleck (J. pr. Chem., 1937, [ii], **148**, 88—94; cf. A., 1935, 1322).—The systems, $Co(NO_3)_2,4H_2O$–$Zn(NO_3)_2,4H_2O$–$Cd(NO_3)_2,4H_2O$ and $Co(NO_3)_2,6H_2O + Zn(NO_3)_2,4H_2O \rightleftharpoons$

$Co(NO_3)_2,4H_2O + Zn(NO_3)_2,6H_2O$, have been examined. H. W.

Heat of sublimation of graphite. G. Herzberg, K. F. Herzfeld, and E. Teller (J. Physical Chem., 1937, **41**, 325—331).—The spectroscopic val. for the heat of dissociation of CO should be 25% < the heat of sublimation of graphite in vac.; this is in agreement with experiment (Chem. Rev., 1937, 20, 145). F. R. G.

Thermochemical data for titanium oxides. N. Nasu (Kinz.-no-Kenk., 1935, 12, 411—418; cf. this vol., 31).—Vals. of ΔF, ΔH, and ΔS are calc. for the reactions $2TiO_2 + H_2 = Ti_2O_3 + H_2O$, $Ti_2O_3 + 0{\cdot}5O_2 = 2TiO_2$, $2Ti + 3/2O_2 = Ti_2O_3$ and $2TiO_2 + CO = Ti_2O_3 + CO_2$. Ch. Abs. (*e*)

Heat of formation of tricalcium silicate at 1300°. H. E. von Gronow (Zement, 1936, **25**, 61—62; Chem. Zentr., 1936, i, 2908).—The heat of formation from β-$2CaO,SiO_2 = -2$ to -3 g.-cal. per g.; the heat of transformation β- $\rightarrow$ γ-$2CaO,SiO_2 = 8{\cdot}8$ g.-cal. per g. at 675° and 6·0 g.-cal. per g. at 20°. J. S. A.

Heat of dissolution and dilution of formic acid. A. A. Glagoleva (J. Gen. Chem. Russ., 1936, **6**, 1769—1777).—The heat of dilution passes through a max. for 1 : 1·2 HCO_2H–H_2O mixtures at 25° and 60°. The results agree with those calc. from Kirchhoff's formula. R. T.

Heats of combustion of liquid normal paraffin hydrocarbons from hexane to dodecane. R. S. Jessup (J. Res. Nat. Bur. Stand., 1937, **18**, 115—128).—Measurements made with a bomb calorimeter are recorded. The heat of combustion of liquid n-C_nH_{2n+2} ($n = 6$—12) in O_2 at 1 atm. pressure, at 25°, is $259{\cdot}28 + 648{\cdot}84n + 0{\cdot}2587n^2$ international kilojoules per g.-mol. A. J. E. W.

Heat of combustion of nitro-derivatives of naphthalene. M. Badoche (Bull. Soc. chim., 1937, [v], **4**, 549—558).—The heats of combustion (at const. vol. and 17°) of 1-$C_{10}H_7{\cdot}NO_2$, 1 : 5- and 1 : 8-$C_{10}H_6(NO_2)_2$, and 1 : 3 : 8- and 1 : 4 : 5-$C_{10}H_5(NO_2)_3$ are 6875·9, 5289·7, 5295·5, 4256·6, and 4267·9 g.-cal. per g., respectively. E. S. H.

Conductivity of potassium chloride solutions. C. W. Davies (J.C.S., 1937, 432—436).—Measurements on dil. KCl solutions at 25° are in accord with the results of Shedlovsky (A., 1932, 699) and, together with data at 18°, suggest that conductivities based on the Kohlrausch scale are 0·07% > those based on Jones and Bradshaw's standard (A., 1933, 676). The equation $\Lambda = 149{\cdot}92 - 93{\cdot}85C^{1/2} + 50C$ represents the conductivity of very dil. solutions better than Shedlovsky's equation. It is considered that faulty cell design and inadequate earthing arrangements have not caused serious errors in previous investigations, but that considerable polarisation errors may be anticipated when a cell containing greyed electrodes is used outside a very restricted concn. range. J. W. S.

Differences between conductivity coefficients of strong electrolytes in the same solvent. M. Hłasko (Rocz. Chem., 1937, **17**, 11—19).—The conductivity coeffs. of HF, HCl, HBr, and HI are practically identical in H_2O, but differ in other solvents, to an extent which increases with diminishing dielectric const.; the order of the coeffs. for the acids is: HF<HCl<HBr<HI. A similar result is obtained for the salts MX ($M = NH_4$, K, Li, Rb; X = Cl, Br, I), and for the bases LiOH, NaOH, and KOH. The λ_∞ of different ions in the solvents studied (H_2O, MeOH, EtOH, Pr^aOH, C_5H_5N, AcOH, and $EtCO_2H$) increases in the series Li<Na<K<Rb<Cs<F<Cl<Br<I. R. T.

Graphical representation of Ostwald–Arrhenius and Kohlrausch–Debye–Hückel [conductivity] equations. J. G. van Ginkel (Rec. trav. chim., 1937, **56**, 155—160).—In their application to experimental data the above equations are preferably utilised in a "reduced" form, the equiv. conductivity being divided by the conductivity at infinite dilution and the concn. by the dissociation const. R. C.

Transport numbers of unsymmetrical electrolytes and a simplified moving-boundary apparatus. G. S. Hartley and G. W. Donaldson (Trans. Faraday Soc., 1937, **33**, 457—469).—A simplified accurate moving-boundary apparatus is described and measurements for K_2SO_4, $K_3Fe(CN)_6$, and $Co(NH_3)_6Cl_3$ are recorded. The conductivities of the multivalent ions of these salts at infinite dilution at 25° are 80·8, 100·9, and 101·9, respectively. At low concns. the transport nos. of unsymmetrical electrolytes change with concn. as predicted by Onsager's theory, but at higher concns. the change is < that predicted by the theory. J. W. S.

Transport numbers of some salts in aqueous solution at higher temperatures. C. S. Samis (Trans. Faraday Soc., 1937, **33**, 469—474).—The transport nos. for aq. solutions of KCl, $AgNO_3$, $ZnBr_2$, and $K_2C_2O_4$ have been determined at 40° and for HCl at 50°, by the moving boundary method. The limiting transport no. for $K^{\cdot}$ in KCl at 40° is $0{\cdot}4913 \pm 0{\cdot}0003$. The limiting mobilities of the ions at 50° and the limiting transport nos. for the above salts are calc. J. W. S.

Comparison of hydrogen, quinhydrone, and glass electrodes in magnesium sulphate solutions. E. S. Amis and J. L. Gabbard (J. Amer. Chem. Soc., 1937, **59**, 557—561).—The behaviour of the electrodes has been compared in aq. $MgSO_4$ of various concns. and p_H vals. The potential of the glass electrode is not affected by the presence of $Mg^{\cdot\cdot}$ in concns. up to $2M$. The H_2O error of the glass electrode agrees with Dole's equation (A., 1932, 126, 1207). The glass electrode is suitable for measuring the "salt error" of the quinhydrone electrode in solutions buffered with traces of HCl; this error depends on the p_H of the solution. E. S. H.

Potential developed by the hydrogen electrode and by the glass electrode in concentrated acid solutions. J. A. Cranston and H. F. Brown (J. Roy. Tech. Coll., 1937, **4**, 32—45).—The potential of the H_2 electrode in solutions of HCO_2H, AcOH, $EtCO_2H$, H_3PO_4, and H_2SO_4 increases with acid concn. In H_2SO_4 > 65% and in AcOH and $EtCO_2H$ >80%

the behaviour of the H_2 electrode is abnormal. The glass electrode is untrustworthy, the electrode being permanently changed with conc. H_2SO_4 and H_3PO_4. The magnitude of the junction potential between saturated KCl and H_2SO_4 has been calc. C. R. H.

Hydrolysis of salts. I. Measurement by the glass electrode. II. KCN, $CuSO_4$, $NaHSO_4$, and $Pb(NO_3)_2$. J. A. Cranston and H. F. Brown (J. Roy. Tech. Coll., 1937, 4, 46—53, 54—60).—I. The advantages and disadvantages of the H_2, quinhydrone, and glass electrodes for the study of salt hydrolysis are discussed. When the glass electrode is used as a reversible H_2 electrode, its behaviour is apparently unaffected by neutral salts at concns. $\not> N$.

II. The p_H vals. have been measured at various dilutions using the glass electrode. The average val. for the hydrolysis const. for KCN is $1\cdot27 \times 10^{-5}$ at 15°. The average val. for the dissociation const. of $NaHSO_4$, regarding it as an acid, is 0·146 calc. from Rudolphi's formula. C. R. H.

Reactions of scandium at the dropping mercury cathode. R. H. Leach and H. Terrey (Trans. Faraday Soc., 1937, **33**, 480—486).—The deposition potential of Sc at the dropping Hg cathode is $-1\cdot84\pm0\cdot01$ volts, relative to the normal Hg_2Cl_2 electrode. The polarographic method can be used for detection and determination of Sc simultaneously with Al in acid solution under conditions which are detailed. J. W. S.

Potential of iron and other metals in hydrochloric and nitric acids. M. L. Guitton (Bull. Soc. chim., 1937, [v], 4, 570—580).—The potentials of H_2, Pt, Al, and Fe in aq. HCl and of Ni, Zn, Cu, Pb, Al, Sn, Fe, and stainless steels in aq. HNO_3 have been determined as a function of concn. of acid. The curves are discussed in relation to corrosion. E. S. H.

Electrochemical investigation of the anti-corrosive properties of sodium nitrite. A. V. Soloviev (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 295—298).—The potential of an Fe electrode in $0\cdot5N$-$NaNO_2$ falls from an initial val. of —28 mv. to —390 mv. in 48 hr., and does not vary between the electrolyte–air boundary and the body of the solution. The potential of Fe in $0\cdot5N$-NaCl is reduced by the addition of $NaNO_2$. On contact with Zn, Cd, Ni, Pb, and Cu in $0\cdot5N$-$NaNO_2$, Fe becomes the cathode. O. D. S.

Cell for measurement of the thermodynamic properties of hydrochloric acid in dioxan–water mixtures. H. S. Harned and J. O. Morrison (Amer. J. Sci., 1937, [v], **33**, 161—173; cf. A., 1923, ii, 117; 1925, ii, 538, 1061; 1936, 1463).—E.m.f. vals. for H_2–Ag|AgCl electrode combinations in dioxan–H_2O solutions of HCl with dielectric consts. of 10—80 have been determined at 0°, 5°, 10°, 15°, 20°, 25°, 30°, 35°, 40°, 45°, and 50°, with a mean error of ±0·03 mv. Electrode poisoning from rubber stoppers was eliminated by the use of ground glass joints. R. C. M.

Electrochemical behaviour of metals which furnish cations of different valency. I. R. Piontelli (Gazzetta, 1936, 66, 787—791).—The electrochemical behaviour of a metal forming two ions of different valency is discussed in relation to the two normal electrode potentials of the metal. O. J. W.

Theory of electrochemical systems with many electrodes and its application to corrosion problems. I. Potentials of binary systems. G. V. Akimov and N. D. Tomaschov (J. Phys. Chem. Russ., 1936, 8, 623—639).—The potential of a "binary electrode," consisting, *e.g.*, of Cu and Cd plates, depends on the relative situation and distances of the plates and the liquid junction, on the relative size of the plates, and on the polarisation of the cathodic plate; a theory accounting for these effects is put forward. J. J. B.

Capacity of a bright platinum electrode in various electrolytes, and its dependence on the treatment of the electrode. B. Erschler and M. Proskurnin (J. Phys. Chem. Russ., 1936, 8, 689—695; cf. A., 1936, 1207).—The capacity is large (up to 1000 µF. per sq. cm.) when the potential of the electrode coincides with that of the H_2 electrode; it is lowered by anodic polarisation, by previous heating of the electrode in H_2, and by impurities. J. J. B.

New effect in electrodic processes. E. S. Sarkisov and P. F. Michalev (J. Phys. Chem. Russ., 1936, 8, 538—542).—The relation between cathodic polarisation and the structure of deposits of Cu and Ni has been studied by the use of an apparatus permitting change of the p.d. (V) between the electrodes without changing the electrolyte and the c.d. Increase in V increases the polarisation and changes correspondingly the character of the deposit. E. R.

Hydrogen overvoltage at high current densities. B. Kabanov (J. Phys. Chem. Russ., 1936, 8, 486—491).—Overvoltage of H has been measured at Pt, Ag, and Ag amalgam cathodes in $5N$ solutions of HCl and H_2SO_4, up to c.d. 100 amp. per sq. cm. At 1·5 volts, the overvoltage is still a linear function of c.d. E. R.

Electrochemical reduction potential of maleic and fumaric acids. G. Semerano and G. Bettinelli (Gazzetta, 1936, 66, 744—749).—The mol. reduction potentials at the dropping Hg cathode of maleic and fumaric acids are —0·409 and —0·414 volts, respectively. The difference in the free energy of reduction of the two acids is 230 g.-cal. It is suggested that the acids dissociate at the electrode into the free radical $CH\cdot CO_2H$. O. J. W.

Photovoltaic effects of naphthylenediamines. (Mlle.) H. T. Nga (Compt. rend., 1937, **204**, 763—764; cf. A., 1936, 665).—The photopotentials of 1 : 2-, 1 : 8-, and 2 : 7-$C_{10}H_6(NH_2)_2$ in aq. solutions of K_2SO_4, KI, HCO_2Na, and $KClO_3$ are recorded. Vals. for 1 : 2-$C_{10}H_6(NH_2)_2$ are consistently < those for the others. A. J. E. W.

Polarographic study of titano-tartaric complexes. V. Caglioti and G. Sartori (Gazzetta, 1936, 66, 741—744).—In solution tartaric acid forms a complex with $TiCl_4$ in which the mol. ratio of Ti : $C_4H_6O_6$ is 1 : 1, and with $Ti(OH)_4$ in which the ratio Ti : $C_4H_4O_6Na_2$ is 2 : 3. O. J. W.

Application of oxidation–reduction potentiometric titration to the determination of the constitution of complex compounds. A. A. Grünberg and D. I. Rjabtschikov (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 119—122: cf. A., 1936, 953).—The titration curves for Magnus' green salt in conc. H_2SO_4, and for $Pt(NH_3)_2Br_2$ with $KMnO_4$ and $KBrO_3$ at room temp. and 85°, show one break corresponding with the total Pt. The curve for $[Pt(NH_3)_4][PtBr_4]$ in HCl with $KBrO_3$ shows one break in the cold, but two at 85° corresponding with the end-points of $[Pt(NH_3)_4]^{++}$ and $[PtBr_4]^{=}$. The curve for $[Pt(NH_3)_4][Pt(CN)_4]$ with $KMnO_4$ shows breaks at the end-points of $[Pt(NH_3)_4]^{++}$ and $[Pt(CN)_4]^{=}$. The curve for the monomeric form $Pt(NH_3)_2(CN)_2$ shows one break corresponding with the total Pt. O. D. S.

Oxidation–reduction potential of reductic acid. (Mme.) N. Mayer (J. Chim. phys., 1937, **34**, 109—116).—A detailed account of work already noted (this vol., 140).

Oxidation–reduction potential of ascorbic acid. I. C. Ghosh and T. L. R. Char (Z. physiol. Chem., 1937, **246**, 115—123)—At p_H 2·5—7·5 the anaërobic oxidation of ascorbic acid (I) is reversed by H_2S. At p_H 2·5—7·7 the oxidation–reduction potential of (I) is 0·370—371 volt. W. McC.

Oxidation–reduction. XXIII. Ascorbic acid. E. G. Ball (J. Biol. Chem., 1937, **118**, 219—239).—The p_H of the oxidation–reduction system containing ascorbic acid (I) can be measured by using mediators, over the p_H range 1·0—8·6. The normal potential at 30° is +0·390 volt. The first dissociation const. of (I) corresponds with $p_K = 4{\cdot}21$. At $p_H > 5$ the oxidant (dehydroascorbic acid) (II) is unstable; this fact is discussed in relation to the behaviour of (I) and its derivatives. (I) may be determined electrometrically, *e.g.*, at p_H 4·6 by titration with $K_3Fe(CN)_6$ with thionine as mediator; results with orange juice agree well with other methods, and indicate that the juice is normally free from (II). F. A. A.

Two-step oxidation–reduction of phthiocol. E. S. Hill (Proc. Soc. Exp. Biol. Med., 1936, **35**, 363).—Solutions of phthiocol at $p_H > 10$ are reduced slowly and an intermediate violet colour is observed. In the reductive titration, separation of the two steps begins at about p_H 9·0. The max. val. of the ratio semiquinone : total dye is about 0·5 at p_H 13·4—14·3. H. J. E.

Mechanism of redox reactions. I. Qualitative relationships. A. M. Zanko and V. F. Stefanovski (J. Gen. Chem. Russ., 1937, **7**, 100—110).—Anomalous forms of curves obtained in the titration of $K_2Cr_2O_7$ by $FeSO_4$, $K_4Fe(CN)_6$, K_3AsO_3, $SnCl_2$, Na_2SO_3, or $CrSO_4$, under various conditions of acidity and concn., are ascribed to the formation of intermediate products. R. T.

Oxidation–reduction potentials and their applications. S. Glasstone (Inst. Chem., 1937, 28 pp.).—A lecture.

Introduction of thermodynamic variables into reaction kinetics. M. G. Evans and M. Polanyi (Trans. Faraday Soc., 1937, **33**, 448—452).—Mathematical. J. W. S.

Application of affinity to coupled reactions. P. van Rysselberghe (Bull. Acad. roy. Belg., 1936, [v], **22**, 1330—1335).—A general thermodynamic discussion of coupled reactions, and the conditions of velocity which they satisfy, is given. R. S. B.

Kinetics of consecutive reactions with a common reactant. A. Skrabal (Rec. trav. chim., 1937, **56**, 145—154).—A claim for priority over Stuurman (A., 1936, 1468). The theory is extended to cover the formation of two isomeric intermediate products. R. C.

Rates and mechanisms of some inorganic reactions. H. P. Treffers (J. Chem. Educ., 1937, **14**, 74—83).—Recent kinetic studies of many reactions, especially those of use in analytical chemistry, are reviewed. L. S. T.

Periodic reactions. F. M. Schemjakin (Kolloid. Shurn., 1936, **2**, 259—260).—Theoretical. J. J. B.

Deduction of reaction mechanisms from the theory of absolute rates. A. E. Stearn and H. Eyring (J. Chem. Physics, 1937, **5**, 113—124).—Inconsistencies in the simple kinetic collision theory are discussed and compared with mechanisms based on the theory of abs. rates, particularly for the Menschutkin reaction. The activated complex closely resembles the final products in configuration. The free energy of activation of proton transfer has been evaluated from data on the conductivity of H_2O and on the dielectric relaxation of ice. The mechanism of the denaturation of proteins is discussed in relation to their energies of activation and a H-bond mechanism is consistent with the newer theory of activation. W. R. A.

Latent energy of combustion. W. T. David (Phil. Mag., 1937, [vii], **23**, 345—355; cf. A., 1936, 432, 1343).—Published work is summarised and discussed. Latent energies of 1—10% of the heat of combustion, *H*, in large-vessel explosions and of 5—28% of *H* in flames burning at const. pressure have been observed. These differences are interpreted in terms of the pressure in the flame front. J. G. A. G.

Lower limit of reaction between hydrogen and oxygen. A. Biron and A. Nalbandjan (Acta Physicochim. U.R.S.S., 1937, **6**, 43—56).—The lower limit (p) of ignition of H_2–O_2 (O_2 40%) mixtures in re-fused Pyrex vessels is not sensibly affected by the presence of A, thus confirming the theory of Kassel and Storch (A., 1935, 709). In SiO_2 vessels where p is considerably higher, addition of A diminishes p in proportion to the partial pressure of A, in accordance with the theory of Bursian and Sorokin (A., 1931, 688). In both cases p is the partial pressure of $H_2 + O_2$. Experiments are recorded showing the relation between p and the % composition of A-free H_2–O_2 mixtures. F. L. U.

Lower limit of inflammation in "oxyhydrogen" gas. N. Semenova (Acta Physicochim. U.R.S.S., 1937, **6**, 25—42).—A method is described whereby consistent vals. for the lower limit (p) of ignition of $2H_2 + O_2$ can be obtained. With Pyrex vessels of diameter (*d*) $\nless$ 15 cm., the relationship $pd =$ const. is shown to be accurate within 2·5%. For smaller diameters pd is less, *e.g.*, 15—25% less for 6 mm. In agreement with theory, the relation between p and temp. is expressed by $p/T = ae^{E/RT}$, where $E = 11,000$ g.-cal. F. L. U.

Formation of hydrogen peroxide from hydrogen atoms and oxygen molecules. G. Kornfeld (Z. physikal. Chem., 1937, B, 35, 236—238).—A H_2O_2 mol. is able to break two chains in the H_2–Cl_2 reaction. Bodenstein and Schenk's rejection (A., 1933, 577) of the chain mechanism $HO_2 + H_2 = H_2O_2 + H$ for the formation of H_2O_2 by the H_2–Cl_2 reaction in presence of O_2 on the grounds that the H would propagate the chains is therefore unjustifiable. R. C.

Experimental verification of the formula $Li^n =$ const. for the ignition limit of gaseous mixtures with the break spark. P. P. Pirotzki (Acta Physicochim. U.R.S.S., 1937, 6, 131—136).—The relation between the min. val. of the current (*i*) needed for the ignition of a CH_4–air mixture by a break spark in a circuit of self-induction L is given with fair accuracy by $Li^4 =$ const., when L varies from 0·508 to 4 henries and the p.d. is 70 or 110 volts d.c. This result throws doubt on the importance hitherto attributed to the energy of the magnetic field. F. L. U.

Explosion limits of gaseous mixtures. III. Explosion limits of mixtures of carbon monoxide and of methane. M. Rivin and A. Sokolik (Acta Physicochim. U.R.S.S., 1937, 6, 105—114; cf. A., 1936, 1468).—The effect of addition of H_2 to $2CO + O_2$, and of N_2 to $CH_4 + 2O_2$, on the explosion limits of the respective mixtures has been studied. In the former the change in the explosion limit produced by H_2 is analogous to the change in ignition temp. and rate of propagation of the flame. In the CH_4 mixtures the lower limit is raised by addition of N_2 until $[N_2]/[O_2] = 2$, beyond which an explosion wave is not formed. The existence of two possible structures of the explosion wave is indicated. F. L. U.

Two-stage process of thermal ignition of an [equimolecular] mixture of butane and oxygen. E. A. Andreev (Acta Physicochim. U.R.S.S., 1937, 6, 57—64).—The increase of pressure with time has been measured at different temp. for an equimol. mixture of n-C_4H_{10} and O_2 at an initial pressure of 382 mm. Over the range 287—441° the ignition process is characterised by two stages, in the first of which a cold flame is formed, accompanied by a large quantity of intermediate products, whilst in the second a hot flame occurs. With rise of temp. the pressure increase associated with the cold flame decreases, and vanishes at 461°. At 279° only the cold flame occurs. F. L. U.

Spontaneous ignition under pressure of simpler aliphatic hydrocarbons, alcohols, and aldehydes. G. P. Kane, E. A. C. Chamberlain, and D. T. A. Townend (J.C.S., 1937, 436—443).—Previous work on the effect of pressure on the spontaneous ignition of paraffin–air mixtures is discussed with respect to the "knocking" properties of these fuels. In the series derived from CH_4, C_2H_6, and C_3H_8, ease of spontaneous ignition is in the order aldehyde > alcohol > paraffin, but the time lag is PrOH > C_3H_8. With paraffins containing > 4C, the ease of ignition is paraffin > alcohol, suggesting that the importance of the intermediately formed aldehydes is < in the case of the lower paraffins. Cool flames were observed with certain binary mixtures of air with MeCHO, C_3H_8, PrOH, and EtCHO. J. G. A. G.

Influence of nitrogen on the inflammation of diethyl ether. J. Baron and P. Laffitte (Compt. rend., 1937, 204, 777—779).—The effect of added N_2 on the temp. of inflammation of Et_2O–O_2 mixtures is in accord with the Semenov chain theory. A. J. E. W.

Heterogeneous combustion of mixtures of carbon monoxide and oxygen on a vitreous surface. M. Prettre (Compt. rend., 1937, 204, 775—777; cf. A., 1927, 28; 1930, 299; 1932, 916; 1933, 30).—The reaction rate in a Pyrex vessel packed with Pyrex fragments, at about 550°, is $k(p_{CO} + p_{O_2})p_O/(p_{CO} + ap_{CO_2})$, where p_O is the pressure of the reactant which is in excess, and a depends on the initial composition of the mixture. The mechanism probably involves the reaction of adsorbed mols. with mols. in the gas phase. A. J. E. W.

Ignition of gaseous mixtures by hot particles. R. S. Silver (Phil. Mag., 1937, [vii], 23, 633—657).—An arrangement for finding the min. temp. at which a hot sphere will cause ignition of gaseous mixtures of known composition is described. Data are tabulated and plotted for quartz and Pt spheres of various diameters and coal gas–air, H_2–air, and C_5H_{12}–air mixtures. In the first two cases the ignition point was independent of, and in the third case showed slight dependence on, sphere substance. The min. ignition point varied with sphere size, diminishing with increasing sphere diameter. In all cases min. ignition point was much above the "ignition temp." of the mixture. A qual. theoretical treatment is developed. N. M. B.

Factors influencing the height of the combustion levels attained in flame gases. W. T. David (Nature, 1937, 139, 289—290).—Factors such as the nature of the combustion gases, nature of the diluent gases, size of vessel, and pressure, affecting this level in flames and explosions are discussed. The combustion level may be raised by increasing the pressure of the gases before combustion or by arranging for high instantaneous pressure in the flame front. L. S. T.

Inflammation of gaseous mixtures. VII. Induction period of cold flames in pentane–oxygen mixtures. B. V. Aivasov and M. B. Neuman (J. Phys. Chem. Russ., 1936, 8, 543—558).—The dependence of the induction period of the cold flame of $C_5H_{12} + O_2$ on temp., diameter of the vessel, total pressure, partial pressure of N_2, and addition of MeCHO and NO_2 has been studied. A formula is derived and discussed on the basis of the theory of chain reactions. E. R.

Ignition and self-inflammation of ammonia and of nitrogen–hydrogen mixtures. N. V. Tokarev and N. I. Nekrassov (J. Phys. Chem. Russ., 1936, 8, 504—513).—The min. temp. ($t_{\text{min.}}$) of self-inflammation of $H_2 + N_2 + O_2$ and $NH_3 + O_2$ are 440° and 700°, respectively; the min. pressures ($p_{\text{min.}}$) are 5 and 10 mm.; $t_{\text{min.}}$ and $p_{\text{min.}}$ are independent of composition of the mixture. The limits of ignition by a spark of the same mixtures are 5—90% H_2 and 10—80% NH_3; $p_{\text{min.}}$ is a hyperbolic function of the composition, with a min. at 36% H_2 (or NH_3), and a linear function of temp. Extrapolated curves of $p_{\text{min.}} = f(t)$ for spark ignition intersect in a point identical with $p_{\text{min.}}$ for self-inflammation, showing the essential identity of the mechanisms of both reactions. E. R.

Kinetics of oxidation of hydrides in the gaseous phase. II. Oxidation of phosphine. P. S. Schantarovitsch. **III. Oxidation of hydrogen sulphide.** B. Jakovlev and P. S. Schantarovitsch (Acta Physicochim. U.R.S.S., 1937, 6, 65—70, 71—94).—II. As with SiH_4 (A., 1936, 163), the pressure limits of ignition of PH_3–O_2 mixtures depend on the composition. As the temp. is raised the lower limit falls and the upper rises. Data are given for mixtures with 10, 22, 32, and 57% of PH_3.

III. H_2S–O_2 mixtures show, at pressures considerably > the ordinary upper limit, an additional upper limit above which ignition again takes place. This third limit coincides with that described by several previous workers. The ordinary ignition region is considerably displaced towards lower temp. by increasing $[O_2]$, and a definite relation exists between the ignition limits and composition. Outside the ignition limits, and also during the induction period preceding an explosion, a slow reaction occurs, the velocity of which increases with pressure and appears to differ from an ignition reaction. F. L. U.

Homogeneous unimolecular decomposition of gaseous alkyl nitrites. VIII. Decomposition of ethyl and *n*-propyl nitrites at low pressures and a general discussion of the results for the entire series. E. W. R. Steacie and S. Katz (J. Chem. Physics, 1937, 5, 125—130).—The kinetics of the decomp. of EtO·NO and Pr^{a}O·NO have been investigated at low pressures, and so far as the effect of pressure on the rate is concerned can be explained, as can the results for the other members of the same series, by the theory of Kassel. This theory does not, however, explain the increase in the high-pressure rate with increasing mol. complexity. Probably this arises from a progressive change in binding energy as a series is ascended. W. R. A.

Thermal decomposition of ethane. H. Sachsse (J. Chem. Physics, 1937, 5, 199—200).—The assertion by Steacie and Phillips (A., 1936, 1344) that the [H] required by the chain mechanism for the decomp. of C_2H_6 is in agreement with Sachsse's experimental val. is denied. Using Steacie's data it is shown that the theory does not agree with the experimental val. W. R. A.

Factors influencing rates of reaction in solution. R. A. Ogg, jun., and O. K. Rice (J. Chem. Physics, 1937, 5, 140—143).—A survey is given of factors peculiar to solutions which may affect rates of reaction, *e.g.*, restriction of free space and solvation effects. An explanation of the parallelism between A and E of the reaction equation $K = Ae^{-E/RT}$ is advanced. W. R. A.

Theory of electro-kinetic effects in solution: reactions between ions and polar molecules. E. A. Moelwyn-Hughes (Proc. Roy. Soc., 1936, A, 157, 667—679).—The derivation of the expression $k = PZe^{-E_A/RT}$ has been re-investigated, and an expression for the average electrostatic energy of interaction between the ion and the reacting dipole is introduced. The conditions under which P can deviate from unity are thus determined; theoretical predictions relating to the influence of electrolytes on k, of the temp. on E_A, of the charge on the ion, and of the sign of the dipole on P are consistent with known facts. L. L. B.

Behaviour of hypophosphorous and phosphorous acids and their mono-esters towards iodine. Comparative kinetic study. P. Nylén (Z. anorg. Chem., 1937, 230, 385—404).—The kinetics of reaction of H_3PO_2, H_3PO_3, H_2MePO_3, H_2EtPO_3, and $H_2Pr^aPO_3$ with I at 20° or 25° have been determined. The structures of these substances are discussed in the light of the results. E. S. H.

Action of potassium halides on mercurous nitrate. J. A. Fjalkov (Mem. Inst. Chem. Ukrain. Acad. Sci., 1936, 3, 563—571).—Addition of K salts to aq. $HgNO_2$ results in the reactions $KX + HgNO_2 \rightarrow HgX + KNO_2$; $2HgX \rightarrow Hg + HgX_2$. The velocity of the second reaction falls in the series $X = CN > CNS > I > Br > Cl$. R. T.

Possible acid-dissociation of metal-ammonia ions, and its bearing on certain reactions. (A) F. J. Garrick. (B) J. S. Anderson, N. L. Spoor, and H. V. A. Briscoe (Nature, 1937, 139, 507—508, 508). (A) NH_3 mols. in cobaltammines appear, by co-ordination, to be unable to form NH_4 ions, and these co-ordinated NH_3 groups can dissociate as acids according to $(Co,6NH_3)^{\cdot\cdot\cdot} \rightleftharpoons (Co,5NH_3,NH_2)^{\cdot\cdot} + H^{\cdot}$.

(B) The mechanism of H interchange given is $[Co(NH_3)_6]^{\cdot\cdot\cdot} \rightleftharpoons [Co(NH_3)_5NH_2]^{\cdot\cdot} + H^{\cdot}$; $[Co(NH_3)_5NH_2]^{\cdot\cdot} + HDO \rightarrow [Co(NH_3)_5NH_2D]^{\cdot\cdot\cdot} + OH^-$; $H^{\cdot} + OH^- \rightleftharpoons H_2O$, where the second reaction determines the rate of reaction, for which an expression is deduced. In agreement with this, it is found for the interchange between H_2O and hexamminecobaltic chloride (I) containing D that (i) the rate of interchange is inversely $\propto [H^{\cdot}]$, (ii) for a given concn. of (I), it is independent of the initial "heaviness" of (I), and (iii) for (I) of given heaviness, it is inversely $\propto \sqrt{\text{concn. of (I)}}$. L. S. T.

Kinetics of co-ordination reactions in the cobaltammine series. I. Aquotisation of the chloropentammine ion. F. J. Garrick (Trans. Faraday Soc., 1937, 33, 486—496).—The aquotisation of the $[Co(NH_3)_5Cl]^{\cdot\cdot}$ ion at 20—30° is unimol., and is opposed by a bimol. back reaction. The velocity coeff. of the forward reaction is given by $k = 2{\cdot}4 \times 10^{13} \times e^{-23700/RT}$. The effects of inert salts are sp. and dependent on the anion. They are positive in all cases investigated except with ClO_4'. J. W. S.

Kinetics of the reaction between potassium dichromate and sodium sulphite in aqueous

solution. A. Sconzo (Atti V Congr. Naz. Chim., 1936, 2, 557—569).—When $K_2Cr_2O_7$ and Na_2SO_3 are mixed in the mol. ratio 1 : 1 in cold aq. solution CrO_2 is formed together with Cr_2O_3 and small amounts of basic sulphites. The latter, however, are not formed when the solutions are boiled. In this case CrO_2,H_2O is obtained. With an initial mol. ratio of 2 : 1 the reaction is similar, but with a ratio of 1 : 2, both in the cold and on boiling, a mixture of various basic sulphites is obtained. The reaction velocity in dil. solution, starting with a mol. ratio 1 : 1, at every instant $\propto [H^{\cdot}][Na_2SO_3]$. O. J. W.

Reaction between bromosuccinate ion and thiosulphate ion. F. A. Long and A. R. Olson (J. Physical Chem., 1937, **41**, 267—281).—The rate of reaction, studied by titration and polarimetric methods, is determined by the initial formation of a β-lactone, for which the heat of activation of 26,400 g.-cal. is independent of initial and added salt concn. and of temp. between 12·5° and 50°. F. R. G.

Kinetics of condensation polymerisation ; reaction of ethylene glycol with succinic acid. P. J. Flory (J. Amer. Chem. Soc., 1937, **59**, 466—470).—Re-calculation of published data (A., 1936, 685, 1209) shows the reaction to be predominantly a termol. process. The rate $\propto [OH]$ and $[CO_2H]^2$. The energy of activation is about 25 kg.-cal. E. S. H.

Kinetics of bromine addition to olefinic compounds. P. W. Robertson, N. T. Clare, K. J. McNaught, and G. W. Paul (J.C.S., 1937, 335—343).—The rate of addition of Br to cinnamic, *trans*-cinnamic, undecenoic, and acrylic (I) acids and allyl acetate, chloroacetate, benzoate, and phenylacetate has been studied in dry CCl_4 and AcOH at 0—50°. In CCl_4, reaction probably results from impact of Br_2 on a surface film of the unsaturated compound (II). The stability of the film decreases with decrease of concn. and with rise of temp., and under these conditions the rate is diminished, and the reaction may become homogeneous and termol. HBr catalyses the reaction, which remains predominantly heterogeneous, but H_2O has little effect. In AcOH, the reactions have low heats of activation, are homogeneous, and termol.; the process involves one mol. of (II) and $2Br_2$. H_2O changes the order from termol. to bimol. and increases the velocity, since the effect of the more frequent collisions is not offset by the increased energy of activation. *trans*-Isomerides show irregularities owing to partial stereoconversion, which is complete in presence of HBr. HBr does not catalyse the Br_2-addition except in the case of (I) and vinyl bromide. With (I), the Br_2 is activated by the HBr and the reaction becomes bimol. J. G. A. G.

Reaction of sugars with boric acid. F. J. Berenschtein and A. U. Schpakovski (Ukrain. Chem. J., 1936, **11**, 433—455).—The dissociation const. of H_3BO_3 is increased in presence of dulcitol (I), arabinose (II), xylose, or mannose; H_3BO_3 may be titrated in presence of $\nless 2$ mols. of (I) or 8 of (II) per mol. of H_3BO_3. The [α] and the velocity *v* of mutarotation of the sugars are unaffected by presence of H_3BO_3. The *v* of glucose, (II), or galactose (III), but not of fructose, rises in presence of borax, and the [α] falls, in the case of mono- but not di-saccharides, to an extent $\propto [Na_2B_4O_7]$. Lævorotatory solutions of (III) are obtained in presence of 0·1*M*-borax when the concn. of (III) $\ngtr 1{\cdot}8\%$. R. T.

Bromine oxidation and mutarotation measurements of α- and β-aldoses.—See A., II, 177.

Thermal polymerisation of styrene in solution. J. W. Breitenbach and H. Rudorfer (Monatsh., 1937, **70**, 37—43).—The polymerisation of styrene has been studied at 100° and in PhMe, xylene, dioxan, and $C_{10}H_{18}$ solution. J. W. S.

Velocity of reaction between aldehydes and ketones. II. Reaction between furfuraldehyde and acetophenone. III. Reaction between benzaldehyde and acetone. IV. Reaction between benzaldehyde and acetophenone. E. K. Nikitin (J. Gen. Chem. Russ., 1937, **7**, 9—13, 71—79, 148—150).—II. The velocity of reaction between furfuraldehyde (I) and COPhMe $\propto$ concn. of (I). Furfurylideneacetophenone gives an intense yellow coloration in acid solution, and the reaction is adapted to the detection of (I) ($\nless 1$ p.p.m.), as well as to the colorimetric determination of (I) or COPhMe.

III. The velocity of reaction of PhCHO with $COMe_2$ in alkaline aq. solution $\propto [PhCHO]^2$. The greenish-yellow coloration given by the condensation product in acid solution serves for the detection ($\nless 100$ p.p.m.) or determination of PhCHO.

IV. The velocity of reaction of PhCHO with COPhMe $\propto$ [PhCHO]. The condensation product gives a yellow coloration in acid solution, serving for detection of $\nless 0{\cdot}1\%$ of either component. R. T.

Complex group of reactions involved in the final stages of the idealised hydrolysis of aqueous solutions of sodium bromoacetate. (Mrs.) M. S. Burr and H. M. Dawson (Proc. Leeds Phil. Soc., 1937, **3**, 293—299).—The rate of formation of NaBr in the final stages (90—100%) of the hydrolysis of $CH_2Br{\cdot}CO_2Na$ has been studied under conditions precluding complications due to the formation of intermediate compounds. Data obtained confirm the six reaction stages previously reported (cf. A., 1936, 685). The max. velocity at 5% idealised hydrolysis of *N*-$CH_2Br{\cdot}CO_2Na$ is similarly interpreted. N. M. B.

Hydrolysis of alkyl halides. II. S. C. J. Olivier (Rec. trav. chim., 1937, **56**, 247—262; cf. A., 1934, 971; 1937, II, 1).—The velocities of hydrolysis of α-bromo-, α-bromo-β- and γ-methylpentane, α- and β-bromo- and α-chloro-hexane, and α-bromo-heptane and -octane by aq. $COMe_2$ solutions of H_2SO_4 and KOH, and by aq. $COMe_2$ have been measured. The reactions are unimol., and catalysed by OH' but not by $H^{\cdot}$. The ratio rate of alkaline hydrolysis : rate of acid hydrolysis diminishes with increasing proximity of Me to halogen, but is appreciable only when the Me and halogen are attached to the same C. The rate of hydrolysis of α-bromohexane is 16% slower in D_2O–$COMe_2$ than in aq. $COMe_2$. J. D. R.

Salt effect in rearrangement of benzil-*o*-carboxylic acid.—See A., II, 195.

Solutions in liquefied gases. XVI. Kinetics of the ammonolysis of desmotroposantonin and

of ethyl tartrate in liquid ammonia in presence of ammonium salts. A. I. Schattenstein (J. Phys. Chem. Russ., 1936, 8, 696—708).—The rate of reaction was measured polarimetrically. Desmotroposantonin does not react with liquid NH_3 alone; in catalytic power, $NH_4Cl > NH_4Br > NH_4I$. $(OH\cdot CH\cdot CO_2Et)_2$ reacts even in absence of salts; the rate is increased by $NH_4Cl > NH_4Br > NH_4NO_3 > NH_4I > NH_4ClO_4$. J. J. B.

Exchange of hydrogen between pyrrole and water. M. Koizumi and T. Titani (Bull. Chem. Soc. Japan, 1937, 12, 107—108).—In the range p_H 14—2 pyrrole exchanges only one H in presence of D_2O at 30° (A., 1936, 1338). When, however, the acidity is increased to p_H 2—1 all five H are exchangeable with measurable velocity. Below p_H 1 the exchange becomes immeasurably rapid. The distribution quotient $k(CH/H_2O) = 0{\cdot}70$, compared with $k(NH/H_2O), = 0{\cdot}88$. The results are interpreted as indicating a desmotropic change in the pyrrole mol. F. L. U.

Photographs at intervals of 0·0001 second of phenomena accompanying the detonation of a shattering explosive. A. Michel-Lévy and H. Muraour (Compt. rend., 1937, 204, 576—579; cf. A., 1934, 943, 1313; 1935, 713; 1936, 7, 568).—The photographs confirm that luminosity accompanying the detonation is due to the effects of the shock wave on the surrounding gases. A. J. E. W.

Kinetics of dehydration of magnesium sulphate heptahydrate. A. S. Mikulinski and E. N. Podtimtschenko (J. Phys. Chem. Russ., 1936, 8, 600—608).—The velocity of dehydration of $MgSO_4,7H_2O$ in an air stream has been measured, at 50—200°. It is assumed that the process proceeds in two stages: $7H_2O \rightarrow 6H_2O \rightarrow 1H_2O$, and that its velocity depends on two consts., the first being that of a chemical reaction and the second that of a diffusion. These consts. are calc., and their logs represented by straight lines as functions of $1/T$. The activation energy of the dehydration is calc. to be 1670 g.-cal. per mol. of H_2O. E. R.

Calculation of the activation energy of dehydration of magnesium sulphate. A. S. Mikulinski and R. N. Rubinstein (J. Phys. Chem. Russ., 1936, 8, 609—612).—The accuracy of the result obtained (cf. preceding abstract) is discussed. E. R.

Detonation of ammonium nitrate.—See B., 1937, 395.

Oxidisability of nickel. G. Valensi (Bull. Soc. chim., 1937, [v], 4, 405—415; cf. A., 1937, I, 88).—Pure Ni, annealed in vac., begins to oxidise in O_2 at 550°; Ni reduced from the oxide at 750° begins to oxidise at 320°. The behaviour in O_2 and air is the same, but the reaction is catalysed by H_2O vapour. The velocity of oxidation is hardly affected by cold-working, polishing, or annealing in H_2, and is the same for pure and 98·7% Ni. E. S. H.

Periodic dissolution of iron in nitric acid. M. Karschulin (Arh. Hemiju, 1936, 10, 89—97).—A reddish-brown layer forming at the surface of Fe immersed in HNO_3 is shown spectrographically to contain $Fe(NO)(NO_3)_2$, the periodic decomp. of which causes periodicity in the velocity of dissolution of the Fe. R. T.

Potentiometric methods for predicting corrosion of ferrous alloys.—See B., 1937, 351.

Kinetics of dissolution of calcium carbonate. V. M. Gortikov and L. I. Panteleeva (J. Gen. Chem. Russ., 1937, 7, 56—64).—The velocity of dissolution of $CaCO_3$ in dil. aq. HCl $\propto p_H$ and rate of stirring, and in aq. AcOH also to the [AcOH]. In aq. CO_2 the velocity approaches a const. max. val. with increasing rate of stirring, determined by the velocity of the reaction $CO_2 + H_2O \rightleftharpoons H_2CO_3$. R. T.

Velocity of dissolution of comminuted substances. III. W. Jacek (Rocz. Chem., 1937, 17, 64—72; cf. this vol., 88).—A simplified form of the previously derived equation is given. R. T.

Rate of reaction of magnesium with acids in ethyl alcohol. M. Sclar and M. Kilpatrick (J. Amer. Chem. Soc., 1937, 59, 584—593).—Mg displaces H_2 from EtOH without the intermediate formation of solvated $H^{\cdot}$. When Mg dissolves in EtOH–acid mixtures the main reaction is between Mg and EtOH. The rate of reaction depends on what portion of the measured surface of Mg is available for reaction. This is related to [OEt′] at the reaction interface, which is determined by the actual rate of reaction between Mg and EtOH and the rate of removal of OEt′ by neutralisation and transport. E. S. H.

Kinetics of the substitution of copper and iron by metallic zinc in chloride solutions. A. S. Schachov (J. Phys. Chem. Russ., 1936, 8, 525—537).—The velocity of deposition of Cu from $CuCl_2$ solutions and of Fe from $FeCl_2$ solutions, by Zn, has been measured at 25° and 60°. It is unimol.; the velocity coeff. increases with acidity and decreases on addition of $ZnCl_2$. At 80° in acid solution, and in presence of $CdCl_2$, the deposition of Fe is strongly accelerated and obeys a bimol. law. E. R.

Mechanism of the action of aqueous solutions of acids on metals. A. Quartaroli (Atti V Congr. Naz. Chim., 1936, 2, 466—511).—In the action of aq. acid solutions on metals the undissociated acid mols. take an active part as well as the $H^{\cdot}$ ions. The action of the acid mol. is particularly manifested with more oxidisable metals, and it is considered that the acid reacts not directly with the metal itself, but with a film of oxide, which is continuously produced from the metal and H_2O. The rate of dissolution of metals in acids is discussed from this point of view. O. J. W.

Acid–base catalysis in gas reactions. I. Depolymerisation of paraldehyde. R. P. Bell and R. Le G. Burnett (Trans. Faraday Soc., 1937, 33, 355—363).—The depolymerisation of paraldehyde vapour (I) is catalysed by HCl and HBr at 100—190°, $\nless$95% being converted into MeCHO. The reaction occurs with reproducible velocity after the surface of the reaction vessel has become aged by contact with the reaction products. The course of each experiment is unimol. and the velocity coeffs. are independent of the pressure of (I), and ∝ the pressure of catalyst. The temp. coeff. of the reaction velocity is negative for HBr catalysis and has a low positive val. for HCl catalysis. The reaction is also catalysed by HI, HCO_2H, $CHCl_2{\cdot}CO_2H$, and moist SO_2, but not by dry SO_2 or by AcOH. J. W. S.

***cis–trans* Rearrangement of ethylene compounds catalysed by molecular oxygen.** B. Tamamushi and H. Akiyama (Z. Elektrochem., 1937, **43**, 156—157).—The activity of O_2 in catalysing the change of Me_2 maleate into Me_2 fumarate has been investigated between 100° and 195°. The change, which is accelerated by increasing the O_2 pressure, is attributed to the paramagnetic properties of O_2. N_2, which is diamagnetic, is much less active than is O_2. C. R. H.

Heterogeneous–homogeneous catalysis : $C_2H_4 + O_2$. M. V. Poljakov and F. M. Weinstein (J. Phys. Chem. Russ., 1936, **8**, 576—583).—The production of the peroxide $C_2H_4O_2$, by explosion and by slow catalysed reaction of C_2H_4 with O_2 at low temp., has been measured in relation to pressure and the relative concn. of C_2H_4 and O_2. The curves obtained show that the same laws apply to both kinds of reaction. This supports the assumption of a common mechanism of heterogeneous and of volume-reactions, as developed previously for the oxidation of H_2 (cf. A., 1935, 588). E. R.

Heterogeneous–homogeneous catalysis : $CH_4 + O_2$. M. V. Poljakov, P. M. Stadnik, and I. E. Neimark (J. Phys. Chem. Russ., 1936, **8**, 584—586).—The production of a peroxide in the catalytic oxidation of CH_4 is proved, and its yield measured in relation to the relative concn. of CH_4 and air. The results are considered as giving support to the theory of a unique mechanism of catalysed and explosive oxidation (see preceding abstract). E. R.

Active iron. XI. Catalysis by ferric salts in the systems oxalic acid–hydrogen peroxide and oxalic acid–mercuric chloride–hydrogen peroxide. A. Simon and T. Reetz (Z. anorg. Chem., 1937, **231**, 217—237; cf. A., 1936, 950).—Data are recorded for the rate of oxidation of $H_2C_2O_4$, $(NH_4)_2C_2O_4$, and $Na_2C_2O_4$ by H_2O_2 in presence of $FeCl_3$. The reaction is catalysed by daylight and by the walls of the containing vessel. The catalytic action of $FeCl_3$ decreases as the p_H decreases, due to diminution in the $[HO_2']$. The autocatalytic effect in the reaction is due to increase in p_H. Addition of $NaHCO_3$ produces the same effect. The $[Fe^{\cdot\cdot}]$ in the solution increases as the reaction proceeds. In presence of $HgCl_2$, HgCl is pptd. at $p_H > 2$. The rate was measured in this case. Glyoxylic acid was detected as an intermediate in the oxidation. Reaction mechanisms involving HO_2, formed in the process $HO_2' + Fe^{\cdot\cdot\cdot} = HO_2 + Fe^{\cdot\cdot}$, are discussed. H. J. E.

Reaction between hydrogen peroxide and phosphorous acid induced by ferrous salts. K. Nerz and C. Wagner (Ber., 1937, **70**, [*B*], 446—449).—When acidified $Fe^{\cdot\cdot}$ solution is gradually added to a mixture of H_3PO_3, H_2O_2, and H_2SO_4 in absence of air, the amount of H_2O_2 which enters into reaction at first increases almost ∝ the amount of added $Fe^{\cdot\cdot}$ and then attains a max. If the amount of H_2O_2 is const., the reaction does not depend greatly on the amount of H_3PO_3 if it is in large excess; with a very small excess the reaction is less extensive. With a const. excess of H_3PO_3 less reaction takes place initially with greater than with smaller amounts of H_2O_2. In absence of air, H_2O_2 appears to assume the predominant rôle in rupture of the chain but the exact mechanism is not explained. More rapid addition of $Fe^{\cdot\cdot}$ induces less reaction; this involves increased concn. of the chain carriers and greater possibility of their mutual destruction (*e.g.*, $Fe^{\cdot\cdot} + Fe^{\cdot\cdot\cdot\cdot} \rightarrow 2Fe^{\cdot\cdot\cdot}$). In presence of air the graph of the decomp. of H_2O_2 as function of the amount of $Fe^{\cdot\cdot}$ assumes an **S** form whilst passage of O_2 nearly inhibits reaction even in presence of much $Fe^{\cdot\cdot}$. The chain is therefore readily broken by O. H. W.

Reaction between nitric acid and tin in presence of catalysts. I. G. S. Kasbekar and A. R. Normand (Proc. Indian Acad. Sci., 1937, **5**, **A**, 115—123).—$FeSO_4$ and $FeCl_3$ retard the reaction between Sn and HNO_3, and cause an increase in the yield of NH_3 and a decrease in that of NH_2OH. The reaction is retarded by $NaNO_2$ and unaffected by $CO(NH_2)_2$, indicating that no HNO_2 is formed in the reaction. H_2SO_4 and $TiCl_3$ retard the reaction at lower concns., but accelerate it at higher concns., with increase in the yields of NH_3 and NH_2OH. The reaction is unaffected by glucose. $NaNO_3$, $NaHSO_3$, Na_2SO_3, and NaCl all retard the reaction, but NH_4Cl does not affect it. J. W. S.

Acid catalysis in liquid ammonia. A. I. Schattenstein (J. Amer. Chem. Soc., 1937, **59**, 432—435; cf. A., 1936, 1075; this vol., 191).—Ammonolysis of santonin, desmotroposantonin, and Et tartrate is also catalysed by phenols and carbohydrates. The order of catalytic activity of carboxylamides in liquid NH_3 corresponds with that of the acids in H_2O : AcOH<BzOH<HCO_2H. E. S. H.

Kinetics of the thermal isomerisation of cinnamic acid catalysed by iodine. R. G. Dickinson and H. Lotzkar (J. Amer. Chem. Soc., 1937, **59**, 472—475).—Reaction rates have been determined in C_6H_6 solution at 99·4° and 122·5°. The rates, which are of first order with respect to *cis*-cinnamic acid and half-order with respect to I, indicate that the catalytic agent is the I atom as in the photochemical reaction. By comparison of the temp. coeffs. of the thermal and photochemical reactions the energy of dissociation of I_2 into I in C_6H_6 solution is calc. as 38,800 g.-cal., which agrees fairly well with the val. for the dissociation of I_2 vapour at 18°, calc. from spectroscopic data. E. S. H.

Decomposition of acetaldehyde catalysed by bromine.—See A., II, 176.

Catalytic isotope exchange between water and oxygen. N. Morita and T. Titani (Bull. Chem. Soc. Japan, 1937, **12**, 104—106; cf. this vol., 41).—Complete exchange of O isotopes between gaseous O_2 and H_2O occurs when a mixture of O_2 and H_2O vapour is passed slowly over Pt-black heated above

540°. A slight exchange is detectable at 300°. Heated CuO, Fe_2O_3, and Ag_2O are ineffective.
F. L. U.

Study of chemical systems by observing changes in weight at linearly varying temperatures. I. P. Vallet (Ann. Chim., 1937, [xi], 7, 298—366).—The dehydration of $CuSO_4,5H_2O$ and $MgSO_4,7H_2O$ has been investigated by means of Guichard's method (cf. A., 1925, ii, 559) with a view of determining the influence of variations in the humidity of the air stream, in the rate of heating, and in the shape and size of the reaction vessel. Both powdered salts and single crystals were examined. The decomp. of the hydrates of $CuSO_4$ is catalysed by addition of the next lower hydrate. C. R. H.

[Catalytic] oxidation of ammonia to nitrous oxide.—See B., 1937, 341.

Amorphous and crystallised oxide hydrates and oxides. XXXII. Oxidation of potassium iodide by hydrogen peroxide in presence of ferric hydroxides. A. Krause and Z. Ernst (Ber., 1937, **70**, [*B*], 443—446).—All Fe^{III} hydroxides (I) have an inductive action on the liberation of I from KI by H_2O_2 in neutral solution or at p_H 5·5—6·0. The I vals. are almost ∝ to the amounts of (I); the concn. of KI is important whereas that of H_2O_2 has little influence. The amount of liberated I is characteristic for each type of (I) and is considered to be related to the activity of H in the OH groups of (I). The rapidity with which the change ceases is remarkable. KOH is adsorbed by most types of (I) but the change does not depend exclusively on this factor. I is not adsorbed. H. W.

Catalysis by fused substances. I. E. Adadurov (J. Phys. Chem. Russ., 1936, **8**, 621—622).—Polemical (cf. Steacie and Elkin, A., 1936, 685).
E. R.

Contact effects of glass and platinum on the dissolution of iron and steel in nitric acid of various concentrations. H. Endô and H. Kawasé (Sci. Rep. Tôhoku, 1936, **25**, 755—770).—The dissolution of Fe in 45—55% HNO_3 at the points of contact with glass is due to interference by the glass with the periodic formation and breaking of the liquid film of $[Fe(NO)](NO_3)_2$. Periodic dissolution of the Fe is due to the latter effect. No marked attack occurs on replacing glass by Pt. There was no local attack of the Fe in contact with glass in HCl.
H. J. E.

Simultaneous dehydrogenation and dehydration of alcohol by single and mixed catalysts. A. M. Rubinstein and E. P. Gratscheva (J. Phys. Chem. Russ., 1936, **8**, 725—735).—$C_5H_{11}{\cdot}OH$ between 350° and 530° gives chiefly H_2 and smaller amounts of C_5H_{10}, CO, CO_2, and an acid. The relation (rate of dehydrogenation) : (rate of dehydration) is for $Fe_2O_3 > ZnO > Cr_2O_3 > BeO$; it is almost independent of the temp. for Fe_2O_3 and ZnO but decreases with increasing temp. for Cr_2O_3 and BeO. The latter catalysts cause a deposition of C; they consequently become mixed catalysts during the reaction.
J. J. B.

Catalytic reactions among complex molecules. H. S. Taylor (Trans. Electrochem. Soc., 1937, **71**, Preprint 13, 133—139).—A review of experiments on catalytic interchange of D for H in C_2H_6 and C_3H_8. Active Cu catalysts which would hydrogenate C_2H_4 at 0°, gave no reaction involving breaking of the C–C linking in C_2H_6–H_2 mixtures up to 400°. This reaction took place readily on Ni at 170°. Cr_2O_3 gel gave no CH_4 from $C_2H_6 + H_2$ at $<400°$. PhMe in contact with active Ni at $>200°$ yields C_6H_6 and xylene. On the same catalyst C_6H_6 and C_2H_4 at $>180°$ yield PhEt. At $>300°$ C_2H_6 and C_6H_6 give CH_4 and PhMe. H. J. E.

Rôle of oxygen in hydrogenation of ethylene on palladium. D. Dobitschin and A. Gelbart (Acta Physicochim. U.R.S.S., 1937, **6**, 95—104; cf. A., 1936, 1472).—Addition of 0·01—1·0% of O_2 to a H_2–C_2H_4 mixture does not affect the rate of hydrogenation on sputtered films of Pd at about 20 mm. and room temp. The Pd can be activated by the reaction of CH_4 on its surface, which undergoes mechanical disintegration resulting in the formation of active centres. Neither O_2 nor H_2O takes part in catalytic hydrogenation on Pd. F. L. U.

Catalytic combustion of acetylene. W. Davies (Phil. Mag., 1937, [vii], **23**, 409—425; cf. A., 1935, 455; 1936, 571).—The combustion with air and O_2 of C_2H_2 and mixtures with H_2 and CH_4 on a Pt filament was investigated at temp. $<1700°$. Combustion of 0·5—2% C_2H_2–air mixtures does not occur at $<600°$, but if air is replaced by O_2, reaction commences at approx. 500°. The combustion of H_2–air mixtures, which is normally initiated at approx. 200°, is inhibited by C_2H_2 until the temp. is raised to 600°, above which both the C_2H_2 and the H_2 react. Hence Pt cannot be used for the preferential catalytic combustion of H_2 in presence of C_2H_2. It appears that C_2H_2 is adsorbed by Pt at room temp. and that reaction occurs only when it evaporates at such a rate that O_2 can gain access to the surface. CH_4 does not affect the conditions of combustion of H_2 or C_2H_2, and the catalyst acts preferentially towards either of these gases mixed with CH_4 provided the temp. is not raised to the val. above which CH_4 reacts. A 2% C_2H_2–air mixture reacts on a Ni filament at $>600°$, but a 10% H_2–air mixture does not react at $<$ approx. 1100°. Au, Ag, Cu, and Fe do not catalyse these combustions.
J. G. A. G.

Amorphous and crystallised oxide hydrates and oxides. XXXI. Peroxidase properties of amorphous ferric hydroxides. Catalysed oxidation of formic acid by hydrogen peroxide. A. Krause and M. Gawrychowa (Ber., 1937, **70**, [*B*], 439—443).—The oxidation of HCO_2H by H_2O_2 in presence of Fe^{III} orthohydroxide (I) is a change of the first order. Since indefinite amounts of HCO_2H can be thus oxidised, the action of (I) is truly catalytic. It is not shown by goethite and is ascribed to the presence of OH groups with active H. H. W.

Catalytic combustion of formaldehyde on a platinum wire. W. Davies and R. Spence (Proc. Leeds Phil. Soc., 1937, **3**, 300—304; cf. A., 1936, 571).—For dil. CH_2O–air mixtures the rate of heating of the wire ∝ $[CH_2O]$. For concn. 20—65%, explosion occurs after inception of the surface reaction.

Results for rich mixtures are complicated by simultaneous homogeneous oxidation, but when [CH_2O] reaches 85% the heterogeneous reaction is suppressed. The presence of adsorbed O_2 is probably an essential condition for surface combustion. N. M. B.

Active oxides. CVI. Zinc oxides, formed by the thermal decomposition of various complex zinc oxalates, as catalysts in the methyl alcohol decomposition. G. F. Hüttig and H. Goerk (Z. anorg. Chem., 1937, **231**, 249—263; cf. A., 1936, 1474).—Comparative catalytic data for 14 specimens of ZnO, prepared from simple and complex Zn salts, are recorded. The activity varies considerably with the source of the ZnO; *e.g.*, ZnO from $ZnC_2O_4,2H_2O$ is a good catalyst, yielding mainly CO and H_2, whereas ZnC_2O_4,2MeOH gives on ignition a poor catalyst, the chief product from which is HCO_2Me. Complex Zn oxalates with relatively firmly bound groups in the cation gave the best catalysts and produced a min. of secondary products. The structure of the various ZnO specimens used is discussed. H. J. E.

Catalytic reduction of ethylene chlorohydrin.—See A., II, 174.

Dehydrogenation of *cyclo*hexane by sulphide and oxide catalysts.—See A., II, 181.

Catalysis in hydrocarbon chemistry. IV. Adsorption of hexane on catalysts. R. H. Griffith and S. G. Hill. **V. Promoter concentrations. VI. Conversion of phenol into benzene. VII. Carrier action and molecular size.** R. H. Griffith (Trans. Faraday Soc., 1937, **33**, 405—407, 407—409, 409—412, 412—416).—IV. Activated adsorption occurs in many cases of adsorption of C_6H_{14} on various catalysts at 20—450°. Adsorption can lead to (*a*) decomp. with deposition of C through secondary reactions from adsorption of primary reaction products, (*b*) decomp. with loss of H_2, (*c*) decomp. with loss of CH_4, or (*d*) holding of the mol. without decomp. It is concluded that catalytic activity is always accompanied by adsorption, but the latter does not necessarily involve activity.

V. The concn. of other oxide promoter which gives the greatest activity to MoO_3 catalyst, reduced in H_2 at 500°, for decomp. of C_6H_{14}, lies between 4·3 and 4·6 at.-% for each of 8 oxides tested. It is concluded that the amount required is a function of the catalyst and not of the promoter. If the promoter is present as metal (Fe, Cu, Pb) the concn. is only half that required with an oxide. It is concluded and proved experimentally that no higher activity is obtained by adding a second promoter to the most active concn. of the first.

VI. The optimum concn. of promoter for conversion of PhOH into C_6H_6 with a MoO_3 catalyst reduced in H_2 at 440° is higher than for the reduction of C_6H_{14}. Especially with alkali oxides, compound formation occurs between the MoO_3 and added oxides, the compounds being undecomposed at 440°.

VII. It is concluded that the most active catalyst has not necessarily the largest no. of active centres. The addition of a carrier to a catalyst containing a large no. of active centres produces a lowering of activity at a concn. dependent on the size of the reactant mol. This reduction is not due to compound formation with the catalyst. Such a carrier may produce an initial increase in activity by preventing sintering. Addition of a promoter produces a surface of type different from that of the pure catalyst. Change in activity of Cr_2O_3 catalyst occurs on reduction. J. W. S.

Electrolytic separation of hydrogen isotopes on a palladium cathode. A. Farkas (Trans. Faraday Soc., 1937, **33**, 552—559; cf. A., 1934, 1070, 1315).—The D content of gas evolved at a Pd cathode during electrolysis of a mixture of light and heavy water has been compared with that of the occluded gas. The separation factors found are $(H/D)_{occl.}/(H/D)_{liq.} = 6·6$, and $(H/D)_{evolv.}/(H/D)_{liq.} = 4·4$. The factor 6·6 can be regarded as caused by establishment of the equilibrium $MH + HDO \rightleftharpoons MD + H_2O$ on the electrode (M), in agreement with the theory of Halpern and Gross (A., 1935, 1210). The difference between the two factors is attributed to a different rate of recombination of H and D atoms on the Pd. F. L. U.

Electrolytic preparation of heavy water. Relation between electric current density and isotopic separation coefficient. Anon. (J. Electrochem. Soc. Japan, 1935, **3**, 127).—The c.d. had no effect on the separation coeff. in the electrolysis of 20% NaOH solution in 0·08% D_2O with Ni electrodes and a c.d. of 0·05—1·0 amp. per sq. cm. Ch. Abs. (*e*)

Deposition of small amounts of metal from large volumes of liquid by electrolysis. F. Hernler and R. Pfenigberger (Mikrochem., Molisch Festschr., 1936, 218—223).—The liquid is passed slowly through two cells in tandem. 0·1 mg. of Cu may be deposited quantitatively from 1 litre of solution. J. S. A.

Use of crystals as calcium electrodes. H. J. C. Tendeloo (J. Biol. Chem., 1937, **118**, 253—254).—A reply to criticism by Anderson (*ibid.*, 1936, **115**, 323) of the method previously described (A., 1936, 443; see also A., 1936, 1479). F. A. A.

Electrolytic etching method for revealing microstructure of electrodeposited nickel. A. J. Krombholz (Trans. Faraday Soc., 1937, **33**, 511—512).—The Ni is anodically etched in a saturated EtOH solution of dimethylglyoxime containing a little dil. HCl, using a c.d. of 0·06—0·2 amp. per sq. cm. Cu used as a basis metal is not attacked, and pitting and rapid attack of the edges of the deposit are avoided. F. L. U.

Preparation of thin layers of titanium by an electrolytic method. M. Haïssinsky and (Mme.) H. Emmanuel-Zavizziano (Compt. rend., 1937, **204**, 759—761; cf. A., 1936, 1213).—The layers are prepared by electrodeposition from aq. $Ti(SO_4)_2$ solutions (p_H 1·2—1·6), containing 1·7—2 mg. of TiO_2 and 0·15 g. of Na_2SO_4 per c.c., using a c.d. of 15—20 milliamp. per sq. cm. Deposits are obtained with cathodes of Zn, Sn, or Pb, but not with Ni or Pt, deposition appearing to depend on a high H_2 overvoltage at the cathode. A. J. E. W.

Electrolytic preparation of magnesium persulphate. L. Li and K. Pei (Contr. Inst. Chem., Nat. Acad. Peiping, 1935, 2, 1—20).—A solution containing approx. 60% of MgS_2O_8 was prepared by electrolysing aq. $MgSO_4$ with Pt electrodes. The solid compound could not be isolated. An unglazed porcelain diaphragm must be used. The optimum anode c.d. was 70 amp. per sq. dm. Formation of H_2SO_5 is negligible. Ch. Abs. (e)

Electrolytic preparation of ferrochromium.—See B., 1937, 355.

Amalgamation of platinum as an electrolytic process.—See B., 1937, 356.

Electrolytic fractionation of lithium isotopes. G. Champetier and P. Regnaut (Bull. Soc. chim., 1937, [v], 4, 592—594).—No significant fractionation was effected by electrolysing LiCl, using a cathode of circulating Hg. E. S. H.

Metallic scandium. W. Fischer, K. Brünger, and H. Grieneisen (Z. anorg. Chem., 1937, 231, 54—62).—Electrolysis of $ScCl_3$ dissolved in molten KCl–LiCl eutectic with a molten Zn cathode yields a 2% Sc–Zn alloy from which *scandium* is obtained by heating in a vac. at 1250°. Metal of 98% purity (containing Si 0·3—0·5, Fe 0·2—0·5%, and Sc_2O_3) has m.p. about 1400° and *d* 3·1. F. L. U.

Continuous automatic control of acidity in the electrolytic preparation of persulphates.—See B., 1937, 360.

Electrolysis of salts in anhydrous glycerol. M. Centnerszwer and J. Szper (Bull. Acad. Polonaise, 1936, A, 378—381).—The electrolysis between Cu electrodes of solutions of $CuCl_2$, $ZnCl_2$, and $MgCl_2$ in anhyd. glycerol (I) has been investigated, at temp. from 90° to 140°. In all cases Cl_2 is liberated at the anode and reacts to form $CuCl_2$. When the anode is covered with a layer of $CuCl_2$ the Cl_2 reacts with (I). At the cathode H_2 is liberated and metallic glycerates $C_3H_6O_3M$ are formed [probably $OH\cdot CH(CH_2\cdot O)_2M$], where M is metal atom. These compounds are colourless and insol in H_2O and org. solvents. When heated they decompose before melting. They are hydrolysed by hot H_2O and by acids. The yield by the current at the anode and cathode is aprox. 100%. O. D. S.

Kolbe's electrochemical synthesis in deuterium oxide. H. Erlenmeyer and W. Schoenauer (Helv. Chim. Acta, 1937, 20, 222—223).—When KOAc in D_2O is electrolysed the C_2H_6 produced contains scarcely any D. E. S. H.

Electrochemical oxidation of copper lactate.—See A., II, 175.

Electrolytic reduction of maleimide and pyrroline.—See A., II, 165.

Rôle of ions in gaseous chemical reactions in electrical discharge. N. I. Nekrassov (J. Phys. Chem. Russ., 1936, 8, 736—755).—Theoretical. Reactions in the glow discharge are not initiated by ions, but mols. attracted to ions (clusters) are more easily activated than free mols. (cf. Thomson, A., 1924, ii, 222). J. J. B.

Reactions of oxygen and hydrogen at low pressures. W. H. Rodebush (J. Physical Chem., 1937, 41, 283—291).—H atoms with O_2 in the electrodeless discharge give H_2O_2, but O atoms do not react with H_2. It is supposed that this reaction occurs on the glass wall and no homogeneous reaction was observed. At atm. pressure O_2 reacts rapidly only with paramagnetic mols. (cf. Pauling and Coryell, A., 1936, 616). F. R. G.

Mechanism of the photo-reduction of ferric chloride dissolved in alcohols. M. Prasad, B. V. Mohile, and K. D. Nigudkar (J. Univ. Bombay, 1936, 5, Part II, 142—150).—Published work is discussed. E. S. H.

Formation of hydrogen fluoride from its elements, and absorption of light by fluorine. M. Bodenstein and H. Jockersch [with S. H. Chong] (Z. anorg. Chem., 1937, 231, 24—33).—H_2 and F_2 scarcely react at pressures about 100 mm. in Mg vessels at or below room temp., nor is combination induced by light from a quartz Hg vapour lamp. If Cl_2 is substituted for F_2 the gases combine very slowly. In Pt vessels H_2 and F_2 unite explosively at room temp., but very slowly at —80°. Illumination does not increase the velocity. The results are interpreted as showing that the reaction depends, as with Cl_2 and Br_2, on the production of atoms, and that the reaction chains are readily broken at suitable surfaces. The heat of dissociation of F_2 is calc., from fresh measurements of the ultraviolet absorption spectrum, to be 70 kg.-cal. F. L. U.

Photographic latent image considered from the standpoint of the quantum mechanics model of crystals. J. H. Webb (Phot. J., 1937, 77, 142—158).—A detailed discussion is given of the new view of electronic energy levels applied to crystals as a whole, and not to their atoms, as a basis for the explanation of photographic processes; the explanations are still very hypothetical. Broadly speaking, ripening of the emulsion produces *U*-centres in Ag halides, which act as a source of electrons to be lifted to upper *F* levels, by exposing light quanta; the *U* and *F* levels are discrete energy levels a little above the lower filled zone and a little below the upper empty level respectively, these latter being the allowed energy zones. The results obtained with alkali halides are compared. The hypotheses are to a large extent in agreement with the concn.-speck hypothesis of sensitivity, and even sensitising dyes may perhaps be considered as impurities causing irregularities in the crystal lattice. These hypotheses afford little explanation, however, of reversal and reciprocity-law failure; the latter, at high intensities, is considered to be related to the Dember photo-effect, producing a deep-seated, undevelopable latent image. J. L.

Critical number of quanta in photography. II. Polydisperse emulsion. S. P. Schuvalov (J. Phys. Chem. Russ., 1936, 8, 514—524).—The discussion already given (this vol., 193) for a monodisperse layer is generalised for emulsions containing grains of different size. E. R.

Photochemical reduction with *X*-rays and effects of addition agents. G. L. Clark and W. S. Coe (J. Chem. Physics, 1937, 5, 97—105).—Reduction of inorg. compounds by *X*-rays has been studied quantitatively and an accurate method of determining oxidising substances, particularly $Ce(SO_4)_2$ in dil. H_2SO_4, with *o*-phenanthroline as indicator is developed. The % reduction $\propto$ the amount of irradiation and is independent of the salt concn. The catalytic or inhibitory properties of added substances are apparently quite arbitrary; *e.g.*, $AgClO_4$ and $AgNO_3$ decrease and $Hg(NO_3)_2$ and AcOH increase the amount reduced. The effect may be due either to a catalytic process or to direct interaction of the substance with the inorg. salt under the influence of the rays. *X*-Ray reduction of $KMnO_4$ produces either MnO_2 or $Mn^{\cdot\cdot}$, depending on the concn. and p_H of the solution. The effects of added substances are similar to those for $Ce(SO_4)_2$. The reduction of $KBrO_3$ and KIO_3 has also been studied. A suggested mechanism for the process involving (*a*) formation of H_2O_2 and (*b*) direct action of activated H_2O mols. is advanced. W. R. A.

Photochemical antagonism of radiations. G. Holst (Nature, 1937, 139, 285).—An example of the power of light of different λλ to shift the equilibrium of a thermal oxidation–reduction system of the type $A + BH_2 \rightleftharpoons AH_2 + B$ is described and discussed. The system consists of methylene-blue (A)–leucomethylene-blue (AH_2) and phenylhydrazinesulphonate (BH_2)–benzenediazosulphonate (B) in dil. acid solutions, the photo-active absorption of AH_2 and BH_2 being situated in the near and in the middle ultra-violet, respectively. L. S. T.

Photochemistry of polyatomic molecules containing alkyl radicals. IV. Mercury dimethyl. J. W. Linnett and H. W. Thompson (Trans. Faraday Soc., 1937, 33, 501—507).—The photochemical decomp. of $HgMe_2$ vapour by light of λ 2537 A. yields Hg and a mixture of hydrocarbons, mainly C_2H_6. The quantum efficiency is approx. 1, and the facts are explained by assuming that the primary action yields Hg and C_2H_6 without production of reaction chains, but a few radicals formed by the subsidiary processes yielding $Hg + Me + Me$, or $HgMe + Me$ may give rise to chains and subsidiary products. J. W. S.

Photo-decomposition of gaseous acetone. R. Spence and W. Wild (J.C.S., 1937, 352—361; cf. A., 1936, 1077).—The decomp. in ultra-violet light has been investigated at 0—60° chiefly with <165 mm. of $COMe_2$. The products are C_2H_6, CO, Ac_2, and small proportions of CH_4, the main net reaction being $(2y - x)COMe_2 = yC_2H_6 + xCO + (y - x)Ac_2$. In the region of continuous absorption (I), the primary process is $COMe_2 + h\nu \rightarrow Me + Ac$, but Ac_2 is found in the products only at the lower temp. since Ac is decomposed instantly at 60°; the ratio $r = C_2H_6/CO$ is increased by increasing [$COMe_2$], decreased by raising the temp., and rises to approx. 2·5 as the light intensity, *L*, is increased. With unfiltered Hg-light (II), *r* rises with *L* to approx. 1·9 and then approaches 1·5 at high *L*. The process in the region of discrete absorption, $COMe_2 + h\nu \rightleftharpoons COMe_2^* \rightarrow C_2H_6 + CO$, may not involve free radical formation; *r* is approx. unity, but the decomp. in this region is too small to explain the decrease of *r* when (II) replaces light corresponding with (I). The gaseous products from 860 mm. of $COMe_2$ at 60° contained 14—28% of CH_4 (cf. A., 1934, 1184). Reaction schemes consistent with the data are developed. J. G. A. G.

Photochemical behaviour of the aldehydes. G. K. Rollefson (J. Physical Chem., 1937, 41, 259—265).—An interpretation of the results of Blacet and Roof (A., 1936, 437). F. R. G.

Reaction of dichromate with formate in light. H. Ammann-Brass (Z. wiss. Phot., 1937, 36, 33—48, 49—58).—The photo-reduction of dichromate with a buffer-mixture of formate and HCO_2H produces only Cr^{III} and CO_2 at $p_H < 4$ (reaction takes place in the dark at $p_H < 2·5$). From p_H 2·5 to 4·5, there is a linear relation between the reaction velocity and the HCO_2' ion, for any given const. concn. of the latter, which is independent of the dichromate concn. and of temp. The p_H is a secondary factor, being only an indication of the HCO_2' concn. Above p_H 4·0, the reaction proceeds in stages, forming chromic chromate (1 Cr^{IV} : 2 Cr^{III}) of basic formula $(CrO_2)_n$. Of various heavy-metal ions investigated, only Fe^{II} or Fe^{III} increases the reaction velocity (the effect increasing as reaction proceeds), and Ce^{III} retards reduction. Addition of fairly high concns. of $MgSO_4$ (*i.e.*, a neutral salt) increases the velocity, and the results, by Brönsted's theory, tend to show that the action of light is first to produce a neutral mol. (CrO_3) which secondarily oxidises the formate. The quantum yield is about 1/10 for a formate concn. of 4 mol. per litre. Whilst max. reduction velocity of dichromate is at p_H 4·5, that for molybdate is at p_H 2·5; for a mixture, the final reaction product is the reduced Cr, and reaction is accelerated three times. This is due to re-oxidation of reduced molybdate by dichromate. J. L.

Photochemistry of some aliphatic nitroso-compounds. D. L. Hammick and M. W. Lister (J.C.S., 1937, 489—493; cf. A., 1936, 37).—The photochemistry of $CMe_2Cl\cdot CMe_2\cdot NO$ (I), 1-chloro-1-nitroso-*cyclo*hexane, $CMeBu^{\gamma}Cl\cdot NO$, and $NO_2\cdot CMe_2\cdot NO$ in C_6H_6, $CHCl_3$, MeOH, and EtOH has been studied. It is very probable that the primary process is the elimination of the radical NOH with formation of an olefine, which then enters into subsequent reactions. The rate of photolysis $\propto$ light intensity, and the quantum efficiency is in the neighbourhood of 1. The photolysis of (I) is unaffected by the presence or absence of O_2, but in the other cases photo-oxidation occurs. A. J. M.

Oxidation of rubrene in light. W. Koblitz and H. J. Schumacher (Z. physikal. Chem., 1937, B, 35, 11—24; cf. A., 1934, 977).—The photo-oxidation in C_5H_5N and C_6H_6 solutions has been investigated. A reaction scheme, the principal features of which are the following, is advanced to account for the results. A rubrene mol. excited by light, R^-, is not capable of forming a stable RO_2 mol. by collision with an O_2 mol.; it must first collide with another R mol. to give an R* mol. capable of oxide formation. An R^- mol. may, however, form with O_2 an unstable RO_2 mol., which can be stabilised by collision with another R mol. The mean life of R^- and R* is 10^{-9}—10^{-7} sec. Neither excited O_2 mols. nor long-lived excited R mols. (cf. A., 1936, 1570) play any material part in the reaction. The quantum yield in C_6H_6 is > in C_5H_5N. R. C.

Photochemical addition of hydrogen peroxide to the double linking.—See A., II, 175.

Synthesis of sodamide from its elements, and its thermal decomposition. II. Thermal decomposition. K. SAKURAZAWA and R. HARA (J. Soc. Chem. Ind. Japan, 1937, **40**, 10B; cf. J.C.S., 1894, 65, 504; A., 1921, ii, 334).—$NaNH_2$, prepared either from its elements with an Fe, or from Na and liquid NH_3 with a Pt, catalyst, decomposed in an evacuated steel vessel at 330—400° thus: $NaNH_2 = NaH + 0{\cdot}5H_2 + 0{\cdot}5N_2$, some NH_3 being formed, probably by the reaction $NaNH_2 + H_2 \rightleftharpoons NaH + NH_3$. The reaction became $NaNH_2 = Na + H_2 + 0{\cdot}5N_2$ when the pressure was kept below the decomp. pressure of NaH, which pressure was determined in the range 330—400° and found to agree with the data of Keyes (A., 1912, ii, 627). The decomp. pressure of $NaNH_2$ at 400° was approx. 6·4 atm. R. C. M.

Products obtained by the reducing action of metals on salts in liquid ammonia solution. IV. Action of potassium and sodium on silver salts. V. Action of calcium on silver salts. W. M. BURGESS and F. R. HOLDEN (J. Amer. Chem. Soc., 1937, **59**, 459—462, 462—463; cf. Chem. Rev., 1931, 8, 265).—IV. Na and K reduce Ag salts to Ag in liquid NH_3 solutions. The reduced Ag may catalyse the reaction between the alkali metal and NH_3, especially with K. With AgCNS the CNS radical is partly reduced, but with AgCNO the CNO radical is stable.

V. Ca reduces Ag salts to Ag in liquid NH_3 solutions. The reduced Ag is pyrophoric and catalyses the reaction between Ca and NH_3. In Ag salts the CNS radical is reduced completely and the CNO radical partly. E. S. H.

Reciprocal reaction between chlorides. G. AJON (Atti V Congr. Naz. Chim., 1936, 1, 255—271).—The pptn. of NaCl and of KCl from aq. solution by the addition of $CaCl_2$, either in solution or in the solid state, has been studied. NaCl is pptd. more readily than KCl. The ionic equilibria in these solutions are discussed. O. J. W.

Preparation and properties of cæsium and rubidium sulphide, selenide, and telluride. A. BERGMANN (Z. anorg. Chem., 1937, **231**, 269—280).—The prep. of Cs_2S, Cs_2Se, Cs_2Te, Rb_2S, Rb_2Se, and Rb_2Te from the elements in vac. is described. Polysulphide formation is minimised by using HgS instead of S. The temp. of incipient thermal decomp. in vac. were 510—520°, 660°, 680°, 530°, 690°, and 640°, respectively. Data for the electrical conductivity of Cs_2S, Cs_2Se, and Cs_2Te containing Cs are given. The temp. coeff. was positive. The metal atoms enter the lattice of the compound. H. J. E.

Amides of [elements of] groups I and II. I. Metal amides. R. JUZA (Z. anorg. Chem., 1937, **231**, 121—135).—A general survey of heats of formation, physical properties, and constitution of the metal amides is given. F. L. U.

Optical research of thin [metal] layers. L. S. ORNSTEIN and P. J. HARINGHUIZEN (1st Internat. Electrodep. Conf., 1937, 4 pp.; cf. A., 1935, 1310).—The corrosion of evaporated and electrodeposited layers of Cu on glass due to immersion in heated transformer oil and in olive oil, at room temp., has been measured by determination of the light absorption of the layers. Both layers give the same order of corrosion, but measurement for evaporated layers is much more sensitive and accurate. A. J. K.

Precipitation of copper sulphate by sodium carbonate. M. GELOSO and (MLLE.) É. GIORDANO-ORSINI (Compt. rend., 1937, **204**, 588—590).—The ppt. obtained on adding Na_2CO_3 to aq. $CuSO_4$ solution has the composition $SO_3,4CuO,xH_2O$. This is confirmed potentiometrically if atm. CO_2 is excluded. A. J. E. W.

Sodium cupricyanurate: two differently coloured forms of the anhydrous salt. New specific reaction for cyanuric acid. A. OSTROGOVICH and G. OSTROGOVICH (Atti V Congr. Naz. Chim., 1936, 2, 431—436).—The hydrated salt has the composition $[Cu(C_3N_3O_3H_2)_4]Na_2,6H_2O$ (cf. A., 1914, i, 150). The anhyd. salt can exist in two forms, a violet α-form and a steel-blue β-form (stable only at <150°). The formation of this insol. complex salt by the addition of a few drops of dil. $Cu(OAc)_2$ or $CuSO_4$ to a cooled solution of $(HCNO)_3$ in 25—30% NaOAc forms a sensitive test for $(HCNO)_3$. O. J. W.

Compounds of magnesium chloride with organic compounds. Compounds with magnesium acetate and ethyl acetate. (MLLE.) M. L. QUINET (Bull. Soc. chim., 1937, [v], 4, 518—522).—AcOH combines with $MgCl_2$ at room temp. forming $MgCl_2,6AcOH$ and $MgCl_2,4AcOH$. In boiling AcOH the product is $Mg(OAc)_2,1{\cdot}5AcOH$. In vac. at 100° the product is $Mg(OAc)_2$ with HCl and AcOH; under other conditions this mixture may yield $3MgCl_2,Mg(OAc)_2$ or $MgCl_2,3Mg(OAc)_2$. $MgCl_2$ and EtOAc react slowly at room temp. forming $MgCl_2,3EtOAc$, which decomposes under reduced pressure into $MgCl_2,EtOAc$. E. S. H.

Silicates. V. Nature of reaction products of pyrophyllite with molten magnesium and cobalt chlorides. E. THILO and H. SCHÜNEMANN (Z. anorg. Chem., 1937, **230**, 375—380; cf. this vol., 206).—The products are $MgO,Al_2O_3,2{\cdot}5SiO_2 + SiO_2$ and $CoO,Al_2O_3 + SiO_2$, respectively. E. S. H.

Double compounds of carbamide with magnesium nitrate and magnesium sulphate. J. Y. YEE, R. O. E. DAVIS, and S. B. HENDRICKS (J. Amer. Chem. Soc., 1937, **59**, 570—571).—The prep. of $MgSO_4,5CO(NH_2)_2,2H_2O$, $MgSO_4,6CO(NH_2)_22H_2O$, and $Mg(NO_3)_2,4CO(NH_2)_2,2H_2O$ is described. Optical and *X*-ray data have been determined. E. S. H.

Reactivity of zinc amalgams. H. A. LIEBHAFSKY (J. Amer. Chem. Soc., 1937, **59**, 452—458).—

When violently agitated with different oxidising solutions, the rate of oxidation of Zn amalgam is limited mainly by the rate at which a fresh surface can be exposed; when this is const., the rate of oxidation increases slightly with concn. of amalgam, $\propto$ the concn. of oxidising agent, and is almost unaffected by change of temp. The reaction appears to involve the capture of electrons by the oxidising agent at the surface of the Zn amalgam, followed by the expulsion of $Zn^{\cdot\cdot}$. Conc. Zn amalgams appear to be inert only because the amount of Zn disappearing from them is proportionally small enough to escape detection. E. S. H.

Influence of small quantities of metallic oxides on the crystallisation of zinc borate. R. Paris and P. Mondain-Monval (Compt. rend., 1937, **204**, 579—581; cf. A., 1936, 1079).—Alkali oxides accelerate crystallisation; oxides of group II metals have a weak retarding action. This is greater with other oxides (except PbO). The effect does not increase linearly with the content of added oxide. Ce, U, and W oxides are more effective when partly reduced. A. J. E. W.

Tetrahydrate of zinc sulphate. P. Vallet (Compt. rend., 1937, **204**, 496—497; cf. A., 1934, 859; 1935, 308).—$ZnSO_4,4H_2O$ was obtained by controlled heating of $ZnSO_4,7H_2O$. A. J. E. W.

Preparation and hydration of CaO,Fe_2O_3 and $2CaO,Fe_2O_3$. Y. Sanada (J. Soc. Chem. Ind. Japan, 1937, **40**, 16B; cf. A., 1935, 1329).—CaO,Fe_2O_3, formed from $CaCO_3 + Fe_2O_3$ at 1200°, does not hydrate, whilst $2CaO,Fe_2O_3$, formed from $2CaCO_3 + Fe_2O_3$ at 1400°, reacts with H_2O thus: $2CaO,Fe_2O_3 + H_2O \rightarrow Ca(OH)_2 + CaO,Fe_2O_3$. R. C. M.

Purification of mercury. K. Klein (Chem. Fabr., 1937, **10**, 150—151).—Hg is atomised with compressed air as it flows from a dropping funnel and falls in a finely divided state into a washing solution, *e.g.*, $Hg(NO_3)_2$ with HNO_3. An overflow from the washing vessel leads into a similarly fitted H_2O vessel. The arrangement is safe, convenient, and yields a product equal to electrolytic Hg. C. I.

Action of hydrogen sulphide on mercurous chromate. M. A. Hamid, V. S. Bhatia, and H. B. Dunnicliff (J. Indian Chem. Soc., 1937, **13**, 697—699).—At 0° the ppt. contains $Cr_2(SO_3)_3$, $Cr_2(SO_4)_3$, $Cr_2(S_2O_3)_3$, $Cr(OH)_3$, Hg_2S, and S. Above 60° the sulphite is quantitatively converted into sulphate. D. C. J.

Active oxides. CIV. "Memory" of solid materials. G. F. Hüttig, E. Zeidler, and E. Franz (Z. anorg. Chem., 1937, **231**, 104—120; cf. A., 1936, 1474).—Al_2O_3 prepared by heating the Al salts of various volatile acids has a relatively higher rate of dissolution in the acid from which it was prepared, when extraneous factors affecting the comparison are eliminated. Similarly, $SrCl_2$ prepared by heating $SrCl_2,8NH_3$ combines with NH_3 more rapidly than with H_2O, whilst the converse is true of $SrCl_2$ prepared by heating $SrCl_2,6H_2O$. Such influence of the previous history of a solid on its chemical behaviour is not shown when, during its prep., it has undergone fusion. F. L. U.

Rare earth metals. W. Klemm and H. Bommer (Z. anorg. Chem., 1937, **231**, 138—171).—All the rare earth metals, except Ho, have been prepared by heating the chloride with an alkali metal. *X*-Ray spectra show them to have lattice structures to be expected from their relationship to neighbouring groups. The at. vol. curve shows sharp max. at Eu and Yb, and flat min. at Ce, Pr, and Tb. It is inferred from the at. vols., and confirmed by magnetic measurements, that several of the metals form bivalent and quadrivalent as well as tervalent ions. Ferromagnetism is observed only in Gd. F. L. U.

Rare earth salts. Precipitation and p_H studies with the glass electrode. J. A. C. Bowles and H. M. Partridge (Ind. Eng. Chem. [Anal.], 1937, **9**, 124—127).—The order of basicity of the salts studied is $Ce^{IV} < Th < Yb < Nd < Pr < Ce^{III} < La$. When NaOH is added to the chlorides, the ppt. remains colloidal until a slight excess of NaOH has been added; pptn. occurs at a lower p_H in sulphate than in chloride solutions. Separation of rare earths (except Ce^{IV}) by fractional pptn. of hydroxides is impracticable. Ce^{IV} and La can be separated by controlling the p_H of the solution. E. S. H.

Relations between cyanide, cyanamide, and nitride of some elements of the rare-earth group. A. Perret and A. Banderet (Compt. rend., 1937, **204**, 586—588; cf. A., 1933, 229, 1252).—The yields of cyanamide and nitride obtained on heating NaCN with La, Ce, and Nd chlorides, with and without Fe powder, have been investigated. Low stability of a cyanamide is associated with a high affinity of the metal for N. A. J. E. W.

Carbon suboxide. M. V. Volkenschtein (Uspechi Chim., 1935, **4**, 610—631).—A review. Ch. Abs. (*e*)

Products of reaction of sodium silicates with electrolytes. I. V. A. Kargin, S. A. Katz, and A. F. Komovski. **II.** V. A. Kargin and S. A. Katz (J. Appl. Chem. Russ., 1937, **10**, 82—85, 86—92).—I. *X*-Ray and viscosity data do not suggest formation of alkaline-earth silicates when aq. $MgCl_2$, $CaCl_2$, or $BaCl_2$ is filtered through a mixture of SiO_2 and Na silicate.

II. Different titration curves of aq. Na silicate with $5N$-$CaCl_2$ are obtained, according to the initial SiO_2 gel content of the solutions. The results point to adsorption of $Ca(OH)_2$ by SiO_2 gel. R. T.

Reaction of concentrated solutions of sodium silicates with calcium chloride. V. A. Kargin and S. A. Katz (J. Appl. Chem. Russ., 1937, **10**, 93—98).—A double membrane forms at the zone of contact of the solutions, consisting of SiO_2 gel with adsorbed $Ca(OH)_2$ at the $CaCl_2$ surface, and of SiO_2 gel at the Na silicate surface. R. T.

Titanium. VI. Mechanism of reaction, and products of chlorination of titaniferous materials. A. V. Pamfilov and E. G. Schtandel (J. Gen. Chem. Russ., 1937, 7, 258—261).—The reaction $TiO_2 + 2Cl_2 + C \rightarrow TiCl_4 + CO_2$ preponderates at <600°, whilst the dominating reaction at 600—1000°

is $TiO_2 + 2Cl_2 + 2C \rightarrow TiCl_4 + 2CO$. The liquid chlorination products consist of $TiCl_4$, $SiCl_4$, and $COCl_2$. R. T.

Reduction of stannic oxide by means of carbon monoxide. E. Crepaz (Atti V Congr. Naz. Chim., 1936, 1, 346—352).—In the range 600—1000° the vals. of K for the equilibrium $SnO_2 + 2CO \rightleftharpoons Sn + 2CO_2$ are given by $\log K = 418{\cdot}5/T - 0{\cdot}9725$. Below 550° the process $SnO_2 + CO \rightleftharpoons SnO + CO_2$ takes place. O. J. W.

Chlorites. G. R. Levi (Atti V Congr. Naz. Chim., 1936, 1, 382—386).—The *compounds* $Pb(ClO_2)_2,PbCl_2$ and $Pb(ClO_2)_2,PbBr_2$ have been prepared. The former is very stable. The reaction $CaCO_3 + 2ClO_2 + H_2O_2 \rightarrow Ca(ClO_2)_2 + CO_2 + H_2O + O_2$ is quant. The halogens react with solutions of chlorites to give halides and ClO_2; with Cl_2 this reaction is quant. O. J. W.

Preparation of acid ammonium sulphate $3(NH_4)_2SO_4,H_2SO_4$, usable in analysis. P. Laffitte and P. Locuty (Ann. Chim. Analyt., 1937, [iii], 19, 61—63).—$(NH_4)_2SO_4$ (3 mols.) is dissolved in 30% H_2SO_4 (1 mol.), and cooled to 0°. $3(NH_4)_2SO_4,H_2SO_4$ crystallises, and may be washed at 0° with H_2O. Its use as an acidimetric standard is proposed. J. S. A.

Properties of ammonium nitrate.—See B., 1937, 339.

Phosphorus sulphobromide. A. E. van Arkel and F. J. Lebbink (Rec. trav. chim., 1937, 56, 208—210).—Action of Br_2 on a mixed CS_2 solution of P and S yields chiefly $PSBr_3$, which has an X-ray diagram similar to that of CBr_4 and, contrary to statements in the lit., forms no hydrates. Attempts to obtain evidence of the existence of $PSBr_3,PBr_3$ (Annalen, 1873, 164, 36) have been unsuccessful. R. C.

Preparation of permonophosphoric acid. G. Toennies (J. Amer. Chem. Soc., 1937, 59, 555—557).—H_3PO_5 is prepared by interaction of P_2O_5 and H_2O_2 in MeCN. The solutions are relatively stable at room temp. The reaction does not occur appreciably when MeCN is replaced by Et_2O or *iso*amyl alcohol. E. S. H.

Bismuth dichloride, $BiCl_2$. Existence, methods of formation, and properties. E. Montignie (Bull. Soc. chim., 1937, [v], 4, 588—591).—$BiCl_2$ may be prepared by direct synthesis, by reduction of $BiCl_3$, or by interaction of Bi with Hg_2Cl_2. $BiCl_2$ has m.p. 163°, and decomposes at 300° into $BiCl_3$ and Bi; it is a powerful reducing agent. E. S. H.

Permonosulphuric acid in organic media. G. Toennies (J. Amer. Chem. Soc., 1937, 59, 552—555).—The prep. of solutions of H_2SO_5 in EtOH, $Pr^{\beta}OH$, *iso*amyl alcohol, and MeCN is described. Slow decomp. occurs, but at −12° solutions containing $\not> 0{\cdot}6M$-H_2SO_5 are of convenient stability. Attention is directed to the possibility of explosive reactions with *sec.* and *tert.* alcohols, and with other org. solvents when $[H_2SO_5]$ is high. E. S. H.

Preparation and conservation of sodium tetrathionate. B. Cacciavillani (Boll. Soc. ital. Biol. sperim., 1936, 11, 754—756).—A modification of Sander's method (A., 1915, ii, 161, 629) yields a pure and relatively stable prep. F. O. H.

Chemistry in liquid sulphur dioxide. III. Thionyl thiocyanate and its "acidic" properties in pure sulphur dioxide solutions. G. Jander and D. Ullmann (Z. anorg. Chem., 1937, 230, 405—415; cf. A., 1937, II, 137).—$SO(SCN)_2$ is formed in liquid SO_2 by interaction of NH_4SCN and $SOCl_2$; NH_4Cl is pptd. $SO(SCN)_2$ reacts with $K_2S_2O_5$ in SO_2, yielding KSCN and SO_2. In these reactions $SO^{\cdot\cdot}$ behaves in an analogous way to $H^{\cdot}$ in aq. solutions. The stability of the solutions is discussed. E. S. H.

Action of ethyl alcohol on aqueous solutions of potassium tellurate. M. Patry (Compt. rend., 1937, 204, 497—500).—Addition of EtOH to aq. solutions of K_2TeO_4 causes separation into two phases. The denser, viscous phase is rich in EtOH and contains most of the Te; $K : Te < 2$. The effect is ascribed to hydrolysis of the K_2TeO_4, with production of an acid tellurate which is more sol. in aq. EtOH than the neutral salt. Evaporation of the alcoholic phase gives successively a gel and an amorphous metatellurate. A. J. E. W.

Basic chromium sulphites. A. Sconzo (Atti V Congr. Naz. Chim., 1936, 2, 548—557).—When solutions of $Cr_2(SO_4)_3$ and Na_2SO_3 are boiled together SO_2 is evolved and basic sulphites are pptd. (except when the mol. ratio of the two reactants is 1 : 1). With a mol. ratio of 1 : 2 of the reactants the basic sulphite, after drying over fused $CaCl_2$, has the composition $2Cr_2O_3,SO_2,9H_2O$. When boiled with $K_2Cr_2O_7$ in H_2SO_4 only 7·11% of the SO_2 is oxidised. With an initial mol. ratio 1 : 3 or 1 : 5 the compound $3Cr_2O_3,2SO_2,14H_2O$ is obtained (58·96% of SO_2 oxidisable by $K_2Cr_2O_7$). By boiling a solution of $Cr(OH)_3$ (pptd. in the cold) in aq. SO_2 the compound $Cr_2O_3,SO_2,4H_2O$ is obtained (93·28% of SO_2 oxidisable), or if Na_2SO_4 has been added to the mixture before boiling $3Cr_2O_3,2SO_2$ is pptd. O. J. W.

Relative and absolute spatial configuration of isomorphous optically active complex salts. II. Comparison of the tri-diamino-salts of cobalt, rhodium, and chromium. F. M. Jaeger (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 108—116; cf. this vol., 170).—Treatment of $[Cr(C_5H_5N)_3Cl_3]$ with the respective bases yields the *compounds* $[Cr(en)_3]Cl_3,H_2O$, $[Cr(d\text{-chxn})_3]Cl_3,3H_2O$, and $[Cr(d\text{-cptn})_3]Cl_3,3H_2O$ [en = $(CH_2{\cdot}NH_2)_2$, chxn = *cyclo*hexanediamine, cptn = *cyclo*pentanediamine], isomorphous with the corresponding Co and Rh salts. They are resolvable through the chloro-*d*-tartrates, the less sol. salts yielding respectively the *D*-, *L*-, and *L*-forms. The less sol. chloro-*d*-tartrates also yield L-$[Co(d\text{-cptn})_3]Cl_3,3H_2O$ and L-$[Rh(d\text{-cptn})_3]Cl_3$ from the corresponding racemates. The rotatory dispersions of these compounds are recorded and their relative spatial configurations are discussed. J. W. S.

Preparation of a source of pure polonium suitable for structural analysis by means of electron beam diffraction. M. A. Rollier (Gazzetta, 1936,

66, 797—808).—From the mixture of Ra-*D*, Ra-*E*, and Po, obtained from Ra, the Po is separated by a convenient chemical treatment. The Po is then electrodeposited on Ni and finally distilled in H_2 on to a collodion film. The crystal structure of Po was determined by electron diffraction: pseudo-hexagonal or monoclinic, 6 or 12 atoms per unit cell, *a* 4·254 A., *c*/*a* 3·32, $d_{calc.}$ 9·39 (pseudo-hexagonal) or 9·24 (monoclinic); for *d* 9·39 the at. vol. = 8·95.
O. J. W.

Exchange reactions of iodine compounds. H. A. C. McKay (Nature, 1937, **139**, 283—284).—Results obtained by Juliusburger *et al.* (A., 1936, 40) using the radioactive indicator method have been confirmed and extended. The MeI–NaI exchange has been carried out in both directions, *i.e.*, starting first with active NaI and then with active MeI. The exchange also occurs in alcohol in presence of SO_2, showing it to be independent of traces of free I. Et, Pr^{α}, Pr^{β}, Bu, and *iso*amyl iodides exchange I with NaI at 100°. CH_2I_2 and CHI_3 also exchange with NaI at 100° in alcoholic solution. Certain aromatic compounds, such as PhI, *p*-$C_6H_4I\cdot NO_2$, and *p*-$C_6H_4I\cdot NH_2$, fail to exchange at 100°. In aq. solution $CH_2I\cdot CO_2H$ exchanges with NaI at room temp., but $CH_2I\cdot CH_2\cdot CO_2H$ exchanges only on heating to the b.p. *m*- and *p*-$C_6H_4I\cdot CO_2H$ fail to exchange with NaI in $COMe_2$ solution. L. S. T.

Crystallised manganic sulphate. L. Domange (Bull. Soc. chim., 1937, [v], **4**, 594—597).—Good crystals of $Mn_2(SO_4)_3$ can be prepared by a modification of Franke's method (A., 1888, 229). E. S. H.

Preparation of highly dispersed iron. V. A. Baev (Zavod. Lab., 1936, **5**, 496—497).—Known methods are described. R. T.

Higher oxygen compounds of iron. I. B. Petrov and B. Ormont (J. Phys. Chem. Russ., 1936, **8**, 665—676).—The green K perferrate of Goralevitch (A., 1927, 433) was impure K_2MnO_4.
J. J. B.

Influence of granule size of sodium peroxide on the process of fusion with ferro-silicon. E. L. Zauber and A. L. Vorobiev (Zavod. Lab., 1936, **5**, 671).—Sputtering or explosion of Fe-Si-Na_2O_2 mixtures during fusion is avoided by using finely powdered Na_2O_2. R. T.

Preparation of ferrites by substitution of ferrous ions in magnetite. J. Bénard and G. Chaudron (Compt. rend., 1937, **204**, 766—768).—On heating Fe_3O_4 with NiO or CoO, complete substitution of one atom of Fe by Ni or Co occurs, the corresponding ferrite being formed. With Mn and Cu substitution is incomplete, solid solutions being formed. Fe_3O_4 and ferrites probably contain a very stable O atom lattice, in which the metal atoms are loosely bound. A. J. E. W.

Double bromide of iron and ammonium. J. M. Mercier (Compt. rend., 1937, **204**, 500—502).—$NH_4[Fe^{II}Br_3],6H_2O$ is formed by crystallising an aq. solution of 4 mols. of $FeBr_2$ and 1 mol. of NH_4Br. A ternary equilibrium diagram for the system $FeBr_2$–NH_4Br–H_2O is given. A. J. E. W.

Cobaltic chloride. (Mlle.) D. Hibert and C. Duval (Compt. rend., 1937, **204**, 780—783).—Methods of prep. of $CoCl_3$ are discussed. Good yields are obtained by the action of HCl on Co_2O_3 in presence of Et_2O, at −5°, in the dark. The properties of the product are described. Below −60° the colour changes from green to pale yellow; the green compound is $Co[CoCl_6]$ (I), the yellow one probably $CoCl_3$. An Et_2O solution of (I) gives $Na_3[Co(NO_2)_6]$ on treatment with $NaNO_2$, and $[Co(NH_3)_6]Cl_3$ with NH_3. A. J. E. W.

Determination of the number of interchangeable hydrogen atoms in complex salts. J. Horiuti and G. Okamoto (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, **31**, 205—210).—Samples of $[Co(NH_3)_6]_2(SO_4)_3,5H_2O$, $[Co(NH_3)_5NO_2]Cl_2$, $[Co(NH_3)_5H_2O]Cl_3$, and $[Co(NH_3)_4CO_3]Cl$ were treated with 99·6% D_2O and then with H_2O. All the H atoms in the complex salts were replaceable by D, or *vice versa*, in solution at room temp. H. J. E.

Complex salts of the racemic and optically active *cyclo*hexanediamines with tervalent cobalt and rhodium. II. Complex tri*cyclo*hexanediamine-rhodium salts. F. M. Jaeger and L. Bijkerk (Proc. K. Akad. Wetensch. Amsterdam, 1937, **40**, 116—123; cf. this vol., 170).—The *compounds* $Rh(d\text{-chxn})_3Cl_3.3H_2O$ and $Rh(l\text{-chxn})_3Cl_3,3H_2O$ (chxn =*cyclo*hexanediamine) are obtained by boiling aq. Na_3RhCl_6 with the active *cyclo*hexanediamine and EtOH. After separation of most of these compounds by crystallisation the residue can be pptd. as the iodide. On treatment with the appropriate Ag salts this yields the corresponding chloride, bromide, nitrate, and perchlorate. Crystallographic data for these compounds are recorded. The chlorides have been resolved through their bromo-*d*-tartrates, and their rotatory dispersions in racemic and resolved forms are recorded. J. W. S.

New type of complex formation of iridium. N. K. Pschenicin (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 293—294).—$(NH_4)_3[IrCl_6],NH_4NO_3$ (I) is formed by reaction in aq. solution between NH_4NO_3 and $(NH_4)_3IrCl_6$. (I) is analogous in its properties with Wilm's salt, $(NH_4)_3[RhCl_6],NH_4NO_3$, and dissociates into five ions in aq. solution. O. D. S.

Application of curved crystals to *X*-ray spectrum analysis. M. Blochin (Zavod. Lab., 1936, **5**, 439—447).—Known methods are discussed.
R. T.

Magneto-optic method of analysis. D. C. Bond (J. Amer. Chem. Soc., 1937, **59**, 439—444).—Evidence of the validity of the method has been obtained and the theoretical implications are discussed.
E. S. H.

Importance of colour reactions in analytical chemistry. J. V. Dubský (Chem. Listy, 1937, **31**, 84—88).—A review. R. T.

Structure of precipitates obtained in chemical analysis. I. I. P. Alimarin (J. Appl. Chem. Russ., 1937, **10**, 171—183).—Tananaev's classification of ppts. as cryst. or amorphous is criticised. The influence of conditions of pptn. on the structure of ppts. is discussed. R. T.

Dilution method of hydrogen-ion concentration determination. II. J. McCrae (J. S. African Chem. Inst., 1937, **20**, 10—11; cf. A., 1935, 1336).—Improved colorimetric technique is described. J. S. A.

Determination of p_H of natural waters. J. I. Usatenko and A. A. Vojtaschik (Zavod. Lab., 1936, **5**, 436—438).—Colorimetric and potentiometric determinations of p_H confirm the validity of the formula $p_H = 7{\cdot}719 + \log K/a$, where K is the H carbonate content, in ° German, of the H_2O, and a is the $[CO_2]$ in mg. per litre. R. T.

Anhydrous sodium carbonate as a standard of reference in acidimetry. Stability of sodium carbonate in the temperature range 300—400°. G. F. Smith and G. F. Croad (Ind. Eng. Chem. [Anal.], 1937, **9**, 141—142).—Na_2CO_3 which has been heated at 300° is suitable as a standard, but at slightly higher temp. decomp. with loss of CO_2 occurs. E. S. H.

Standard solution for p_H measurements. A. K. Airola (Suomen Kem., 1937, **10**, A, 29—34).—Measurements have been made with the solution recommended (this vol., 196), and corrections applied for diffusion potential and varying atm. pressure. An accuracy of $\pm 0{\cdot}01$ p_H is claimed. M. H. M. A.

Micro-p_H measurements with quinhydrone. F. Fuhrmann (Mikrochem., Molisch Festschr., 1936, 130—146).—Apparatus and technique for electrometric p_H measurement are described, using $<0{\cdot}5$ c.c. of liquid. J. S. A.

Keeping properties of standard acids and alkalis. Use of copper bottles. J. Lindner (Mikrochem., Molisch Festschr., 1936, 301—313).—Advantages of using Cu bottles as storage reservoirs for standard solutions are discussed. J. S. A.

Micro-titration of very weak bases. J. Mika (Mikrochem., Molisch Festschr., 1936, 319—337).—Weak bases which form stoicheiometric non-volatile hydrochlorides of sufficient stability may be determined by evaporating them to dryness with HCl; the hydrochloride is then dissolved and titrated with alkali. J. S. A.

Acidimetric determination of water with acid chlorides. C. J. van Nieuwenberg (Chem. Weekblad, 1937, **34**, 217).—Small quantities of H_2O (1—10 mg.) can be accurately determined by measuring acidimetrically the HCl liberated from cinnamoyl chloride. S. C.

Rapid determination of small amounts of moisture in salts.—See B., 1937, 341.

Rapid determination of moisture in unbaked brick.—See B., 1937, 345.

Aromatic phosphorus halides and their suitability for the volumetric determination of water.—See A., II, 220.

Permanganometric determination of chlorates. S. S. Schraibman and A. V. Baleev (Zavod. Lab., 1936, **5**, 425—427).—Standard $FeSO_4$ in $10N$-H_2SO_4 is added to the solution, and after 5 min. excess of Fe^{II} is titrated with $KMnO_4$. The $[H_2SO_4]$ of the reaction mixture should be $\not<20\%$. R. T.

Potentiometric titration of bromine and bromates by thiosulphate. R. Cernatescu and R. Ralea (Ann. Sci. Univ. Jassy, 1935, **20**, 118—128).—The potentiometric titration of Br, or of $KBrO_3$ after liberating Br, has been studied using $Na_2S_2O_3$, in presence of HCl and $(NH_4)_2MoO_4$: $S_2O_3'' + 4Br_2 + 5H_2O = 2SO_4'' + 10H^{\cdot} + 8Br'$. The min. wt. of $KBrO_3$ analysable is 0·073 mg., and $0{\cdot}001N$-$Na_2S_2O_3$ may be titrated with great accuracy. R. S. B.

Titrimetric determination of small amounts of bromine in presence of chlorides. H. Doering (Z. anal. Chem., 1937, **108**, 255—258).—Br is oxidised to BrO_3' by means of NaOCl, the reaction being made quant. by neutralising the HCl formed by means of $CaCO_3$. The excess of NaOCl is removed by means of HCO_2Na at 100°, and the BrO_3' is determined iodometrically. J. S. A.

Potassium iodide as a primary standard substance in permanganimetry. I. M. Kolthoff, H. A. Laitinen, and J. J. Lingane (J. Amer. Chem. Soc., 1937, **59**, 429—432).—An accuracy of 0·05% can be obtained in standardising $KMnO_4$ against KI. KI and As_2O_3 are more suitable for standardising aq. $KMnO_4$ than is $Na_2C_2O_4$. E. S. H.

Dioxan as a reagent for detection and determination of small amounts of iodide. Application to the detection of iodide in iodised salt. A. Saifer and J. Hughes (J. Biol. Chem., 1937, **118**, 241—245).—Free I is liberated when iodides are warmed with dioxan in slightly alkaline solution, and then HNO_3 added. Colorimetrically, 0·1 mg. of I′ can be determined, ±3%; large amounts of certain other ions do not interfere. F. A. A.

Analysis of fluorides. F. Specht (Z. anorg. Chem., 1937, **231**, 181—191).—Details are given for the determination of F by pptn. as PbClF and subsequent titration of the Cl with $AgNO_3$. Special directions are given for the analysis of cryolite and of org. compounds containing F, and for determination of H_2SiF_6 and H_2SO_4 in hydrofluoric acid. F. L. U.

Determination and detection of fluoride ion with lanthanum. P. Giammarino (Z. anal. Chem., 1937, **108**, 196—197; cf. A., 1936, 693).—Pptn. from cold solution with 2% $La(NO_3)_3$ in presence of NH_4OAc + AcOH gives more accurate results than Meyer's method. Small amounts of F′ may be so determined nephelometrically. J. S. A.

Analysis of ozone, when very dilute, based on the catalytic action exerted by this gas in the oxidation of aldehydes. E. Briner and E. Perrottet (Helv. Chim. Acta, 1937, **20**, 293—298).—The O_3 content of air is determined by the oxidation of solutions of PhCHO in CCl_4 or of PrCHO in hexane. Variations of $[O_3]$ of the order of 10^{-8} can be determined. E. S. H.

Colour reaction between nitroprusside and sulphites (Bödeker's reaction). G. Scagliarini (Atti V Congr. Naz. Chim., 1936, **2**, 544—546; cf. A., 1934, 1189).—The *compounds* $Zn_2[Fe(CN)_5NOSO_3],2(CH_2)_6N_4,12H_2O$ and $Ni_2[Fe(CN)_5NOSO_3],2(CH_2)_6N_4,8H_2O$ have been prepared. In the presence of H_2O they are intensely blood-red in colour, but in the dry state are dark reddish-violet. Oxidation–reduction potential measurements show that in Bödeker's reaction the $[Fe(CN)_5NO]''$ ion is transformed into the $[Fe(CN)_5NOSO_3]''''$ ion. O. J. W.

Potentiometric determination of sulphuric and persulphuric acids and hydrogen peroxide when present together. E. I. Denisov (Trans. Leningrad Ind. Inst., 1936, No. 9, 40—46).—The end-point in Gleu's method (A., 1931, 326) is improved by use of a bimetallic W–Pt electrode. The time for determining H_2SO_5 is reduced by using dil. KBr. G. H. C.

Detection of traces of sulphur in argon. I. I. Strishevski and I. V. Korablev (Zavod. Lab., 1936, 5, 591—592).—An A–steam mixture is heated at 800°, and the resulting gas is passed into a funnel wetted with aq. $Pb(OAc)_2$; a brown stain indicates presence of S, SO_2, or SO_3 in the A. Methods of determination are outlined. R. T.

Areametric determination of small amounts of sulphate as barium sulphate. V. R. Damerell and P. Spremulli (Ind. Eng. Chem. [Anal.], 1937, 9, 123—124).—By measuring the area of $BaSO_4$ pptd. under controlled conditions, 0·01—4 mg. can be determined. E. S. H.

Detection of sulphur in steel by the Baumann stain method.—See B., 1937, 352.

Volumetric determination of sulphur in pyrites.—See B., 1937, 340.

Chromatometric determination of tellurous acid in hydrochloric acid solution. Determination of antimonious acid or arsenious acid in presence of tellurous acid. R. Lang and E. Faude (Z. anal. Chem., 1937, 108, 258—266).—The liberation of Cl from $H_2TeO_3 + K_2Cr_2O_7$ in HCl solution is due to the induced oxidation of HCl, which is inhibited in presence of $Mn^{\cdot\cdot}$ or $Ce^{\cdot\cdot\cdot}$ as acceptors. 0·5 equiv. of acceptor is thereby oxidised. Excess of $K_2Cr_2O_7$ is added and the excess of $Mn^{\cdot\cdot\cdot}$ (or $Ce^{\cdot\cdot\cdot\cdot}$) is titrated back with $FeSO_4$. In presence of Br′, Ce is preferable as acceptor, and HPO_3 is added to inhibit induced liberation of Br during the back titration. $As^{III} + Sb^{III}$ are determined in presence of Te^{IV} by adding $MnSO_4$, and titrating the solution, acidified with $H_2SO_4 + HCl$, with KIO_3 or $KBrO_3$. Te is then determined by adding excess of $K_2Cr_2O_7$, as above. As alone may be titrated with $Ce(SO_4)_2$ at 45—55° in presence of $MnSO_4$ + 3—4 drops of 0·002*N*-KIO_3, with Fe-*o*-phenanthroline as indicator, Te being subsequently determined as before. Alternatively, As or Sb may be titrated at room temp. with $Ce(SO_4)_2$, 10 c.c. of 0·5*N*-KCN and 3 c.c. of 0·5*M*-ICl being added to the solution. J. S. A.

Characterisation and micro-determination of nitrates. M. Lemoigne, P. Monguillon, and R. Desveaux (Compt. rend., 1937, 204, 683—686).—Nitrates are reduced to nitrites with Zn at 0°, excess of Zn being separated. *p*-$NH_2 \cdot C_6H_4 \cdot SO_3H$, and a solution of I in AcOH, are added; excess of I is decomposed with $Na_2S_2O_3$, and $C_{10}H_7 \cdot NH_2$ added. The resulting colour is compared with standards. 0·14 mg. per litre of N as NO_3' can be determined, and 0·01 mg. per litre detected. A. J. E. W.

Colorimetric determination of nitrates. G. V. L. N. Murty and G. Gopalarao (Z. anorg. Chem., 1937, 231, 298—303).—α-$OH \cdot C_{10}H_6 \cdot SO_3H$ produces with solid nitrates a compound which, on neutralisation with alkali, gives a persistent yellow colour, suitable for the colorimetric determination of NO_3'. $NH_4^{\cdot}$, Mg salts, and PO_4''' have no effect, but Cl′, CO_3'', and NO_2' interfere. 0·05—1·0 mg. of N in the form of NO_3' may be determined in the residue after evaporating a solution to be examined. H. J. E.

Separate determination of nitrogen oxides in the gases of Gay Lussac towers.—See B., 1937, 338.

Determination of certain elements with the spectrograph by arc process. II. K. Konishi and T. Tsuge (J. Agric. Chem. Soc. Japan, 1937, 13, 162—171; cf. A., 1936, 695).—Over the range 0·2—8·0% P there is a linear relation between [P] and intensity of the lines. The calc. amounts of P in rice and wheat straw and in soya-bean leaves agree with those determined chemically. J. N. A.

Determination of phosphoric acid by weighing the molybdenum precipitate. G. Jørgensen (Z. anal. Chem., 1937, 108, 190—196; cf. this vol., 44).—The effect of the presence of Ca, SO_4, SiO_2, citric acid, etc. is discussed. Ca and SO_4 lead to high results. J. S. A.

Determination of phosphorus in coal and coke.—See B., 1937, 311.

Determination of free arsenic trioxide in calcium arsenite.—See B., 1937, 340.

Determination of arsenic in ores and products.—See B., 1937, 340.

Determination of arsenic in gases.—See B., 1937, 341.

Apparatus for determining small amounts of carbon in steel by the baryta method.—See B., 1937, 352.

Determination of carbon in mild steel by magnetic analysis.—See B., 1937, 352.

Rapid determination of the carbon content of solid and liquid fuels.—See B., 1937, 311.

Analysis of carborundum and of refractory carborundum articles.—See B., 1937, 346.

Rapid determination of silicic acid and calcium oxide in copper slags.—See B., 1937, 352.

Determination of potassium by means of an aqueous solution of trisodium cobaltinitrite in presence of nitric acid. L. V. Wilcox (Ind. Eng. Chem. [Anal.], 1937, 9, 136—138).—Modified gravimetric and volumetric procedures are described. The accuracy is within ±0·05 mg. of K. E. S. H.

Determination of sodium and potassium. C. S. Piper (J. Proc. Austral. Chem. Inst., 1937, 4, 18—26).—The gravimetric determination of Na as triple uranyl acetate, especially by Kahane's method, and of K as K_2PtCl_6 or $KClO_4$ and by means of

$Na_3Co(NO_2)_6$ (I) are reviewed. The composition of the ppt. formed with (I) under standardised conditions varies continuously with the [K], and reaches the limiting composition $K_2NaCo(NO_2)_6$ in presence of $\nless 93$ mg. of K_2O. J. S. A.

Rapid indirect determination of sodium and potassium present together. S. I. Meschalkin (Zavod. Lab., 1936, 5, 422—424).—Na and K are separated from other elements as chlorides, which are weighed and dissolved in H_2O, and Cl′ is titrated in an aliquot part of the solution; the K and Na contents are hence calc. R. T.

Interferometric determination of potassium nitrate in black powder.—See B., 1937, 396.

Determination of silver by means of acetylene. I. I. Strishevski (Zavod. Lab., 1936, 5, 590—591).—5 ml. of 50% tartaric acid and 10 ml. of 10% NH_3 are added to 25 ml. of feebly acid solution, containing $\nless 0{\cdot}01$ g. Ag, at 60°, and pure C_2H_2 is passed for 15 min. The ppt. is collected, washed with saturated aq. C_2H_2, boiled for 10 min. with 30 ml. of 25% HNO_3, and the solution is titrated with standard NH_4CNS. R. T.

Performance of microchemical reactions. W. Böttger (Mikrochem., Molisch Festschr., 1936, 47—51).—The effects of the concn. of solutions on nucleus formation and deposition of ppts. of characteristic habit is discussed with reference to AgCl and $MgNH_4PO_4$. J. S. A.

Qualitative micro-analysis by electrolysis and spectrography. Precipitation at the mercury electrode. A. Schleicher and L. Laurs (Z. anal. Chem., 1937, 108, 241—247).—Cations are deposited electrolytically from 0·1 c.c. of solutions containing chlorides or bromides, on to a Hg electrode formed by electrolytic amalgamation of a pointed Cu wire. A Ag-plated Pt anode is used or, alternatively, N_2H_4,H_2O may be added to the solution as a depolariser. The cathode is subsequently used as an electrode for the interrupted arc discharge, and the spectrum examined between 3700 and 7300 A. By control of the deposition voltage, Ca, Sr, Ba, Li, Na, Rb, and Cs may be detected and approx. determined. Zn, Mn, and Pb may be detected similarly with lower sensitivity. The sensitivity, for Ca etc., is 0·0001—0·001 mg. J. S. A.

Determination of hardness of water by Blacher's method, and determination of calcium and magnesium.—See B., 1937, 397.

Determination of carbonate hardness in water.—See B., 1937, 397.

Micro-determination of strontium and calcium in mixtures containing both. A. E. Sobel, A. Pearl, E. Gerchick, and B. Kramer (J. Biol. Chem., 1937, 118, 47—59).—At p_H 3·0 Sr in small quantities, although not pptd. alone as oxalate, is co-pptd. with CaC_2O_4, but in presence of SO_4'' and C_2O_4'', $SrSO_4$, which is insol. at this p_H, is pptd. selectively whilst Ca is still selectively pptd. as CaC_2O_4. Hence Ca can be determined alone as CaC_2O_4 in presence of Sr as $SrSO_4$. Both metals are pptd. quantitatively as oxalate in 20% aq. EtOH at p_H 5·5. As the ppt. adsorbs C_2O_4'' it is converted into carbonate, which is dissolved in acid and back-titrated. The resulting solution is available for pptn. as above, CaC_2O_4 being determined by $KMnO_4$ or after conversion into $CaCO_3$. Small amounts of Mg do not affect the combined oxalate ppt.; larger amounts give a slight co-ppt., which is removed by repptn. after dissolving in HCl. R. M. M. O.

Polarographic analysis of commercial barium chloride.—See B., 1937, 340.

Hydrogen carbonate method of separation of beryllium oxide from aluminium oxide. J. A. Fialkov and L. S. Berenblum (Bull. Sci. Univ. Kiev, 1936, 2, 51—57).—Minor modifications of Parsons and Barnes' method (A., 1907, ii, 52) are described. R. T.

Conductometric determination of magnesium by [titration with] sodium hydroxide solution. J. Wierciński (Przemysł Chem., 1936, 20, 141—142).—10 g. of limestone are ignited at 850—1000°, the product is suspended in 80 c.c. of hot H_2O, 12 c.c. of 50% H_2SO_4 are added, followed by excess of 2*N*-NaOH and 200 c.c. of 95% EtOH, the suspension is filtered, and the residue is washed with 80% EtOH. The filtrate + washings are boiled to eliminate EtOH, the residue is diluted to 300 c.c., and CO_2-free air is passed through the solution, which is electro-titrated with 0·5*N*-NaOH. R. T.

Zinc periodate. Analytical applications. R. Fabre and T. G. Tomesco (Bul. Soc. Chim. România, 1936, 18, 59—61).—The *compound* $Zn_5(IO_6)_2$ was prepared by addition of excess of aq. $Zn(OAc)_2$ to cold or hot aq. Na periodate. It is a stable white powder, insol. in AcOH, but sol. in very dil. mineral acids. Addition of 2% aq. $Zn(OAc)_2$ containing 3% of AcOH gives a ppt. with 1 mg. of the periodate ion per c.c. in the cold. IO_3' gives no ppt. The reaction is not sp. for Zn. H. J. E.

Dithizone method for measurement of small amounts of zinc. P. L. Hibbard (Ind. Eng. Chem. [Anal.], 1937, 9, 127—131).—Zn (0·001—0·1 mg.) is determined by adding NH_3 to the solution and shaking with a solution of dithizone in $CHCl_3$, subsequently comparing the red colour produced with a standard, or titrating with Br. Many other metals, if present, must be separated first. E. S. H.

Determination of zinc in coloured alloys by means of hydroxyquinoline.—See B., 1937, 353.

Rapid determination of zinc in sulphide copper ores, concentrates, and tailings.—See B., 1937, 340.

Spot test for cadmium. F. P. Dwyer (J. Proc. Austral. Chem. Inst., 1937, 4, 26—34).—A 0·02% solution of *p*-nitrodiazoaminoazobenzene (prep. described) (I) in 0·02*N*-KOH–EtOH gives with alkaline solutions of Cd, saturated with Et_2O, a sp. orange-red, slightly fluorescent lake; limiting sensitivity 0·0002 mg. of Cd per c.c. Cu, Ag, Mg, Fe, Co, Ni, Cr, and Mg interfere, but Cd may be detected in presence of 10,000 parts of Bi, Pb, Sn, As, Sb, Al, or Zn. As a spot test, drops of (I), the Cd solution, and KOH are added successively, forming a bright pink central spot. NH_4 salts inhibit the reaction; Ag and Hg must be separated chemically. Other interfering metals may be suppressed by adding Na K tartrate (II). The blue coloration given by (I) with Mg is inhibited by (II), but Mg may be detected in presence of Cd by adding KCN and then (I).

J. S. A.

Purification of diazoamino-compounds. [Detection of cadmium.]—See A., II, 144.

Separation of lead from copper and their subsequent determination. K. M. Sil, G. C. Roy, and P. N. Das-Gupta (J. Indian Chem. Soc., 1936, **13**, 747—750).—Pb is pptd. as $Pb_5O_7,3H_2O$ by treating the ammoniacal solution with 3% H_2O_2, and is weighed as such. Double pptn. is necessary.

J. S. A.

Rapid determination of lead in the atmosphere.—See B., 1937, 397.

Potentiometric studies in oxidation–reduction reactions. I. Oxidation with potassium iodate. B. Singh and I. Ilahi (J. Indian Chem. Soc., 1936, **13**, 717—722).—$Tl^{\cdot}$, $Sn^{\cdot\cdot}$, $Hg^{\cdot}$, AsO_3''', and $SbO^{\cdot}$ may be titrated potentiometrically with 0·05*N*-KIO_3 in HCl solution. J. S. A.

Separation and determination of metallic impurities in foodstuffs.—See B., 1937, 389.

Detection of copper with phenolphthalin–cyanide reagent. I. M. Kolthoff and J. J. Lingane (Mikrochem., Molisch Fetschr., 1936, 274—278).—0·005 mg. of Cu per litre of H_2O may be detected by its catalytic acceleration of the atm. oxidation and recoloration of phenolphthalin (obtained by reducing phenolphthalein with Zn dust + NaOH) in presence of KCN. In the absence of ions such as $[Fe(CN)_6]$ which cause oxidation without the presence of KCN, the reaction is sp. for Cu. J. S. A.

Sodium diethyldithiocarbamate for detecting the solubility corrosion of metals. W. R. G. Atkins (Trans. Faraday Soc., 1937, **33**, 431—432).—Addition of 0·1% of the reagent to a corrosion agent, *e.g.*, sea-H_2O, enables detection and approx. determination of solubility corrosion of metals, especially Cu, Fe, Pb, and Zn. J. W. S.

Determination of small quantities of copper in iron.—See B., 1937, 352.

Micro-analytical application of "thionalide." R. Berg, E. S. Fahrenkamp, and W. Roebling (Mikrochem., Molisch Festschr., 1936, 42—46).—0·15—0·001 mg. of Hg, Cu, and As may be determined nephelometrically with "thionalide" (I) by treating the salt solution, acidified with H_2SO_4, with a 1% solution of (I) in AcOH at 100°. The turbidity is compared with that produced from standard solutions of Cu, Hg, or As. 0·005—0·30 mg. of Tl is determined colorimetrically by pptn. with (I) in presence of NaOH + KCN. The ppt. is separated centrifugally, and redissolved in alcoholic H_2SO_4. The solution is treated with 1—3 drops of a solution (II) of phosphomolybdic acid, Na_2WO_4, and H_3PO_4, followed by $HCO{\cdot}NH_2$ at 40°. The solution (II) is reduced by (I), and the blue colour produced is colorimetered against standard Tl solutions or blue dye standards. J. S. A.

Electro-titration of mercurous salts. E. Michalski (Rocz. Chem., 1937, **17**, 83—87).—A galvanometer is connected with two Pt electrodes, immersed respectively in the Hg^I salt solution and in I in aq. KI, and standard KCl is added to the former solution until the galvanometer reads zero. R. T.

Colour reactions of rare earths with alkaloids. III. F. M. Schemjakin (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 115—117).—Ce^{IV} gives a dark, and Ce^{III} a light, chocolate ppt. with morphine hydrochloride (I) in aq. NH_3. In a KOH medium the ppt. with Ce^{III} is $\ll$ that with Ce^{IV}. La^{III} and Th^{III} show no colour effect with (I) in aq. NH_3, neutral or acid media. With brucine in AcOH, Ce^{IV} gives a stable pink coloration and Ce^{III}, La, and Th show no effect. In alkaline medium Ce^{IV} gives a dark brown ppt. with brucine and Ce^{III}, La, and Th give colourless gelatinous ppts. O. D. S.

Ferrometric determination of cerium, manganese, chromium, and vanadium in presence of one another. R. Lang and E. Faude (Z. anal. Chem., 1937, **108**, 181—189).—(*a*) $Ce^{\cdot\cdot\cdot}$ and $Mn^{\cdot\cdot}$, present together in HPO_3 solution, free from Cl′, are oxidised by means of $K_2S_2O_8$ in presence of $AgNO_3$ to $Ce^{\cdot\cdot\cdot\cdot}$ and MnO_4', which are determined by titration with $FeSO_4$. In the same solution, $Ce^{\cdot\cdot\cdot}$ and $Mn^{\cdot\cdot}$ are then oxidised inductively by means of K_2CrO_4 + AsO_3'''. $Ce^{\cdot\cdot\cdot\cdot}$ and $Mn^{\cdot\cdot\cdot}$ so formed are titrated with $FeSO_4$. (*b*) Ce, Mn, Cr, and V together are oxidised by $K_2S_2O_8$ + $AgNO_3$ to $Ce^{\cdot\cdot\cdot\cdot}$, MnO_4', CrO_4'', and VO_3'. After titration with $FeSO_4$, Ce, Mn, and V are oxidised inductively to $Ce^{\cdot\cdot\cdot\cdot}$, $Mn^{\cdot\cdot\cdot}$, and VO_3' as above. $VO^{\cdot}$ in a separate sample is oxidised selectively to VO_3' by means of $KMnO_4$, the excess of which is destroyed by AsO_3''' in presence of OsO_4. Finally, Ce, Mn, Cr, and V are oxidised completely with $K_2S_2O_8$ + $Ag^{\cdot}$; $Ce^{\cdot\cdot\cdot\cdot}$ and MnO_4' are reduced by HCl, leaving CrO_4'' + VO_3', which are determined as before. W, if present, interferes with the final V and Cr titrations. A potentiometric method may be used or, better, Fe, Mn, and Ce may be pptd. as $Fe(OH)_3$, $Ce(OH)_4$, and $Mn(OH)_4$. Mn and Ce in the ppt. are determined as (*a*); Cr and V in the solution are titrated with $FeSO_4$ after addition of excess of NaF. J. S. A.

Detection of aluminium with eriochromcyanin R. E. Eegriwe (Z. anal. Chem., 1937, **108**, 268—269; cf. A., 1929, 530).—The sensitivity of the reaction in presence of other ions is recorded.

J. S. A.

Use of "aluminon" in determining small quantities of aluminium. V. M. Peschkova (Trans. Inst. Pure Chem. Reag. U.S.S.R., 1935, No. 14, 42—48).—To 15 c.c. of the neutral solution are added 5 c.c. of *N*-HCl, 5 c.c. of 3*N*-NH_4OAc, and 5 c.c. of 0·1% aluminon reagent. After 5 min. 0·5 c.c. of 5*N*-aq. NH_3 and of 5*N*-$(NH_4)_2CO_3$ are added. $2{\cdot}5 \times 10^{-6}$ g. of Al can be detected. The colour varies in presence of alkali or alkaline-earth ions. Fe should be absent. Ch. Abs. (*e*)

Determination of aluminium. K. Young and H. Lay (Contr. Inst. Chem., Nat. Acad. Peiping, 1935, **1**, 181—188).—Al can be determined in neutral solutions of its salts by pptn. as basic Al salicylate, and igniting to Al_2O_3. Filtration is easier than in the case of pptd. $Al(OH)_3$. Ch. Abs. (e)

Determination of aluminium in presence of iron. S. Ishimaru (Sci. Rep. Tôhoku, 1936, **25**, 780—784).—The solution is made slightly acid with HCl, a large excess of $Na_2S_2O_3$ is added, and the solution is boiled for 4—5 min. A 1 : 1 solution of NHPh·NH_2 in EtOH is added, and the ppt. ignited and weighed as Al_2O_3. H. J. E.

Microchemical examination of products of corrosion of aluminium and magnesium alloys.—See B., 1937, 355.

Determination of aluminium in ferrosilicon and ferrosilide.—See B., 1937, 352.

Qualitative separations on a micro-scale. II. Separations in the ammonium sulphide group. A. A. Benedetti-Pichler and W. F. Spikes (Mikrochem., Molisch Festschr., 1936, 3—35).—A complete scheme is described for the qual. analysis of the $(NH_4)_2S$ group, including Ga, In, rare earths, Zr, V, Be, W, and U, using <1 c.c. of solution, and following in general the Noyes and Bray macro-separations. Ga + Fe are extracted with Et_2O from HCl solution, and separated by reducing the $Fe^{\cdot\cdot\cdot}$ with Hg. Mn is pptd. as MnO_2 from HNO_3 solution before treating the Ni group with Na_2O_2; Zn is separated electrolytically from Be. <0·05 mg. of W cannot be detected in presence of Cr, V, U, and PO_4'''; Cr is best removed as CrO_2Cl_2 by treatment with $HClO_4$ + NaCl at 210°. J. S. A.

Detection of bivalent manganese. M. Uljanischtschev (J. Appl. Chem. Russ., 1937, **10**, 195—196).—Na_2O_2 is moistened with a drop of solution, and the mass is fused; Mn is indicated by formation of green Na_2MnO_4. R. T.

Colorimetric determination of manganese and molybdenum in steel.—See B., 1937, 352.

Analytical chemistry of rhenium. XII. Crystal reactions of rhenium trichloride and chlororhenic acid. W. Geilmann and F. W. Wrigge (Z. anorg. Chem., 1937, **231**, 66—77; cf. A., 1935, 946).—$ReCl_3$ gives cryst. double salts with KCl, RbCl, CsCl, and hydrochlorides of various org. bases, which are suitable for its identification microscopically. Salts formed from H_2ReCl_6 may similarly be used for the detection of the latter. Photomicrographs are given. F. L. U.

Thiocyanate test for iron. T. N. Karskoi (Trans. Inst. Pure Chem. Reagents U.S.S.R., 1935, No. 14, 81—87).—The thiocyanate test for Fe cannot be used in presence of Hg and Pb salts and of $Cd(NO_3)_2$ and $CdSO_4$. It is not entirely satisfactory in presence of Zn salts. Ch. Abs. (e)

Determination of metallic iron in presence of ferric and ferrous oxide. I. T. Taranenko (Zavod. Lab., 1936, 5, 365).—Wilner and Merck's $HgCl_2$ method is preferred. R. T.

Separation of iron, titanium, and aluminium from their mixtures by means of 8-hydroxyquinoline. A. M. Zanko and G. A. Butenko (Zavod. Lab., 1936, 5, 415—418).—3 g. of NH_4OAc and 1 g. of tartaric acid are added to 100 ml. of solution. The solution is neutralised with aq. NH_3, 20 ml. of 80% AcOH and excess of 2% 8-hydroxyquinoline (I) in AcOH are added, and the mixture is heated almost to the b.p. and filtered. The ppt. of Fe salt is washed with dil. AcOH and H_2O, dried, and weighed. The filtrate is conc. to 150 ml., 4 g. of $(NH_4)_2C_2O_4$ are added, the solution is neutralised with aq. NH_3, 3—5 drops of AcOH are added, and Ti is pptd. by a small excess of (I) in EtOH. The filtrate + washings are diluted to 500 ml., and Al is pptd. from 100 ml. of the slightly alkaline solution by means of 2% (I) in AcOH. R. T.

Application of *N*-phenylanthranilic acid to simultaneous determination of vanadium and chromium, and to determination of iron in ores. V. S. Sirokomski and V. V. Stepin (Zavod. Lab., 1936, 5, 263—267).—H_2SO_4 is added to the vanadate solution to 2·5*M*, and 2—4 drops of 0·005*M*-*o*-NH_2·C_6H_4·CO_2Na (I) are added, when a violet coloration develops in presence of $\not< 2 \times 10^{-7}$ g. V^V. Cr and V are determined in steel by a modification of Lang and Kurtz' method (A., 1932, 36), with (I) as the indicator. A modification of Knop's method for determination of Fe in ores consists in extraction of the ore with H_2SO_4, without addition of H_3PO_4, and titration with $K_2Cr_2O_7$ in presence of (I). R. T.

Colorimetric micro-determination of cobalt and potassium. C. P. Sideris (Ind. Eng. Chem. [Anal.], 1937, **9**, 145—147).—K is determined indirectly in the $K_2NaCo(NO_2)_6$ ppt. by determining colorimetrically the Co in the acid solution of the ppt. by means of 1 : 2 : 3 : 6-NO·$C_{10}H_4(OH)(SO_3Na)_2$, which gives with Co salts a stable, intense red coloration. E. S. H.

Determination of nickel in alloys as nickel dimethylglyoxime.—See B., 1937, 353.

Methods of separation in the aluminium–chromium group. A. A. Benedetti-Pichler and W. F. Spikes (Mikrochem., Molisch Festschr., 1936, 36—41).—Methods for the micro-analysis of the group are discussed with reference to the quant. recovery of V, U, and W. W tends to be lost completely during removal of Cr; separation by conversion of Cr into CrO_2Cl_2 (see above) affords the greatest sensitivity for W. J. S. A.

Spectrum analysis of steel for chromium and tungsten.—See B., 1937, 352.

Micro-colorimetric determination of tungsten in alloy steels.—See B., 1927, 352.

Fluorescence of fluorite. III. Line fluorescence spectrum. IV. Detection of uranium in fluorites and low-temperature fluorescence. H. Haberlandt, B. Karlik, and K. Przibram (Sitzungsber. Akad. Wiss. Wien, 1935, [iia], **144**, 77—83, 135—140; Chem. Zentr., 1936, i, 2898; cf. A., 1936, 1089).—III. Data are recorded for fluorites, yttrofluorites, and synthetic fluorites activated with rare earths.

IV. Fluorescence due to Eu and Yb is destroyed by ignition; that due to U is unaffected, and forms a measure of the [U]. The yellowish-green low-temp.

fluorescence due to Yb increases with the proximity of the source of fluorites to eruptive rocks.
J. S. A.

Determination of titanium in non-rusting steels.—See B., 1937, 352.

Separation of hafnium and zirconium. II. Rôle of phosphoric acid in the chemistry of zirconium. W. Prandtl, G. Mayer, and L. Büttner (Z. anorg. Chem., 1937, **230**, 419—426; cf. A., 1933, 38).—The PO_4''' content of several Zr minerals has been determined. PO_4''' is present in all the minerals examined, although generally in amounts that might escape detection, and interferes with the separation of Zr and Hf by the $K_4Fe(CN)_6$ procedure.
E. S. H.

Use of hexamine for the separation of thorium from the rare earths, and its application to the determination of thorium in monazite sand. A. M. Ismail and H. F. Harwood (Analyst, 1937, **62**, 185—191).—$(CH_2)_6N_4$ in presence of NH_4 salts ppts. Th (as hydroxide) but not the other rare earths. Ce may then be pptd. in the filtrate by addition of aq. NH_3 and H_2O_2 and boiling. The max. recorded difference is 0·07% compared with the longer $Na_2S_2O_3$ method for monazite sand. J. G.

Volumetric determination of vanadates by a precipitation method. K. S. Miroschnitschenko (Mem. Inst. Chem. Ukrain. Acad. Sci., 1936, **3**, 573—575).—25 ml. of 0·1*N*-$AgNO_3$ are added to 10 ml. of neutral, approx. 0·1*N*-Na_3VO_4, and excess of Ag is titrated in the filtrate. R. T.

Separation of vanadium pentoxide from vanadate solutions containing sexavalent chromium. E. F. Krauze and O. I. Vorobieva (J. Appl. Chem. Russ., 1937, **10**, 197—201).—93—96% of the V^V present in vanadate solutions is pptd. by adding HCl to 0·03—0·18*N*. The ppt. does not contain Cr.
R. T.

Electro-analytical determination of antimony. S. L. Yovanovitch (Compt. rend., 1937, **204**, 686—688).—Correct conditions for satisfactory deposition of Sb are described. Dil. H_2SO_4 solutions originally containing solid hydrolysis products gave good results.
A. J. E. W.

Determination of small amounts of antimony by the method of internal electrolysis. N. S. Krupenio (Zavod. Lab., 1936, **5**, 592—593).—A pellet of Co (0·2—0·3 g.) is left in contact with Pt gauze immersed in 50 ml. of acid solution, for 2 hr. and the gauze is washed, dried, and weighed, when the difference between initial and final wt. represents the Sb content of the solution. Cu, but not Sn, interferes. R. T.

Rapid determination of antimony in lead-rich alloys.—See B., 1937, 354.

Colorimetric determination of niobium and tantalum. N. F. Krivoschlikov and M. S. Platonov (J. Appl. Chem. Russ., 1937, **10**, 184—191).—Nb gives a yellow coloration with alkaline, but not acid, solutions of pyrogallol in aq. Na_2SO_3, whilst the reverse is the case for Ta. A colorimetric method for determination of Nb and Ta, based on these effects, is described. R. T.

Qualitative reactions for niobium and tantalum. M. S. Platonov, N. F. Krivoschlikov, and A. A. Marakaev (J. Gen. Chem. Russ., 1936, **6**, 1815—1817).—Excess of aq. NH_3 and resorcinol in aq. $(NH_4)_2C_2O_4$ are added to the solution; a blue colour develops in presence of Nb ($\nless$0·5 mg. per ml.), whilst Ta and Ti give faint green colorations. Pyrogallol gives a yellow coloration with Nb and Ti in alkaline, and with Ta ($\nless$0·05 mg. per ml.) and Ti in acid, solution; the colour due to Nb or Ta, but not Ti, is discharged by H_2O_2. R. T.

Determination of gold by Chiddy's method. A. Wogrinz (Z. anal. Chem., 1937, **108**, 266—267).—Au in cyanide liquors containing $[Fe(CN)_6]''''$ may be determined by evaporating the liquid down with H_2SO_4. The insol. residue, after dilution, is separated and dissolved in HCl + HNO_3, and is subsequently determined by Chiddy's method. J. S. A.

Gas burners in the laboratory. J. G. de Voogd (Chem. Weekblad, 1937, **34**, 187—191).—The heating efficiencies of gas rings (screened) and Bunsen, Teclu, and Heintz burners for heating H_2O to the b.p. in Erlenmeyer flasks are compared. When a Bunsen burner is properly used, its efficiency is almost equal to that of a gas ring (about 30%). The type of glass used for the flask has practically no effect but asbestos gauzes reduce the efficiency to 2/3. Cr–Ni gauze is recommended for laboratory use. For large quantities of H_2O the best efficiency (80%) is obtained by using flat metal pans. S. C.

Simple laboratory cryptol furnace. M. L. Vinokur (Zavod. Lab., 1936, **5**, 679—681). R. T.

Constant-temperature gas-regulated water-bath. J. L. Parkinson (J. Sci. Instr., 1937, **14**, 94—96).—The double-chamber bath described is suitable for use at any temp. about 3° > its surroundings, and is const. to ±0·001°. The H_2O in both chambers is stirred by air bubbles, and the gas jet is regulated by a capillary dipping into a Hg–$CHCl_3$-filled spiral. N. M. B.

Automatisation of the d'Arsonval thermostat. G. B. Talkovski (Zavod. Lab., 1936, **5**, 681).
R. T.

Thermoregulator for high temperatures. A. S. Michelson (Zavod. Lab., 1936, **5**, 792—793).
R. T.

Short-period platinum thermometers. J. J. Manley (Phil. Mag., 1937, [vii], **23**, 695—701).—The construction and time-consts. for cooling in air and H_2O of 13 thermometers designed for min. heat capacity, max. resistance with limited bulb vol., and instantaneous response to small temp. variations, for measuring small changes in the m.p. of substances consequent on intensive drying, are described.
N. M. B.

Use of Philips sodium lamps in polarimetry. P. Karsten (Chem. Weekblad, 1937, **34**, 195—196).—The light source in Philips Na lamps is too narrow to illuminate the field of a polarimeter uniformly. This is obviated by the use of a screen of ground glass placed between the lamp and the instrument.
S. C.

Chromatography under pressure. C. Sannié (Bull. Soc. chim., 1937, [v], 4, 580—582).—Modified apparatus is described. E. S. H.

Sachs focussing camera for inverse roentgenograms. V. V. Netschvolodov (Zavod. Lab., 1936, 5, 345—346). R. T.

Film camera, with cathode-ray oscillograph, for experiments on artificial radioactivity. L. G. Grimmett and W. H. Rann (J. Sci. Instr., 1937, 14, 96—100).—The construction and performance of a camera for photographing (four tracks on a film) the movements of the light spot of an oscillograph are described. The film speed can be const. or can vary automatically to follow the activity being studied. N. M. B.

Cameras for *X*-ray analysis by the inverse-ray method. J. P. Selisski (Zavod. Lab., 1936, 5, 779—782). R. T.

Measurement of intensity of *X*-rays. V. I. Veksler, A. V. Bibergal, and M. P. Ivanov (J. Exp. Theor. Phys. U.S.S.R., 1935, 5, 490—495).—A Geiger-Müller counter is combined with a thyratron and used for intensities of 10—1000 quanta per sec. Ch. Abs. (e)

Measuring absorption coefficients for *X*-rays by means of a tri-electrode ionisation chamber. G. A. Wrenshall and E. L. Harrington (Canad. J. Res., 1936, 14, A, 209—215).—Modifications in the method used by Stoner and Martin (A., 1925, ii, 257) are described. The use of a pair of sectored Pb discs, the common aperture of which can be adjusted during rotation, and of a three-electrode ionisation chamber results in increased simplicity and accuracy. F. L. U.

Photo-electric spectrophotometer of high accuracy. J. S. Preston and F. W. Cuckow (Proc. Physical Soc., 1937, 49, 189; cf. this vol., 48).—An addendum. N. M. B.

Absorption spectrophotometry of solutions in the short-wave ultra-violet. H. Mohler (Helv. Chim. Acta, 1937, 20, 282—285).—Apparatus and technique are described. E. S. H.

Modern refractometry. B. Pesce (Atti V Congr. Naz. Chim., 1936, 2, 446—459).—Improvements in the measurement of the refraction of liquids at 0—85° by means of the Pulfrich refractometer are described. The interpretation of refractometric measurements of electrolytes in terms of the deformation and association of ions is reviewed. O. J. W.

Photometric test plates. A. K. Taylor (Proc. Physical Soc., 1937, 49, 105—111).—Characteristic curves of the variation of reflexion factor with the angles of incidence and view are given for flat plates of white pot opal glass, MgO, white filter-paper, white matt celluloid, Mg oxychloride, white blotting-paper, and plaster of Paris. The use of the plates as sub-standards of reflexion factor or for measurement of illumination is discussed. N. M. B.

Researches on chemical kinetics by means of photo-electric colorimetry. U. Sborgi [with E. Rabaglia] (Atti V Congr. Naz. Chim., 1936, 2, 531—543).—A photo-electric colorimeter, which has been used in studying the reaction between H_2O_2 and KI in aq. solution and the catalytic effect of $Fe^{\cdot\cdot}$ ions thereon, is described. O. J. W.

Colorimetry with colloidal solutions. R. Juza and R. Langheim (Angew. Chem., 1937, 50, 255—260).—Using a Zeiss Pulfrich photometer, with filter S. 53 to give max. sensitivity, Ni can be accurately determined colorimetrically with diacetyldioxime, if gelatin be added as protective colloid. The Lambert–Beer Law is followed for [Ni] = 0·025—0·500 mg. per 50 c.c. With certain precautions, the determination is accurate in presence of Co, Zn, Mn, and Co + Zn + Mn. Similarly Cu may be determined as the ferrocyanide, and Cd as CdS if gelatin be added. R. C. M.

Time lag in the vacuum photo-cell. N. R. Campbell (Nature, 1937, 139, 330).—The *KV*6 cell always contains H_2 and should not be regarded as a true vac. cell. (cf. A., 1937, I, 113). L. S. T.

Photometry by means of a photo-element. V. A. Suchich and N. N. Petin (Zavod. Lab., 1936, 5, 763—764).—Intensity of light is measured by means of a photo-electric cell. R. T.

Measurement of hydrogen-ion concentration by means of the glass electrode. S. M. Mehta (J. Univ. Bombay, 1936, 5, Part II, 77—82).—Modified apparatus and technique are described. E. S. H.

Comparator for p_H determination. E. A. Andreeva (Zavod. Lab., 1936, 5, 352—353). R. T.

Continuous measurement of p_H. F. Tödt (Chem. Fabr., 1937, 10, 121—124).—Continuous-flow valve potentiometer devices, with special reference to quinhydrone and Sb electrodes, and photo-electric colorimeters are described. J. S. A.

Glass electrode and p_H control. K. Schwabe (Z. Elektrochem., 1937, 43, 152—155).—The application of the glass electrode to measurement of p_H and to acidimetric titrations is described. C. R. H.

Electrodes for p_H measurement. A. R. Riddle (J. Counc. Sci. Ind. Res. Australia, 1937, 10, 45—46).—To avoid cracking of glass holders of Pt electrodes and also the poisoning of electrodes by blue sealing glass, the electrode is connected to an insulated bronze rod by means of Pt wire and a porcelain connector. A. G. P.

Measurement and control of p_H with the glass electrode. D. A. MacInnes and L. G. Longsworth (Trans. Electrochem. Soc., 1937, 71, Preprint 14, 141—156).—The history of the glass electrode and constructional details of modern types are discussed. Apparatus in which the electrode is applied to routine p_H measurement and to maintaining a const. p_H during bacterial growth is described. J. W. C.

Visual balance-detectors for conductance bridges. C. Morton (Trans. Faraday Soc., 1937, 33, 474—479).—A full-wave metal rectifier connected to a d.c. galvanometer can be used as an a.c. balance detector over a wide frequency range for p.d. $\not<$ 0·1 mv. A thermionic a.c. balance detector is also described. J. W. S.

Electron-beam sectrometer. Line-operated vacuum-tube titrometer for potentiometric titrations with cathode-ray tube replacement of the micro-ammeter. G. F. Smith and V. R. Sullivan (J.S.C.I., 1937, 56, 104—108T).—The arrangement described employs the 6*E*5 cathode-ray tube, and indicates equivalence-breaks automatically. It is generally applicable with any of the usual electrode systems, and the sector shadow responds instantly to changes of potential in the titration cell, giving an insight into reaction velocities; effects due to temp., acidity, and dilution are readily noted. N. M. B.

Apparatus for electrodialysis. Č. Nučić (Arh. Hemiju, 1936, 10, 97—100). R. T.

Appliance for use in electrometric micro-titration and electro-analysis. S. I. Raspopov and D. N. Finkelschtein (Zavod. Lab., 1936, 5, 353—354). R. T.

Determination of dielectric constants at very high frequencies. V. I. Kalinin (Physikal. Z. Sovietunion, 1936, 10, 257—259).—A modification of the second method of Drude is described. A. J. M.

Half-element for electrometric measurements. C. J. Rabinovitsch (Zavod. Lab., 1936, 5, 676).—A cell, in which a Pt wire wound around a W rod is immersed in 25% H_2SO_4 in a sintered glass funnel, is described. R. T.

Efficiency of the γ-ray counter. H. Yukawa and S. Sakata (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 31, 187—194).—Efficiencies are calc. for counters made of Al and Pb, and for a counter with a wall which is thin compared with the range of most of the secondary electrons. H. J. E.

Sensitiveness of a Geiger point counter in the region between its threshold voltage and the voltage for constant counting. B. Dasannacharya and T. S. K. Moorthy (Phil. Mag., 1937, [vii], 23, 609—620).—The β-ray sensitivity of a Geiger point counter depends on the geometry of the ray, determined by the position of the radioactive source, and the applied voltage. The effect of placing sheets of paper and Al of various thicknesses between the source and the counter is discussed. F. J. L.

Method of measuring electrophoresis by the ultramicroscope. T. B. Lane and P. White (Phil. Mag., 1937, [vii], 23, 824—828).—Measurements based on Smoluchowski's theory may be in error by $>30\%$. The true electrophoretic velocity is the mean of vals. at the two prescribed levels. Results on a graphite sol are corr. from 20·4 to 2·3% probable error. N. M. B.

Mechanical tracer for electron trajectories. D. Gabor (Nature, 1937, 139, 373).—An apparatus for tracing the paths of electrons in electrostatic fields is described. L. S. T.

[Apparatus for] potential measurements in oxido-reduction mixtures. D. B. Kroon (Science, 1937, 85, 205—206). L. S. T.

Application of electrolytic rectification of alternating current in electro-drop analysis. H. Fritz (Mikrochem., Molisch Festschr., 1936, 125—129; cf. A., 1935, 1473).—The direct use of a.c. in conjunction with rectifying electrodes of Al, Ta, or Mg is recommended. J. S. A.

Field distortion in the standard ionisation chamber. W. H. Love and W. B. Smith-White (Brit. J. Radiol., 1936, [ii], 9, 51—58; Chem. Zentr., 1936, i, 3095).—Distortion of the field by direct charging of the collector plate to potentials <1 volt is negligibly small, the vol. from which ions are collected being changed by $<0·35\%$. J. S. A.

Separation of magnetic particles under the microscope. E. W. Blank (J. Chem. Educ., 1937, 14, 33).—A device which enables magnetic particles to be separated and recovered is described. L. S. T.

Auto-bubbler pipette. M. Burton and T. W. Davis (Ind. Eng. Chem. [Anal.], 1937, 9, 139). E. S. H.

Simple micro-burette. M. Struszyński (Przemysł Chem., 1936, 20, 53—55).—A tube is drawn to a capillary jet (diameter 0·12 mm.), and weighed, filled with standard solution. The tip is immersed in the solution to be titrated, and the tube is re-weighed after completed titration. R. T.

Simple micro-burette. A. L. Vorobiev (Zavod. Lab., 1936, 5, 798).—A pipette is fitted with a capillary jet (diameter $\ngtr 0·5$ mm.), and filling and delivering are achieved by means of a rubber bulb. R. T.

Measuring vessels. J. S. Lialikov (Zavod. Lab., 1936, 5, 793—795).—Burettes and pipettes of Russian manufacture are criticised. R. T.

Use of normal ground joints in micro-Kjeldahl apparatus. J. Unterzaucher (Mikrochem., Molisch Festschr., 1936, 436—438).—The decomp. flask is used also for the distillation, the distillation head fitting on by a standard ground-glass joint. J. S. A.

Apparatus for micro-hydrogenation by a volumetric method. H. Bretschneider and G. Burger (Chem. Fabr., 1937, 10, 124—127).—Apparatus and technique are described. J. S. A.

Membrane or frits for measurements by the dialysis method. H. Brintzinger and H. Beier (Z. anorg. Chem., 1937, 230, 381—384).—Comparative measurements of diffusion coeffs. show that cellulose membranes have advantages over glass frits. E. S. H.

Tap-grease for ground-glass surfaces. A. T. Sveschnikov (Zavod. Lab., 1936, 5, 503).—20 parts of rubber solution are mixed with 80 of vaseline, and the mixture is heated to complete elimination of light petroleum. R. T.

Preparation of polished surfaces for metallographic analysis. V. J. Kizelschtein (Zavod. Lab., 1936, 5, 324—330).—The prep. of abrasive pastes, consisting of Cr_2O_3 80, SiO_2 gel 3, stearin 15, and kerosene 2%, for rough, and Cr_2O_3 74, SiO_2 gel 2, stearin 20, kerosene 2, and stearin fat 2%, for fine, polishing is described. R. T.

Automatic control for currents of gas under moderately reduced pressures. R. C. Brimley (J. Sci. Instr., 1937, 14, 102—103).—A device consisting of a glass tube divided into two by a porous diaphragm is described; the amount of diaphragm exposed by mercury from a connected manometer is controlled by suction. N. M. B.

Hydrostatic prospecting balance. P. de Béthune (Natuurwetensch. Tijds., 1937, **19**, 77—82).—The specimen is balanced in air at a suitable position on the left-hand beam against a counterpoise placed at the end of the right-hand beam. It is then immersed in H_2O and the counterpoise moved along the right-hand beam, which is graduated to give *d* directly. The balance is very simply constructed. S. C.

Air-driven ultracentrifuge for molecular sedimentation. R. W. G. Wyckoff and J. B. Lagsdin (Rev. Sci. Instr., 1937, [ii], **8**, 74—77).—Improvements in the driving mechanism, construction, light source, and photographic recorder of the apparatus previously described (cf. A., 1936, 956) are detailed. N. M. B.

Meter for recording slow liquid flow. J. O. Ivie and L. A. Richards (Rev. Sci. Instr., 1937, [ii], **8**, 86—89).—The reversible meter described is designed to work as part of a soil moisture flow gauge, the flow being measured by forming drops of water in a less dense non-miscible liquid and electrically recording the drops. An empirical equation for the effect of temp. and flow rate on drop size is derived. N. M. B.

Variational graph paper for determination of distribution [of results] of analysis. L. A. Bizov (Zavod. Lab., 1936, **5**, 644—651). R. T.

Apparatus for washing out precipitates. V. I. Salminen (Suomen Kem., 1937, **10**, A, 40). M. H. M. A.

Measuring rotational speeds. L. B. Snoddy and J. W. Beams (Science, 1937, **85**, 273—274).—A simple method for speeds up to 3000 r.p.s. is described. L. S. T.

Precision determination of the lattice constants of coarse-grained materials. H. Kostron (Z. Metallk., 1936, **28**, 390—391).—A driving mechanism for rotating the specimens in determining the lattice consts. by the back-reflexion method is described. A. R. P.

Electrosmotic circulation in closed vessels. P. White (Phil. Mag., 1937, [vii], **23**, 811—823).—Mathematical. Two sources of error in electrophoretic measurements are eliminated by interpretation of results in the light of proposed modifications to Smoluchowski's theory. N. M. B.

Regulating beaker stand. C. E. Martinson (J. Chem. Educ., 1937, **14**, 30).—A device for adjusting the height of a beaker in a Witt filter flask is described. L. S. T.

Micro-determination of density of liquids by the coloured jet method. M. Struszyński (Przemysł Chem., 1936, **20**, 51—53).—A trace of dye is added to 0·1 c.c. of liquid, which is introduced through a horizontal capillary tube into a liquid of known *d*, in which the given liquid is sol. The jet of coloured fluid is horizontal when the *d* of the two liquids are identical. R. T.

Preparative handling of small amounts of material. A. Soltys (Mikrochem., Molisch Festschr., 1936, 393—404).—The technique of evaporation, centrifugal filtration, and distillation etc. on a micro-scale is discussed. J. S. A.

Smoke method of measuring supersonic velocities. R. C. Parker (Proc. Physical Soc., 1937, **49**, 95—104; cf. Pearson, *ibid.*, 1935, **47**, 136).—The smoke method has been investigated with elimination of various sources of error. The mean velocities for the frequency range 92·2—801·7 kc. per sec. in air, O_2, and N_2 were $331\cdot7_6$, $315\cdot3_0$, and $337\cdot0_2$ m. per sec. correct to 1 in 3000. There was no evidence of dispersion. N. M. B.

Viscosimeter with removable capillary. Louis (Ann. Off. nat. Comb. liq., 1936, **11**, 1149—1151).—By changing the size of the capillary tube in the apparatus described investigation of a wide range of η is possible. R. B. C.

Efficiency of packings of laboratory distilling columns. M. J. Marshall, F. Walker, and D. H. Baker (Canad. J. Res., 1937, **15**, **B**, 1—6).—No. 18 is the most efficient size of jack chain for packing distilling columns, as tested by the separation of EtOH–H_2O mixtures. Lessing rings, 0·22 in. diameter, are less efficient. J. W. S.

Automatic apparatus for laboratory steam distillations and for the determination of water. C. P. A. Kappelmeier (Chem. Weekblad, 1937, **34**, 219—220).—An apparatus for the continuous steam distillation of volatile solvents from paints etc. is described. The sample is boiled with H_2O and the distillate is collected in a graduated U-tube, the solvent collecting in one limb and the condensed H_2O passing from the other back to the flask. By using CCl_4 instead of H_2O the apparatus can be used for determining the H_2O content of oils etc. Dioxan is recommended for cleaning the apparatus. S. C.

Determination of permeability of synthetic materials towards water vapour. B. Wurzschmitt and F. W. Kerckow (Z. anal. Chem., 1937, **108**, 247—249).—H_2O vapour diffuses from a space of controlled humidity through a septum of the material, into a dried gas stream. The rate of transpiration is then determined gravimetrically by absorption in P_2O_5. J. S. A.

Technique of preparing ultrafilters and their use in analytical chemistry. G. L. Abkin (Kolloid. Shurn., 1935, **1**, 571—574).—Paper filters are dipped three times in a collodion solution. J. J. B.

Special type of fluted filter. D. G. Moskvin (Zavod. Lab., 1936, **5**, 359—360).—A method of folding fluted filter-papers is described. R. T.

Rapid filtration of silicic acid. N. N. Lisitzki (Zavod. Lab., 1936, **5**, 366—367).—The prep. of filter-paper reinforced with cellulose pulp, for rapid filtration of SiO_2 gel, is described. R. T.

Measurement of surface tension. S. M. Mehta (J. Univ. Bombay, 1936, **5**, Part II, 101).—A correction (cf. *ibid.*, 1935, **4**, 138). E. S. H.

Fixation of nitrogen. S. Zuffanti (J. Chem. Educ., 1937, **14**, 73).—A lecture demonstration. L. S. T.

Origin of Fahrenheit's thermometric scale. J. N. Friend (Nature, 1937, 139, 395—398). L. S. T.

Historical development of the conception of chemical elements. B. N. Menschutkin (J. Chem. Educ., 1937, 14, 59—61). L. S. T.

Hermann Kopp, historian of chemistry. J. Ruska (J. Chem. Educ., 1937, 14, 3—12).—Historical. L. S. T.

Chemical philosophy of Jean Baptiste van Helmont. (Mlle.) H. Metzger (Ann. Guébhard-Séverine, 1936, 12, 140—155).

Geochemistry.

Chemical exploration of the stratosphere. F. A. Paneth (Proc. Roy. Inst., 1937, 29, 350—366).—A lecture.

Analysis of radioactive water of the Celja spring. S. Miholić (Arh. Hemiju, 1936, 10, 85—89).—Analytical data are recorded. R. T.

Moldavian water courses. I. Atanasiu and R. Cernatescu (Ann. Sci. Univ. Jassy, 1935, 21, 486—496).—Analyses of H_2O from the steppe rivers Jijia and Balhui show that the mineralisation of a river is determined mainly by the alterations in its basin. There is much Na_2SO_4 and $MgSO_4$, probably produced by exchange of Na and Mg for Ca by the clay substance, a process which at an earlier date must have been reversed as is shown by the low concn. of Cl relative to Na. The carpathic rivers Moldova, Bistrita, and Trotus were also examined. The cryst. nature of the basin of the Bistrita, and saliferous nature of that of the Trotus, account for the low mineralisation of the former, and high content of Na and Cl′ of the latter, river. In the carpathic rivers $[Ca^{\cdot\cdot}]$ and $[HCO_3']$, and $[Na^{\cdot}]$ and $[Cl']$, are nearly equal, whereas in the steppe rivers $[HCO_3'] \gg [Ca^{\cdot\cdot}]$, and $[Na^{\cdot}] \gg [Cl']$. R. C. M.

Andesitic rocks of Ditrău. V. Ianovici (Ann. Sci. Univ. Jassy, 1935, 20, 86—97).—An analysis of the silicates and a discussion of their inter-relationships is given. R. S. B.

Analysis of the water of the river Bahluĭ (Roumania). I. Atanasiu and R. Cernatescu (Ann. Sci. Univ. Jassy, 1935, 20, 406—414).—Variation in dissolved mineral has been studied. R. S. B.

Radioactivity of the water and mud of the lakes of Southern Bessarabia. A. Cisman (Ann. Sci. Univ. Jassy, 1935, 20, 190—196).—The H_2O has a negligible radioactivity. For the mud from the lakes Budaki and Burnaz the radioactivity is, respectively, 0·54 and 0·47 m.μc. per litre. R. S. B.

Attempts to discover eka-cæsium. K. Heller and A. Mayer (Mikrochem., Molisch Festschr., 1936, 201—208).—Eka-Cs (87) could not be detected in various Bohemian natural springs and saline deposits rich in Rb and Cs. J. S. A.

Regularities in the composition of mineral gases. J. V. Gretschni (Ukrain. Chem., J., 1937, 12, 42—52).—The content of He, N_2, and A of the gas in natural reservoirs falls with increasing depth of the reservoir, and with decrease in the relative vol. of capillary H_2O to that of the reservoir. R. T.

Tenham (Queensland) meteoritic shower of 1879. L. J. Spencer (Min. Mag., 1937, 24, 437—452).—A collection of 102 stones (total wt. 107¾ lb.) represents only a portion of the fall of this unique shower. The stones are of the veined enstatite-olivine-chondrite type. In chemical composition (a previously unpublished analysis made in 1913 in the Govt. Chem. Lab., Brisbane) they are very close to the Warbreccan stones from the same district (A., 1916, ii, 633), which probably belong to the same fall. Showers of meteoritic stones have been produced by the breaking up of a single large mass of friable material in the earth's atm. With the more coherent siderites showers are much less common, and a meteorite crater could be formed only by a very large siderite. L. J. S.

Stony meteorites can furnish no indication of the nature of basic rocks. R. Perrin (Compt. rend., 1937, 204, 509—510).—The composition of meteorites is not a trustworthy indication of the average composition of the bodies from which they originate. A. J. E. W.

Analysis of the powder which fell on 26 April, 1928. (A) A. S. Cocosinschi (Ann. Sci. Univ. Jassy, 1935, 20, 116—117); (B) R. Cernatescu (*Ibid.*, 1935, 16, 173—174).—(A) The analysis is compared with that of Cernatescu (*ibid.*, 1929, 16, 29).

(B) Polemical. R. S. B.

The tektite problem. L. J. Spencer (Pop. Astron., 1936, 44, 381—383; Min. Mag., 1937, 24, 503—506; cf. A., 1933, 252, 802, 1268).—Fused material on the surface of meteorites is ablated as quickly as formed, leaving only a film to solidify as glass. Tektites could, therefore, not have been completely fused and shaped in the earth's atm. These natural glasses, found in strange situations, are quite different in composition from any meteorite actually observed to fall. Of known terrestrial materials, they compare most closely with the silica-glass formed by the fusion of terrestrial rocks at meteorite craters. L. J. S.

Potash-soda-felspars. I. Thermal stability. E. Spencer (Min. Mag., 1937, 24, 453—494; cf. A., 1930, 1397).—Chemical analyses and optical data are given for 26 K Na felspars, and the effects of heating to 1120° studied in detail. In the orthoclase-microperthite series there is (up to 60% Na_2O) a linear relation between *d*, *n*, and albite content; and albite conforms to the end-member of the series. The members of this series usually show a fine perthitic structure with schiller, and when heated for some time at 750—800° the microperthite goes into solid solution with destruction of this structure and diminution in *d* and *n*. On very slow cooling again exsolution occurs and the original properties reappear. Adularia, sanidine, anorthoclase, and microcline show some variations in their optical properties from this series, depending apparently on their thermal history. L. J. S.

Texture analysis of metamorphic rocks. Orientation rule for cyanite. C. Andreatta (Period. Min., 1935, **6**, 205—212; Chem. Zentr., 1936, i, 3115).—Cyanite crystals in gneiss appear to be generally oriented preferentially with (100) parallel to the foliation. J. S. A.

Two granites from the Cogne mines, Aosta valley. A. Sandero (Period. Min., 1935, **6**, 205—212; Chem. Zentr., 1936, i, 3115).—Characteristics are described. J. S. A.

Coralloidal opal. C. R. Swartzlow and W. D. Keller (J. Geol., 1937, **45**, 101—108).—Coralloidal opal, an epigenetic opaline deposit found in lava tubes, is pptd. by capillary H_2O on the tips of basalt spines and globules, which gives the deposit an appearance of some forms of org. coral. Some of the opal gives a slight carbonate reaction. Hydration of minerals in the surrounding basalt is the source of the material. L. S. T.

Eclogites in the neighbourhood of Glenelg, Invernessshire. A. R. Alderman (Quart. J. Geol. Soc., 1936, **92**, 488—530).—The Glenelg eclogites are composed essentially of garnet and omphacite. Chemical analyses are recorded, and a statistical survey of analyses of typical eclogite minerals is presented. L. S. T.

New lamprophyres and monchiquites from Jersey. H. G. Smith (Quart. J. Geol. Soc., 1936, **92**, 365—383).—Descriptive. L. S. T.

Accessory minerals in igneous and metamorphic rocks. J. C. Reed (Amer. Min., 1937, **22**, 73—84).—A review. L. S. T.

Nature and relations of the zeolites. M. H. Hey (Trans. Ceram. Soc., 1937, **36**, 84—97).—A summary of the present knowledge of the nature and properties of the true zeolites and their relationship to the artificial zeolites and the clays. J. A. S.

Zeolites. A. N. Winchell (Amer. Min., 1937, **22**, 85—96; cf. *ibid.*, 1925, **10**, 166).—Variations in composition in thomsonite, chabazite, and gmelinite; phillipsite and stilbite; gismondite, mesolite, scolecite, natrolite, laumontite, heulandite, mordenite, and ptilolite are represented diagrammatically and discussed. L. S. T.

Structure of serpentines. J. W. Gruner (Amer. Min., 1937, **22**, 97—103; cf. A., 1936, 1483).—*X*-Ray diffraction lines for chrysotile (I) and antigorite (II) structures are tabulated and discussed. Serpentines are divided into these two groups and all other variety names should be discontinued. Dimorphism probably exists and *X*-rays are often the only means of identification since optical properties are similar in both groups. As shown by Warren and Bragg (A., 1931, 415), (I) has a chain structure, and the structure of (II) may be chain- or sheet-like. L. S. T.

Oriented inclusions of magnetite and hæmatite in muscovite. C. Frondel and G. E. Ashby (Amer. Min., 1937, **22**, 104—121).—Inclusions of magnetite (I) and hæmatite (II), which are described and illustrated, have been identified in muscovite (III) from numerous localities. Structural relations of (I), (II), and (III) are discussed. L. S. T.

Heavy accessory minerals of the Val Verde tonalite. R. W. Wilson (Amer. Min., 1937, **22**, 122—132).—These minerals are relatively limited but of fairly const. frequency. Zircon, apatite, and sphene are the chief. L. S. T.

Aenigmatite. N. L. Bowen (Amer. Min., 1937, **22**, 139—140).—Aenigmatite from a lava from Lake Niavasha has α 1·81±0·01, β 1·82±0·01, γ 1·88±0·015. L. S. T.

Paragenesis of potassium and magnesium. J. Grzymek and T. Kuczyński (Przemysł Chem., 1935, **19**, 186—190).—Formation of schönite from saturated aq. K_2SO_4–$MgSO_4$ does not take place in presence of an equal vol. of MeOH, at −40°. Separate crystallisation of K_2SO_4 and $MgSO_4$ from supersaturated 1 : 1 MeOH–H_2O solution is possible at room temp. R. T.

Paragenesis of pyrrhotite. G. M. Schwartz (Econ. Geol., 1937, **32**, 31—55).—The minerals most commonly associated with pyrrhotite in order are: chalcopyrite, pyrite, sphalerite, arsenopyrite, magnetite, pentlandite, cubanite, and marcasite. Relative ages are discussed. L. S. T.

Lepidolite from Kyûbiri, Korea. J. Yoshimura, T. Sudô, and Y. Fukazawa (Bull. Inst. Phys. Chem. Res. Japan, 1937, **16**, 166—169).—Composition and optical properties are recorded. H. J. E.

Asbestos deposits of Thetford District, Quebec. S. Paige (Econ. Geol., 1937, **32**, 108—109).—A discussion of previous conclusions (cf. A., 1936, 308, 1357). L. S. T.

Mineralogy and chemical composition of garnets from the schist complex of Nellore. N. Jayaraman (Proc. Indian Acad. Sci., 1937, **5**, **A**, 148—160).—Specimens of garnet from the mica schist of Nellore all comprised a mixture of almandite, pyrope, grossularite, and spessartite in varying proportions, with quartz, ilmenite, and sillimanite inclusions. The variations of colour and physical properties with composition and with the impurities present are traced. J. W. S.

Geochemical diagram of the pegmatites of the principal arcs of mountain chains of Central Asia. A. F. Sosedko (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 299—301).—A diagram is given showing the occurrence of pegmatites, arranged according to the time of their formation, in the central part of the Turkestan mountain chain. O. D. S.

Composition of cassiterites. J. Larionov and J. M. Tolmatschev (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 303—306).—The qual. compositions of hydrothermal and pegmatitic cassiterites from the Turkestan chain have been determined spectrographically, and are compared. O. D. S.