BRITISH CHEMICAL ABSTRACTS

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

OCTOBER, 1937.

Interferometer wave-lengths in the secondary spectrum of hydrogen. R. G. LACOUNT and R. E. HODGDON (Physical Rev., 1937, [ii], 52, 98-99).--Measurements accurate to ± 0.0003 A. for 34 lines in the range $\lambda\lambda$ 3750-4200 are tabulated.

dructure of the luminous flaches pro-

<u>) — Results for more inert massa and that</u> stars and for fig-A mixtures are given and

N. M. B.

Bands of HD and D_2 ending on the $2p^{1}\Sigma$ state. G. H. DIEKE and (MISS) M. N. LEWIS (Physical Rev., 1937, [ii], 52, 100-125).-Full data for the extensive systems originating from $3d^{1}\Sigma$ and $3d \Pi$ and for some weaker and less complete systems are tabulated. The H₂ consts. of all the states concerned are recalc. and the consts. and properties of the states are examined from a comparison of the three isotopic mols. N. M. B.

New intensity dissymmetry of the Stark effect components of hydrogen. N. Ryde (Naturwiss., 1937, 25, 494).-With an electric field of 150-500 kv. per cm. a considerable dissymmetry of intensity of H_{β} , which is not affected by the conditions of excitation, was observed. A. J. M.

Intensity measurements in the spectrum of helium. H. C. BURGER, J. B. VAN MILAAN, and L. S. ORNSTEIN (Physica, 1937, 4, 730–732).— Intensity measurements for $\lambda\lambda$ 4472, 17003, 3965, and 15088 A. are recorded. H. J. E.

Phases of splitting and field strength relationships for the combined Zeeman and Stark effects of helium lines. W. STEUBING and F. STOLPE (Ann. Physik, 1937, [v], 30, 1-33; cf. A., 1935, 1437).-Three phases of splitting have been observed in the combined Zeeman and Stark effects of He. These are determined by the ratio of the electric and magnetic fields and are separated by two crit. vals. at which sharp splitting different from either the pure Stark or Zeeman effect was observed. Intermediate states show broadened and diffuse components. O. D. S.

Anode drop in the rare gases helium, neon, and argon. M. J. DRUYVESTEYN (Physica, 1937, 4, 669-682). visation mon non H.J. E.

[1, 2] band and predissociation of the $c^{3}\Pi$ [1, 2] band and prediscounted of N_2 . P. level of the second positive group of N_2 . P. TRAUTTEUR (Nuovo Cim., 1937, 14, 222—227).— The higher terms of the [1, 2] band of the second positive group of N_2 have been observed. In the low-pressure are the rotational levels up to J = 71are excited. The existence of predissociation is confirmed. O. J. W.

Nuclear moments of aluminium. D. A. JACK-SON and H. KUHN (Nature, 1937, 140, 110) .---

Measurements of the intensity of the components in the hyperfine structure of certain absorption and emission lines give a val. of 9/2 for the nuclear spin of Al, which disagrees with the val. of 1/2 suggested by Ritschl (A., 1933, 199). The magnetic moment, cale. from Goudsmit's formula, is 3.6 to 4.1 nuclear magnetons. Deslorer mulbi L. S. T.

First Effect of magnetic field on the air

Continuous absorption spectrum of chlorine in the region 4000-5000 A. R. G. AICKIN and N. S. BAYLISS (Trans. Faraday Soc., 1937, 33, 1333-1338).—The absorption coeffs. of Cl₂ over the region 4000-5400 A. have been measured at 18-709°. The continuous spectrum contains two components. The stronger (A) has $\varepsilon_{\max} = 66$ at 3300 Å, and is due to the transition ${}^{1}\Pi_{u} \leftarrow {}^{1}\Sigma_{g}{}^{*}$ leading to dissociation into normal atoms, whilst the other (B) has ε_{\max} . approx. 1 at about 4250 A. and is a composite of transitions ${}^{3}\Pi_{1n} \leftarrow {}^{1}\Sigma_{g}{}^{+}$ and ${}^{3}\Pi_{0u} \leftarrow {}^{1}\Sigma_{g}{}^{+}$ (corresponding with the visible bands) and producing dissociation into Cl $({}^{2}P_{1i}) + Cl ({}^{2}P_{1i})$ and Cl $({}^{2}P_{1i}) + Cl ({}^{2}P_{1})$, J. W. S. respectively.

Depolarisation factor of the light diffused by argon. A. ROUSSET. The depolarisation factor of A illuminated by plane polarised light is 3×10^{-4} . R. S. B.

Negative terms and broad lines in the neutral calcium spectrum. H. E. WHITE (Physical Rev., 1936, [ii], 49, 204-205).-No broad lines due to the combination of negative with lower terms could be L. S. T. detected.

Deep terms in the spectra of Sc VIII and Sc IX. P. G. KRUGER and L. W. PHILLIPS (Physical Rev., 1937, [ii], 52, 97-98).-Spectrograms previously discussed (cf. this vol., 436) show 23 lines identified as radiations connecting higher terms with the ground states of Sc VIII and Sc IX. N. M. B.

Variations of intensity in titanium and vanadium lines, caused by the introduction of sodium and potassium salts into the arc. S. A. BOROVIK and T. T. BOROVIK-ROMANOVA (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 543-546).-The intensities of four lines of at. Ti are increased by the presence of foreign substances in the C arc in the order : $Pb_3O_4 < K_2CO_3 < SiO_2 < NaCl < KCl;$ in the case of four lines of ionised Ti the order is NaCl, $SiO_2 > Pb_3O_4 > K_2CO_3$. KCl has a depressant action. The intensities of three lines of at. V are considerably raised by KCl and NaCl, whereas those of five lines of ionised V are unaffected by NaCl, and reduced by KCl. R. C. M. SAH ADG Gd T

Hyperfine structure of the λ 4336.89, $sp^{33}D_{2}$ - $Sp^{3}D_{1}$ line in the first spark spectrum of arsenic and its nuclear spin. S. K. MUKERJI (Indian J. Physics, 1937, 11, 213—217).—The λ 4336.89 line in the first spark spectrum of As is a regular quartet degraded towards the ultra-violet; the nuclear spin of As is 3/2. F. J. L.

NO A CTUTSY

Effect of magnetic field on the absorption of selenium. S. ROUPPERT (Compt. rend., 1937, 204, 1723-1725).—The absorption spectrum of Se vapour at 615-630° shows an increase under a magnetic field of 24,400 gauss. R. S. B.

Pressure shift of spectral lines. H. KUHN (Physical Rev., 1937, [ii], 52, 133; cf. this vol., 272).—A test of the statistical theory by comparison of observed and calc. data for 30 lines in the visible region of Kr shows good agreement. N. M. B.

Band spectra and energy of dissociation of the rubidium molecule. N. T. ZÉ and T. S. TSIANG (Physical Rev., 1937, [ii], 52, 91-96; cf. Kusch, A., 1936, 397).—Data and analyses for 118 bands of the violet and 160 bands of the blue system of Rb₂ in absorption. The upper vibrational frequencies are 40.42 and 36.46 cm.⁻¹, respectively. The lower level, common to both systems, is the ¹\Sigma ground state, and its vibrational frequency 57.45 cm.⁻¹ The energy of dissociation of the ground state is 0.49 ± 0.02 volt. A green edge of the blue system at 5032 A. has been observed. N. M. B.

Hyperfine structure of the resonance lines of rubidium. A. V. HOLLENBERG (Physical Rev., 1937, [ii], 52, 139).—The resonance lines λ 7800 and λ 7947 were photographed with two experimental arrangements. Hyperfine structure patterns are given, components are ascribed to ⁸⁵Rb and ⁸⁷Rb present in the ratio 3:1, and consts. are calc.

N. M. B.

Gradient of the high-pressure discharge in various metal vapours. W. ELENBAAS (Physica, 1937, 4, 747-751).—Data for discharges in Cd and Zn are recorded. H. J. E.

Extreme ultra-violet spectrum of antimony. L. BLOCH and E. BLOCH (J. Phys. Radium, 1937, [vii], 8, 217—228).—The spectrum of Sb, excited by an electrodeless discharge, is recorded between 200 and 2400 A. and agrees with recorded data. Many new lines are given. By comparing plates for different excitations separation of the spectrum into Sb I, Sb II, Sb III, Sb IV, and Sb V is made. Assignments agree with those previously given; new lines are assigned. The presence of lines of Sb VI is postulated. An analysis of the Sb VI spectrum enables the Te VII spectrum (this vol., 335) to be analysed and a comparison of isoelectronic spectra is made. W. R. A.

Zeeman effects in the spectrum of Sa II. W. ALBERTSON and A. S. KING (Physical Rev., 1936, [ii], 49, 209).—Measurements of the n components of 300 lines of Sa II in a field of 31,100 gauss show that the low levels of Sa II have good *LS* coupling, whilst the high levels are markedly perturbed. L. S. T.

Spectra of Sa II and Gd I. W. ALBERTSON (Physical Rev., 1936, [ii], 49, 208; cf. this vol., 103). L. S. T. Arc and spark spectra of lutecium. W. F. MEGGERS and B. F. SCRIBNER (J. Res. Nat. Bur. Stand., 1937, 19, 31-39).—Data obtained between λ 2000 and 11,000 A. are recorded and discussed.

DIFFIT

C. R. H.

Fine structure of the luminous flashes produced by the discharge of a condenser through a tube of gas. M. LAPORTE and P. CORDA (J. Phys. Radium, 1937, [vii], 8, 233-234; cf. A., 1936, 538).—Results for pure inert gases and their binary mixtures and for Hg-A mixtures are given and discussed. W. R. A.

Test of the interval rule in the ${}^{2}D_{3/2}$ state of Bi I. E. U. MINTZ and L. P. GRANATH (Physical Rev., 1936, [ii], 49, 196).—Measurements of the intervals between the six hyperfine structure components of the line 4722.5 A. in the arc spectrum of Bi reveal a deviation from the Landé interval rule in the ${}^{2}D_{3/2}$ state. L. S. T.

Lowering of spark potential of the inert gases by irradiation. R. SCHADE (Naturwiss., 1937, 25, 568-569; cf. this vol., 55).—The previous explanation of this phenomenon is untenable. Processes which were previously described as space-charge effects are now supposed to be of a cumulative kind depending on the c.d. A. J. M.

Stratified Geissler discharge in various gases at atmospheric pressure. J. JAFFRAY (Compt. rend., 1937, 205, 32—33).—The effect has been observed with CO, impure CH_4 , and air containing a trace of turpentine. The discharge is preceded by a feeble disruptive spark. On reducing the pressure, the positive column shortens, the dark space lengthens, and the luminous mantle gradually extends to the cathode. C. R. H.

Low-pressure arc characteristics. J. D. COBINE (Physical Rev., 1936, [ii], 49, 479).—For air, N_2 , O_2 , and CO_2 the re-ignition potential of the short a.e. arc between pure graphite electrodes is a linear function of the gas pressure. Factors affecting re-ignition and a possible mechanism are discussed. L. S. T.

Mechanism of the discharge in a Siemens ozone tube. A. KLEMENC, H. HINTENBERGER, and H. HÖFER (Z. Elektrochem., 1937, 43, 708—712; cf. this vol., 273).—Examination with a cathode-ray oscillograph indicates that the current through the ozoniser comprises strong pulses of short duration occurring every half cycle of the applied a.c. potential. No high-frequency oscillations could be detected.

J. W. S.

Transition from ordinary glow discharge to multi-spark discharge with increasing thickness of the electrolytic oxide layer on aluminium. A. GÜNTHER-SCHULZE and W. BAR (Z. Physik, 1937, 106, 662—668).—Multi-spark discharge from oxidecoated Al cannot be obtained with borate-formed layers. Forming in 5% H₂C₂O₄ gives thicker porous layers from which multi-spark discharge occurs. Current-voltage curves, from test-plate measurements, show that multi-spark discharge begins with layers 2μ thick and is complete at 10 μ thick. The field strength in the oxide layer decreases with increasing thickness. Ta_2O_5 layers show no sign of multi-spark discharge. L. G. G.

Theory of radiation of a gaseous discharge. V. FABRIKANT (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 451-455).—A method for calculating the total intensity of radiation in a discharge such that secondary processes can be neglected, where electron concn. and temp. are known, is developed. The theory agrees with the results of Druyvesteyn and Warmoltz (A., 1934, 124) for a Na discharge.

0. D. S.

Spectral classification of the stars of types A to K. W. W. MORGAN (Astrophys. J., 1937, 85, 380-397). L. S. T.

Nuclear K electron capture. L. W. ALVAREZ (Physical Rev., 1937, [ii], 52, 134—135).—An attempt to test the consequence of the Fermi theory of β -decay that positron-active nuclei may capture at. electrons instead of emitting positrons was made by detecting the X-rays which would result from the refilling of the K shell using a Ra-V source and counter method and correction for γ -radiation and absorption. The ratio of probabilities of K electron capture and positron emission is 1.0 ± 0.4 , and is of the order of magnitude predicted by theory. N. M. B.

Intensity variation of L series X-ray lines with tube voltage. G. H. BANCROFT (Physical Rev., 1937, [ii], 52, 6—11).—Investigation with a Cu target showed a marked increase in the slope of the intensity-applied voltage curve immediately after the excitation of the K state. Intensity plotted against the square of the voltage difference between the K excitation and applied voltages gives an approx. straight line in agreement with theory. N. M. B.

L emission and absorption spectra of rhenium and its characteristic levels. (MLLE.) Y. CAU-CHOIS (J. Phys. Radium, 1937, [vii], 8, 267—272; cf. A., 1936, 1169; this vol., 159).—L emission and L absorption spectra of Re have been investigated and the energies of electronic levels determined.

W. R. A.

L emission and absorption spectra of radium. Characteristic levels. H. HULUBEI (J. Phys. Radium, 1937, [vii], 8, 260—266; cf. A., 1936, 1169, 1311, 1438).—The L emission and L absorption spectra of Ra have been investigated and the energies of different electronic levels determined. W. R. A.

Half-value widths of X-ray interference lines. H. MÖLLER and A. ROTH (Mitt. Kaiser-Wilh.-Inst. Eisenforsch., 1937, 19, 123—126).—The determination of the half-val. widths of X-ray interference lines by examination of photographs by registering photometers is discussed. The connexion between electrometer reading, blackening of film, and X-ray intensity is obtained, thus making it possible to transform photometer curves into X-ray intensity curves. From the latter the half-val. width can be determined independently of time of irradiation. The results are independent of the temp. and period of use of the photographic developer within the limits of $17-22^{\circ}$, and up to 3 months, respectively. A. J. M.

Double Compton scattering. F. BOPP (Ann. Physik, 1937, [v], 30, 35-71; cf. A., 1936, 1439).

Mathematical. The spectral distribution and total intensity of double Compton scattering are calc. for two cases in which the incident and scattered ray are symmetrical with respect to the scattering plate. Unexpectedly high vals. of intensity are obtained for Pb and Al, even for small thicknesses of the scattering medium. The theory is applied to the results of Gentner (A., 1936, 918). O. D. S.

Origin of satellite lines in X-ray spectra. L. PINCHERLE (Nuovo Cim., 1937, 14, 185—195).—All the most intense satellite lines in X-ray spectra are due to multiple ionisation. The intensities of satellite lines due to double electronic transitions are in general too small to be observed, but may become important in the spectra of light elements. O. J. W.

Photo-thermionic effect in incandescent metals. I. RANZI and R. RICAMO (Nuovo Cim., 1937, 14, 114—118).—By means of experiments with light of various colours it is shown that the photothermionic effect obtained with white light on W filaments is a purely thermal effect. In the case of cathodes consisting of alkaline-earth oxides the effect with white light is partly photo-electric. O. J. W.

Fowler's photo-electric theory, assuming quantum absorption probability a function of electronic energy. A. T. WATERMAN (Physical Rev., 1936, [ii], 49, 410).—Theoretical. L. S. T.

Ionisation energy of Li⁺ and He. H. A. S. ERIKSSON (Nature, 1937, 140, 151).—The application of certain corrections to the calc. val. for the ionisation potential of Li⁺ gives a val. of 610,100 cm.⁻¹ (experimental val. 610,079 \pm 25 cm.⁻¹). For He, the calc. val. is 198,325 cm.⁻¹ (experimental 198,305 \pm 15 cm.⁻¹). L. S. T.

Ionisation of neon, krypton, and xenon by bombardment with accelerated neutral argon atoms. H. WAYLAND (Physical Rev., 1937, [ii], 52, 31-37; cf. Beeck, A., 1930, 1494).—Investigations by an electrometer method and curves obtained gave positive evidence of ionisation. Onset potentials for ionisation are: Xe bombarded by A, 55 volts; Kr by A, 50 volts; Ne by A, 130 volts approx.

N. M. B.

Absorption of high-energy electrons. I. J. J. TURIN and H. R. CRANE (Physical Rev., 1937, [ii], 52, 63-67).—The losses in passing through an absorber, given by the curvatures of the incident and emergent tracks, when the recoil electrons produced by 6 m.e.v. γ -radiation from F bombarded by protons passed through 5-mm. C and 0.5-mm. Pb absorbers were in good agreement with the theoretical losses due to electron collision alone. Radiative losses in the case of low at. no. C are negligible, but in the case of Pb are considerable. N. M. B.

Spectrographic study of the conductivity electrons in magnesium-aluminium alloys. J. FARI-NEAU (Compt. rend., 1937, 205, 365—366; cf. A., 1936, 1311; this vol., 337).—The K emission spectra of Al₂Mg₃ and Al₃Mg₂ are similar to those of the pure metals excepting in the β - bands, the width of which is > for the pure metals. The intensity distribution within the bands is in accord with the assumption that the conductivity electrons are held in common and can fall to a K level on either an Al^{\dots} or Mg^{\dots} ion. The band widths are slightly > the vals. calc. on the assumption that the valency electrons obey Fermi statistics. J. W. S.

Maximum in secondary electron emission from metals. D. R. BHAWALKAR (Proc. Indian Acad. Sci., 1937, 6, A, 74–78).—Theoretical. The presence of the max. in secondary electron emission curves is explained on the assumption that the rate of loss of energy obeys the Thomson–Whiddington law, and that secondary electrons are absorbed by the target on their way out. C. R. H.

Calculation of the mean ionic energy of gases. E. BAGGE (Ann. Physik, 1937, [v], 30, 72—90).—An equation for the velocity distribution of secondary electrons from gas atoms, and an approx. formula for the differential ionisation of gases, are deduced and are in agreement with experiment. Mean ionic energies are calc. as follows: for 20 kv. energy, H 33.9, N₂ 28.6, and Ne 42.2 volts. O. D. S.

Capture of orbital electrons. F. HOYLE (Nature, 1937, 140, 235-236).—Theoretical. L. S. T.

Scattering of fast electrons in hydrogen. A. L. HUGHES and S. S. WEST (Physical Rev., 1937, [ii], 52, 43-45; cf. A., 1936, 1170).—The classical and the wave theories lead to different expressions for the probability of scattering of particles by similar particles, and hence to a difference in the ratio of the no. of inelastically to the no. of elastically scattered electrons. Experimental results are in closer agreement with wave-theory predictions. A slight difference between experimental results for H₂ and He is probably due to diffraction effects in scattering by diat. mols. N. M. B.

Production of positron and electron pairs by bombardment of mercury with β -particles of low energy. F. C. CHAMPION and A. BARBER (Nature, 1937, 140, 105).—Examination of many photographs of the tracks of β -particles from Ra-*E* in a mixture of 5% of HgMe₂ and 95% of N₂ has revealed two definite cases of the production of pairs of positrons and electrons by β -particles of energy slightly >1 m.v. A comparison with previous results (A., 1935, 425; 1936, 401) indicates that the probability of pair production by β -particles of low energy increases rapidly with at. no., and is large when the energy of the β -particle is of the order 2 mc². L. S. T.

Magnetic spectrum of positrons generated in lead by thorium- $C'' \gamma$ -rays. G. L. LOCHER and C. L. HAINES (Physical Rev., 1936, [ii], 49, 198).— Results obtained with a specially-constructed β -ray spectrograph are recorded. L. S. T.

Secondary processes of ionisation in mercury vapour. B. L. SNAVELY (Physical Rev., 1937, [ii], 52, 174–183).—Ionisation due to the impact of electrons of energy <10.4 volts was investigated as a function of electron velocity bombarding current, and pressure of Hg vapour. For velocities >7volts data correspond with ionisation of metastable atoms by electron impact. Crit. potentials at 8.4, 8.6, and 6.9 volts are identified. Large nos. of negative ions around 4.9 volts probably indicate ionisation due to the simultaneous formation of a positive and a negative ion on the collision of a $2^{3}P_{0}$ with a $2^{3}P_{1}$ atom. N. M. B.

Collector theory for ions with Maxwellian and drift velocities. A. H. HEATLEY (Physical Rev., 1937, [ii], 52, 235–238).—For a gaseous discharge in which the ions have a drift velocity superimposed on a Maxwellian distribution, the removal of the restriction, in the Mott-Smith-Langmuir theory, to collectors having a high ratio of sheath to collector diameters is examined.

N. M. B. Magnetic focussing of ion beams. H. A. STRAUS (Physical Rev., 1937, [ii], 52, 128—130).— The effect of the angle of incidence on the position of the focus when the ion beam enters the field along a line other than the field normal was investigated, and results are in satisfactory agreement with theory. N. M. B.

Emission of positive ions at low temperatures. M. A. SFORZINI-PIEROTTI (Nuovo Cim., 1937, 14, 8—13).—The emission of positive ions from a W filament commences at 170°. These are probably ions of alkali metals occluded in the W. With Pt quite a marked emission occurs at 50°. O. J. W.

Range of protons in aluminium and in air. D. B. PARKINSON, R. G. HERB, J. C. BELLAMY, and C. M. HUDSON (Physical Rev., 1937, [ii], 52, 75-79). —Using a 2×10^6 volt generator the range of protons in air, r_n , and in Al, r_{Al} , was measured as a function of proton energy ≥ 2 m.e.v. Results in air agree well with the theoretical results of Mano (cf. A., 1935, 275) at high energies, but diverge considerably at energies <0.7 m.e.v. r_a/r_{Al} increases from approx. 1000 at 200 kv. to 1550 at 1200 kv., and thence to the max. voltage remains nearly const. N. M. B.

Ionic recombination in the ionosphere. L. B. LOEB (Physical Rev., 1937, [ii], 52, 136; cf. this vol., 437).—A correction. N. M. B.

Mass-ratio of the lithium isotopes. F. A. JENKINS and A. MCKELLAR (Physical Rev., 1936, [ii], 49, 205).—New measurements of the red band system of Li₂ give for the isotopic mass-coeff. $\omega''/\omega' = 1.04100$ and $\omega' \omega' = 1.04107$ compared with the vals. 1.04141 given by the blue-green system and 1.04077 obtained by Almy and Irwin (A., 1936, 264).

L. S. T.

Packing fractions of krypton and xenon. F. W. ASTON (Nature, 1937, 140, 149).—Direct and more accurate (A., 1927, 914) measurements of the packing fractions have been made by comparison with hydrocarbon doublets. The packing fractions and isotopic wts. deduced from H 1.00812 and C 12.00355 are: 78 Kr -7.30, 77.9430 ± 0.0020 ; 82 Kr -7.70, 81.9369 ± 0.0015 ; 84 Kr -7.60, $83.9362\pm$ 0.0015; 86 Kr -7.40, 85.9363 ± 0.0015 ; 129 Xe -4.46, 128.9424 ± 0.0020 ; and 132 Xe (provisional) -4.4, 131.942, respectively. L. S. T.

Further investigations of the atmospheric ionisation associated with rainfall. G. R. WAIT and A. G. MCNISH (Physical Rev., 1936, [ii], 49, 201). —Previous findings that the increased ionisation produced in the atm. by rainfall is due to radioactive matter, chiefly Ra-*B* and -*C*, brought down by rain, are confirmed. L. S. T.

Radioactivity of potassium prepared from animal tissue. A. LASNITZKI and E. A. OESER (J.C.S., 1937, 1090—1091).—The radioactivity of K from the muscular tissue of rabbits is equal to that of K of mineral origin, within the limits of experimental error (2%) (cf. A., 1934, 1028). J. G. A. G.

Yield of thoron by the "gas-flow" method. R. DUCHON (J. Phys. Radium, 1937, [vii], 8, 285— 293).—The yield of thoron has been investigated by a gas-flow method using both open and closed circuits. The influence of factors such as temp., rate of flow, etc. has been determined. The theoretical treatment of the method accords well with experimental data.

W. R. A.

Range of the α -particles from thorium. G. H. HENDERSON and G. C. LAURENCE (Physical Rev., 1937, [ii], 52, 46–47).—Recent vals. of this range are discussed. The results of Kurie (cf. A., 1933, 443) are criticised. N. M. B.

 α -Ray standards. H. STOILMANN (Physikal. Z., 1937, 38, 645-654).—The construction of α -ray standards (*i.e.*, apparatus to furnish a definite current under given conditions) using U_3O_8 is described. Apparatus is described in which the current is independent of air pressure and potential >1800 volts, and another in which the current α air pressure.

A. J. M.

Possibility of a dual β-disintegration of potassium. C. F. von WEIZSÄCKER (Physikal. Z., 1937, 38, 623-624).—The radioactivity of K is due to ⁴⁰K. which has two stable isobars, ⁴⁰₂₀Ca and ⁴⁰₁₈A. The normal radioactivity of "K is ascribed to the transformation into 20Ca, but transition into 18A is also possible. It is suggested that practically all the "A in the atm. is a disintegration product of K, explaining the fact that A is about 1000 times as abundant in the atm. as it should be when considered in connexion with the abundance of other elements. When the amount of ⁴⁰A is subtracted from the total, A falls into its proper place in the abundance-at. no: curve. Consideration of the relative abundance of the inert gases makes it possible to calculate approx. the ratio of ⁴⁰Ca and ⁴⁰A derived from K. Approx. 1 in 3 ⁴⁰K nuclei gives "A. Both disintegrations have abnormally long half-life periods. A. J. M.

Ionisation by gamma rays and Röntgen rays in argon at high pressures. An absolute dosemeter. J. CLAY and G. VAN KLEEF (Physica, 1937, 4, 651—658).—An Al collecting chamber of 2.7 c.c. capacity, with automatic recording, is described. H. J. E.

Measurement of γ -ray energies with a cloud chamber. J. R. RICHARDSON and F. N. D. KURIE (Physical Rev., 1936, [ii], 49, 209).—The best conditions and the most trustworthy method of measurement are discussed. L. S. T.

 γ spectrum of Ra-B and Rd-Ac. S. ROSEN-BLUM and M. GUILLOT (Compt. rend., 1937, 204, 1727-1729).—Theoretical. The radiations from RaB and Rd-Ac are compared and shown to obey similar numerical relations. R. S. B.

Energy of the γ -rays of radioindium and radiomanganese. A. C. G. MITCHELL and L. M. LANGER (Physical Rev., 1937, [ii], 52, 137).—Curves for the absorption of the γ -rays in Al are given and an energy expression is obtained. The average energies are 1.39 and 1.65 m.e.v., respectively. The absorption of the rays and of those of Th-C'' in Pb and Cu was measured. 'The rays are monochromatic and of the same period as that of the β -activity (of. A., 1936, 1441). N. M. B.

Number of neutrons emitted by a radiumberyllium source. C. J. BAKKER (Physica, 1937, 4, 723—729).—The no. of neutrons was $(2 \cdot 1 \pm 0 \cdot 2) \times 10^4$ per sec. per m.C. of Ra. H. J. E.

Simultaneous ejection of three neutrons from elements bombarded with fast neutrons. M. L. POOL, J. M. CORK, and R. L. THORNTON (Physical Rev., 1937, [ii], 52, 41; cf. this vol., 389).—Evidence of three-neutron emission in the case of Sc, and possibly in the cases of Cu and F, is discussed. The reaction for Sc is ${}^{48}Sc + n \rightarrow {}^{48}Sc + n + n + n$. N. M. B.

Effects of long-range forces on neutron-proton scattering. S. S. SHARE and J. R. STEHN (Physical Rev., 1937, [ii], 52, 48—51).—A possible explanation of discordant experimental results on the angular distribution of fast neutrons scattered by protons is proposed. N. M. B.

Scattering of neutrons by deuterons. L. I. SCHIFF (Physical Rev., 1937, [ii], 52, 149-154; cf. this vol., 391).-Mathematical. N. M. B.

Capture of thermal neutrons by deuterons. L. I. SCHIFF (Physical Rev., 1937, [ii], 52, 242; cf. preceding abstract).—Mathematical. Calculations for this process are given. The capture cross-section is 0.3×10^{-26} sq. cm., well within the observed upper limit 3×10^{-26} sq. cm., and indicates that capture is too improbable for experimental observation.

N. M. B.

Scattering of slow neutrons by liquid orthoand para-hydrogen. J. HALPERN, I. ESTERMANN, O. C. SIMPSON, and O. STERN (Physical Rev., 1937, [ii], 52, 142).—Scattering of slow neutrons (90° abs.) is greater by ortho- than by para-H₂, as predicted by theory (cf. Schwinger, this vol., 339). Approx. data show that the mean free path of the neutrons in ortho-H₂ is about the same as in H₂O but much larger in para-H₂. N. M. B.

Production and absorption of slow neutrons in hydrogenic materials. G. A. FINK, J. R. DUNNING, G. B. PEGRAM, and E. SEGRÈ (Physical Rev., 1936, [ii], 49, 109).—Relative data for the no. of slow neutrons emerging from zones at the end of a paraffin cylinder are given. The no. of neutrons emerging from a Rn-Be source placed in the centre of cylinders of different size containing H_2O have been determined. The mean life time calc. for a neutron in paraffin is ~ 10⁻⁴ sec. L. S. T.

Magnetic scattering of slow neutrons. O. HALPERN and M. H. JOHNSON, jun. (Physical Rev., 1937, [ii], 52, 52—53).—It is suggested that the contribution of at. or ionic magnetic moments to the crosssection for the scattering of slow neutrons may be separated from that due to nuclear scattering by a comparison of the scattering of a metal with the scattering from the corresponding ions of different valency, and that this magnetic scattering, in unmagnetised paramagnetic bodies, should be several times > nuclear scattering. N. M. B.

Absorption coefficients for thermal neutrons. (A) C. T. ZAHN. (B) O. LAPORTE (Physical Rev., 1937, [ii], 52, 67-71, 72-74).-(A) Mathematical. Integrals arising in the interpretation of experiments are expressed as convenient series for evaluation and numerical data are tabulated.

(B) The integrals are discussed for larger vals. of the independent variable. N. M. B.

Energies of nuclear disintegration. L. GOLD-STEIN (J. Phys. Radium, 1937, [vii], 8, 235–240).— Theoretical. Corrections necessary to account for all the energy associated with a nuclear transformation are discussed, more particularly in respect of natural α -radioactivity. W. R. A.

Sargent curves for artificially radioactive substances. A. C. G. MITCHELL (Physical Rev., 1937, [ii], 52, 1—5).—Points plotted for a no. of elements, the end-points of which were determined by extrapolation of the Konopinski–Uhlenbeck curves, lie approx. on three smooth curves agreeing in shape with the predictions of that theory. Relative vals. for the transition matrix moments are obtained and the spins of radioactive elements are discussed. N. M. B.

Recoil atoms of radioactive bodies. L. GOLD-STEIN (J. Phys. Radium, 1937, [vii], 8, 316—320).— Mathematical. A consideration of the effects produced within a radioactive atom when it emits charged particles. The probabilities that the atom is left in an excited or an ionised state are discussed.

W. R. A.

Radioactivity produced by high-energy neutron bombardment. M. L. POOL, J. M. CORK, and R. L. THORNTON (Physical Rev., 1937, [ii], 52, 239— 240).—A tabular summary of available data for period, intensity, sign, and assignment for all elements investigated. N. M. B.

Artificial radioactivity produced by α -particles. W. J. HENDERSON and L. N. RIDENOUR (Physical Rev., 1937, [ii], 52, 40; cf. this vol., 439).— A method of obtaining enhanced activities is described. Provisional identifications, half-life, and emissions accompanying decay are: from Cr, ⁵⁵Fe, 8.9 min., positrons, and ⁵⁶Mn, 160 min., negative electrons; from Co, ⁶²Cu, 10.0 min., positrons; from Cu, ⁶⁸Ga, 68 min., positrons, and ⁶⁶Ga, 9.4 hr., positrons; from As, ⁷⁸Br, 6.3 min. N. M. B.

Artificial radioactivity produced by α -particles. L. N. RIDENOUR and W. J. HENDERSON (Physical Rev., 1937, [ii], 52, 139; cf. this vol., 439).—Direct bombardment of Ni with α -particles confirms the presence of a product of half-life 37 min., attributed to ⁶³Zn, and separable from the much stronger ⁶¹Cu. The corr. relative initial intensities are ⁶¹Cu: ⁶³Zn = 1.9:10 (cf. Thornton, this vol., 439). N. M. B.

Angular distribution of the disintegration particles in the transmutation of light atomic nuclei by hydrogen positive rays. II. H. NEUERT (Physikal. Z., 1937, 38, 618-622; cf. this vol., 161).—The angular distribution of the disintegration particles produced in the reactions ${}^{11}_{8}B + {}^{11}_{8}H \rightarrow$ ${}^{12}_{8}Be + {}^{12}_{8}He$, ${}^{11}_{8}B + {}^{11}_{1}H \rightarrow$ ${}^{23}_{8}He$, and ${}^{21}_{8}Li + {}^{11}_{8}H \rightarrow$ He + He has been further examined. The distribution of particles in the first reaction was measured up to an angle of 20° with the direction of the protons, the no. of particles at this angle being approx. twice that at 90°. For the second reaction the angular distribution curves for emitted *a*-particles of range >20 mm. was determined for angles between 20° and 110°. The form of the curve is dependent on the range of the α -particles. For the last reaction there is uniform angular distribution of *a*-particles between 90° and 150°. A. J. M.

Positrons from deuteron-activated phosphorus. H. G. PAXTON (Physical Rev., 1936, [ii], 49, 206).—Approx. one positron was observed for each 50 electrons from ³²P; half-life period 50 ± 10 hr. The energy distribution appears to have the form of a disintegration spectrum with an upper limit at approx. 0.6 mv. L. S. T.

Radioactive isotopes of (A) manganese, iron, and cobalt. J. J. LIVINGOOD, F. FAIRBROTHER, and G. T. SEABORG. (B) Antimony. J. J. LIVIN-GOOD and G. T. SEABORG (Physical Rev., 1937, [ii], 52, 135, 135-136).-(A) Fe bombarded with 5.5 m.e.v. deuterons gives a negative electron activity of approx. 40 days half-life in the fraction after pptn. as $Fe(OH)_3$ or extraction as $FeCl_3$. A similar Fe activity was separated from CoO bombarded over long periods with neutrons, and this Fe fraction, after deuteron bombardment, contains an 18 hr. positron emitter and a complex of half-life 100-200 days (cf. Sampson, A., 1936, 1172). The deuteronbombarded Fe shows, in the Mn ppt., a positron emitter of about 5 days' half-life and a negative electron emitter of several months' period, as well as the 2.5-hr. activity of ⁵⁶Mn, even from very pure Fe. A Mn positron emitter of 46 min. half-life is produced when Cr is bombarded with deuterons.

(B) Sb bombarded with slow neutrons and 5.5 m.e.v. deuterons gives an activity of approx. 60 days half-life, and a 2.5-day period. Both are negative electron emitters and are attributed to ¹²²Sb and ¹²⁴Sb. Results confirm available data. Sb bombarded with fast neutrons gives ¹²⁰Sb, 16 min. half-life, and Sn bombarded with deuterons gives the same product. N. M. B.

Radioactive arsenic. P. HARTECK, F. KNAUER, and W. SCHAEFFER (Naturwiss., 1937, 25, 477).— The disintegration products of As activated by slow neutrons were β -particles, and a few positrons, some paired. As has an anomalous β -spectrum, the limit being at 3.4×10^6 e.v., and the max. approx. 9×10^5 e.v. It is considered that the analysis of the β spectrum into two portions is not justified. The positrons probably arise from the process $\frac{73}{33}$ As \rightarrow $\frac{76}{36}$ Ge + e^+ . A. J. M.

Artificial radioactivity induced in arsenic, nickel, and cobalt under deuteron bombardment. R. L. THORNTON (Physical Rev., 1936, [ii], 49, 207).—Bombardment of As, sublimed on Al, with 4.3 m.e.v. deuterons gives a 2.5 hr.-period activity ascribed to Si in the Al base, and an activity of 27 ± 1 hr. period due to ⁷⁶As. Strong γ -rays, less energetic than those of radio-Na, accompany this activity. Absorption measurements on the disintegration electrons indicate a max. energy of 1.5 m.e.v. Bombardment of Ni foil with 5.2 m.e.v. deuterons gave periods of 10 min. and 3.5 ± 0.1 hr.; the former is probably due to contamination by C. Bombardment of Co with 4.3 m.e.v. deuterons gave activities of 10 min. (probably contamination by C), 3.6 hr., and one or more activities of periods > a day. L. S. T.

Radioactive isotopes of element 43. C. PER-RIER and E. SEGRÈ (Nature, 1937, 140, 193—194).—A strong activity produced in Mo irradiated with deuterons in the cyclotron is probably due to isotopes of at. no. 43. This element shows the same reactions with H_2S , nitron, etc. as Re, from which it can be separated by the method of Geilmann and Weibke for the separation of Mo and Re. L. S. T.

Ionisation by γ -rays and cosmic rays in gases at high pressure and high collecting fields. J. CLAY (Physical Rev., 1937, [ii], 52, 143—148).—In measurements at high pressures (cf. Physica, 1935, 2, 825) there was no vol. recombination, and results are independent of those of Bowen (cf. this vol., 211). Investigations in air and A for γ -rays and cosmic rays indicate that for all pressures the vol. ionisation ∞ the pressure and that ionisation produced by electrons ejected from the wall is, for high pressures, independent of the pressure, in agreement with theory. N. M. B.

Specific ionisation in air for cosmic rays and gamma rays. J. CLAY (Physica, 1937, 4, 645–647).—The val. of N_{0Y}/N_{0C} at 38 atm. was 3.3.

H. J. E.

Determination of Eve's constant as proof for the saturation of the ionisation in air at high pressures. J. CLAY and M. A. V. TIJN (Physica, 1937, 4, 648-650). H. J. E.

Cosmic rays and the earth magnetic field. II. E. M. BRUINS (Physica, 1937, 4, 659-666).— Earth magnetic effects cannot be explained by assuming a single dipole. Local magnetic disturbances have an effect on the cosmic ray intensity. H. J. E.

Cosmic radiation. P. M. S. BLACKETT (J. Soc. Arts, 1937, 85, 893—903, 905—918, 921—931).— Cantor lectures.

Absorption of the soft component of cosmic radiation. W. HETTLER (Nature, 1937, 140, 235).— Theoretical absorption curves for Pb and Al have been calc. on the basis of the quantum theory; they follow approx. an ordinary mass absorption law. The few experimental vals. available fall on the curves. L. S. T.

Demonstration of neutrons of ultra-radiation in photographic emulsion. E. SCHOPPER (Naturwiss., 1937, 25, 557-558).-Traces of protons, liberated by the action of rapid neutrons, were obtained on photographic plates after the passage of ultraradiation through Pb and paraffin. The presence of slow neutrons was demonstrated by using an emulsion containing B. A. J. M.

High-altitude measurements on the energies of cosmic-ray tracks. C. D. ANDERSON, R. A. MILLIKAN, and S. H. NEDDERMEYER (Physical Rev., 1936, [ii], 49, 204).—The majority of the tracks measured at Pike's Peak are similar in kind to those at sea level, and can be ascribed to positive and negative electrons. Showers are more frequent and, on the average, larger than those found at sea level. The few heavily ionising positive tracks are interpreted as protons produced by nuclear disintegration.

L. S. T.

Absorption of cosmic-ray electrons at 10,600 ft. and at sea level. R. H. WOODWARD and J. C. STREET (Physical Rev., 1936, [ii], 49, 198).—Counter measurements at Echo Lake, Colorado, 10,600 ft., are compared with those at sea level (A., 1935, 1050). L. S. T.

Ionic recombination in the ionosphere. L. B. LOEB (Physical Rev., 1937, [ii], 52, 40-41; cf. this vol., 437).—The Thomson mechanism at very low pressures is discussed. N. M. B.

Emission of electrified particles by the sun and the theory of polar auroræ. D. BARBIER (J. Phys. Radium, 1937, [vii], 8, 303-308).—The penetration of the earth's atm. by aurora-producing particles indicates that the energy of these particles is considerably > that of particles emitted by the sun. This is discussed in relation to the earth's change.

W. R. A.

State of ionisation and the absorption of energy in planetary nebulæ. G. G. CHLIÉ (S. African J. Sci., 1937, 33, 136-143). H. J. E.

Woolley's theory of the hydrogen emission of prominences. G. G. CILLIÉ (S. African J. Sci., 1937, 33, 130–135). H. J. E.

Nuclear exclusion principle and the neutronproton pattern. W. D. HARKINS (Physical Rev., 1937, [ii], 52, 39).—A summary and justification of principles developed in recent years with reference to the pattern of 305 at. species now known.

N. M. B.

Neutrons. P. CERNUSCHI (J. Phys. Radium, 1937, [vii], 8, 273—276).—Mathematical. The application of Schrödinger's relativistic equation is made on the basis that a neutron consists of a proton and an electron, but is inacceptable because it leads to only one stable state with a life period of 10^{-27} sec. The elementary particles are the electron, the positron, and the neutron, and on this view the effective crosssection for the photo-electric disintegration of the proton can be cale. W. R. A.

Fundamental atomic constants. R. T. BIRGE (Physical Rev., 1937, [ii], 52, 241).—A discussion of the results of von Friesen (cf. this vol., 441). It is suggested that all vals. of h/e are low. N. M. B.

Magnetic moment of the proton. L. A. YOUNG (Physical Rev., 1937, [ii], 52, 138).—An attempt to explain the divergent results of Stern and of Rabi (cf. A., 1936, 1316) on the basis of the theoretical treatment of the two methods employed.

N. M. B.

Sign of the magnetic moment of the neutron. P. N. Powers, H. CARROLL, H. BEYER, and J. R. DUNNING (Physical Rev., 1937, [ii], 52, 38—39; cf. this vol., 441).—Measurements of the reorientation of neutron spin in a precessing field are reported. The direction of the precessing field giving max. reorientation indicates that the neutron moment is negative. Indications between limits of the magnitude of the moment, as given by the reorientation probability, are in agreement with theory (cf. Schwinger, this vol., 278). N. M. B.

Sign of the magnetic moment of the ³⁹K nucleus. H. C. TORREY (Physical Rev., 1937, [ii], 52, 30; cf. this vol., 210).—A correction.

N. M. B.

Interaction of two particles in relativistic wave mechanics. J. L. DESTOUCHES (J. Phys. Radium, 1937, [vii], 8, 251—256).—Mathematical. In applying the generalisation of the Lorentz transformation (e.g., A., 1936, 660) it is found that the superposition of forces is an essential condition of relativity. The interaction of two electrons cannot be treated in relativistic theory as a mechanical problem of two particles but requires wave-mechanical treatment. W. R. A.

First deviation of the ⁴He and ¹₈O nuclei from the Hartree model. B. O. GRÖNBLOM (Naturwiss., 1937, 25, 526).—Mathematical. A. J. M.

Calculation of binding energies in light nuclei. W. V. HOUSTON (Physical Rev., 1936, [ii], 49, 206; cf. A., 1936, 1175). L. S. T.

Interaction of nuclear particles. N. KEMMER (Nature, 1937, 140, 192-193).—Theoretical.

L. S. T.

Recent developments in the study of the [atomic] nucleus. S. A. KORFF (Bol. Soc. Quím. Peru, 1937, 3, 3-14).—A review. F. R. G.

Geometrical model of the atomic nucleus. W. WEFELMEIER (Naturwiss., 1937, 25, 525).— Theoretical. Possible geometrical arrangements of α -particles in the nuclei of various atoms are proposed and discussed. A. J. M.

Energy of nuclear reactions. E. GRASSMANN (Physikal. Z., 1937, 38, 674—675).—The relationship stated by Wilson (A., 1936, 266) that the energy set free in nuclear processes is an integral multiple of 3.85×10^5 e.v. has been tested with the data collected by Flügge *et al.* (this vol., 59) for 59 nuclear reactions of elements from Li to S. Only 5% of the reactions agree well with the relationship, and 17% give deviations of 0.41—0.5 from integers for the quotient of the energy liberated by 3.85×10^5 . It is concluded that the data do not support the relationship. A. J. M.

Electrical quadrupole moments of atomic nuclei. U. FANO (Naturwiss., 1937, 25, 602).— Theoretical. The α -particle model of the at. nucleus gives a reasonable explanation of the observed large positive quadrupole moments of nuclei. A. J. M. Bremsstrahlung. J. C. JAEGER (Nature, 1937, 140, 108–109).—Theoretical. The method previously used (A., 1936, 400) to calculate the crosssection for pair production by a beam of γ -rays has been extended to transitions of a Dirac electron between two states of positive energy in a Coulomb field. L. S. T.

Radiation field of the electron. F. BLOCH and A. NORDSIECK (Physical Rev., 1937, [ii], 52, 54— 59).—Mathematical. A method of overcoming defective results in the treatment of radiative corrections in non-stationary processes such as the scattering of an electron in an at. field or the emission of a β -ray is developed. The quantum mechanical calculation yields the directly reinterpreted results of the classical formulæ. N. M. B.

Low-frequency radiation of a scattered electron. A. NORDSIECK (Physical Rev., 1937, [ii], **52**, 59—62; cf. preceding abstract).—Mathematical. The radiative scattering of a non-relativistic electron is treated by an approx. method which neglects the reaction of the radiation field on the motion of the electron.

N. M. B. Polarisation effects and the Dirac electron. G. WANNIER (Arch. Sci. phys. nat., 1937, [v], 19, 111-118).—Mathematical. Perturbation effects are independent of electron spin, and, if exchange effects are neglected, the formation of an electron pair by an electron is independent of the spin of the latter.

N. M. B. Existence of heavy electrons. E. C. G. STUEC-KELBERG (Physical Rev., 1937, [ii], 52, 41-42).-Evidence for the existence of charged particles of mass 50 times that of the electron is examined mathematically. N. M. B.

Mass of the neutrino from the disintegrations of carbon by deuterons. T. W. BONNER, L. A. DELSASSO, W. A. FOWLER, and C. C. LAURITSEN (Physical Rev., 1936, [ii], 49, 203-204).—The disintegration energies found for the reactions ${}^{r}_{6}C +$ ${}^{*}_{1}H \rightarrow {}^{13}C + {}^{1}_{1}H$, ${}^{12}C + {}^{*}_{1}H \rightarrow {}^{13}_{7}N + {}^{1}_{0}n$, and ${}^{13}_{7}N \rightarrow$ ${}^{13}_{6}C_{6} + e^{+}$ + neutrino are $2 \cdot 65 \pm 0 \cdot 07$, $-0 \cdot 37 \pm 0 \cdot 03$, and $1 \cdot 45 \pm 0 \cdot 10$, respectively. Using $1 \cdot 00859 \pm 0 \cdot 00011$ as the mass of the neutron and O = 16, this gives $0 \cdot 00006 \pm 0 \cdot 00017$ for the mass of the neutrino.

Constitution of the photon considered as a dipole. J. MALFITANO (Compt. rend., 1937, 205, 220-222).—The photon is considered as an aggregate of a neutrino, a positron, and a negatron.

A. J. E. W. Quantisation of the field in the theory of the photon. L. DE BROGLIE (Compt. rend., 1937, 205, 345-349).—Mathematical. J. W. S.

Electronic charge e and the materialisation of the photon. S. A. DE MAYOLO (Compt. rend., 1937, 205, 360-362).—Mathematical. J. W. S.

Mathematical expression of charge distribution in a space lattice. V. JOHNSON (Physical Rev., 1936, [ii], 49, 412). L. S. T. Method of determining the ranges of charged corpuscles. G. A. ANSLOW (Physical Rev., 1936, [ii], 49, 480).—An equation is given. L. S. T.

Symmetrical theory of the electron and of the positron. E. MAJORANA (Nuovo Cim., 1937, 14, 171-184).—Theoretical. O. J. W.

Study of the matrix. Electric moment. M. COURTINES (Ann. Physique, 1937, [xi], 8, 5—145).— Mathematical. The matrix electric moment is developed, and the results are applied to the Stark effect with strong fields, the theorem of Niessen, and dielectric polarisation. A. J. M.

Magnetic and electric moment of the electron according to Dirac's theory. W. KOFINK (Ann. Physik, 1937, [v], 30, 91–98).—It is shown that the components of the density of the magnetic and electric moments of the electron can be calc. from the components of the density of the current and the mechanical spin-moment. O. D. S.

Physics of the ionosphere. H. R. MIMNO (Rev. Mod. Physics, 1937, 9, 1-43).—A comprehensive survey under the following main headings: historical and experimental basis and elementary theory; forces on, and equations of motion of, the electron; magneto-ionic double refraction; collisional friction; analysis by conformal representation; "fine structure" of the ionosphere; stratification and tidal effects; sunspots, the aurora, magnetic storms, meteors, and barometric effects; scattering and interaction of radio waves, and eclipse observations. N. M. B.

Specific oscillation of a Fermi gas and application of Bloch's retardation formula for fast particles. H. JENSEN (Z. Physik, 1937, **106**, 620-632).—Theoretical. A. E. M.

Characteristic symbols in light absorption. A. THIEL (Z. Elektrochem., 1937, 43, 696-697).--Suggestions are made for standard nomenclature and symbols. J. W. S.

Sharp absorption lines for use as a comparison spectra in stellar photography. F. H. SPEDDING (Physical Rev., 1937, [ii], 52, 137-138).— The absorption spectra of solid $Eu_2(SO_4)_3, 8H_2O$ and of Eu_2O_3 suspended and dissolved in B_2O_3 glass were photographed and gave sharp lines even at room temp. The simple well-placed multiplets 4600, 5200, and 5700 A. are well suited for measuring Doppler shifts of other lines, and are theoretically preferable to those of Nd. N. M. B.

Ultra-violet emission spectrum of the slow thermal dissociation of silver azide. R. AUDU-BERT (Compt. rend., 1937, 205, 133-135; cf. this vol., 164, 370).—The spectrum obtained with a quartz prism monochromator was explored with a CuI photon counter in the λ range 1950—2600 A. Narrow bands at approx. 2150, 2300, and 2400 A. were observed. These $\lambda\lambda$ correspond with possible electronic transitions of N₂. A. J. E. W.

Radical OH in hydrogen flames at low pressures. V. KONDRATEEV and M. ZISKIN (Acta Physicochim. U.R.S.S., 1937, 6, 307-319).—From absorption spectra the presence of OH radicals, at a concn. approx. 1000 times the equilibrium concn., has been established in the combustion zone of H_2 burning in O_2 at 470—550° and at 3—25 mm. Hg. The absorption coeffs. of the individual rotation lines lead to calc, vals. for the temp. of the flames approx. equal to vals. obtained with a thermocouple. An important role in the combustion mechanism of H_2 is ascribed to the OH radicals. C. R. H.

Band spectrum of chromium hydride, CrH. A. G. GAYDON and R. W. B. PEARSE (Nature, 1937, 140, 110).—A band observed in the region 3600— 3700 A. when a high-tension arc is run between Cr electrodes in a flame of H₂ burning in air is attributed to CrH. L. S. T.

Molecular spectra of zinc hydride and deuteride. Y. FUJIOKA and Y. TANAKA (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, **32**, 143—156).—The ${}^{2}\Pi \rightarrow {}^{2}\Sigma$ bands of ZnH and ZnD in the violet have been photographed. Twelve branches of $0 \rightarrow 0$ bands are analysed and the consts. of the ${}^{2}\Sigma$ and ${}^{2}\Pi$ states are calc. for both spectra. A. J. M.

Fine structure of the 5998.9 band of nitric oxide. C. JAUSSERAN, L. GRILLET, and M. DUF-FIEUX (Compt. rend., 1937, 205, 39-41).—The structure of the band has been examined with improved apparatus. The fine structure precludes any connexion with the known 2Σ states for the neutral NO mol., but the existence of triplets suggests that the band is due to the ionised NO mol. C. R. H.

Absorption spectrum of bivalent samarium. F. D. S. BUTEMENT and H. TERREY (J.C.S., 1937, 1112—1113).—The absorption spectrum of aq. SmCl₂ consists of bands with max. at 5593 and 4731 A., and a region of overlapping bands extending from about 4500 A. into the ultra-violet. The spectrum, which fades rapidly owing to the reaction 3SmCl₂ + 3H₂O \Rightarrow 2SmCl₃ + Sm(OH)₃ + 3H, resembles that of Eu^{***} as was anticipated theoretically, but the bands are broader than is usual for rare earths, J. G. A. G.

Absorption spectra evidence of the decomposition of the ground term of Nd⁺⁺⁺ ion due to crystalline fields. (A) D. M. BOSE. (B) W. G. PENNY and G. J. KYNCH (Nature, 1937, 140, 109, 109—110).—(A) Results obtained [P. C. MUKHERJI] on the absorption spectra of crystals of NdCl₃,6H₂O are discussed. They agree with the predictions of Penney and Schlapp's theory (A., 1932, 985), and appear to afford an optical verification of the splitting up of a term in a cryst. field as calc. from purely magnetic data.

(B) Spedding's conclusions (this vol., 216) are critically discussed. L. S. T.

Structure of the bands in the fluorescence spectrum of the aqueous solutions of terbium salts. N. KREMENEVSKI, J. LARIONOV, and A. SEIDEL (Acta Physicochim. U.R.S.S., 1937, 6, 481— 486; cf. A., 1936, 778).—The fluorescence spectrum of aq. TbBr₃ is much weaker than that of aq. Tb₂(SO₄)₃, Tb₂(SeO₄)₃, or TbCl₃, and decreases rapidly with rising temp., disappearing at 75°. This is due to absorption by Br', since the fluorescence is also destroyed by interposing in the light beam aq. KBr or HBr at >70°. The long- λ limit of continuous absorption of 0.05% aq. KBr is displaced from 2150 A. at 0° to 2265 A. at 97-99° (cf. A., 1929, 1363). The fluorescence bands of Tb" salts all show separate sharp max. at 6210, 5890, and 5440 A., which coincide for all salts. TbCl₃ and TbBr₃ also show a third max. in the yellow band, attributable to the presence of a complex. It is inferred that surrounding ions produce an influence on the excited ions. J. W. S.

Third absorption bands of co-ordination compounds. IV. [Co dg₂' pyCl], [Co(NH_3)₂(NO_2)₂ox] NH_4 ,H₂O, and [Co ox₃] K_3 ,3·5H₂O. S. KASHIMOTO and M. KOBA-

YASHI (Bull. Chem. Soc. Japan, 1937, 12, 350-352; cf. this vol., 216).-Extinction coeffs. of aq. solutions of $[Co dg'_{2}, C_{5}H_{5}N, Cl], [Co(NH_{3})_{2}(NO_{2})_{2}C_{2}O_{4}]NH_{4}, H_{2}O,$ and $[Co(C_2O_4)_3]K_3,3.5H_2O$ (dg' = dimethylglyoxime radical) have been determined. In each case a third absorption band was found at $v = 120 \times 10^{13}$, showing that a chelate bivalent radical, e.g., C₂O₄, can also give rise to the third absorption band when coupled with a negative radical co-ordinated in the trans position. J. G. A. G.

Scheme of dissociation of the CN molecule. R. SCHMID, L. GERÖ, and J. ZEMPLÉN (Naturwiss., 1937, 25, 558).—A method for obtaining the dissociation scheme for CN is outlined. A. J. M.

Ultra-violet absorption spectrum of carbon disulphide vapour. J. F. NIELSEN, F. W. CRAW. FORD, and L. D. HUFF (Physical Rev., 1936, [ii], 49, 413).-Many bands between 2300 and 1900 A. have been measured and those between 3800 and 2900 A. re-measured. The variation of the intensities with temp. has been studied for both band systems by Clements' method. L. S. T.

Fluorescence of acetone vapour. R. PADMA-NABHAN (Proc. Indian Acad. Sci., 1937, 5, A, 594).-Bands previously reported as structureless (A., 1934, 1184) consist of diffuse bands superposed on a continuous spectrum; approx. $\lambda\lambda$ of these bands are given. A similar fine structure was observed with COMeEt. A. J. E. W.

Ultra-violet absorption spectrum of benzene. G. B. KISTIAKOWSKY and A. K. SOLOMON (J. Chem. Physics, 1937, 5, 609-616).-The ultra-violet absorption spectra of C_6H_6 and C_6D_6 have been examined at temp. between -15° and 220°. Two fundamental frequencies of the normal state are deduced from the Boltzmann distribution function. One of these is the Raman frequency 404 cm.⁻¹ and the other is approx. 605 cm.-1 The significance of these frequencies in interpreting the spectrum of C₆H₆ is discussed.

W. R. A.

Influence of substituents on the ultra-violet absorption of benzene chromophores conjugated with other chromophores. M. PESTEMER (Z. Elektrochem., 1937, 43, 691).-Cf. A., 1936, 1318; this vol., 280. J. W. S.

Absorption spectra of pyrrole and its derivatives. IX. Absorption spectra of acetyl derivatives. G. V. KORSCHUN and K. V. ROLL (Trav. Inst. Chim. Charkov, 1935, 1, 9-18).-Introduction of Ac groups into 2:4-dimethylpyrrole causes a shift of the absorption curves towards the red end of the

spectrum, and of max. absorption in the direction of thinner layers. The effect is more marked with 3than with 5-Ac derivatives, and is not significantly intensified by introducing a second Ac, but is weakened in presence of CO_2Et at 3 or 5. The curves in EtOH and EtOH-NaOH are practically identical. R. T.

Reversible polymerisation as a cause of new types of absorption bands. III. G. SCHEIBE, A. MAREIS, and H. ECKER (Naturwiss., 1937, 25, 474-475; cf. this vol., 165).—Previous work on the absorption spectra of aq. solutions of pinacyanol chloride (I) is reviewed and extended. The distribution of (I)between C_5H_{11} ·OH- C_6H_6 mixtures and H_2O shows that for higher conces. (I) has the same mean mol. wt. in both solvents. In C₅H₁₁·OH-C₆H₆ there is no great change in the absorption spectrum over the concn. range $6.8 \times 10^{-7} - 8.7 \times 10^{-5}$, contrary to the behaviour in H₂O, although polymerisation occurs. Hence there are optically "active" and "inactive" types of polymerisation. If a quinoline group in ψ -isocyanine chloride is replaced by the benzthiazole or benzselenazole group, the dyes produced have, at higher concns. a new, wider absorption band, and show gelatinisation. If ψ -isocyanine chloride is mixed with one of these dyes, there is not simple superposition of the absorption spectra, but a new band is produced, depending in position and width on the proportions of the substances mixed. H₂O is necessary for the production of the band. A. J. M.

Absorption spectra of compounds related to sterols. T. R. HOGNESS, A. E. SIDWELL, jun., and F. P. ZSCHEILE, jun. (J. Biol. Chem., 1937, 120, 239-256).—Absorption spectra of the following have been determined in EtOH: phenanthrene, phenanthraquinone, 7-dehydrocholesterol, theelin, androsterone, Δ^4 -androstene-3: 17-dione, cholestenone, cortical compound E (A., 1936, 1117), ergosterol, and o-, m-, and *p*-cresol. The last four compounds were examined also in *iso*octane. There is strong similarity between the curves for theelin, œstradiol, theelol, and p-cresol. p-Cresol was isolated from several urine concentrates. Compound E probably contains an $\alpha\beta$ unsaturated ketone grouping. J. N. A.

Absorption spectroscopy in the ultra-violet. I. Absorption spectra of proteins, carbohydrates, and fats, including their constituents and decomposition products. F. ELLINGER (Separate, Den Haag, 1937, 53 pp.).—Absorption spectra of 188 compounds are graphically represented. C. R. H.

Absorption spectra of visual purple and of indicator-yellow.—See A., III, 340.

Raster type of reflexion grating. K. H. HELL-WEGE (Z. Physik, 1937, 106, 588-596).-Formulæ are developed which can be applied to a reflexion grating with grooves of rectangular cross-section. An example shows that such a grating with grooves of suitable depth and spacing can be used in the far infrared, since at 35 µ it is four times as effective as a wire grating with similar consts. A. E. M.

Spectrum and molecular structure of carbon suboxide, and evidence for hybrid links. H. W. THOMPSON and J. W. LINNETT (J.C.S., 1937, 1291-1295).-Vals. of the force consts. of the linkings

in the C_3O_2 mol. calc. from the vibration frequencies (this vol., 62, 110) lie between those of double and triple linkings (cf. A., 1933, 1222). J. G. A. G.

Infra-red absorption spectrum of carbon suboxide. R. C. LORD, jun., and N. WRIGHT (J. Chem. Physics, 1937, 5, 642—649).—The infra-red spectrum of C_3O_2 has been examined between 2 and 25μ . The non-appearance of Raman-active fundamental frequencies in the absorption curve supports the view that C_3O_2 has a centre of symmetry. On this basis the allowed binary and ternary combination tones are discussed, particularly those affecting the two infra-red-active degenerate frequencies. One of these is approx. 200 cm.⁻¹ and outside the range of experimental determination; the other cannot be fixed with certainty, but is most probably 550 cm.⁻¹ An interpretation of observed bands is given.

W. R. A.

Spectroscopic studies of the hydrogen bond. I. A photometric investigation of the association equilibrium in the vapour of acetic acid. R. M. BADGER and S. H. BAUER (J. Chem. Physics, 1937, 5, 605-608).-By photometric measurement of the narrow OH band at 9750 A. the association equilibrium of AcOH vapour has been studied. This band is characteristic of single mols. The agreement between the results and those of v.p. measurements is good. This indicates that association is predominantly due to H bond formation and that two H bonds are formed. In the vapour state an OH band characteristic of double mols. could not be detected under the experimental conditions, but in the liquid state and in CCl₄ solution an OH band at 10,100 A. was observed. The spectroscopic criterion of the presence of H bonds should be the shift and modification of the OH band rather than its disappearance. W. R. A.

Complexity of absorption bands in the infrared for OH. P. BARCHEWITZ and R. FREYMANN (Compt. rend., 1937, 204, 1729–1732; cf. this vol., 344).—The 3600 cm.⁻¹ band of org. compounds is shown to be split into two under the influence of α -Cl, -Br, -I, and of C:C, or CO in an added mol. (e.g., BuOH + COMe₂), due probably to the effect on the free rotation of the OH. The displacement of the band is related to the electrical moment of the substituent. R. S. B.

Near infra-red absorption band of liquid water at 1.79 μ . J. R. Collins (Physical Rev., 1937, [ii], 52, 88–90; cf. Ellis, A., 1931, 1211).— The existence of the band is confirmed. No apparent changes in the band were detected in the temp. range 4—137°. N. M. B.

Infra-red absorption spectra of liquid and solid water and water in solution. G. BOSSCHIE-TER and J. ERRERA (Compt. rend., 1937, 204, 1719— 1721).—The absorption spectrum of approx. 0.01% H_2O in CS₂ shows a band at 3640 cm.⁻¹, which becomes 3550 and 3720 cm.⁻¹ in CCl₄, corresponding with the valency vibrations of a single mol. The doubling in CCl₄ is due to rotation, which is favoured by the approx. spherical mols. of CCl₄. In liquid and solid H_2O bands occur owing to H links in which each O is surrounded by 4 H (cf. Bernal and Fowler, A., 1934, 13). R. S. B.

Intramolecular linkings of water studied in the infra-red at 3 μ . G. BOSSCHIETER and J. ERRERA (J. Phys. Radium, 1937, [vii], 8, 229–232; cf. A., 1935, 564).—By determining the spectrum of H₂O near 3 μ in different states, at different temp., and at various concess. in different solvents two bands can be distinguished. One (3500–3700 cm.⁻¹) is due to single mols. and alters in position according to the nature of the solvent; the other at about 3300 cm.⁻¹ is multimol. in origin and due to H bonds.

W. R. A.

Far infra-red spectrum of water vapour. H. M. RANDALL, D. M. DENNISON, N. GINSBURG, and L. R. WEBER (Physical Rev., 1937, [ii], 52, 160— 174).—Full data, measured at high dispersion, for 18—75 μ are tabulated. Identifications, analyses, and energy levels of the mol. up to and including the group of J = 11 accurate to 0.1 cm.⁻¹ are given and checked by combination relations and the formation of analytic series from analogous lines. All allowed transitions with their intensities are calc. and plotted above the observed spectrum. Improvements in the long-wave spectrometer are described. N. M. B.

Hindrance of inner rotation in ethane. E. BARTHOLOME and J. KARWEIL (Naturwiss., 1937, 25, 476).—A re-examination of the fundamental frequencies of C_2H_6 in the infra-red and Raman spectra and calculation of the sp. heat gives 420 g.-cal. for the height of the potential barrier which must be exceeded for free inner rotation of the Me groups in C_2H_6 .

A. J. M.

Infra-red spectrum and molecular structure of diketopiperazine and tetramethyldiketopiperazine. L. KELLNER (Nature, 1937, 140, 193).— Absorption bands in the region $2 \cdot 8$ — $3 \cdot 6 \mu$ and their assignments to vibrations of mol. groups are recorded. The similarity of the spectra of the two compounds confirms the view that in the cryst. state diketopiperazine occurs in the keto-form free from admixture with the enol form. The possibility that a certain amount of each substance exists in the lactim form is not excluded. L. S. T.

Infra-red absorption of cyanides, thiocyanates, and their isomerides. D. WILLIAMS (Physical Rev., 1936, [ii], 49, 197).—Several org. cyanides and aq. solutions of inorg. cyanides show a characteristic band in the region $4\cdot38-4\cdot90 \mu$. This absorption is attributed to changes in the vibrational energy of the bound CN group. In org. cyanides and thiocyanates and their isomerides bands characteristic of NC are of greater intensity and appear at longer $\lambda\lambda$ than the corresponding CN bands. L. S. T.

Infra-red absorption spectrum of vitamin-C. D. WILLIAMS and L. H. ROGERS (J. Amer. Chem. Soc., 1937, 59, 1422—1423).—Investigation of the region 2—8 μ in aq. solution has revealed the existence of the 6 absorption bands which are to be expected from considerations of the mol. structure, and 2 other bands which may arise from the lactone linking. E. S. H.

п (а)

Chemical application of the Raman effect. J. H. HIBBEN (J. Washington Acad. Sci., 1937, 27, 269—299).—Presidential address. An outline of the interpretation, development, and application of Raman spectra, and an analysis of the data on which such interpretations and applications are predicted. N. M. B.

Degree of depolarisation of light scattered under different conditions. R. GANS (Physikal. Z., 1937, 38, 625-626).—The Krishnan equation for degree of depolarisation of scattered light is considered inaccurate. The observations of Krishnan agreed with his equation but it is pointed out that the error involved in such determinations is considerable.

Low and high Raman frequencies for water. I. R. RAO and P. KOTESWARAM (J. Chem. Physics, 1937, 5, 677).—Various Raman lines recorded by Magat (A., 1936, 1179) and Hibben (this vol., 218) as excited by 2537 A. Hg line are actually the 3200— 3600 cm.⁻¹ band excited by other Hg lines. A line 1659 cm.⁻¹ previously reported as doubtful is now shown to be genuine. W. R. A.

Scattering of light by water. L. H. DAWSON and E. O. HULBURT (J. Opt. Soc. Amer., 1937, 27, 199-201).—Using a quartz spectrograph and recording densitometer, measurements of the relative intensities of light scattered by pure H_2O for the range 5790-2536 A. were made. The scattering coeff. increased with decreasing λ in fair agreement with the λ^{-4} f(μ) expression of the density fluctuation theory. N. M. B.

O-H Raman frequency in inorganic acids. C. S. VENKATESWARAN (Nature, 1937, 140, 151).— Raman frequencies, near 3000 A., of the OH band are recorded for 100% H₂SO₄, and crystals of HIO₃, H₂SeO₃, H₆TeO₆, and H₃BO₃. In these acids the OH frequency is represented by a weak, broad, and diffuse band, at a val. < that in KOH or in MeOH and EtOH. There is a progressive fall in the characteristic frequency shift and a diminished intensity of the band with an increase in strength of the acid. In the case of H₂SO₄, the band appears to be resolved into two components. The existence of the O-H linking in acids, although considerably weakened as compared with alkalis, must now be postulated.

L. S. T.

Raman spectrum of deuterium peroxide. F. FEHÉR (Z. Elektrochem., 1937, 43, 663-664).-- D_2O_2 can be prepared by the action of D_2O vapour on D_2SO_4 and $K_2S_2O_3$ at 70° and fractionated to 99.7% concn. The exchange reaction between D_2O_2 and H_2O_2 is very rapid, and an equimol. mixture yields 48 mol.-% of HDO₂. The Raman spectra of H_2O_2 and D_2O_2 both show a frequency of 877 cm⁻¹, attributable to the valency vibration between the O atoms. The frequencies 3395 and 1421 cm.⁻¹ in H_2O_2 change to 2510 and 1009 cm.⁻¹, respectively, in D_2O_2 . This reduction of $1/\sqrt{2}$ is in accord with theory. HDO₂ shows a combination of the D_2O_2 and H_2O_2 spectra. J. W. S. Molecular vibrations and Raman spectrum of deuterium compounds. O. REDLICH (Z. Elektrochem., 1937, 43, 661).—Recent work of the author and his co-workers is summarised. J. W. S.

Raman spectra of gaseous, liquid, and solid hydrogen sulphide. G. M. MURPHY and J. E. VANCE (J. Chem. Physics, 1937, 5, 667).—Employing as exciting radiation a helical Pyrex arc, H_2S gas at 2 atm. gives only one Raman line at 2615 cm.⁻¹ in agreement with previous observations. Liquid H_2S at -80° shows a single frequency of 2577 cm.⁻¹ as previously recorded. Only two lines (not four as reported by Sirkar and Gupta; A., 1936, 922) at 2550 and 2523 cm.⁻¹ could be detected for solid H_2S . Gaseous D_2S gives one frequency at 1885 cm.⁻¹ in tolerable agreement with infra-red data. W. R. A.

Raman effect with aqueous solutions of alkali chlorides. F. CENNAMO (Nuovo Cim., 1937, 14, 64-69).—The frequencies and intensities of the Raman bands in aq. solutions of the chlorides of Li, Na, K, Rb, and Ca have been measured. The bands are only slightly different from those of H₂O. In NaOH the bands are considerably modified.

O. J. W.

Raman effect and dipole moment in relation to free rotation. IX. Rotation around the S-S bond. Y. MORINO and S. MIZUSHIMA (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 32, 220-227).--The Raman spectrum of S₂Cl₂ has been examined. There is no difference in intensity between the Raman spectrum of S₂Cl₂ and its solution in C₆H₁₄, which suggests that, if the constitutional formula is Cl·S·S·Cl, there is no oscillatory rotation about the transposition, such as has been observed with (CH₂Cl)₂. Considerations of dipole moment do not allow the rigid trans-structure, and electrostatic interaction prevents completely free rotation. There must be a stable configuration other than the trans-structure, and for this it is necessary to assume the existence of an intramol. force more powerful than the electrostatic or steric repulsion. This force can be produced by interaction of the electronic clouds of the S atoms. The normal modes of vibration of such a mol. with an azimuthal angle of 90° are considered, and the force consts. are calc. A. J. M. TTT: OUT

Raman spectra of the two molecular forms of phosphorus pentachloride. H. MOUREU, M. MAGAT, and G. WETROFF (Compt. rend., 1937, 205, 276—278).—The Raman spectra of liquid and solid PCl_5 are different, and at the m.p. the two spectra are superposed. In the liquid PCl_5 has the trigonal bipyramidal structure; in the solid it is $(PCl_4)Cl$ in which four Cl are arranged tetrahedrally, the fifth being more loosely (perhaps electrovalently) bound.

F. J. G. Raman spectrum of anhydrous perchloric acid. A. SIMON and H. REUTHER (Naturwiss., 1937, 25, 477).—The Raman spectrum of 99.8% HClO₄ consists of 5 lines and 2 bands. The HClO₄ mol. is pyramidal with the Cl at the centre of gravity, the 3 O at the base, and an OH at the apex. The pyramid has an axis of three-fold symmetry and a plane of symmetry. HClO₄ is a pseudo-acid changing into the aci-form on dilution. A. J. M.

A. J. M.

Raman spectra of low frequencies and intermolecular forces. E. GROSS and E. KOMAROV (Acta Physicochim. U.R.S.S., 1937, **6**, 637–638; cf. A., 1936, 547; this vol., 283).—The Raman spectrum of CS₂ at about 0.5 atm. shows no trace of the strong 70 cm.⁻¹ frequency observed in the solid, although the less intense 655 cm.⁻¹ line is distinct. This is interpreted as proving that the low-frequency Raman spectrum is due to intermol. forces. J. W. S.

Raman effect. LXXI. cycloPropanecarboxylic and acrylic acids and derivatives. K. W. F. KOHLRAUSCH and R. SKRABAL (Monatsh., 1937, 70, 377-397; cf. this vol., 220).—Data are recorded for cyclopropanecarboxylic acid and acrylic acid and their Me, Et, Pr^a, Pr^b, and Bu^{γ} esters and chlorides, for the Bu^{γ} esters of AcOH and Pr^aCO₂H, and for the Pr^a, Pr^b, and Bu^{γ} esters of Pr^bCO₂H. Constitutive influences in these spectra are discussed. H. J. E.

Raman effect. LXXII. Nitrogen compounds. IV. Nitriles. A. W. REITZ and R. SKRABAL (Monatsh., 1937, 70, 398-404).—Data are recorded for cyanocyclo-propane, -butane, and -pentane, and for aceto-, propio-, *iso*butyro-, acrylo-, and *n*- and *iso*-valero-nitrile. The variation of the C=Nfrequency is discussed. H. J. E.

Raman spectrum of some ketones. Influence of cyclisation. (MLLE.) D. BIQUARD (Compt. rend., 1937, 204, 1721—1723).—The Raman spectra of COMePr, COEt₂, cyclopentanone, COMeBu, COEtPr, cyclohexanone, COMe C_5H_{11} , COEtBu, COPr₂, suberone, COPhEt, indanone, COPhPr, tetralone, COPhBu, and benzosuberone have been determined. The frequency ~ 1680 to 1700 cm.⁻¹ corresponding with CO increases on passing from a chain to a compound with a 5-membered ring, but decreases when the ring contains 6 or 7 atoms. The frequency decreases with cyclic compounds on increasing the no. of atoms in the ring from 5 to 7. R. S. B.

Raman effect. LXXIII. Derivatives of the three- and four-ring. R. SKRABAL (Monatsh., 1937, 70, 420—424).—Raman spectrum data are recorded for Et_2 cyclopropane- and cyclobutane-1:1-dicarboxylate, Me cyclopropyl- and cyclobutyl-carbamate, aminocyclobutane and its N-Me₂ derivative and diazotisation products. From the Raman spectrum, the diazotised product contains approx. equal proportions of cyclopropylcarbinol and cyclobutanol.

H. J. E. Raman frequencies of dioxan. R. C. WILLIAM-SON (J. Chem. Physics, 1937, 5, 666).—Raman displacements are recorded. W. R. A.

Raman spectra of oxonium compounds. G. BRIEGLEB and W. LAUPPE (Nature, 1937, 140, 236-237).—Frequencies are recorded for the following systems, at temp. from -80° to -32° , with the H halide in excess: MeOH-HCl (or HBr), EtOH-HCl (or HBr), Me₂O-HCl (or HBr), and Et₂O-HCl (or HBr). The spectra of these solutions are characteristically different from those of the components, and show that the compounds do not exist in solution of excess of H halide as oxonium compounds, but as compounds, named "oxan," with O^{TV}. L. S. T. Intensity of the Raman continuum in alcoholbenzene mixtures. A. CARBELLI and F. CENNAMO (Nuovo Cim., 1937, 14, 217–221).—The Raman continuous spectrum obtained with $EtOH-C_6H_8$ mixtures in the neighbourhood of the 4046 A. exciting line is abnormal, due to the vibration frequencies of intermol. bonds. O. J. W.

Scattered radiation of mixed crystals. M. VUKS (Acta Physicochim. U.R.S.S., 1937, 6, 327-338).—Mixed crystals of p-C₆H₄Br₂ and p-C₆H₄Cl₂ were examined over a range of concess. For large frequencies the spectrum of each component is superposed on the other, but for smaller frequencies there is gradual transition from one component to the other. The crystals of p-C₆H₄Br₂ are isomorphous with the α -modification of p-C₆H₄Cl₂. It is impossible to obtain mixed crystals with the β -modification of p-C₆H₄Cl₂ if the concent of p-C₆H₄Br₂ is > 1%. C. R. S.

Polarisation of Raman lines of some organic compounds. B. K. CHAUDHURI (Indian J. Physics, 1937, 11, 203—211).—The depolarisation factors for lines in the Raman spectra of piperidine (I), $(CH_2 \cdot NH_2)_2$, NHEt₂, and NEt₃ have been determined. (I) has puckered ring structure; in $(CH_2 \cdot NH_2)_2$ there is no free rotation about the C–C axis, but the NH₂ rotate about the C–N bonds. F. J. L.

Physical identity of enantiomerides. IV. Raman spectra of d- and l-camphoric acids and -camphoric anhydrides. B. K. SINGH and B. MISRA (Proc. Indian Acad. Sci., 1937, 6, A, 90— 96).—Raman spectra of the d- and l-forms are identical. An intense line at 706 cm.⁻¹ in the acid, due to the C(C)₄ group, is shifted to 607 cm.⁻¹ in the anhydride. C. R. H.

Inhibition of fluorescence. K. S. G. Doss (Proc. Indian Acad. Sci., 1937, 6, A, 24-31).—The efficiency of various ions as inhibitors of the fluorescence of solutions of quinine sulphate and Na fluoresceinate, and the efficiency of quinine sulphate and "aniline-iodoeosin" as auto-inhibitors of fluorescence, have been calc. from recorded data. Whilst inhibition by ions such as Cl', Br', etc. can be interpreted on the basis of collisions of the second kind, the high efficiency of auto-inhibition can be explained only by assuming polymerisation of the fluorescent substances. C. R. H.

Band analysis of the scintillation spectra of zinc sulphide phosphors excited by α -rays. W. KUTZNER (Z. Physik, 1937, 106, 551-571).--Phosphors were prepared consisting of 5 g. of ZnS⁺+ 0.0005 g. of Cu (or other metal) +0.5 g. of alkali halide. Details of spectra from 22 such preps. are recorded. The no. of bands from each varied from 2 to 6 and fell in the range 4250-6350 A. A. E. M.

Contact potentials for metals immersed in a dielectric and conduction of electricity by liquid dielectrics. H. J. PLUMLEY (Physical Rev., 1937, [ii], 52, 140; cf. Baker, this vol., 437; Reiss, *ibid.*, 337).—The problem of the origin of the electrical conductivity of pure non-polar dielectric liquids involves the explanation of the field-independent current and of the current at higher field strengths. Experiments on the contact potential between Au and brass electrodes in *iso*octane are described which are entirely inconsistent with the Edler-Zeier and Baker-Boltz thermionic emission theory of high field current phenomena. N. M. B.

Photovoltaic effect with a highly insulating substance. G. NADJAKOV (Z. physikal. Chem., 1937, B, 36, 314—321).—When the composition of the light incident on a $S-H_2O$ interface is changed by a filter, a p.d. is established, electrons moving in a direction opposite to that of the incident light. The effect occurs within the S, not merely at the surface. The migration of charge in S seems to be facilitated by light. R. C.

External and internal photo-electric effects of non-conductors. G. NADJAKOV (Z. physikal. Chem., 1937, B, 36, 309–313).—An improvement in the classical method of observing the Hallwachs-Lenard effect is to coat the auxiliary electrode with paraffin, which eliminates its external photo-electric effect. Under these conditions only non-conductors having a photo-electric conductivity exhibit an apparent inverse effect. With Al, brass, shellac, resin, paraffin oil, and glycerol, the external photo-electric effect is ontirely unipolar. For S it is unipolar only for $\lambda\lambda < 265$ mµ. R. C.

Effect of light on thin metallic layers. Q. MAJORANA (Physikal. Z., 1937, 38, 663-667; cf. A., 1933, 114, 555).—The production of a pulsating electric current in thin foils intermittently illuminated has been further studied with Au foils, and Au films deposited by cathodic sputtering. There is qual. agreement with results calc. on the basis of heat theory, although this is insufficient to explain the smaller phase displacement with thicker foils, and the change in phase displacement with thin foils when different light sources are used. A. J. M.

Photo-conducting effect in thin metallic films. T. FUKUROI (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 32, 187—195).—The increase in electrical conductivity on exposure to ultra-violet light of films of Hg, Cd, and Zn deposited on cold (-180°) glass or quartz plates is max. for a definite thickness of film characteristic of each metal. The threshold λ is the same as that of the external photo-electric effect. It is suggested that the film is composed of isolated metallic granules, and that when exposed to ultra-violet light photo-electrons are emitted and move along the surface of the glass or quartz foundation under the potential gradient. A. J. M.

Nature of the barrier layer in the cuprous oxide photo-voltaic cell. II. J. W. BALLARD and E. HUTCHISSON (Physical Rev., 1936, [ii], 49, 411).---Sensitisation of the Cu₂O surface occurs on bombarding with positive ions, negative ions, or electrons; it has not been obtained by heating the disc as a whole. Positions of max. spectral responses and of limiting λ in the near infra-red are independent of the kind of gas used in bombardment. Electrical resistance and total response of a cell depend on the kind of gas, and the former apparently increases with time of bombardment. Max. sensitisation depends on an optimum time, but the position of max. spectral response is independent of the time of bombardment and probably of the kind of metallic film. L. S. T.

Carrier mobility spectra of spray electrified liquids. S. CHAPMAN (Physical Rev., 1937, [ii], 52, 184—190).—The mobility spectrum of distilled H_2O , and solutions of NaI, LiCl, KCl, AlCl₃, and MgSO₄ electrified by spraying and bubbling was investigated by means of an Erikson mobility apparatus under high resolving power. Current-mobility curves are given, and peaks and the variation of electrification with concn. are interpreted and discussed. The effects on the curves of age of the carriers and humidity of the air were examined. Results indicate that the peaks represent stable groupings and that all the carriers are singly charged. N. M. B.

Mechanism of current conduction in liquids of low dielectric constant. K. H. REISS (Ann. Physik, 1937, [v], 30, 34; cf. this vol., 169).—A correction. The application of Onsager's theory contains a calculation error. O. D. S.

Experiment about electric absorption. C. J. GORTER and F. BRONS (Physica, 1937, 4, 667– 668).—A const. electric field up to 5×10^4 volts per cm. had no effect on dielectric losses in dil. solutions of different polar substances in C₆H₆ and PhNO₂. H. J. E.

Dipole loss and molecular structure. E. KEUT-NER and G. POTAPENKO (Physikal. Z., 1937, 38, 635– 636).—Dispersion and absorption determinations with MeOH, EtOH, Pr^aOH, and Bu^aOH at λ 130— 18 cm. have been carried out. The relaxation times from absorption experiments are < those from dispersion, the ratio of the times being equal to the association factor of Debye and Ramm. The calc. mol. radii of the alcohols agree with those obtained from stereochemical data. The rotation of the OH group independently of the rest of the mol. is solely responsible for the dipole loss and dispersion in the above λ range. A. J. M.

Dipole moment and structure of dimethyltelluronium di-iodide. (A) H. C. YUAN. (B) C. H. YAO and C. E. SUN (J. Chinese Chem. Soc., 1937, 5, 219-222; cf. this vol., 169).—Polemical. R. C.

Possible explanation of some anomalous dipole moments. F. C. FRANK and L. E. SUTTON (Trans. Faraday Soc., 1937, 33, 1307—1316).—It is suggested that the apparent electric moment of non-polar mols. containing balanced polar groups may be due to a combination of local dipole fields and the field applied for measurement in producing local changes in solvent density. This effect will depend on the nature of the solvent and on the moments and no. of polar groups in the solute. The abs. val. for the polarisation of *p*-benzoquinone calc. from the theory is in accord with experiment. The theory is compared with that of Jenkins (A., 1936, 924, 1183) and Bauer (*ibid.*, 1065). J. W. S.

Dielectric properties of acetylenic compounds. VIII. Propiolyl chlorides and other acid chlorides. S. M. KOEHL and H. H. WENZKE (J. Amer. Chem. Soc., 1937, 59, 1418—1420; cf. this vol., 347). -Electric moments of acetyl, propionyl, butyryl, benzoyl, cinnamoyl, butylpropiolyl, and amylpropiolyl chlorides have been determined. Consideration of the data of dipole moments and chemical reactivity indicates the existence of resonance in these compounds. Three forms are assumed to contribute to the mol. The moments of the acid chlorides attached to unsaturated hydrocarbon residues are > those of the saturated acid chlorides, by reason of resonance of the COCl group with the unsaturated hydrocarbon residue. E. S. H.

Electric moments of some aliphatic dinitriles. P. TRUNEL (Compt. rend., 1937, 205, 236–238).– Vals. of the moment are given for the dinitriles $CN \cdot [CH_2]_n \cdot CN$, ranging from 3.55 for n = 3 to 4.47 for n = 10; they are discussed in relation to the shape of the mols., free rotation of the linkings, and the interaction between the CN groups. The interaction is a max. for n = 6. These nitriles exist as single mols. in C_6H_6 solution. A. J. E. W.

Dipole moment of a monosubstituted derivative of cyclopropane (*n*-propylcyclopropane). J. BÖESEKEN and H. V. TAKES (Rec. trav. chim., 1937, 56, 858-862).—n.*Propyl*cyclopropane, b.p. 68.5°, has a small dipole moment, 0.75×10^{-18} . F. L. U.

Moments of coumarin and its 3-phenyl derivative and of substituted γ -pyrones. C. G. LE FÈVRE and R. J. W. LE FÈVRE (J.C.S., 1937, 1088— 1090).—The following dipole moments have been determined : coumarin 4.4_8 D, 3-phenylcoumarin 4.3_0 , 2 : 6-dimethyl- γ -pyrone 4.6_5 , 3 : 5-diacetyl-2 : 6dimethyl- γ -pyrone 4.6_6 , 2 : 6-diphenyl-3 : 5-diacetyl-2 : 6dimethyl- γ -pyrone 1.8_0 , dehydracetic acid 2.8₃. The bearing of these results on the structures of the mols. is discussed. J. G. A. G.

Dipole moment of phenyl p-tolyl sulphide and covalency angle of sulphur. S. L. CHIEN and T. C. LAY (J. Chinese Chem. Soc., 1937, 5, 204—213; cf. A., 1934, 131).—The dipole moment is 1.75 D. It is calc. that the covalency angle of S in Ph₂S is 115—116.5°. Equations for calculating covalency angles of O and S, allowing for interaction moments, have been derived. R. C.

Electrical saturation in dilute solutions of nitrobenzene. A. PIEKARA (Physikal. Z., 1937, 38, 671-674).—The decrease $(\Delta\epsilon)$ in dielectric const. of solutions of PhNO₂ in C₆H₆, CCl₄, and C₆H₁₄, respectively, when placed in an electric field (strength E) has been determined. There is an approx. linear relationship between $\Delta\epsilon$ and E^2 . The mutual coupling of PhNO₂ mols. decreases very rapidly with decreasing concn. The coupling between PhNO₂ mols. and mols. of solvent varies considerably for different solvents, being weakest with C₆H₁₄, and strongest with C₆H₆. The deformation moment of PhNO₂ is due to a displacement of the two O atoms attached to N. In a field of 100 ky. per cm. the O atoms are displaced to the extent of 0.001 A. A. J. M.

Molecular rotation in crystalline disubstituted ethanes. A. H. WHITE and S. O. MORGAN (J. Chem. Physics, 1937, 5, 655-665).—Dielectric consts. and conductivities of solid and liquid $(CH_2Cl)_2$, $(CH_2Br)_2$, $(CH_2 \cdot CN)_2$, $(CH_2 \cdot NH_2)_2$, and $(CH_2 \cdot CNS)_2$ over a wide LL (A., I.) range of temp. have been measured. Thermal measurements show new transitions in $(CH_2 \cdot CN)_2$ at -38° to -46° and in $(CH_2Br)_2$ at -23° to -25° . $(CH_2 \cdot CN)_2$ rotates about all three axes of the crystal between transition and m.p. Internal rotational motion in the various mols. is discussed. W. R. A.

Rotation of some long[-chain] molecules in the solid state. C. P. SMYTH and W. O. BAKER (J. Chem. Physics, 1937, 5, 666).—The dielectric consts. of long-chain mols. in the solid and liquid states have been investigated. Et undecoate does not appear to possess general rotational freedom since the dielectric const. drops sharply on solidification and then decreases uniformly and slowly with falling temp. The temp. variations of the dielectric consts. of Et palmitate (α and β), Et stearate, and cetyl alcohol are reported and discussed. W. R. A.

Refractive indices of liquid oxygen, nitrogen, and hydrogen. H. E. JOHNS and J. O. WILHELM (Canad. J. Res., 1937, 15, A, 101–108).—Vals. of nfor λ 6939, 5461, and 4358 A. have been obtained at temp. ranging from the f.p. to the b.p. The vals. at the b.p. for λ 5461 A. are O₂ 1.2242, N₂ 1.1990, H₂ 1.1120. C. R. H.

Birefringence of quartz in the far ultra-violet and the Schumann region. R. SERVANT (Compt. rend., 1937, 205, 230–231).—Measurements at $\lambda\lambda$ between 2300 and 1450 A. are recorded. The birefringence increases rapidly at low $\lambda\lambda$, for which the Coode-Adams formula does not apply. A. J. E. W.

Optical rotatory power of turbid solutions in an electric field. (A) J. KUNZ and R. G. LABAW. (B) E. B. LUDLAM, A. W. PRYDE, and H. G. BULE (Nature, 1937, 140, 194).—(A) The rotation previously described (A., 1936, 1447) is due to suspended material.

(B) Careful filtration removes the optical activity. The effect is due to dichroism induced in the particles by the electric field. L. S. T.

Genealogy of phosphorus and its compounds. T. MIŁOBĘDZKI (Rocz. Chem., 1937, 17, 239—253).—A lecture. R. T.

Structurally equivalent units and the classification of normal and abnormal liquids. R. H. EWELL (J. Amer. Chem. Soc., 1937, 59, 1575—1576).— Liquids are classified as (1) abnormal (compounds which form H linkings, e.g., H₂O, NH₃, alcohols, org. acids, HF, etc.), (2) intermediate (compounds containing C.O, C:N, or N:O groups, e.g., ketones, esters, nitriles, NO₂-derivatives, etc.), and (3) normal (all others except molten metals and salts, e.g., hydrocarbons, ethers, SO₂, PCl₅, CS₂, HCl, CO₂, etc.). Consideration of a no. of aliphatic org. liquids leads to the conclusions that the CH₂ group is structurally equiv. to ether O and the CH group to *tert*. N. The structural equivalence does not appear to hold for aromatic compounds. E. S. H.

Optical dissociation of polyatomic molecules in vapours. B. VAN MANEN (Chem. Weekblad, 1937, 34, 549-555).—A review. S. C.

Shape of phase boundaries in liquids. N. F. LASCHKO (Trav. Inst. Chim. Charkov, 1936, 2, 101104).—A generalised form of Thomson's formula is derived. R. T.

Theory of the expanded film. K. ARIYAMA (Bull. Chem. Soc. Japan, 1937, 12, 335–337).—The sudden appearance of the expanded state (cf. A., 1934, 140) is interpreted as the two-dimensional analogue of the sharp transition between the "ferromagnetic" and "paramagnetic" states of an ensemble of mols. with permanent electric moment, μ . The theory is supported by existing data for myristic acid, and leads to the val. $\mu = 2.5 \times 10^{-18}$ e.s.u. J. G. A. G.

Energy exchange between a gas and a solid surface. J. M. JACKSON and H. TYSON (Mem. Manchester Phil. Soc., 1937, 81, 87—102).—Theoretical. The exchange energy between a gas and a solid surface is examined for Ne and W using London's perturbation theory instead of the Born collision theory. The results show that the contribution to the accommodation coeff. from transitions between free states of gas atoms is very small. The energy exchange is mainly carried on by atoms of low kinetic energy by means of transitions between the adsorbed levels and the continuum of free energy states.

A. J. M. Size of pores and interior volume of amorphous and crystalline substances. G. GBAUE and N. RIEHL (Z. anorg. Chem., 1937, 233, 365—375). —A detailed account of work already noted (this vol., 405). F. J. G.

Intensity of orbital interaction in crystals. R. FORRER (J. Phys. Radium, 1937, [vii], 8, 241–250). —On the hypothesis of the electronic orbital system the linking which fixes an atom with respect to its neighbours is termed the contact orbital and its intensity $T = F/\sqrt{N}$, where T is temp. of fusion and N is the no. of contacts. A systematic study of F as a function of Z (at. no.) has been made. F depends on a "factor of origin" and the no. of uncoupled spin electrons. "Factors of origin" for elements are identical with factors for ions of singly ionised solid salts and both factors depend only on the principal quantum no. W. R. A.

Influence of a double linking on the firmness of nearby single linkings. T. FÖRSTER (Z. Elektrochem., 1937, 43, 667—668).—The rule that the presence of a double linking weakens the single linking next but one to it can be deduced from the modern quantum-mechanical theory of valency. J. W. S.

Quantitative discussion of linking orbitals. L. PAULING and J. SHEBMAN (J. Amer. Chem. Soc., 1937, 59, 1450—1456).—Theoretical energy curves for one-electron linkings between two atoms are calc. for linking orbitals formed by hybridisation of 2s and 2p orbitals, 3s and 3p orbitals, and 3s, 3p, and 3d orbitals, the same radial part being used for the orbitals in a set. For s-p hybridisation the linking energy is closely proportional to S^2 , with S the magnitude of the angular part of the linking orbital in the linking direction. The energy of a normal covalent linking A-B between unlike atoms is probably represented more closely by the geometric than by the arithmetic mean of the linking energies for A-A and B-B. The energy of the one-electron linking in the Li mol.-ion, calc. by consideration of the s-p separation, is 1.19 e.v. The hybrid linking orbital involves approx. equal contributions from the 2s and 2p orbitals of the Li atom. E. S. H.

Carbon-halogen distance in the methyl halides. G. B. B. M. SUTHERLAND (Nature, 1937, 140, 239-240).—The distances between C and halogen atoms in the Me halides now recalc. from spectroscopic data are < the vals. previously accepted and those obtained by electron diffraction. Comparison with the corresponding distances in the C tetrahalides and of the force consts. for the C-halogen linking in the two cases supports the revised vals. L. S. T.

Force constants and molecular structure. II. Ethylene. III. Molecules containing C:O and C:C linkings. H. W. THOMPSON and J. W. LINNETT. IV. Ethylene and tetrachloroethylene. J. W. LINNETT and H. W. THOMPSON. V. Relation between force constant and bond length. H. W. THOMPSON and J. W. LINNETT. VI. Compounds containing the cyanide link. J. W. LIN-NETT and H. W. THOMPSON (J.C.S., 1937, 1376–1384, 1384–1393, 1393–1396, 1396–1399, 1399–1403; cf. this vol., 494).—An investigation of the force consts. of polyat. mols. and their correlation with mol. structure.

II. A potential function for the C_2H_4 mol. is deduced, taking into account both parallel and perpendicular vibrations (cf. Sutherland and Dennison, A., 1935, 569) and force consts. are calc. The form of the vibrations is discussed. The vibration frequencies of C_2D_4 are estimated and differ from those calc. by Manneback and Verleysen (A., 1936, 1324).

III. Potential functions are obtained for C_2H_4 , allene, keten, and CH_2O . Force consts. are deduced and compared with those of C_2H_4 (see above), CO_2 , C_3O_2 , CO, and C_2H_2 (cf. Part I, *loc. cit.*). Vals. for corresponding linkings are, in general, in agreement. Differences can be interpreted as due to the existence of resonance hybrids, C_3O_2 and CO_2 , or to electron drifts in the mol. due to the attraction of the CO group for electrons. The forms of the mol. vibrations are discussed.

IV (cf. this vol., 224). The C-C bond const. in C_2Cl_4 is < in C_2H_4 . It is suggested that the mol. of C_2Cl_4 is a hybrid structure. V. The relation between force const. and bond

V. The relation between force const. and bond length of the C·O, C·C, and C·H linkings in the compounds investigated is in fair agreement with the relationships of Badger (A., 1936, 14) and Clark (this vol., 66).

VI. The force consts. of CN, the CN⁻ ion, HCN, DCN, C_2N_2 , CNCl, CNBr, CNI, the CNS⁻ ion, Hg(CN)₂, and the Ag(CN)₂⁻ ion are discussed. The val. of the force const. of the C:N linking in C_2N_2 is < the normal val.; it is suggested that the compound has a mesomeric structure. Similar low vals. are obtained for CNCl, CNBr, and CNI, and for the CNS⁻ ion, which, it is suggested, may have bonds of 1½ or 24 units. The val. of the C·H bond const. in HCN is high (cf. Part V). The variation of the force const. with bond length is compared with the theories of Badger and Clark (*loc. cit.*). O. D. S.

(e) II (g)

Application of a new mathematical method to vibration-rotation interaction. (MISS) J. E. ROSENTHAL and L. MOTZ (Proc. Nat. Acad. Sci., 1937, 23, 259-265). N. M. B.

Vibration-rotation energy levels of polyatomic molecules. III. Effect of centrifugal distortion. E. B. WILSON, jun. (J. Chem. Physics, 1937, 5, 617-620).—Mathematical. An approx. quantummechanical treatment is used to calculate the effect of centrifugal distortion on the individual rotational energy levels of semi-rigid asymmetrical rotator mols. Assuming that the vibration functions are harmonic oscillator functions, the numerical coeffs. in this treatment are the same as those obtained by classical treatment. W. R. A.

Elements of the factored secular equation for the semi-rigid water-type rotator, with application to the hydrogen sulphide band at 10,100 A. B. L. CRAWFORD, jun., and P. C. CROSS (J. Chem. Physics, 1937, 5, 621—625; cf. preceding abstract).— Numerical vals. of the coeffs. of the mol. consts. in the secular equation of Wilson are given and a procedure for obtaining the roots of the equation is described. An application to the H_2S band at 10,100 A. is made and the vals. are compared with those derived from classical treatment. The new mol. consts. and term vals. of H_2S are given.

W. R. A.

Surface tension of heavy water. H. LACHS and I. MINKOW (Rocz. Chem., 1937, 17, 363—366).— No difference is found between the surface tension of H_2O and D_2O , or of its temp. coeff., at 20—27°. Selwood and Frost's results (A., 1933, 1233) are not confirmed. R. T.

Surface tension of some alcohols of the decahydronaphthalene and hydrindane series. W. HUCKEL and F. REIMER (J. pr. Chem., 1937, [ii], 149, 81-84).—Measurements of the surface tension of *trans*-decahydro- α - and - β -naphthol, *cis*-decahydro- β naphthol, *cis*- and *trans*-5-hydroxyhydrindane, and menthol show that the differences observed are parallel with differences in *d*. In general the differences in surface tension are too insignificant to be useful in the elucidation of constitution. H. W.

Methyleneimines : determination of parachor. D. DICKINSON and J. GRAYMORE (J.C.S., 1937, 1368—1370).—The parachors of methyleneimines prepared by the action of CH_2O on NH_2Me , NH_2Et , NH_2Pr^{α} , NH_2Pr^{β} , NH_2Bu^{α} , and NH_2Bu^{β} have been measured. Vals. agree with those calc. from Sugden's consts. for the cyclic formula ($NR \cdot CH_2$)₃, but deviate from those calc. from Mumford and Phillips' standards. The deviation increases on ascending the series and is a max. for the Pr compound. iso-*Propylmethyleneimine* has b.p. 220°. O. D. S.

Focussing of electrons in an X-ray tube. N. C. BEESE (Rev. Sci. Instr., 1937, [ii], 8, 258—262).— A theory to account for the variations in the observed focal spot patterns on the anodes of X-ray tubes caused by changes in the geometry of the cathode structures is postulated. Data on the variation in size and energy distribution within the focal spots with these characteristics are given. N. M. B. Passage of X-rays through oscillating crystals. R. M. LANGER (Physical Rev., 1936, [ii], 49, 206).—Theoretical. L. S. T.

Lattice sums involved in the calculation of elastic constants. M. G. GOEPPERT-MAYER and A. May (Physical Rev., 1937, [ii], 52, 242; cf. A., 1936, 1053).—A correction. N. M. B.

Surface migration of barium. M. BENJAMIN and R. O. JENKINS (Nature, 1937, 140, 152).—No surface migration of Ba either on Ni or W even after 16 hr. at 1100° abs. could be detected. L. S. T.

Structure of electronic excitation levels in insulating crystals. G. H. WANNIER (Physical Rev., 1937, [ii], 52, 191—197; cf. Slater, this vol., 8).—Mathematical. A method of studying the energy spectrum for an excited electron configuration (a single excited electron taken out of a full band of N electrons) in an ideal crystal is described.

N. M. B.

Modern theory of solids. III. F. SEITZ and R. P. JOHNSON (J. Appl. Physics, 1937, 8, 246— 260; cf. this vol., 286).—A survey of the properties of crystal surfaces and of the influence of impurities and flaws on certain vol. characteristics. Contemporary theory is discussed critically and hypotheses are provisionally advanced. N. M. B.

Anisotropic liquids. W. KAST (Physikal. Z., 1937, 38, 627-635).-A review.

Anisotropic growth of silver crystals by condensation from vapour. J. H. Hower (Physical Rev., 1936, [ii], 49, 200).—Under certain conditions, Ag vapour condensing in a vac. on suitable nuclei of solid Ag kept at a temp. slightly < the m.p. forms single-crystal needles. Features of this growth are described and an explanation is put forward.

L. S. T.

Type of crystalline texture observed in aluminium wire subjected to alternating torsion. R. JACQUESSON (Compt. rend., 1937, 205, 331-332).-Crystals of Al subjected to alternating torsion at first suffer a small dislocation and then break up into an aggregate of crystallites with an oriented structure. R. S. B.

Crystal structure of compounds of the rare earths with the metalloids of the fifth group. II. Nitrides of lanthanum, cerium, and praseodymium. A. IANDELLI and E. BOTTI (Atti R. Accad. Lincei, 1937, [vi], 25, 129—132; cf. this vol., 401).—LaN, CeN, and PrN have a face-centred cubic lattice of the NaCl type, with a 5.27, 5.01, 5.15 A., respectively. The val. of a for CeN is abnormally low. The radius of the N''' ion is calc. to be 0.75— 0.77 A. O. J. W.

Constitution of nitrosyl compounds. Crystal structure of nitrosyl perchlorate and nitrosyl borofluoride. L. J. KLINKENBERG (Rec. trav. chim., 1937, 56, 749–754; cf. A., 1936, 275).— X-Ray diagrams of NOClO₄ and NOBF₄ afford evidence of their heteropolar constitution, and show them to be isomorphous with the corresponding NH₄ compounds. Comparison of the diagrams for perchlorates and borofluorides shows that, with respect to size, NO[•] = H₃O[•] < NH₄[•]. Dimensions of the unit cell of NOClO, are : $a 9.00 \pm 0.05$, $b 5.68 \pm 0.05$, $c 7.23 \pm 0.03$ A., mol. vol. 56.0; of NOBF₄ : $a 8.79 \pm 0.03$, $b 5.66 \pm 0.03$, $c 7.10 \pm 0.10$ A., mol. vol. 53.5. F. L. U.

X-Ray study of potassium hydrogen carbonate. J. DHAR (Indian J. Physics, 1937, 11, 187– 191).—KHCO₃ crystals are monoclinic prismatic, a $15 \cdot 01$, b $5 \cdot 69$, c $3 \cdot 68$ A., $\beta \ 104^{\circ} \ 30'$, space-group $C_{2h}^{\circ} (P2_1/\alpha)$. The CO₃ group has the same shape and dimensions as in NaHCO₃. F. J. L.

Salts of hexahydrated cations. I. Hexahydrated hypophosphites of bivalent metals. A. FERRARI and C. COLLA (Gazzetta, 1937, 67, 294– 301).—X-Ray measurements show that the compounds $M(H_2PO_2)_2, 6H_2O$ (M = Mg, Ni, Co) have a tetragonal symmetry. In the lattice the $[M(H_2O)_6]^{"}$ cations have an octahedral configuration and are arranged with a face-centred, monometric symmetry. The H_2PO_2' anions have a tetrahedral configuration and are arranged tetragonally; for the compounds in above order a = 10.29, 10.30, 10.22 A., respectively. Rose's compound, $2Ca(H_2PO_2)_2, Co(H_2PO_2)_2, 2H_2O$, does not exist. O. J. W.

Crystal structure of the ethyl sulphates of the rare earths and yttrium. J. A. A. KETELAAR (Physica, 1937, 4, 619-630).—The dimensions of the elementary cells of the Et sulphates of La, Ce, Pr, Nd, Sa, Gd, Dy, and Yt [$M(SO_4Et)_3,9H_2O$] were a 14.080, 14.048, 14.007, 13.992, 13.961, 13.931, 13.906, 13.903 and c 7.11, 7.11, 7.09, 7.07, 7.08, 7.06, 7.04, and 7.05 A., respectively (symmetry C_{3h}). The intramol. arrangement of the atoms is discussed. H. J. E.

Crystal and molecular structure of carbon tetraiodide and tetrabromide. C. FINBAK and O. HASSEL (Z. physikal. Chem., 1937, **B**, 36, 301— 308; cf. A., 1925, i, 1).—CI₄ crystals at room temp. are probably monoclinic and isomorphous with those of CBr₄, but near the m.p. become isotropic. The unit cell of CBr₄ has a 21·12, b 12·26, c 24·14 A. Electron diffraction experiments with CI₄ vapour show the distance C—I in the tetrahedral mol. to be $2\cdot12\pm0\cdot02$ A. The corresponding val. for CBr₄ is $1\cdot93\pm0\cdot02$ A. R. C.

Crystallography of herapathite. C. D. WEST (Amer. Min., 1937, 22, 731-735).—Data for crystals found in various herapathite preps. are recorded, and their unusual optical properties are discussed. L. S. T.

New form of resorcinol. A. R. UBBELOHDE and J. M. ROBERTSON (Nature, 1937, 140, 239).— β -Resorcinol, a 7.91, b 12.57, c 5.50 A., cell vol., 547 A.³, 4 mols. per cell, d. 1.327, space-group C_2^{\bullet} , (*Pna*), is prepared by the slow evaporation of a solution in C_6H_6 at room temp. using specially-dried air. Vac. sublimation of m- $C_6H_4(OH)_2$ under certain conditions gives a preponderance of β -crystals in large, shining, flakes. When cryst. from boiling C_6H_6 , $C_6H_4(OH)_2$ gives good crystals of the α -form, but $C_6H_2D_2(OD)_2$ (I) gives poor crystals of the β -form. On vac. sublimation (I) again behaves differently in giving a preponderance of crystals with the α -structure. L. S. T. Explanation of the disposition and inclination of rows of molecules in layers of organic acids according to X-rays. V. V. TSCHELINCEV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 16, 95—97).—It is suggested from a study of the fusibility curves and thermal data for systems of phenols and carboxylic acids that an oxonium bond is present, and that, by analogy, the sheets of mols. in the long-chain paraffin acids are held together by oxonium bonds between CO_2H groups R·C(OH):O $<_{O-R\cdotCO}^H$. This would

account for the inclination of the chains to the planes of the layers, as found by X-rays. R. S. B.

X-Ray and thermal examination of $\alpha x'$ -diglycerides.—See A., II, 397.

Elementary cell and space-group of ethylchlorophyllide. J. A. A. KETELAAR and E. A. HANSON (Nature, 1937, 140, 196).—X-Ray diagrams of ethylchlorophyllide prepared from the leaves of *Heracleum* by the method of Stoll give $a 8.90 \pm 0.02$ and $c 38.4 \pm 0.2$ A.; 2.7 or approx. 3 mols. per unit cell: space-group C_3^2 or C_3^2 , with the Mg atoms arranged in spirals around the c axis. L. S. T.

Crystal structure of cellulose. H. MARK and K. H. MEYER (Z. physikal. Chem., 1937, B, 36, 232-236).—A reply to Sauter (this vol., 226).

R. C.

Molecular structure of canna starch.—See A., II, 400.

Molecular structure of P_4O_6 , P_4O_8 , P_4O_{10} , and As₄O₆ by electron diffraction. L. R. MAXWELL, S. B. HENDRICKS, and (MISS) L. S. DEMING (J. Chem. Physics, 1937, 5, 626-637).—P₄O₆ has symmetry T_4 and P—P separation 1.67±0.03 A. The angle P-O-P is 128.5±1.5°. The As—As separation in As₄O₆ is 3.20 ± 0.05 A. The valency angle As–O-As is most probably 140° although 120° and 127.5° cannot be definitely excluded. More accurate determination is impossible on account of the scattering of As atoms. In P₄O₆ the P—O separation is 1.67 A., which is < the sum of the single bond radii (1.76 A.) and the P valency angle is approx. $98\pm2^\circ$, the same as the recorded vals. for black P, PCl₃, and POCl₃. P₄O₁₀ is of lower symmetry than P₄O₆ but the P atoms appear to have approx. the same arrangement as in P₄O₆. The diffraction pattern of P₄O₈ closely resembles that of P₄O₁₀. W. R. A.

Standard substances for exact measurements in electron diffraction method. N. A. SCHISCHA-KOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 461-462).—One of the most suitable standard substances for the determination of interplanar spacings in crystals is the two-dimensional crystal of Si_2O_5 resulting from the action of electrons on clay minerals. O. D. S.

Electron diffraction at natural faces of organic single crystals. P. A. THESSEN and T. SCHOON (Z. physikal. Chem., 1937, B, 36, 216-231).—From measurements with n-C₃₀H₆₂, n-C₃₁H₆₄, stearic acid (I), and cetyl palmitate the dimensions of the unit cells have been determined and the internal potentials calc. The surface of a crystal of the unstable β -form of (I) may contain the stable α -form. The use of electron diffraction measurements to determine in the case of crystals of substances of high mol. wt. which groups are outermost in the surface mols. is discussed. Combination of electron diffraction and X-ray measurements considerably enhances the expedition and trustworthiness of structure analysis investigations. R. C.

Electron-microscopic observations on field cathodes. E. W. MÜLLER (Z. Physik, 1937, 106, 541-550).—Metallic single crystals are employed as cathode in a form of high-voltage cathode-ray tube. The image on the screen, giving a picture of the electron distribution in the discharge and/or the crystal structure of the cathode, corresponds with a magnification of 2×10^5 . The c.d. of the discharge may attain 10^8 amp. per sq. cm. L. G. G.

Variation of the modulus of quartz as a function of the temperature. II. Low tempertures. A. LANGEVIN and (MLLE.) A. M. MOULIN (J. Phys. Radium, 1937, [vii], 8, 257-259; cf. this vol., 290).—The piezo-electric modulus of quartz has been measured from 23° to -60° . It remains const. between 23° and 0° but decreases linearly by 5.8% between 0° and -60° . W. R. A.

Theory of the dependence of ferromagnetic properties of metals on temperature. N. Aku-Lov (Compt. rend. Acad. Sci. U.R.S.S., 1937, **15**, **445**—450).—Mathematical. O. D. S.

Magnetic interaction and resultant anisotropy in unstrained ferromagnetic crystals. L. W. MCKEEHAN (Physical Rev., 1937, [ii], 52, 18— 30).—Mathematical. The derivation of the mutual potential energy of two equal and parallel magnets for special distributions of magnetic moment in each is applied, with special reference to higher terms, to the atoms in ferromagnetic crystals, and, for the computation of ferromagnetic anisotropy, sums to the sixth order of zonal harmonics are given. Data and results for a no. of metals and alloys are tabulated. N. M. B.

Magnetic quality of nickel wire as influenced by the surface. T. F. WALL (Nature, 1937, 140, 238; cf. this vol., 402).—Data for Ni wires in a condition of max. permeability show that the magnetic characteristic of a wire depends on its diameter. The coercive force and remanence are both greater in a wire of smaller diameter ($\frac{1}{32}$ in.). L. S. T.

Atomic moments and Curie points in solid solutions of nickel. V. MARIAN (J. Phys. Radium, 1937, [vii], 8, 313—315; cf. this vol., 297).—On addition of non-ferromagnetic elements to Ni the mean at. moment (M) and the Curie point (θ) are reduced linearly as the at. moment of added element is increased; the diminutions in M and θ are the greater the greater is the valency of the added element. When M or θ is plotted against the no. of extranuclear electrons in the added element for Ni alloys with Cu, Zn, Al, Sn, Sb, and Mo practically superposable, straight lines are obtained. The slope of these lines for M shows that addition of one electron decreases M by one Bohr magneton. W. R. A.

"Transformation temperature " of a metallic film. T. FUKUROI (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 32, 196–219).—The temp. at which there is an abrupt irreversible decrease of electrical resistance as a thin film is heated has been investigated by determining the change of resistance, reflexion of light, and X-ray diffraction with rise of temp. of films of Cd, Zn, Hg, Mg, Sb, Pb, and Bi condensed on glass. The results (see this vol., 358), and those of investigations of the growth of cracks in the films, can be explained as due to recrystallisation. It is suggested that the term " transformation temp." A. J. M.

Optical changes in freshly-evaporated aluminium-magnesium films. H. W. EDWARDS and R. P. PETERSEN (Physical Rev., 1936, [ii], 49, 207).— The three types of changes in reflexion and transmission that occur in these films are described.

L. S. T. Optical constants of thin gold films by means of transmission and reflexion measurements from the ultra-violet to the infra-red. F. Goos (Z. Physik, 1937, 106, 606-619).—Au films of various thickness on quartz were prepared by cathode sputtering. From measurements of the % reflexion from both sides of the film and the % transmission, in the 265 to 1050 mµ range, vals. for n and k are obtained. L. G. G.

Optical properties and structure of thin gold films. P. J. HARINGHUIZEN, D. A. WAS, and A. M. KRUITHOF (Physica, 1937, 4, 695-702).—The reflectivity and transmission of films of known thickness was measured for $\lambda\lambda$ between 5000 and 8240 A. The relation between structure and colour is discussed. The Au film when first formed on glass is amorphous. H. J. E.

Oblique reflexion of light at a mercury film condensed on the cold surface of glass or tin leaf. T. FUKUROI (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 32, 157–171).—The effect of thickness of a Hg film deposited on glass or tin foil at -180° on the change in intensity and degree of polarisation of light reflected obliquely from the film was determined. The results agree with those calc. on the assumption that the film is not of uniform thickness, but consists of an aggregate of isolated clusters. A. J. M.

Light absorption of metallic films at low temperatures. T. FUKUROI (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, **32**, 172–186).— In order to discover the ultramicroscopic structure of metallic films, the absorption of light by Hg, Cd, and Zn films deposited on cold (-180°) quartz plates was determined. The results agree with the assumption that the surface has a granular structure (cf. preceding abstract). A. J. M.

Theory of distant diffraction. J SAVORNIN. (J. Phys. Radium, 1936, [vii], 7, 434–440; 1937, [vii], 8, 312). W. R. A.

Experimental study of distant diffraction. J. SAVORNIN (J. Phys. Radium, 1937, [vii], 8, 309— 312).—Diffraction of elliptical vibrations of visible light from Cu, Au, and steel screens as functions of incident angle and λ of incident light has been studied. W. R. A.

Nature of coercivity. E. KONDORSKI (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 457–459).— Theoretical. 0. D. S.

Influence of surface state on the plasticity of crystals. A. V. STEPANOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, **15**, 547-549).—Examination in polarised light of the results of a surface scratch on a crystal of rock-salt showed that this, together with the vol. change produced by it, is a source of slip, which, by causing further slips, may lead to rupture of the whole crystal. R. C. M.

Transitions in crystals having distorted lattices. G. TAMMANN (Z. anorg. Chem., 1937, 233, 286—294).—A no. of observations are summarised to show that distortions of the lattice, similar to those produced by cold-working in metals, are often present in crystals which have been formed at temp. \ll the m.p., and are associated with modifications of various properties. When such crystals are heated, an irreversible transition to the normal state occurs over a definite range of temp. F. J. G.

Solids. G. BUSCH (Naturwiss., 1937, 25, 535– 539).—A summary of papers given at a conference. A. J. M.

Ground state of the Se₂ molecule. S. S. BHAT-NAGAR, H. LESSHEIM, and M. L. KHANNA (Nature, 1937, 140, 152).—The vapour of diat. Se is paramagnetic, showing that the ground-level of Se₂ is ${}^{3}\Sigma$. L. S. T.

Coexistence of dia- and para-magnetism in single crystals of antimony-tin alloys. H. M. HART (Physical Rev., 1937, [ii], 52, 130–131).— The effect of adding small amounts of Sn to Sb was investigated by studying the magnetic anisotropy at room temp. The curve obtained indicates that χ_{II} (originally negative) decreases as Sn is added and finally changes sign so that the crystals become paramagnetic parallel to the trigonal axis. A theoretical explanation is discussed. N. M. B.

Dia- and para-magnetic susceptibilities [of various substances] at 2–10 oersteds. W. SCHRIEVER and R. E. SMITH (Physical Rev., 1936, [ii], 49, 408).—Data for Bi, Sb, Cd, FeCl₃, FeSO₄,7H₂O, and Co₂(SO₄)₃,7H₂O are recorded. L. S. T.

Quantum theory of diamagnetism of aromatic compounds. F. LONDON (Compt. rend., 1937, 205, 28-30).—Theoretical. C. R. H.

Ferromagnetism: lowest energy levels. J. C. SLATER (Physical Rev., 1937, [ii], 52, 198—214).— Mathematical. The theory of ferromagnetism is formulated by the method of energy bands and by the method of spin waves, and the connexion between them is investigated. For studying the temp. variation of magnetisation the spin wave theory should be used, but the energy band theory leads to approx. correct conclusions as to which elements should be ferromagnetic. N. M. B.

Temperature dependence of the magnetisation of a ferromagnetic material at low temperatures. W. OPECHOWSKI (Physica, 1937, 4, 715-722).—Theoretical. H. J. E.

Moments of some rare-earth cations and Weiss magnetism. B. CABRERA (Compt. rend., 1937, 205, 400—403).—Vals. of the magnetic moments of Gd^{...}, Dy^{...}, Ho^{...}, and Er^{...} are recorded. Statistical examination shows these vals. to be in better agreement with Weiss' law than with vals. calc. by quantum mechanics. A val. of 1130-0 units is deduced for the Weiss magneton. A. J. E. W.

Structure and resistance of thin metal films. D. A. WRIGHT (Nature, 1937, 140, 107—108).—The resistance-temp. curve for thin films of In (this vol., 226) indicates a transition temp. of approx. 10°, in agreement with Kramer's formula (A., 1934, 244). On the other hand, thin films of Rb and Cs do not behave in accordance with deductions based on Kramer's theory. L. S. T.

Minimum in the resistance-temperature curve of gold. W. J. DE HAAS and G. J. VAN DEN BERG (Physica, 1937, 4, 683-694; cf. A., 1936, 929).--The min. shifts with the time of annealing the wire at 500°, but is still present when the wire is annealed and measured in vac. Heating of the wire by the measuring current does not cause the min.

H. J. E. Superconducting state. II. J. C. SLATER (Physical Rev., 1937, [ii], 52, 214—222; cf. this vol., 174).—An extension of previous theoretical discussions. N. M. B.

Explanation of magnetic induction in superconductors. J. STARK and K. STEINER (Physikal. Z., 1937, 38, 597).—An additional experiment is described confirming earlier work (this vol., 292). A. J. M.

Measurements on the velocity and absorption of sound in various gases between 100° and -100° . Influence of pressure on the absorption. A. VAN ITTERBEEK and P. MARIENS (Physica, 1937, 4, 609—616).—Data for O_2 , H_2 , and CO are recorded. At low temp. vals. of the absorption coeff. are too high compared with those given by the classical formula. The latter must be corr. for the nonideal nature of the gas. Absorption by H_2 containing 45% of para- H_2 is the same as that by ordinary H_2 . H. J. E.

Collision excitation of intramolecular vibrations in gases and gas mixtures. IV. Sound dispersion and absorption measurements in nitrous oxide and carbon dioxide at high temperatures. A. EUCKEN and E. NUMANN (Z. physikal. Chem., 1937, B, 36, 163—183; cf. A., 1936, 19).—Measurements of the λ and max. absorption of ultrasonic waves at 20—400°, using an improved apparatus, have shown that in N₂O and CO₂ the valency vibrations are excited as readily as the deformation vibrations (cf. this vol., 21). Probably, however, it is the deformation vibrations which are excited primarily and these then rapidly transfer energy to valency vibrations. In presence of H₂O the collision no. of CO₂ passes through a min. with rising temp., whilst that of N₂O rises continually. A possible explanation is that the first (one-quantum) deformation vibrational states of CO_2 and N_2O are excited by collision with H_2O mols. much more readily than the higher quantum states. The results indicate that in general the direct transfer of vibrational energy from mol. to mol. is very little impeded. R. C.

Intensity and polarisation of the light diffracted by supersonic waves in solids. H. MUELLER (Physical Rev., 1937, [ii], 52, 223-229).--Intensity and polarisation are calc. by considering the photoelastic effect due to the strains created by the elastic waves. For natural incident light the diffracted light is partly polarised. In glasses and cubic crystals the diffracted light is partly depolarised if the incident light is polarised. Intensities are calc. by Raman's theory (cf. A., 1936, 148) and results are compared with available experimental data.

N. M. B.

Ratio of specific heats of air, nitrogen, and carbon dioxide as a function of pressure, by the ultrasonic method. J. C. HUBBARD and A. H. HODGE (Physical Rev., 1936, [ii], 49, 194).—Ultrasonic velocities at 27° and at pressures from 1 to 60 atm. for CO₂ and to 100 atm. for air and N₂ have been determined. Vals. of γ for pressures > atm. are recorded. L. S. T.

Entropy of methane. A. FRANK and K. CLUSIUS (Z. physikal. Chem., 1937, B, 36, 291-300).—The mol. heat of the solid has been measured at 15-26° abs. The mol. heat of the transition at 20.4° abs. is 15.6_6 g.-cal., and the mol. heat of vaporisation at 99.5° abs. 2036 ± 3 g.-cal. From these data it is calc. that the caloric entropy at the b.p. $(111.5^{\circ}$ abs.) for the ideal gaseous state is 36.53 ± 0.10 ; the statistical entropy is 36.61, the chemical const. being $i_k - 1.91_0$, and the v.-p. const. $i_p - 1.94_1$. It is inferred that there are no irregularities in the mol. heat-temp. curve, e.g., there is no transition point below 10° abs. A plausible explanation of these observations is that in the lattice the three-term systems of the mol. lose their significance and that in respect of energy distribution all the mol. movements must be represented by a continuum. CD_4 has transition points at 22° and 26.3° abs.

Absolute entropy values for gases. F. A. F. SCHMIDT (Forsch. Geb. Ing.-Wes., 1937, 8, 91–99). Vals. for technically important gases, e.g., N_2 , H_2 , etc., deduced from calorimetric data are reviewed and shown to be in agreement with those derived from spectrographic data. The sp. heats up to 3000° are tabulated for H_2 , N_2 , O_2 , CO, NO, etc. R. B. C.

Calculation of the heat capacity curves of crystalline benzene and hexadeuterobenzene. R. C. LORD, jun., J. E. AHLBERG, and D. H. ANDREWS (J. Chem. Physics, 1937, 5, 649–664).—The heat capacity curve for C_6H_6 has been calc. using the vals. of internal frequencies proposed (this vol., 175) and agrees with experimental data. This close agreement indicates that fundamental frequencies <400 cm.⁻¹ are most probably absent in C_6H_6 . Calculations made using vals. for two proposed fundamentals <400 cm.⁻¹ give a curve which differs considerably from the experimental curve. Vals. for C_6D_6 are given. W. R. A. Temperature variation of some thermodynamic quantities. G. M. MURPHY (J. Chem. Physics, 1937, 5, 637—641).—The quantity $(F^0 - E_0^0)/T$, calc. from spectroscopic data, has been fitted to a five-const. equation in T for 19 mols. It may be used to interpolate vals. for S^0 , E^0 , H^0 , and C_p^0 between 298° and 3000° abs. The equilibrium const. for isotopic exchange reactions exhibits max. or min. and therefore there is an optimum temp. for isotopic separation by means of these reactions. W. R. A.

Determination of latent heats of vaporisation of the selenides of cadmium and mercury and zinc telluride from the absorption spectra of their vapours. L. S. MATHUR (Indian. J. Physics, 1937, 11, 177–185).—The latent heats of vaporisation of CdSe, HgSe, and ZnTe calc. from the long- λ limits of the absorption spectra are 39.40, 83.23, and 61.78 kg:-cal. F. J. L.

Transitions in solid hydrides and deuterides. A. KRUIS, L. POPP, and K. CLUSIUS (Z. Elektrochem., 1937, 43, 664—666; cf. this vol., 450).—Whereas CH_4 has only one transition point (at 20.4° abs.) CD_4 shows two transition points, at 21.4° and 26.3° abs., respectively. This anomaly is discussed. M.p., latent heat of fusion, triple point temp., heat of transition, and transition temp. data for CH_4 , CD_4 , H_2S , D_2S , H_2Se , and D_2Se are tabulated and compared.

J. W. S. Melting of mercury. A. SMITS and G. J. MULLER (Z. physikal. Chem., 1937, B, 36, 288–290).— Measurement of the vol.-temp. curve of highly purified Hg over a temp. range including the m.p. showed the curve not to be discontinuous at the m.p. and that melting occurred over a temp. range of 0.024° . It is considered that the melting of pure Hg would be a discontinuous process. R. C.

Orbital intensity of interaction in combinations of multiple ionisation. R. FOREER (Compt. rend., 1937, 204, 1717—1719).—Theoretical. The m.p. (T) is related to the no. of points of contact (N) of an ion with its neighbours and the valency (v). With const. N, T $\propto v$, as in the series of fluorides, oxides, nitrides, and carbides of NaCl-like structure, for which T is approx. 1000°, 2000°, 3000°, and 4000°, respectively. R. S. B.

Calculation of m.p. of $\alpha\omega$ dibasic acids. C. L. TSENG, C. E. SUN, and C. Y. CHEN (J. Chinese Chem. Soc., 1937, 5, 202-203).—The empirical relation $\theta - 117 = 19 \cdot 5[e^{-2(n-5)a} + (-1)^n 2e^{-(n-5)a}]$, where a is a const. and n = no. of C atoms, agrees fairly well with the observed m.p. R. C.

Theory of the λ -point of helium. H. FROHLICH (Physica, 1937, 4, 639—644).—Theoretical. The transition point is considered analogous to the transition in alloys from the "ordered" to "disordered" state. H. J. E.

Relation between atomic radii and b.p. C. Y. CHEN, C. L. TSENG, and C. E. SUN (J. Chinese Chem. Soc., 1937, 5, 193-201).—The empirical relation $T = a + bV + cV^3$, where $V = \Sigma nr^3$ and T is the b.p., n the no. of atoms of a given element in the mol. and r the at. radius of that element, and a, b, c are consts. for the members of a given homologous series, agrees with experimental data. R. C.

Vapour pressure of camphor. J. H. DE WILDE (Z. anorg. Chem., 1937, 233, 411-414).—Vals. of the v.p. of the solid from $338\cdot3^{\circ}$ to $453\cdot5^{\circ}$ abs. and of the liquid from $451\cdot2^{\circ}$ to $505\cdot5^{\circ}$ abs. are given. Interpolation formulæ: solid, $\log p = -2652\cdot1/T + 7\cdot4382$; liquid, $\log p = -2318\cdot5/T + 7\cdot7046$. The heats of vaporisation, sublimation, and fusion are respectively 12·12, 10·60, and 1·52 kg.-cal. per g.-mol., the triple point is at $453\cdot2^{\circ}$ abs. and $385\cdot8$ mm., the mol. depression of the f.p. is 411·1, and the b.p. is $480\cdot6^{\circ}$ abs. F. J. G.

Critical constants of the inert gases and of hydrogen compounds having the same number of electrons per molecule. G. WOOLSEY (J. Amer. Chem. Soc., 1937, 59, 1577—1578).—A linear relation is obtained when d_c/M is plotted against p_c/t_c .

Energy theory of gases. F. MICHAUD (J. Chim. phys., 1937, 34, 333-350; cf. A., 1936, 19).—The thermodynamical properties of an element, defined as a pure gas in the state of max. dissociation, are implicit in the statement that corresponding masses (*i.e.*, masses m, m', in the ratio of the at. wts.) of two elements under the same conditions of temp. and pressure occupy the same vol. and contain quantities of entropy which differ only by a const. When the substances have, in the solid state, well defined characteristic temp., T_c , T_c' (loc. cit.), the difference between the at. entropies is mS - m'S' = 3/2. R log T_c'/T_c , and since mT_c is nearly the same for many elements, mS - m'S' = 3/2. R log m/m'. Other thermodynamical relations and the criteria for reversible and irreversible chemical change are considered. J. G. A. G.

Persistence of the liquid state of aggregation above the critical temperature. Ethylene. O. MAASS and A. L. GEDDES (Phil. Trans., 1937, A, 236, 303-332).--A technique for determining accurately the pressure-temp.-vol. relationships of substances near the crit. point at $<150^{\circ}$ and <75 atm. has been developed. The pressure of the C2H4 was controlled to ± 0.01 atm. by means of a Hg piston operated by varying the temp. of liquid CO2 in equilibrium with its vapour. The crit. temp., 0_c , of C_2H_4 is $9.50\pm0.01^\circ$ and the crit. pressure is 49.98 atm. The persistence of a discontinuity of d above θ_c is not due to the wt. of the medium itself, but is destroyed by isothermal expansion or compression and by small periodic changes ("fluctuations") of temp. about a mean val., and once destroyed, is not restored by pressure changes alone. Temp. "fluctuations" change d. The discontinuity of d found about θ_c may be due to the persistence of the liquid state if this has dynamical structure. J. G. A. G.

 Liquid state. II. M. SURDIN (J. Phys. Radium, 1937, [vii], 8, 294-302; cf. this vol., 125).—A further consideration of the "unique curve" obtained by plotting vals. of various static properties of liquids under a pressure equal to its saturated v.p. as a function of a suitable reduced temp. expression. The expression $\theta = (T - T_0)/(T_c - T_0)$ is more suitable than the van der Waals expression.

W. R. A. Radiometer effect at low pressures. E. FRED-LUND (Ann. Physik, 1937, [v], 30, 99-112).—The construction of a Knudsen manometer sensitive down to 2×10^{-7} mm. is described. Tests with He, H₂, D₂, A, N₂, and O₂ show that the sensitivity varies slightly with different gases owing to differences in accommodation coeff. O. D. S.

Mean free path for gas beams in mercury vapour. J. A. ELDRIDGE (Physical Rev., 1936, [ii], 49, 411).—Vals. determined for the mean free paths at one bar Hg v.p. are He 12.5, H₂ 6.85, N₂ 5.8, CO_2 5.3, and C_2H_6 5.2 cm. They are slightly <would be predicted from η data on classical lines. L. S. T.

Thermal conductivity of potassium bromide, potassium chloride, and silica at low temperatures. W. J. DE HAAS and T. BIERMASZ (Physica, 1937, 4, 752—756).—KBr and KCl show a min. in thermal resistance at approx. 7° abs. The effect resembles that for SiO₂. H. J. E.

Chemical theory of gases. III. The molecules $(O_2)_2$ and $(NO)_2$. J. DUCLAUX (J. Phys. Radium, 1937, [vii], 8, 277—280).—The differences between the compressibilities of real and perfect gases have been attributed to the formation of double mols. (A., 1927, 927) and the existence of the mols. $(O_2)_2$ and $(NO)_2$ is postulated. The extension of the theory is discussed. W. R. A.

Calculation of lengths of extended molecules of low mol. wt. from the specific viscosity of their solutions. I. SAKURADA (Naturwiss., 1937, 25, 523).—An equation connecting the length of a mol. with the concn., η , and mol. wt. of the substance in solution is derived, and applied to the calculation of the lengths of mols. of paraffins. The results agree with vals. based on the constitution of the mols., and the assumption that the mols. are extended.

A. J. M. Calculation of the lengths of particles of polymerised compounds from the specific viscosity of their solutions. I. SAKURADA (Naturwiss., 1937, 25, 523-524).—An equation connecting mol. wt., degree of polymerisation, η , concn. of solution, and the length of the mol. is derived, and applied to solutions of paraffin wax in C₆H₆. The results agree satisfactorily with those obtained by X-ray methods. The equation is also applied to cellulose acetates. A. J. M.

Diffusion coefficient of methane and air. H. F. COWARD and E. H. M. GEORGESON (J.C.S., 1937, 1085—1087).—The coeff. of interdiffusion of CH₄ and air is $D_{0^{\circ}, 760}$ mm. = 0.196 cm.² per sec. J. G. A. G.

Thermal diffusion in gas mixtures. II. M. PUSCHNER (Z. Physik, 1937, 106, 597-605; cf. A.,

É. S. H.

1934, 1063).—Data for thermal diffusion in the gas mixtures H_2 -CO₂, H_2 -N₂, Ho-Ne, and He-A are given and lead to vals. for the exponent in the law of force of repulsion between mols. The exponent has the vals. 10 and 15 for Ne and A, respectively.

A. E. M. Densities of mixtures of light and heavy water. L. G. LONGSWORTH (J. Amer. Chem. Soc., 1937, 59, 1483—1484).—Data for 25° are recorded. There is no appreciable change of vol. on mixing. A relation between composition and d is derived. E. S. H.

Deviations of ortho- and para-hydrogen from the laws of ideal solutions. F. G. BRICKWEDDE and R. B. Scott (Physical Rev., 1936, [ii], 49, 194).— Differences in the v.p. of liquid mixtures of o- and p-H₂ containing up to 75% o-H₂ have been measured from 14° to 20.4° abs. and for solid mixtures from 10.5° to 14° abs., and the differences in latent and sp. heats calc. Data for 20.4° abs. are recorded. An explanation of the v.p. differences of o- and p-H₂ based on energy differences associated with intermol. forces of orientation is advanced. L. S. T.

Deviations of carbon tetrachloride and silicon tetrachloride solutions from Raoult's law. S. E. WOOD (J. Amer. Chem. Soc., 1937, 59, 1510–1514).— V.p. and fugacities at 25° of the system CCl_4 -SiCl_4 have been determined. The deviations from Raoult's law are positive, but < those calc. from Hildebrand and Wood's equation (A., 1934, 146). E. S. H.

Cohesive energy of liquid mixtures. I. A. J. STAVERMAN (Rec. trav. chim., 1937, 56, 885–890).— Allowance is made for variations in the size and shape of molecules by the use of an interaction const. (s_{12}) in computing the heat of mixing (H) of two liquids. The expression derived is H = $-N_1N_2[\sqrt{L_1} - \sqrt{(s_{12}L_2)}]^2/(N_1s_{12} + N_2)$, in which N and L denote the respective mol. fractions and heats of vaporisation. The formula gives satisfactory constancy for s_{12} when tested by the published data for 10 different mixtures at different vals. of N_1/N_2 . It is valid only for mols. of small polarity.

F. L. U. Conductivity and viscosity of the systems H_2SO_4 -CHCl₂·CO₂H and H_2SO_4 -CH₂Cl·CO₂H. V. TAETAKOVSKAJA, J. BONDARENKO, and L. JEMEL-JANOVA (Acta Physicochim. U.R.S.S., 1937, 6, 609-624).—The viscosities (η) and sp. conductivities (κ) have been determined at 20°, 40°, and 60°, and for the system H_2SO_4 -CH₂Cl·CO₂H also at 80°, and the mol. conductivities are calc. For each system η and κ pass through a max. with changing conc., this being attributed to interaction between the components, in which the CHCl₂·CO₂H and CH₂Cl·CO₂H act as bases, in accord with previous observations (A., 1929, 138; 1936, 22). J. W. S.

Heats of reaction and specific heats of anilineo-chlorophenol mixtures and a test of Macleod's viscosity equation. C. D. ELLYETT (Trans. Faraday Soc., 1937, 33, 1218—1224).—The heats of reaction and sp. heats of NH_2Ph -o- C_6H_4Cl ·OH mixtures have been measured at 25°, 35°, and 78°. The extent of compound formation, calc. by the law of mass action, is in accord with that deduced from Macleod's equation (A., 1934, 723) at higher, but not lower, temp. No support is obtained for Macleod's theory of increasing heat of reaction with rising temp. (A., 1935, 704). J. W. S.

Solvent effect in dielectric polarisation. I. Polarisations of nitrobenzene and chlorobenzene in certain ethers. II. Positive solvent effect of butyl and amyl ethers. G. THOMSON (J.C.S., 1937, 1051–1057).—I. Dielectric consts., ϵ_{25} , and d for mixtures of C₆H₆ with Pr^g₂O, Bu^g₂O, and amyl ether (I), have been determined at 25° for the entire ranges of concn. The polarisations vary little with concn., and the vals. of ϵ_{25} are : $\Pr_2^{\theta}O 4.0$, $\operatorname{Bu}_2^{\circ}O 3.1$, (I) 2.8. Vals of ϵ_{25} and d for solutions of PhNO_2 and PhCl in these ethers and in CS, have been determined. For the ethers, the polarisations deduced are consistent with the results obtained in other solvents. The relationships between vals. of ϵ for the solvents and the corresponding vals. of ${}_{\infty}P_0$ for a solute proposed by Jenkins (A., 1934, 585), Frank (A., 1936, 150), and Higasi (A., 1936, 550) are not linear for polar solvents, but that between ${}_{\infty}P_0$ and $(\epsilon - 1)^2$ is linear for polar and non-polar solvents but leads to extrapolated vals. for the gaseous state < those observed.

II. The polarisations of $\operatorname{Bu}_2^{\epsilon}O$ and (I) in C_6H_6 and C_6H_{14} decrease with decreasing ϵ of solvent as has been predicted for substances with negative vals. of the Kerr const. J. G. A. G.

Viscosity of hydrocarbon solutions. Methanepropane-crystal oil system. B. H. SAGE, B. N. INMAN, and W. N. LACEY (Ind. Eng. Chem., 1937, 29, 888-892).—The effect of pressure and composition on the η of the liquid phase of a part of the $CH_4-C_3H_8$ -crystal oil system has been studied by using a modified rolling-ball viscosimeter. The observations, limited to 37.8° and to liquid compositions containing <5% CH₄ and 20% C_3H_8 , were made in both the two-phase and condensed-liquid regions at pressures up to 3000 lb. per sq. in. The results are tabulated, and several graphs illustrate the behaviour of the system. H. C. M.

Diffusion of beryllium salts in aqueous solution. L. W. ÖHOLM (Finska Kem. Medd., 1937, 66, 71-78). $-\eta$ has been measured for 0.1-4.0N solutions of BeCl₂, Be(NO₃)₂, and BeSO₄. M. H. M. A.

Electrical conductivities and viscosities at 25° of solutions of potassium, sodium, and lithium chlorides, in water and in one-tenth molar hydrochloric acid. L. NICKELS and A. J. ALLMAND (J. Physical Chem., 1937, 41, 861—872).—In general, the data for A (except at low conens.), d, and η agree with published data. At low conens. the new A vals. are higher. The val. for $A\eta$ for LiCl solutions is independent of [LiCl] above 4N, whilst for NaCl solutions the val. for $A\eta$ passes through a flat min. at approx. 3N, only varying slightly over the range 1.5—5N. The constancy of the vals. for $A\eta$, corr. in the case of the HCl solutions for A and η due to HCl, is discussed in the light of the views of Bernal and Fowler (cf. A., 1934, 13).

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Diffusion of one-tenth molar hydrochloric acid through aqueous solutions of potassium, sodium, and lithium chlorides. L. J. BURRAGE and A. J. ALLMAND (J. Physical Chem., 1937, 41, 887-894).-Diffusion coeffs., D, have been measured at various temp. and recale. to 25°. Vals. for $D\eta$ increase with the chloride concn., max. vals. of 6.8-6.9 being obtained at 1.3-1.5 mol. Below this concn. the $D\eta$ -concn. curves are approx. coincident, but at higher concns. the curves separate and in the case of NaCl pass through a min. val. at approx. 4.7 mol. The data are discussed. C. R. H.

Vapour pressure of saturated aqueous solutions of dihydroxybenzenes. P. DINGEMANS (Rec. trav. chim., 1937, 56, 839-852).-Data are recorded for the range 15° —m.p. (o- and m-), and 15—90° (p-). Max. are shown at 82.0° and 162.6 mm. (0-), and 85.0° and 141.0 mm. (m-). The curve for $p-C_{6}H_{4}(OH)_{2}$ shows no max. in the range studied. V.p. vals. have also been determined for solutions saturated with respect to binary mixtures having the eutectic composition, all three of which exhibit max. Eutectic temp. are as follows: $o + m - 70.8 \pm 0.1^{\circ}$; $o + p - 92.3 \pm 0.1^{\circ}$; $m - + p - 93.7 \pm 0.4^{\circ}$. The complete f.-p. curve is given for $o + m \cdot C_6 H_4(OH)_2$. F. L. U.

Metals and alloys. XXIV. Constitution of sodium-gold alloys. W. HAUCKE (Z. Elektro-chem., 1937, 43, 712—719; cf. this vol., 127).— Extraction of Au-Na alloys rich in Na with liquid NH_3 yields crystals of the γ -phase AuNa₂, of tetragonal structure, similar to CuAl₂ and having a 7.402, c 5.551 A. A third phase of unidentified structure exists in this system, but is probably stable only at higher temp. J. W. S.

Roentgenographic study of alloys of magnesium and silver. N. V. AGEEV and V. G. KUZNET-zov (Bull. Acad. Sci. U.R.S.S., 1937, 289-311).— Four phases may be distinguished by X-ray methods : α (>25 at.-% Mg), β (47—55 at.-% Ag), γ (20.5— 25 at.-% Ag), and δ , consisting respectively of solid solutions of Mg in Ag, Mg or Ag in AgMg, Mg in AgMg₃, and Ag in Mg. Crystal lattice parameters are recorded. R. T.

Velocity of polymorphic transformation of the compound MgCd in the system magnesiumcadmium. I. I. KORNILOV (Bull. Acad. Sci. U.R.S.S., 1937, 313-331).-Hardness, conductivity, and microstructural changes indicate that the transition point of α - to β -MgCd is at 258°. The hardness of the alloys increases to a max. during the transformation, owing to internal stresses involved in the rearrangement. R. T.

 β - and γ -phases of the system Al-Mg. N. S. KURNAKOV and V. I. MICHEEVA (Bull. Acad. Sci. U.R.S.S., 1937, 259-288).-It is concluded from conductivity, temp. coeff. of conductivity, thermal e.m.f., hardness, and m.p. measurements, and crystallographic data for the system Al-Mg that the β -phase consists of a highly dissociated compound of unknown composition in equilibrium with its dissociation products, whilst the y-phase consists similarly of Al₃Mg₄ with its dissociation products. R. T.

X-Ray investigation of the system manganesearsenic. I. N. NOWOTNY and F. HALLA (Z. physikal. Chem., 1937, B, 36, 322-324).-The phases MnAs, with the NiAs or related rhombic structure, and Mn₂As with a tetragonal lattice and the space-group D_{1} , together with a third phase, probably Mn₃As, have been observed. R. C.

Separation process in the crystallisation of Cu-Pb and Cu-Pb-X alloys (binary and polycomponent lead bronzes). W. CLAUS (Z. Elektrochem., 1937, 43, 502-503).-Mixtures of Cu and Pb containing 37-93% of Pb are not completely miscible in the liquid state, and therefore the properties of solid alloys in this range of composition vary with the conditions of crystallisation. Similar properties are observed in Cu-Pb alloys containing other metals, with the additional phenomenon that the secondary components, which tend to remain in the melt, can be deposited in the zone of initial crystallisation. Thus an alloy containing Cu 7.35, Pb 15, Zn 10, and Ni 1.5%, cast into a cylinder, yielded an outermost layer containing Pb 91-7, Zn 5.1, Cu 1.4, and Ni 1.8% and an innermost layer containing Cu 79.2, Zn 10.6, Pb 8.9, and Ni 1.3%. The effect is attributed to liberation of H₂ during crystallisation. J. W. S.

Crystal structure of alloys of zinc with the alkali and alkaline-earth metals and of cadmium with potassium. J. A. A. KETELAAR (J. Chem. Physics, 1937, 5, 668).-X-Ray observations indicate that the alloys of Zn with Na, K, Ca, Sr, and Ba and of Cd with K have the same cubic lattice structure. The no. of atoms in the elementary cell are 111, 113, and 111, respectively for KCd_{13} , NaZn_{13} , and CaZn_{13} . The space-group is either O_{h}^{s} or T_{d}^{s} . W. R. A.

Lattice relationships developed by peritectic formation of beta in the copper-zinc system. A. B. GRENINGER (Amer. Inst. Min. Met. Eng., Tech. Publ. 787, 1937, 12 pp.).—Results of an investigation based on X-ray analysis are discussed. R. B. C.

Alloys for use at high temperatures. IV. Constitution of the alloys of nickel, chromium, and iron. C. H. M. JENKINS, E. H. BUCKNALL, C. R. AUSTIN, and G. A. MELLOR (Iron and Steel Inst., Sept., 1937. Advance copy, 34 pp.).—The solidus of the Ni-Fe system, and the liquidus and solidus above 800° of the Ni-Cr and Ni-Cr-Fe (up to 50% Cr) systems, have been re-investigated. An equilibrium diagram for the ternary alloys containing up to 50% Cr has been constructed from the results and existing data. C. E. H.

Composition of the quaternary phase in the system Al-Cu-Mg-Si. D. A. PETROV (Acta Physicochim. U.R.S.S., 1937, 6, 505-512).—The measurements of Dix *et al* (Trans. Amer. Inst. Min. Eng., Inst. Met. Div., 1932, 99, 119) suggest that the limits of the at. ratios in the quaternary phase Al-Cu-Mg-Si are Mg: Si = 1 - 1.33 and Cu: Si = 10.74-1.10 and that probably Cu: Mg: Si is approx. 4:5:4. Hence in ordinary duralumin containing >0.5% of Si, Mg₂Si must coexist with the quaternary phase, whilst in superduralumin type alloys (C17S and 14S) free Si is present. J. W. S. v (a, b)

Limits of stability of intermetallic phases. F. HALLA (Z. Elektrochem., 1937, 43, 558-560).— It is assumed that d for an intermetallic phase does not lie far outside the limits set by the vals. of dfor the components. Since the d for an unknown phase of definite composition can be calc. by interpolation or extrapolation from the vals. for neighbouring isomorphous compounds, it can be predicted that such phase will be unstable if the calc. d lies outside these limits. The non-existent combinations among compounds of the types XY and X_2Y (X = Mn, Fe, Co, Ni, Cu; Y = P, As, Sb) accord with this criterion. FeSb₂ forms an exception to the rule and is discussed. J. W. S.

Heat of formation of binary and ternary alloys and their significance for metallurgical reactions. W. OELSEN (Z. Elektrochem., 1933, 43, 530-535; cf. B., 1936, 993).—The heats of formation of Fe-Sb, Co-Sb, Ni-Sb, Fe-Al-Si, and Cu-Ni-Al alloys have been determined over the complete concn. range. The heat contents and heats of mixing of various melts are deduced. The application of the data in metallurgy is discussed. J. W. S.

Ferromagnetic moments of some cobalt alloys. T. FARCAS (Ann. Physique, 1937, [xi], 8, 146—152).— The magnetic properties of Co-Cr, Co-Al, Co-W, and Co-Mo alloys have been investigated. For Co-Cr alloys the saturation vals. for different field strengths are given, and the at. moment is calc. The variation of the latter with composition is nearly linear. Extrapolation of the curve to pure Co gives the val. of Weiss magnetons, which is the val. for cubic Co obtained by other methods, and not, as might have been expected, that of hexagonal Co (8-5), in which form the alloys crystallise at the temp. of the experiment. The at. moments of Co-Mo alloys also give the val. 9 Weiss magnetons for Co on extrapolation, but those of Co-Al and Co-W alloys extrapolate to 8.5 Weiss magnetons.

A. J. M. **Magnetic susceptibility of copper amalgam.** H. S. VENKATARAMIAH (Proc. Indian Acad. Sci., 1937, A. 5, 532—534; cf. A., 1936, 1329).—Vals. of χ for amalgams containing >3% Cu are < those corresponding with the mixture law, indicating that amalgamation increases the effective no. of free electrons. χ for pure Hg = -0.170×10^{-6} .

A. J. E. W. Magnetic properties of alloys of iron with ruthenium and osmium. M. FALLOT (Compt. rend., 1937, 205, 227—230).—The Curie points, at. moments, and $\alpha -\gamma$ transformation temp. are given for alloys containing 0—15 at.-% Ru and Os. The α -ferromagnetic state occurs with >14% Ru or 11% Os. A. J. E. W.

X-Ray investigation of the anomalous solid solutions of ammonium chloride with the chlorides of manganese, cobalt, and nickel which are formed in aqueous solution. V. G. KUZNETZOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 469– 471; cf. Gruner and Sieg, A., 1936, 1477).—For solid solutions containing 25—30% $M^{II}Cl_2$ (M = Co, Mn, or Ni) lines corresponding with both the NH₄Cl and with the double salt lattice can be seen in the X-ray diffraction patterns. The most intense NH_4Cl lines are visible up to 48-49% $M^{II}Cl_2$ but disappear above 57% $CoCl_2$. At $61\cdot1\%$ $CoCl_2$, lines corresponding with $CoCl_2,2H_2O$ were observed. The lattice const. of NH_4Cl decreases with increasing $[M^{II}Cl_2]$. The variation in the interplanar spacing of the double salt with changing concn. of the solid phase is recorded. O. D. S.

Critical opalescence of liquid mixtures. R. S. KRISHNAN (Proc. Indian Acad. Sci., 1937, A, 5, 577-593).—Rousset's theory of secondary scattering (cf. A., 1934, 830, 1302) is reviewed and extended, and is not in accord with experimental results. Data obtained for the depolarisation of scattered light in three binary mixtures and one ternary mixture at temp. $\Rightarrow 30^{\circ}$ above the crit. solution temp. (T_{cs}) confirm the existence of mol. clusters. Gans' theory is discussed in relation to this and other anomalous phenomena occurring in the neighbourhood of T_{cs} . A. J. E. W.

Influence of admixtures on the mutual solubility of liquids. P. JANKELEVITSCH (Trav. Inst. Chim. Charkov, 1935, 1, 163—223).—The temp.solubility curves of PhOH in H₂O have been determined in presence of NaCl, CoCl₂, FeCl₃, and a no. of complex salts of Co. The influence of these salts is evident only at high [PhOH] and the action of the salts diminishes with increasing ionic radius. The theoretical aspects of the problem are discussed. R. T.

Solubility of gases in mixtures of water and non-electrolytes. A. VON KISS, I. LAJTAI, and G. THURY (Z. anorg. Chem., 1937, 233, 346–352).— The solubilities of CO_2 and H_2S in mixtures of H_2O with EtOH, COMe₂, CO(NH₂)₂, and glycerol have been determined. The solubility, its temp. coeff., and the heat of dissolution all vary with the concn. of the non-electrolyte, but no simple relationship has been found. F. J. G.

Solubility of sulphur dioxide in calcium hydrogen sulphite solutions. F. H. CONRAD and W. L. BEUSCHLEIN (Paper Trade J., 1937, 105, TAPPI Sect., 67—70).—A method for ascertaining the solubility of SO₂ in aq. solutions of Ca(HSO_3)₂ up to saturation is described; the results are compared with published data. H. A. H.

Solubility of noble metals at high pressures. I. Dissolution of platinum metals in hydrochloric acid under air pressure. V. G. TRONEV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 555— 558).—The view that the dissolution of Pt in HCl in the presence of air without evolution of H₂ involves the reactions $2\text{HCl} + O \implies \text{H}_2O + \text{Cl}_2$, $\text{Pt} + \text{Cl}_2 + 2\text{HCl} \rightarrow \text{H}_2\text{PtCl}_6$, receives qual. support from the fact that the rate of dissolution increases as the air pressure, [HCl], and temp. increase. Both Pt and Au can be dissolved in HCl in presence of H_2O_2 ; Ir and Rh dissolve to some extent after treatment for several hr. in an autoclave under pressure.

R. C. M.

Solubility of dicarboxylic acids. J. H. C. MERCKEL (Rec. trav. chim., 1937, 56, 811-814; cf. this vol., 406).—Solubilities (s) in H₂O of acids of the malonic series (up to azelaic) can be expressed by

log s = a - bn(n - 1), where n = no. of C atoms. a and b have different vals. for the even and uneven members, and are greater for the latter. F. L. U.

Solubility of halogenated hydrocarbon refrigerants in organic solvents.—See A., II, 395.

Solubility of salts of fatty acids in mixed solvents. I. System barium acetate-ethyl alcohol-water, at 25°. E. JózEFOWICZ and T. CHO-WIENCZYK (Rocz. Chem., 1937, 17, 314-318).-Solubility data are recorded for the system at 25°. The solid phases are Ba(OAc)₂ and its monohydrate. R. T.

Colorimetric test of the solubility equation for regular solutions. R. D. VOLD (J. Amer. Chem. Soc., 1937, 59, 1515—1521).—Apparatus and technique for measuring the heat capacities and heats of mixing of corrosive liquids, which must be kept in a closed system to avoid decomp., are described. The heat capacities and heats of formation of the mixtures CCl_4 —SiCl₄, Ccl_4 — C_6H_6 , Ccl_4 —n- C_7H_{16} , and C_6H_6 —n- C_7H_{16} and the heat capacities of the mixtures SnCl₄—CCl₄ and of all the pure components have been determined at 25°. An equation for calculating the heat of mixing has been derived. E. S. H.

Highly polymerised compounds. CLXIII. Solubility and precipitability of substances of high mol. wt. G. V. SCHULZ (Z. physikal. Chem., 1937, 179, 321-355).-It has been deduced theoretically that if a substance with the degree of polymerisation P is distributed between a pure solvent and a mixture of a solvent with a precipitant (concn. γ) $\log_{0} (c_{1}/c_{2}) = -P(A + B\gamma)/RT$, where c_{1} and c_{2} are the concns. in the pure solvent and in the mixture, respectively, and A and B are consts. The approx. relation $s = Ke^{-P(A+BY)/R\theta}$, where θ is a function of the temp. and A, B, and K are consts., has been obtained for the solubility, s, in a mixture of solvent and precipitant. For a given temp. this becomes $\log_e s = a - b\gamma$ (a and b are consts.). The precipitability, measured by the concn. g, of precipitant sufficient just to start pptn., must be a linear function of 1/P, so that P can be calc. from g. g is practically independent of the degree of branching of the mol. chain and rises linearly with the temp. It seems that some or all of A, B, and K are influenced by temp. The above theoretical deductions are supported by experimental data published previously. It is inferred that solutions of highly polymerised solutes do not differ fundamentally from those of solutes of low mol. wt. and that the same theory is applicable to both. R. C.

Determination of adsorption isotherms of hydrogen on charcoal between 90° and 50° abs., in connexion with desorption experiments. A. VAN ITTERBEEK and W. VAN DINGENEN (Physica, 1937, 4, 617—618; cf. this vol., 357).—Corrections are applied to previous calculations for the cooling of the adsorbed H and for the ortho-para-H₂ conversion. H. J. E.

 and 10^{-2} —1 mm. The results are expressed by $X^2 = k_1k_2p/(1+k_2p)$, X being the quantity adsorbed per sq. cm., p the pressure, and k_1 and k_2 consts.

H. J. E.

Adsorption of benzene vapour from a current of air. P. K. MIGAL and V. A. GOLOVTSCHENKO (Trav. Inst. Chim. Charkov, 1936, 2, 157–163).— SiO₂ gel and active C differ in possessing high adsorptive capacity and velocity, respectively; a combination of the two adsorbents gives better results with respect to elimination of C_6H_6 from air than when each is taken separately. The activity of SiO₂ gels rises with increasing [HCI] used for their pptn. R. T.

Use of low-temperature van der Waals adsorption isotherms in determining the surface area of iron synthetic ammonia catalysts. P. H. EMMETT and S. BRUNAUER (J. Amer. Chem. Soc., 1937, 59, 1553—1564).—Adsorption isotherms for 6 different catalysts have been determined with N₂ and A at $-195\cdot8^{\circ}$; N₂, A, CO, and O₂ at -183° ; CH₄ and NO at -140° ; N₂O and CO₂ at -78° ; NH₃ at -36° ; and *n*-butane at 0°. These measurements, in combination with data for the chemisorption of CO by the catalysts at -183° and -78° and for the activated adsorption of H₂, are used in the calculation of the abs. and relative surface areas of the catalysts. Al₂O₃ promoters tend to concentrate at the surface of the catalysts. E. S. H.

Adsorption on gels. II. Comparative study of the capillary spaces in gels of silica and alumina. K. S. RAO and B. S. RAO (Proc. Indian Acad. Sci., 1937, 6, A, 16–23; cf. this vol., 129).– Adsorption of H_2O vapour on "glassy" and "chalky" SiO₂ gels and of C_5H_5N vapour on Al_2O_3 gels activated at 400°, 500°, and 850° has been studied. The observed differences are discussed with reference to variations in capillary size. C. R. H.

Selective adsorption on silica gel from pyridine-alcohol mixtures. N. VENKATANARASIMHA-OHAR and K. S. G. Doss (Proc. Indian Acad. Sci., 1937, 6, A, 32-35).—Data for the whole range of C_5H_5N -EtOH mixtures have been derived from the change in n of the mixtures after adsorption. Evidence is adduced for the formation of C_5H_5N ,2EtOH at the interface. Vals. for n of C_5H_5N -EtOH mixtures at 23-37° are recorded. C. R. H.

Adsorption in the gaseous phase. P. DEMOU-GIN (Mem. Poudres, 1937, 27, 57-71).—Theoretical. W. J. W.

Surface compounds. R. JUZA and R. LANG-HEIM (Naturwiss., 1937, 25, 522-523).—A study of magnetic properties throws light on the adsorption of gases by activated C. The paramagnetism of O_2 disappears when the gas is adsorbed on C at room temp. This can be explained by supposing that surface compounds of C and O are produced, which, like CO and CO₂, would not be paramagnetic. The diamagnetism of C₆H₆, Br, and I, respectively, adsorbed on activated C is < that calc. for the free mols. and C. If the susceptibility of the adsorbed substance is calc. on the assumption that the magnetism of C is the same before and after the adsorption, there is a decrease in the diamagnetic susceptibility of C_6H_6 , and Br and I show a paramagnetic susceptibility instead of being diamagnetic. This may be due to the adsorption of the gases between the lattice planes of the graphite, thus diminishing the anomalous diamagnetism of C, or, more probably, to an alteration in the properties of the gases themselves owing to the special conditions obtaining at the surface.

A. J. M. Properties of hydrogen films on tungsten by method of contact potentials. R. C. L. BOSWORTH (Proc. Camb. Phil. Soc., 1937, 33, 394—402).—The W-WH and W-WD contact potentials are -1.04and -1.02 v., and the WH and WD work functions at 300° K, 5.60 and 5.58 v. At. H is produced when a H₂ mol. strikes a bare W atom; one H atom is absorbed, the other goes into the gas phase. The condensation coeff. for H₂ mols. on cold W is 0.01, and the dipole moment of the absorbed H atom is 0.42 D, independent of the proportion of surface covered. F. J. L.

Passivity of metals. VIII. Rate of growth of oxide films on iron. H. A. MILEY and U. R. EVANS (J.C.S., 1937, 1295—1298; cf. this vol., 301).— Electrical measurements of the thickness of Fe oxide films produced by exposing Fe to dry air at 18— 355° showed that even at room temp. the oxidation is very rapid. In general, the parabolic law connecting mean film thickness and time was not obeyed. It is probable that the film on Fe heat-tinted at temp. >200° is α -Fe₂O₃; above 400° this is backed by Fe₃O₄, and above 575° a third layer, chiefly of FeO, appears. J. G. A. G.

Presence of films on metals. E. I. GUROVITSCH (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 551— 554).—A further proof of the existence of a film on metals has been obtained from photomicrographs of the effect of I vapour on a metal microsection before and after removing the surface layer mechanically under Hg; these show that the "denuded" surface is corroded to a much greater extent. R. C. M.

Visible adsorbed films and the spreading of liquid drops at interfaces. D. H. BANGHAM, S. MOSALLAM, and Z. SAWERIS (Nature, 1937, 140, 237). —When a freshly split mica plate is placed under a jet of the supersaturated vapour of C_6H_6 , MeOH, or H_2O , condensation of bulk liquid occurs only after a film of crit, thickness has been formed. Under suitable conditions films of a thickness < this, but thick enough to show interference colours, are produced. These adsorbed films have properties different from the bulk liquids. The behaviour of drops of different liquids, such as *n*-hexane and C_6H_6 , placed near to each other on a mica plate, is described. L. S. T.

Structure of surface layers of liquids and films. S. E. BRESLER and P. F. POCHIL (Bull. Acad. Sci. U.R.S.S., 1937, 413-420).—The stability of the foam produced from fused *p*-azoxyanisole falls from the m.p. (118°) to zero at the transition point from anisotropic to isotropic liquid, at 137°. The η is at a min. at 130°, and at a max. at 140°, showing that the stability of the foam is not connected with η . The stability of the elementary foam obtained with polar liquids (AcOH, H₂O) is at a max. at

temp. $\geq 0.1^{\circ}$ above their f.p. Dichroism is observed for H₂O at 0°, and disappears at 0.02°. R. T.

Structure of protein monolayers. J. S. Mrr-CHELL (Trans. Faraday Soc., 1937, 33, 1129-1139).-The properties of unimol. films of wheat gliadin, zein, and insulin, prepared by spreading from solution. vary with the concn. of the protein solution and attain limiting vals. at a low concn. (0.01-0.001%). Homo-geneous films of min. mean thickness 1.6-3.8 A. are formed by spreading from 0.01% solution and keep-ing for 1 to 36 hr. The gliadin films are almost identical with those obtained by spreading from the solid. The mechanical properties of the films are analysed in terms of mean properties per CO·NH·CHR residue, and support the structure of protein films suggested by Hughes and Rideal (A., 1932, 909) with certain modifications, which are discussed. The separation of the polar and non-polar side-chains below and above the main chains, yielding a triplex structure in the high-pressure region, appears to justify the application of the results to biological problems. J. W. S.

Protein films. E. GORTER (Trans. Faraday Soc., 1937, 33, 1125-1129).-The fact that the thickness of a unimol. film of protein (10 A.) is < the radius of the globular protein mol. (22.5 A.) is attributed to an unfolding of the mol. with partial denaturation. The tendency of the protein to spread is increased by factors preventing ionisation of the NH3 and CO2 groups, e.g., addition of electrolyte, bivalent acids, or amines. Experiments with artificial complex proteins suggest that the spreading properties of natural proteins depend on their composition. Thus proteins do not spread if their upper surfaces contain too many polar groups or their lower surfaces contain too few. The ion contents of plasma and muscular tissue show a rough parallelism with the concns. required to give a spreading tendency to proteins. J. W. S.

Identification of opaque solids by selective iridescent filming. I. Optics. A. M. GAUDIN (J. Physical Chem., 1937, 41, 811—859).—Theoretical. An optical analysis of thin films between layers of dissimilar substances. C. R. H.

Use of the word substrate. N. K. ADAM (Nature, 1937, 140, 158).—The word "substratum" or "underlying liquid (or solid)" should be used instead of substrate for the denser phase adjoining a surface film. L. S. T.

Properties of detergent solutions. II. Surface and interfacial tensions of aqueous solutions of alkyl sodium sulphates. III. Influence of added electrolytes on the surface activity of the higher alkyl sodium sulphates. J. POWNEY and C. C. ADDISON (Trans. Faraday Soc., 1937, 33, 1243— 1253, 1253—1260; cf. A., 1935, 1458).—II. The surface tensions (γ) of dil. aq. solutions of the compounds C_nH_{2n+1} ·SO₄Na (n = 12, 14, 16, or 18) at various temp. and conces. have been determined by the ring method. Interfacial tensions against xylene (σ) have been determined by the drop-wt. method for the same salts at 60° and for $C_{12}H_{25}$ ·SO₄Na solutions over the range 20—75°. Both the γ -c and σ -c curves show breaks at a crit. val. of c (c_c) at which micellar formation sets in. The temp. coeff. of c_c is <2.5% per degree and is a max. for n = 14. The nature of the surface-active species, the equilibrium between simple long-chain ions and micelles, and the influence of chain length on the temp. coeff. of γ and σ are discussed. Various disturbing factors render application of the Gibbs equation inadvisable.

III. Added salts [NaCl, CaCl₂, Al₂(SO₄)₃, (NaPO₃)₆] modify the surface activity and c_0 to an extent which depends on chain length, temp., and on the valency of the added cation, but is independent of the added anion. J. W. S.

Effect of amino-acids on the surface tensions of sodium chloride solutions. J. W. BELTON (Trans. Faraday Soc., 1937, 33, 1176–1180; cf. this vol., 234).—The surface tension (γ) of 0, 1, 2, 3, and 4N aq. NaCl, saturated with an NH₂-acid (aspartic acid, asparagine, glutamic acid, o-, m-, and p-NH₂·C₆H₄·CO₂H), has been determined by the bubblepressure method. The acids have little influence on γ in the case of H₂O, but this influence increases with increasing [NaCl]. The activities of the undissociated acids and their ions are approx. const. and it is inferred that the NH₂-acid reduces the amount of H₂O adsorbed in the interface. The results are discussed from the viewpoint of the zwitterion theory.

J. W. S. Surface tension and thermodynamics. J. E. VERSCHAFFELT (Chem. Weekblad, 1937, 34, 570— 573).—The views of Gibbs and van der Waals are discussed mathematically. S. C.

Molecular-theoretical treatment of surface tension. C. ZWIKKER (Chem. Weekblad, 1937, 34, 567-570).—A review. S. C.

Wetting and spreading properties of aqueous solutions. Mixtures of sodium hydroxide with *n*-hexoic, *n*-octoic, *n*-decoic, lauric, myristic, and palmitic acids. H. L. CUPPLES (Ind. Eng. Chem., 1937, 29, 924—926).—The surface tensions (γ) , and interfacial tensions against petroleum (σ) , of 1% solutions of fatty acids have been determined in presence of 0.5-3 mol. of NaOH per mol. of acid at 25-65°. Curves of γ , of σ and spreading coeff. (s) against NaOH content are similar in form, showing a min. val. of γ and σ below a mol. ratio of NaOH/acid = 1.0, and a sharp rise at approx. 1.0 followed by a gradual decrease. The increase in γ and σ in the region of the equivalence point rises with decreasing mol. wt., except for n-hexoic acid. Vals. of γ for the fatty acids are > the vals. for the soap solutions containing excess of acid. The curves for s are similar to those for γ and σ , but the relations are inverse in character. Applications are discussed. R. S. B.

Kinetics of wetting and linear corrosion of metals in polyphase systems: metal-liquidliquid and metal-liquid-gas. III. D. I. MIRLIS (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 463— 467; cf. this vol., 367).—The kinetics of wetting and the corrosion of Al in aq. $HCl-C_6H_6$, $H_2O-C_6H_6$, H_2O -air, and aq. HCl-air systems have been studied. For rough Al surfaces pitting corrosion occurs at the phase boundary, whilst for smooth surfaces corrosion is uniform over the whole area of Al covered by the corroding liquid. O. D. S.

Dynamic activity of charcoal filters. N. A. IZMAILOV and K. K. SIGALOVSKAJA (Trav. Inst. Chim. Charkov, 1935, 1, 133—162).—The point of saturation of a layer of C by C_6H_6 , *n*-heptane, PhOH, $C_{10}H_8$, or CS₂ vapours present in air which is passing through the layer has been observed by increase in the wt. of a small adsorbent tube through which the issuing air is passed. The V/V_8 -log D curves (V and V_8 are the vols. occupied by the substance at the given pressure, and at the pressure of its saturated vapour, respectively, and D is the average pore diameter) for the above substances (except CS₂) coincide, in agreement with Kubelka's theory (A., 1931, 1121). The thickness of the adsorbed layer in the capillaries at the moment when the adsorbate appears in the issuing gas is the same for all absorbates studied. The concn. of substance in the gas filling the capillaries is only slightly < that in the issuing gas. R. T.

Action of neutral salts on capillary activity of organic substances. T. M. POLONSKI (Trav. Inst. Chim. Charkov, 1936, 2, 105–155).—The surface tension of aq. $PrCO_2H$ is raised by ions, in the order $Cl > Br > NO_3 > CNS$; Li > Na > K, Ca > Mg = Ba > Cu > Cd, to an extent inversely \propto salt concn. Szyszkowski's equation (cf. A., 1908, ii, 1018) is applicable to the systems, for salt concns. up to 4N. R. T.

Artificial membranes: their structure and permeability. K. H. MEYER (Trans. Faraday Soc., 1937, 33, 1073—1081; cf. A., 1936, 1065, 1335; this vol., 408).—The author's recent work on cation and anion permeability of synthetic membranes is summarised, and the results are compared with those obtained with natural animal and vegetable membranes. J. W. S.

Factors in membrane permeability. E. K. RIDEAL (Trans. Faraday Soc., 1937, 33, 1081-1085). -The formation of unimol, protein films of gel-like structure and the penetration of films by a polar compound in mol. equiv. proportions to form strong mixed films are discussed. It is suggested that substances which modify permeability of natural membranes may either produce or disperse bonds between protein groups directly or through sp. action on the foreign material present in the membrane. Thus substances with a narcotic action must have an active group of suitable sign to enable them to penetrate the gel system and must also possess a large hydrophobic portion so that the complex formed with one of the constituents of the membrane should be stable. Since there appears to be a definite amount of enzyme system per unit vol. of the membrane, substances which are strongly adsorbed will exert their narcotic action when a definite no. of mols. have penetrated unit vol. of the membrane. J. W. S.

Theory of membrane equilibrium. C. S. ADAIR (Trans. Faraday Soc., 1937, 33, 1106—1116).— Donnan and Guggenheim's criteria for equilibrium across a semipermeable membrane (A., 1933, 127; 1934, 840) are restated in terms of molarities and pressures. Terms not usually included in approx. formulæ may be important at high pressures of for membranes permeable to large mols. The calculation of the ratio of mean activity coeffs. of the ions of a salt is suggested as a criterion for equilibrium. The theory of membrane equilibrium and osmotic pressures in ideal systems with low osmotic pressure is discussed and applied to the process of dialysis. J. W. S.

Activation energy of diffusion through natural and artificial membranes. J. F. DANIELLI (Trans. Faraday Soc., 1937, 33, 1139—1140).—Assuming a min. kinetic energy for penetration, formulæ have been derived for the rate of penetration through a membrane and for its temp. coeff. The potential barrier of the membrane appears to be typical for a given type of cell of a given species. The difference between the activation energies for entering and leaving a cell may be very great (4000 g.-cal. for *Arbacia* eggs), indicating that the membrane can maintain concn. differences by utilising the heat energy of its surroundings. J. W. S.

Statistical theory of perfect solutions. R. H. FOWLER and G. S. RUSHBROOKE (Trans. Faraday Soc., 1937, 33, 1272-1294).---Mathematical.

J. W. S.

Associating effect of the hydrogen atom. I. Amides and sulphonamides. H. O. CHAPLIN and L. HUNTER (J.C.S., 1937, 1114—1118).—Association factors for 9 amides and 33 sulphonamides have been calc. from cryoscopic data for solutions in $C_{6}H_{6}$ and PhNO₂. Mol. association is negligible when both amide-H atoms are substituted, but is generally present when there is one free amide-H and this is attributed to intermol. sharing of the H by resonance. The following have been prepared: p-tolucnesulphonphenylbenzylamide, m.p. 139—140°, N-acetyl-p-toluenesulphonmethyl-amide, m.p. 58—59°, -anilide, m.p. 149—150°, -o-toluidide, m.p. 100°, -m-toluidide, m.p. 120°, -p-toluidide, m.p. 135°. J. G. A. G.

Molecular state of liquids. K. L. WOLF, H. FRAHM, and H. HARMS (Z. physikal. Chem., 1937, B, 36, 237-287; cf. this vol., 138).-Measurements of orientation polarisation and heat of mixing indicate that in dil. solutions of alcohols in cyclohexane (I) and C6H14 the mol. state of the solute is the same as in the gaseous state, but with increasing concn. there is association. In dil. solutions of EtOH in (I) the space-demand of the solute is > in more conc. solutions owing to dissociation of associated mols. Even for conc. solutions of $COMe_2$ in such solvents the solute mols. seem to have more residual valency than associated alcohol mols. Lengthening of the hydrocarbon chain of an alcohol or branching near the OH opposes association. Solvation increases with the polarisability of the non-polar constituent of the solution. Solvation tends to reduce the spacedemand. A convenient comparative measure of the dissociating power of the solvent is the concn. at which the heat of mixing ceases to vary with concn. In C_6H_6 the proportion of the double mols. of solute which are polar is > in (I). There is evidence of approach to the formation of mol. compounds in ·CCl₄-EtOH mixtures. The solvation of an alcohol with C₆H₆ is more sensitive to steric influences than

the association of alcohol mols. with each other. Heats of mixing and miscibility relations have been correlated. Owing to its association, EtOH mixed with a small amount of a non-polar liquid behaves in respect of heat of mixing and space-filling like a nonpolar liquid. Viscosity measurements with (I)-EtOH mixtures show the break up of the associated EtOH mols. under the influence of (I) to be cquiv. to a lubricating effect. R. C.

Substituted quaternary azonium compounds. V. Molecular state of phenyldimethylazonium, phenylmethylethylazonium, phenyldiethylazonium, phenylbenzylmethylazonium, and phenylbenzylpropylazonium iodides in dilute solution. B. K. SINGH and M. R. SUD (Proc. Indian Acad. Sci., 1937, A, 5, 522-527; cf. J.C.S., 1914, 105, 1751).---Mol. wt. determinations by the Lumsden-Walker method on dil. aq. and EtOH solutions are recorded. Except for the phenyldiethyl compound, the degree of association is lower in EtOH than in H₂O, contrary to the Nernst-Thomson rule. The degree of association in aq. solution decreases with increasing formula wt.; it decreases on dilution in both solvents.

A. J. E. W.

Compressions of solutions of salts in water, glycol, and methanol. R. E. GIBSON (J. Amer. Chem. Soc., 1937, 59, 1521—1528).—Sp. vols. of NaBr in MeOH and of CdI₂ in MeOH, H₂O, and (CH₂·OH)₂, and compressions of NaI, LiI, NaBr, and CdI₂ in MeOH, NaI and CdI₂ in H₂O, and NaI, KI, CdI₂, LiBr, and NaBr in (CH₂·OH)₂ have been determined and the apparent vols., compressions, and effective pressures computed. Significant differences between the behaviour of aq. and non-aq. solutions are discussed. E. S. H.

Influence of solvents and other factors on the rotation of optically active compounds. XXXV. Attractive power and solvent effect on rotation. T. S. PATTERSON and G. M. HOLMES. XXXVI. Asymmetric solvent action. T. S. PATTERSON and A. H. LAMBERTON (J.C.S., 1937, 1403—1406, 1453—1459; cf. this vol., 279).—XXXV. The relative attractive powers of immiscible solvents for Et tartrate have been determined by experiments on the partition of Et tartrate between H₂O and an org. liquid (C₆H₆, PhMe, o- m- and p-xylene, mesitylene, PhCl, PhBr, PhI, PhNO₂, o-C₆H₄Me·NO₂, PhCHO, CCl₄, CHCl₃, CH₂Cl₂, EtBr, C₂H₄Br₂, C₂H₄Cl₂, CHMeCl₂, MeI, or EtI). Comparison of the vals. obtained with $[\alpha]_{\rm b}$ does not reveal any general relation, but to some extent analogous solvents are grouped together.

XXXVI. A slight difference in the vols. of Bu^{β} d-tartrate and l-tartrate in l-menthyl acetate, and a similar difference in PhNO₂, has been observed. It appears that the vol. is the same in the two solvents. E. S. H.

Application of Verdet's law to solutions. Magnetic rotatory power of ions. R. CORDON-NIER (Compt. rend., 1937, 205, 313-315).—The differences shown by the mol. magnetic rotations of solutions of pairs of salts having the same two anions with a common cation are approx. const. F. J. G. Raman scattering of silicate solutions. S. K. CHAKRAVARTI and P. B. GANCULI (J. Indian Chem. Soc., 1937, 14, 275–277).—The same shift ($\Delta v = 261$ cm.⁻¹) is given by Na₂SiO₃ and by solutions in which the ratio Na₂O: SiO₂ is 1:2 and 1:4. The last gives pronounced general scattering. F. J G.

Size of gas bubbles in liquids. R. SCHNUR-MANN (Kolloid-Z., 1937, 80, 148—151).—The size of macroscopic bubbles, produced by passing gas through a glass filter in EtOH-H₂O mixtures, depends on the viscosity (η) of the liquid and not on the surface tension (cf. A., 1936, 1086). The bubbles are smallest for mixtures of max. η . E. S. H.

[Preparation of] colloidal solutions of silver and copper. H. FREUNDLICH and D. STEINER (J.C.S., 1937, 1081—1085).—Highly disperse Ag sols, free from org. substances and suitable for use as nuclear sols, were prepared by reducing ammoniacal Ag₂O solution with N_2H_4 , H_4 O in the presence of a trace of either Cu⁻, Pb⁻, or Zn⁻. These metals also assist the formation of Ag mirrors, but as in sol formation, the favourable influence is limited to narrow ranges of concn. depending on the [Ag]. Complex cyanides and excess of NH_3 are disadvantageous. P in Et₂O, and PH₃, produce very highly dispersed sols from the Ag₂O solution unassisted by Cu⁻ and unimpeded by excess of NH_3 .

Clear, amicronic, red sols of negatively charged Cu metal, free from protecting colloids, were prepared by reducing boiling ammoniacal CuO solution with N_2H_4, H_2O followed immediately by P in Et₂O. P, in the absence of N_2H_4, H_2O , did not yield the red sols, but, in sufficient quantity, afforded a brownishblack sol probably containing Cu phosphide. Coarser red sols were obtained from N_2H_4, H_2O and the CuO solution in absence of P, and mirror formation was favoured by an excess of $NH_3 <$ the optimum for the highly disperse red sols. The mechanism of the formation of the sols is discussed. J. G. A. G.

Effectiveness of filtration, dialysis, electrolysis, and their intercombinations as purification processes. E. MANEGOLD (Trans. Faraday Soc., 1937, 33, 1088—1094; cf. this vol., 180).—A comparison of the times required for purification of a hydrosol from electrolyte contamination by various methods shows that electrolysis may contribute to purification when the concn. of electrolyte is low. When the smallest particles of hydrosol are relatively large (about 5×10^{-4} cm.) purification is quickly attained by filtration, but when they are very small (e.g., 5×10^{-8} cm.) dialysis gives quicker results than filtration unless high-pressure filtration is used. J. W. S.

Structure of highly-purified sulphide sols. II. Antimony trisulphide sol. W. PAULI, W. KOLBL, and A. LAUB (Kolloid-Z., 1937, 80, 175– 185; cf. this vol., 237).—By electro-decantation of very dil. Sb₂S₃ sols, highly conc., pure sols have been prepared. The conductivity and titration curves of the sols, and their behaviour on coagulation by electrolytes, on freezing and boiling, and on oxidation have been investigated. In general, the results are analogous to those already reported for As_2S_3 sols.

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Potential and transport measurements with ferric oxide hydrosols. II. A. LOTTERMOSER and H. FRITZSOHE (Kolloid-Z., 1937, 80, 166—174; cf. this vol., 460).—Apparatus and technique for determining the [Cl'] of Fe $(OH)_3$ sols by measurement of transport nos. are described. Significant results can be obtained only with an aged sol, as in freshlyprepared sols the [Cl'] varies during the experiment. Results obtained for Fe $(OH)_3$ sols agree with those obtained by measurement of potential. E. S. H.

Viscosimetric behaviour of sodium oleate solutions. W. PHILIPPOFF and K. HESS (Ber., 1937. 70, [B], 1808-1814).-Under suitable conditions Na oleate (I) solutions show a marked structural viscosity such as has been observed previously only with cellulose derivatives (II), caoutchouc, and synthetic polymerides. In dil. solution the η of (I) follows the same law as does that of (II). With increasing concn. the graph changes its direction more rapidly than is required by the law and finally becomes nearly asymptotic. In this last region the presence of cryst. micelles is detected Rontgenographically and it appears probable that the rapid increase of η with concn. is due to such micelle formation, which, however, occurs to some degree in considerably more dil. solution. These micelles appear remarkably stable to alteration in temp. Comparison is made of the properties of solutions of (I) with those of cellulose esters. H. W.

Rontgenographic investigations of resting and flowing colloidal solutions. Detection of the orientation of colloidal particles in flowing through capillaries by the occurrence of fibre diagrams. Hydration of colloidal particles in solution. K. HESS and J. GUNDERMANN (Ber., 1937, 70, [B], 1800-1808).-Rontgenographic investigation of flowing aq. sols of V2O5, Hg sulphosalicylate (I), and Na oleate (II) shows that at comparatively low concn. the reflexion phenomena suffice to elucidate further the nature of the suspended particles in the solution. In confirmation of optical investigations, V2O5 and (I) are found to be extended stiff particles (rod colloids) of cryst. character, probably surrounded by H₂O mols. arranged in lattice formation. The particles of (II) appear to be leaflets composed of layers in which the oleate mols. are perpendicular to the basal plane. With increasing dilution the leaflets diminish in thickness and finally represent a bimol. layer of oleate chains arranged in pairs. The immediate investigation of sol solutions has the great advantage of excluding secondary changes during the separation of the disperse phase from the dispersing agent. Investigation in the flowing condition has the further advantage that it is possible to determine the form of the particles. If orientation effects occur during flow the method is preferable to working with the stationary condition since the increase of intensity which accompanies the opening of the original Debye-Scherrer rings to crescent or point reflexes permits direct observation at considerably lower concn. H. W.

Dispersion of depolarisation of light-scattering in colloids. IV. Iodine, graphite, stearic acid, vanadium pentoxide, arsenic trisulphide, V (e) 7 (a) 7

and ferric hydroxide sols. V. Colloidal dyes. R. S. KRISHNAN (Proc. Indian Acad. Sci., 1937, A, 5, 499—509, 551—563; cf. this vol., 182, 409, 460).—IV. Measurements of the depolarisation factors ρ_u , ρ_c , and ρ_h , and of the extinction coeffs. of the sols, in the λ range 2500—7000 A., are recorded. In I sols the absorption and ρ_u are max. at 4500 A.; the particles are spherical. In graphite sols ρ_u increases and ρ_v decreases with decreasing λ ; the particles are non-spherical and moderately anisotropic. Stearic acid, V_2O_5 , and Fe(OH)₃ sols show normal dispersion due to a particle size effect; the particles are nonspherical, those of V_2O_5 being rod-shaped and highly anisotropic. In As₂S₃ sols ρ_u , ρ_v , and ρ_h increase with λ , the particles being spherical and feebly anisotropic.

V. Similar measurements on ten dye sols show that the depolarisation reaches a max. at the absorption maxima. The condition of the dispersed particles is discussed. A. J. E. W.

Adsorption of precipitates. I. Adsorption of precipitates of ferric, aluminium, and chromic hydroxides. N. A. YAJNIK, P. L. KAPUR, and R. L. MALHOTRA (Kolloid-Z., 1937, 80, 152—155).— Measurements of the adsorption of CN', SCN', NO₃', IO₃', BrO₃', MnO₄', CrO₄'', C₂O₄'', Fe(CN)₆''', and Fe(CN)₆'''' by pptd. Fc(OH)₃, Al(OH)₃, and Cr(OH)₃ show that the order of adsorption does not depend only on valency, but is influenced by sp. chemical factors, such as the formation of insol. or complex salts.

E. S. H.

Thermo-ageing of colloids. II. Variation of the viscosity and opacity. S. S. JOSHI and G. SINGH (J. Indian Chem. Soc., 1937, 14, 254—259; cf. A., 1936, 935).—When colloids are "thermoaged" by refluxing on a water-bath, it would seem that η generally decreases whilst the transparency increases; in some cases, however, these qualities increase or decrease together. F. J. G.

Electrolyte coagulation of weakly solvated sols and electrolyte activity. VIII. Ion antagonism in flocculation. Wo. OSTWALD and K. HOFFMANN (Kolloid-Z., 1937, 80, 186—204; cf. this vol., 410).—The activity coeffs. of binary mixtures of electrolytes are discussed theoretically in the light of published work on ion antagonism. The conclusions reached support the view that the stability of a sol is more influenced by the physicochemical state of the electrolytic dispersion medium than by that of the disperse particles and that coagulation is determined by interionic forces in the dispersion medium. E. S. H.

Cryolysis of casein. F. F. NORD, H. LEICHTER, and G. UMBACH (Z. Elektrochem., 1937, 43, 682).— During freezing, casein solutions show the normal disaggregation-aggregation phenomena of a lyophilic colloid (A., 1935, 1276). Alkaline casein solutions of $p_{\rm fl}$ 6.8—7.2 have a characteristic absorption band at about 2760 A., which varies in intensity in the frozen and unfrozen states in accord with interferometric observations. The variation in mol. size of casein between 75,000 and 275,000 (A., 1930, 386, 488) supports the conclusion that the so-called "normal nos." of proteins, determined by ultracentrifugal methods, depend on the previous treat-MM (A., I.) ment of the sample. The results explain why case in-containing provisions are less stable at room temp. after cooling, e.g., to -17° , since the change in degree of dispersion may facilitate attack by enzymes etc. J. W. S.

Rigidity and constitution of a thermo-reversible gel. F. HIRATA (Proc. Imp. Acad. Tokyo, 1937, 13, 266—269).—The rigidity of a gelatin gel at its isoelectric point, and at temp. between 5° and 23°, has been studied by a modified Michaud method (cf. A., 1932, 122). The results indicate that the change in rigidity with temp. is due to variation of the electrostatic forces between the micelles, caused by changes in the dielectric const. of the intermicellar liquid. A. J. E. W.

Heat of wetting of activated silica gel. D. T. EWING and G. T. BAUER (J. Amer. Chem. Soc., 1937, 59, 1548—1553).—The adsorption-desorption curves obtained for H_2O vapour on SiO₂ gel show no hysteresis. Heats of wetting have been determined for gels of different H_2O content; a max. has been found at 4% H_2O . SiO₂ gel is most highly activated by keeping it for many hr. in vac. at $260-275^\circ$. E. S. H.

Emulsion practice with aqueous carbamideprotein solutions. A. STEIGMANN (Kolloid-Z., 1937, 80, 217—219).—Peptisable AgBr ppts., containing 6—8 times the amount of gelatin, can be prepared by dissolving the gelatin in conc. aq. $CO(NH_2)_2$ and then adding it to cold aq. HBr. The action of $CO(NH_2)_2$ on glutin is disaggregating rather than hydrolytic, and glutin can be made to crystallise rapidly from the solution by adding cold H_2O or slowly by adding hot H_2O . E. S. H.

Deformation mechanism, swelling anisotropy, and fine structure of hydrous cellulose gels. P. H. HERMANS and A. J. DE LEEUW (Naturwiss., 1937, 25, 523—524).—A study of the anisotropy of swelling of threads of artificial cellulose enables the mean direction of the micelles to be determined. The swelling anisotropy (ratio of sp. transverse swelling to sp. longitudinal swelling) as a function of the extension has been measured for a cellulose xanthate thread. It is shown that the cellulose hydrate gels must have net-like structure. The threads are built up of micelles, for which the internal structure is cryst., whereas the external configuration is irregular, being bounded by numerous projecting, disordered cellobiose chains. A. J. M.

Micellar structure and deformation processes of fibrous substances. IV. F. BREUER, O. KRATKY, and G. SAITO (Kolloid-Z., 1937, 80, 139— 148; cf. A., 1935, 286).—Mainly theoretical. Experiments on the degree of swelling of cellulose acetate in dioxan-H₂O mixtures show that with low concns. of dioxan intermicellar swelling occurs, whilst swelling is intramicellar with high concns. of dioxan. The nature of these processes is discussed and the optical phenomena associated with intramicellar swelling are described, particularly with reference to the effect of deformation by stretching. E. S. H.

Tension-optical coefficient as a material constant. A. V. BLOM (Kolloid-Z., 1937, 80, 212215).—The detection of strains in colloidal material, due to internal or external stresses, by means of double refraction is discussed. The determination of the tension-optical coeff. as a means of studying the mol. structure of polymerised substances is recommended. E. S. H.

Isoelectric point of fibroin of Chinese silk.— See A., III, 376.

Micellar structure of rubber. O. KRATKY and F. SCHOSSBERGER (Z. Elektrochem., 1937, 43, 666— 667).—Films of readily sol. and of difficultly sol. rubber, deposited from very dil. solution in C_6H_6 , PhMe, CCl_4 , or $CHCl_3$, show a high degree of orientation. This is interpreted as indicating that the faculty for forming box-like micelles is directly associated with the principal-valency chain.

J. W. S.

Equilibrium $Co + CO_2 = CoO + CO$. III. A. F. KAPUSTINSKI and E. HOFFMANN (Acta Physicochim. U.R.S.S., 1937, 6, 487-490).—Equilibrium data for this reaction at 720-1120° have been determined by the method previously described (A., 1936, 1464; this vol., 137). The heat of formation of CoO is 53,408 g.-cal. per mol., and the change in free energy at 25° is 11,400 g.-cal. per mol. J. W. S.

Calculation of equilibria in the gas phase from thermal data. O. FUCHS and K. RINN (Angew. Chem., 1937, 50, 708—712).—Heat changes in the hydrolysis of Ac_2O , (EtCO)₂O, HCO₂Me, and MeOAc have been measured. Thermal data for 26 gases and vapours are tabulated and their application to the determination of equilibrium consts. in the gas phase is discussed, with special reference to the CO₂-CO-H₂O-H₂ equilibrium. J. W. S.

Vapour-phase hydration of ethylene. M. P. APPLEBEY, J. V. S. GLASS, and G. F. HORSLEY (J.S.C.I., 1937, 56, 279–2817).—The equilibrium for the vapour-phase hydration of C_2H_4 to EtOH has been determined for five temp. ranging from 175° to 275° using cadmium metaphosphate prepared in accordance with B.P. 369,216 (B., 1932, 670) as catalyst. The results plotted logarithmically against 1/T lie on a straight line from which the heat of reaction is estimated to be 9900 g.-cal.

Variation of some technically important gas equilibria with temperature and pressure. H. ZEISE (Z. Elektrochem., 1937, 43, 704–708).—The vals. of log K_p and the degree of dissociation (α) have been calc. over wide limits of temp. and pressure and are presented in tabular form for the equilibria $H_2 \rightleftharpoons 2H, O_2 \rightleftharpoons 2O, H_2O \rightleftharpoons H_2 + \frac{1}{2}O_2, H_2O \rightleftharpoons$ $H_2 + O, H_2O \rightleftharpoons \frac{1}{2}H_2 + OH, H_2O \rightleftharpoons H + OH, and$ $CO_2 \rightleftharpoons CO + \frac{1}{2}O_2$. J. W. S.

Equilibria in protium oxide-deuterium oxide mixtures. W. H. HAMIL (J. Amer. Chem. Soc., 1937, 59, 1492—1494).—Published work on conductance and e.m.f. in H_2O-D_2O mixtures is explained in terms of the various isotopic equilibria, assuming the existence of H_2O^+ , H_2DO^+ , HD_2O^+ , and D_3O^+ . E. S. H.

Exchange equilibria of the hydrogen isotopes between water and molecules with numerous atoms. K. WIRTZ (Z. Elektrochem., 1937, 43, 662). —Cf. this vol., 81. J. W. S.

Theory of binary liquid mixtures. A. MUSL (Z. Elektrochem., 1937, 43, 686–689; cf. this vol., 302).—The previous theory is extended into a general activity theory of binary non-electrolyte liquids. The consts. of the Duhem-Margules differential equation are taken as characteristic magnitudes for activity, and from them the energy of the mixture as well as heats of dissolution, mixture, and dilution can be calc. The results are in accord with experimental data for the heats of mixing of C_6H_6 and CCl_4 , COMe₂ and CS₂, and COMe₂ and CHCl₂. J. W. S.

Structure in electrolytic solutions. P. DEBYE (J. Franklin Inst., 1937, 224, 135-144).—A résumé of the development of the interionic attraction theory. F. J. G.

Electrolyte action with acetic acid. I. Dissociation constant in aqueous ammonium and alkali chloride solutions. S. KILPI and A. MERE-TOJA (Z. physikal. Chem., 1937, 179, 371—392).— The dissociation const., K, has been determined by measuring the buffer capacity. When the acid concn., c, rises from 0.001 to 0.2N, K remains const. for a given salt concn., but in absence of a salt rises owing to the increase in ionic strength with c. For a given salt concn. K is smallest in KCl solution and is greatest in NH₄Cl and LiCl solutions. The mean thermodynamic dissociation const. at 20° is 1.754×10^{-5} . R. C.

Ortho-effect. II. Dissociation constants of o-substituted acids. J. F. J. DIPPY and R. H. LEWIS. III. Alkaline hydrolysis of benzoic esters. D. P. EVANS, J. J. GORDON, and H. B. WATSON (J.C.S., 1937, 1426—1429, 1430—1432; cf. A., II, 418).—II. Thermodynamic dissociation consts. have been determined for o-toluic, o-phenyl-, o-methoxy-, o-, m-, and p-phenoxy-, and o-nitrobenzoic, o-nitrophenylacetic (I), o- and p-chlorocinnamic acids. The recorded vals. ($\times 10^5$) are 12·3, 34·7, 8·06, 29·7, 11·2, 3·00, 671, 9·90, 5·83, 3·86. The greater strength of the o-isomerides of the benzoic series is discussed. The low val. for (I) is ascribed to a H linking between NO₂ and CH₂.

III. The effect of a *m*-substituent on the alkaline hydrolysis of EtOBz is to change the energy of activation without influencing appreciably the val. of P in the kinetic equation $k = PZe^{-E/RT}$. An o-substituent is associated with a relatively low velocity of hydrolysis by decreasing the P factor. This may be due to a reduction of the facility with which the activated complex, formed by the ester and OH' as the first step, breaks down to give the products.

E. S. H.

Dissociation constants of organic acids. XVIII. Cyclic 1:1-diacetic acids. W. L. GER-MAN and A. I. VOGEL (J.C.S., 1937, 1108—1112; cf. A., 1931, 1126; 1932, 572).—By means of potentiometric titrations with the quinhydrone electrode at 25°, classical and thermodynamical dissociation consts. have been determined. The thermodynamical vals., $K_1 \times 10^4$ and $K_2 \times 10^8$, for the following cyclic 1:1-diacetic acids are: cyclopentane- 1.60, 17.0, 3-methylcyclopentane- 1.61, 18.2, cyclohexane- 3.27, 8.26, 2-methylcyclohexane- 2.96, 13.00, 3-methylcyclohexane- 3.23, 8.34, 4-methylcyclohexane- 3.23, 8.02. Intercarboxylic distances have been evaluated. The results support the view that the C rings in these compounds are strainless. J. G. A. G.

Dissociation constant of thyroglobulin.—See A., III, 403.

Causes of the colour change in cobaltous chloride solutions. H. DIRKING (Z. anorg. Chem., 1937, 233, 321—345).—Data relating to mol. wt., conductivity, transport, and absorption spectra have been obtained for solutions of $CoCl_2$, $CoBr_2$, and $Co(SCN)_2$ in org. solvents, with or without the addition of other salts of the same anion. The results indicate that in presence of excess of the anion' the Co is present entirely as complex anions, e.g., $CoCl_4''$; otherwise there is equilibrium between, e.g., $[CoCl_2S_2]$, $[CoS_4]^*$ and $[CoCl_4]''$ (S =solvent). The colour change is due to a change of co-ordination no. from 6 (red) to 4 (blue). F. J. G.

Hydrolysis of cobaltous chloride solutions. A. GOSSERIES (Compt. rend., 1937, 205, 383–386).— Measurements of e.m.f. have been made with the quinhydrone electrode and a spongy Co electrode in 0.001-0.1M-CoCl₂ at 25°. J. G. A. G.

Hydrolysis of uranyl salts. B. SINGH and G. AHMAD (J. Chim. phys. 1937, 34, 351–354).—From e.m.f. measurements with the quinhydrone electrode at 30°, the degree of hydrolysis at corresponding dilutions is $UO_2(NO_3)_2 > UO_2SO_4 > UO_2(OAc)_2$.

J. G. A. G.

Heating curves of borates. I. N. S. KURNA-KOV, A. V. NIKOLAEV, and A. G. TSCHELISCHTSCHEVA (Compt. rend. Acad. Sci. U.R.S.S., 1937, 16, 87— 90).—The heating curves of synthetic and natural borates containing Na, K, Mg, and Ca have been studied. Endothermic arrest points, which all occur below 455°, are due to loss of H₂O. Exothermic regions of change are observed with all borates except with MgHBO₃ and 6MgO,8B₂O₃,MgCl₂. The curves are sufficiently characteristic to be useful in analysis. R. S. B.

Specific heat and hardness of natural borates and their products of heating. II. N. S. KUR-NAKOV, A. V. NIKOLAEV, and A. G. TSCHELISCHT-SCHEVA (Compt. rend. Acad. Sci. U.R.S.S., 1937, 16, 90—92; cf. preceding abstract).—d and hardness have been determined for naturally occurring borates, in the normal state, after removal of H₂O, and after the exothermic transformation. Removal of H₂O is usually accompanied by an increase in d. The contraction coeff. (observed d'/d for dehydrated borate calc. supposing no vol. change) is a max. for $2CaO,3B_2O_3,13H_2O$ and $Na_2O,2CaO,5B_2O_3,16H_2O$, and a min. for $8CaO,10B_2O_3,15H_2O$ and

 $2CaO, 3B_2O_3, 5H_2O$, which contain zeolitic H_2O . The exothermic transformation is accompanied by a sharp rise in d and in hardness. R. S. B.

Hydration heat and exothermic borate transformation for inyoite $[2CaO,3B_2O_3,13H_2O]$. Discussion of the transformation. N. S. KURNAKOV, A. V. NIKOLAEV, and A. G. TSCHELISCHTSCHEVA (Compt. rend. Acad. Sci. U.R.S.S., 1937, 16, 92– 94; cf. preceding abstracts).—The heat of dissolution of inyoite and the products formed on heating have been determined in 25% H₂SO₄. The heat of hydration is 42,700 and the heat of transformation 60,600 g.-cal. per mol. The high heat of transformation at 860–1080° causes spontaneous heating. X-Ray observations show that dehydration is accompanied by the formation of an amorphous phase, which becomes cryst. after further heating owing to the irreversible exothermic transformation. R. S. B.

New equilibrium diagram for the system Fe-C. I. IITAKA (Proc. Imp. Acad. Tokyo, 1937, 13, 277—279).—Anomalies in the "single" and "double" diagrams are discussed. The proposed new diagram contains stable equilibrium lines only, Fe₃C being assumed to decompose on solidification or on separation from austenite. A. J. E. W.

System water-sulphur trioxide. H. C. S. SNETILAGE (Rec. trav. chim., 1937, 56, 891-897).-See this vol., 296. F. L. U.

System pyrogallol -p - phenylenediamine. M. G. J. BEETS (Rec. trav. chim., 1937, 56, 773– 775).—The 1:1 compound has m.p. 120°, and the eutectics with 37.6 and 73.5 mol.-% of pyrogallol melt at 117.0° and 103.2°, respectively. F. L. U.

Rare-earth metals and their compounds. Thermal analysis of rare-earth nitrate mixtures. L. L. QUILL, R. F. ROBEY, and S. SEIFTER (Ind. Eng. Chem. [Anal.], 1937, 9, 389-392).—The liquidus curves of some binary systems of the simple and double nitrates of the Ce group have been determined. All the systems form a series of solid solutions with corresponding rare-earth and Bi salts. The use of the curves to determine the composition from f.-p. data is proposed. E. S. H.

Binary systems with palmitic acid. N. N. EFREMOV, A. D. VINOGRADOVA, and A. M. TICHO-MIROVA (Bull. Acad. Sci. U.R.S.S., 1937, 443—466),— Solid solutions are formed in the systems palmitic acid (I)-myristic, -lauric, and -elaidic acid, -cholesterol, -phytosterol, and -camphor, but not in the systems (I)- $C_{10}H_8$, -oleic, -benzoic, and -salicylic acid. R. T.

Polythermals of the binary system HNO_3-HCl and of the ternary system $HNO_3-HCl-H_2O$. A. G. KOGAN and V. I. NIKOLAEV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 16, 103—106).—In the binary system well-defined max. occur corresponding with the compounds $3HNO_3,HCl$, HNO_3,HCl , and $2HNO_3,HCl$; with $HNO_3,3HCl$ there is a latent max. The compounds are not stable above -50° , when the reaction $HNO_3 + 3HCl = NOCl + Cl_2 + 2H_2O$ occurs. In the ternary system the regions corresponding with the crystallisation of ice, $HNO_3,3H_2O$, HNO_3,H_2O , HNO_3 , $3HNO_3,HCl$, HNO_3,HCl , $2HNO_3,3HCl$, $HCl,3H_2O$, $HCl,2H_2O$, and HCl,H_2O have been studied. R. S. B.

System potassium chloride-potassium chlorate-water at 20°, 50°, and 75°. M. B. DONALD (J.C.S., 1937, 1325-1326).—The solution in equilibrium with both solids contains 25.0% of KCl and

Polytherms of the ternary system $MgSO_4$ - $MgCl_2-H_2O$. V. G. KUZNETZOV (Bull. Acad. Sci. U.R.S.S., 1937, 385-398).—Solubility data are given at 25° and 35°; the solid phases separating are consecutively $MgSO_4.7$, 6, 5, 4, and $1H_2O$, of which the most stable is the monohydrate, but the rate of transformation of the metastable hydrates is very slow. That of the 6- to the 5- or 4-hydrate is faster, but also requires a no. of days for completion with energetic stirring; under natural conditions this reaction is infinitely slow. R. T.

System ammonia-selenic acid-water at 30° . G. B. KING (J. Physical Chem., 1937, 41, 797—801).— The solid phases obtained were $(NH_4)_2SeO_4$, $3(NH_4)_2SeO_4$, H_2SeO_4 , and NH_4HSeO_4 . C. R. H.

Displacement of platinum metals from solutions of their salts by hydrogen at high pressures. V. G. TRONEV (Bull. Acad. Sci. U.R.S.S., 1937, 333-362).—The reaction of pptn. of Pt metals from their salts by H₂ under pressure, with energetic stirring, is of the autocatalytic type, the displaced metals acting as catalysts. The reaction is represented : H₂MCl₆ \implies MCl₆" + 2H^{*}; MCl₆" \implies M^{**} + 6Cl'; H₂MCl₆ \implies MCl₆" + 2H^{*}; MCl₄" \implies M^{**} + 4Cl'; M^{IV} + H₂ \Rightarrow M^{II} + 2H^{*}; M^{II} + H₂ \Rightarrow M + 2H^{*} (M = Pt, Ir, Pd, Rh). Pt can be pptd. from a solution of H₂PtCl₆ and PdCl₂ in 6n-HCl by the action of H₂ at 25°/30 atm. (100 min.). Rh^{III} or Pd^{II} can similarly be separated from Ir^{IV} (1 hr. at 25°/1 atm.). Separation of Rh^{III} and Pd^{II} cannot be effected by this method, owing to the simultaneous pptn. of the metals. R. T.

Heterogeneous equilibria with deuterium. J. R. PARTINGTON and R. P. TOWNDROW (Nature, 1937, 140, 156).—Vals. of K, obtained by a static method between 673° and 773° abs., in the reduction of CoCl₂ by H₂ and by D₂, are recorded. The heats of reaction $(q_v = \Delta U)$ deduced for the reactions CoCl₂ + H₂ = 2HCl + Co and CoCl₂ + D₂ = 2DCl + Co are -31,850 and -30,790 g.-cal. per mol., respectively, at a mean temp. of 450°. The heat of reaction deduced for 2DCl + H₂ = 2HCl + D₂ is 1100 g.-cal. per mol. L. S. T.

Physico-chemical equilibria in the carbonation of aqueous sodium sulphide at 25°. S. Z. MAKAROV and S. N. KRASNIKOV (Bull. Acad. Sci. U.R.S.S., 1937, 363—383).—Equilibrium data are recorded for the system $Na_2S-CO_2-H_2O$, at 25°. The only solid phases separating from unsaturated solution are NaHCO₃ and NaHCO₃, Na₂CO₃, 2H₂O. The process of carbonation of aq. Na₂S consists of the consecutive stages of absorption of CO₂ without and with evolution of H₂S, and, for the latter stage, without and with pptn. of carbonates. Carbonation is complete when the entire Na is present as NaHCO₃. R. T.

Partial pressure of ammonia, carbon dioxide, and water over ammoniacal sulphate and chloride solutions. A. P. BELOPOLSKI, S. J. SCHPUNT, and I. M. PALKINA (J. Chem. Ind. Russ., 1937, 14, 717—719).—V.-p. data are recorded for the systems Na_2SO_4 - and $NaCl-NH_3-CO_2-H_2O$, at 30—60°. R. T.

Thermodynamic conditions and efficiencies of the coupling of chemical reactions. P. VAN RYSSELBERGHE (J. Physical Chem., 1937, 41, 787-796).—A mathematical treatment of the principles of Burk (cf. A., 1931, 655) and others on the thermodynamics of coupled reactions in biological systems. C. R. H.

Heats of dilution of some salts in D_2O and H_2O solutions at 25°. W. BIRNTHALER and E. LANGE (Z. Elektrochem., 1937, 43, 643-659; cf. A., 1936, 1340).—At very low concess. the heats of dilution of NaCl, KBr, KF, Ba(NO₃)₂, CuSO₄, and BeSO₄ in D_2O are equal to those in H_2O . From this it is probable that the dielectric consts. of H_2O and D_2O have equal temp. coeffs. At higher concess. the heat of dilution becomes less positive or more negative on passing from H_2O to D_2O , the difference increasing regularly with increasing conce. At high concess. of KF the differential heat of dilution becomes approx. independent of conce.

Heats of hydration and dissolution of anhydrous copper sulphate in light and heavy water. E. LANGE and H. SATTLER (Z. physikal. Chem., 1937, 179, 427-444).-The integral heats of dissolution of CuSO₄ in D₂O and H₂O and of its deuterates and hydrates in D₂O and H₂O, respectively, have been measured and used to calculate heats of hydration. For both D₂O and H₂O the heat of hydration for the first mol. is positive and approx. twice as great as for each of the other four mols. The binding force between H_2O and an ion is best represented by the "heat of adhesion," estimated either by deducting from the heat of formation of the hydrate the heat of vaporisation of H₂O and the energy required to expand the salt to accommodate the H_2O to be added, or by deducting from the first heat of dissolution the lattice energy of the anhyd. salt and the energy required to create space in the solvent for the solute ions (cf. A., 1936, 1340). Both methods of calculation indicate that the CuSOa ions bind D_2O more firmly than H_2O . R. C.

Recalculation of heat effects. W. A. ROTH and A. BERTRAM (Z. physikal. Chem., 1937, **179**, 445– 449).—The following heats of formation have been calc.: (HCl) $(20-25^{\circ})$, $+21\cdot89\pm0\cdot03$; [HgCl], $+31\cdot41$; (HI) (at 20° and const. vol.), $-5\cdot95\pm$ $0\cdot04$; (Cl₂O) (at 20° and const. vol.), $-24\cdot96\pm$ $0\cdot06$; (HBr) (at 18° and const. pressure), $+8\cdot4_6$; [PbCl₂], $+85\cdot5$; [PbI₂], $+42\cdot9$, kg.-cal. R. C.

Heat of decomposition of dichlorine heptoxide. C. F. GOODEVE and A. E. L. MARSH (J.C.S., 1937, 1161—1166).—By means of a novel thermochemical technique, gaseous Cl_2O_7 was decomposed directly into its elements by streaming over a red-hot Pt filament and the heat evolved was determined by absorption in a continuous-flow calorimeter. The val. of ΔH_{17} for the reaction $\text{Cl}_2\text{O}_7 = \text{Cl}_2 + 3 \cdot 5\text{O}_2$ is $-63 \cdot 4 \pm 3$ kg.-cal. J. G. A. G.

Thermochemistry of complex compounds of aluminium. I. Compounds of aluminium

bromide with metallic bromides. V. A. PLOT-NIKOV and S. I. JAKUBSON (Mem. Inst. Chem. Ukrain. Acad. Sci., 1937, 4, 3—14).—Heats of formation of AlBr₃,MBr and 2AlBr₃,MBr (M = Li, Na, K, Ag) have been determined. Vals. in kg.-cal. per g.-mol. are: 2AlBr₃,LiBr, 4.9; AlBr₃,LiBr, 7.9; 2AlBr₃,NaBr, 7.0; AlBr₃,NaBr, 10.1; 2AlBr₃,KBr, 13.9; AlBr₃,KBr, 16.0; 2AlBr₃,AgBr, 6.9; AlBr₃,AgBr 13.9. These lead to vals. for the decomp. potential in agreement with observation. The heat of dissolution of AlBr₃ (in 2993 mols. of H₂O at 15°) is 91.47 kg.-cal. per g.-mol. F. J. G.

Conductivity of potassium chloride solutions. C. W. DAVIES (J.C.S., 1937, 1326; cf. this vol., 244).— Solvent-corr. conductivities based on the Kohlrausch-Holborn 0.01N standard and on Kohlrausch and Maltby's standard are respectively 0.18% and 0.07-0.10% > those based on Jones and Bradshaw's standard. J. G. A. G.

Van der Waals forces in electrolyte solutions. J. LANGE and E. HERRE (Z. Elektrochem., 1937, 43, 592—595; cf. A., 1936, 1336).—From the f.p. and conductivity of 0.005—0.1N aq. solutions of KIO₃, HIO₃, KCIO₃, picric acid, Na picrate, and Na 2:4-dinitrophenoxide the osmotic coeff. (f_o) and conductivity coeff. (f_μ) have been determined and expressed in the forms $1 - f_o = A_o\sqrt{c} + B_oc$ and $1 - f_\mu = A_\mu(\Lambda_o)\sqrt{c} + B_\mu c$. For ions showing no association $B_o = B_\mu = -0.6$, but when association occurs there are deviations ΔB_o and ΔB_μ . When the association is between similarly charged ions $\Delta B_\mu = -\Delta B_o$, whereas when it is between oppositely charged ions $\Delta B_\mu = +2\Delta B_o$. The attraction between similarly charged ions indicates that the behaviour of strong electrolytes is attributable to quantum mechanical forces. J. W. S.

Theory of electrolytic phenomena in solid metals. K. SCHWARZ (Z. Elektrochem., 1937, 43, 585-587; cf. A., 1933, 571, 908).--The transport nos. of metals in their amalgams and in fused Pd-H, Fe-C, Pb-Au, Au-Pb, Au-Pd, and Au-Cu alloys are in accord with the vals. calc. from their diffusion consts. Ions with the greatest charge density move towards the cathode. The unexpected movement of Au towards the anode in Au-Pb allovs indicates that it is uncharged, in accord with other phenomena observed with this alloy. J. W. S.

Variations in the conductivity of dilute solutions of molybdic acid during neutralisation. (MME.) Z. SOUBAREW-CHATELAIN (Compt. rend., 1937, 205, 222—225).—Conductometric curves are given for titration of molybdic acid with NaOH, glyoxaline, and $(CH_2)_6N_4$, and of mannitomolybdic acid with NaOH. Pronounced peaks are observed corresponding with two mols. of MoO₃ per equiv. of base. Discontinuities occur with one mol. of MoO₃ per two equivs. of base. NaHMo₂O₇ and Na₂Mo₂O₇ are probably formed during neutralisation, the ion [HMo₂O₇]⁻ occurring in solution.

A. J. E. W. Surface conductivity on diaphragms. S. Koma-GATA and M. NISHIKAWA (Z. physikal. Chem., 1937, 179, 461-465).—Surface conductivities of aq. solutions of chlorides have been measured.

R. C. Hittorf transference numbers of solutions of potassium, sodium, and lithium chlorides in water and in one-tenth molar hydrochloric acid. L. NICKELS and A. J. ALLMAND (J. Physical Chem., 1937, 41, 873—886).—The data for dil. neutral solutions at room temp. do not afford evidence for the high hydration vals. usually ascribed to alkali metal cations. In HCl solutions H[•] appears to carry less and the metallic cations more current than is expected from their relative mobilities in solutions of the corresponding single electrolyte. Errors arising from a slight change in composition of the middle layer in the LiCl-HCl mixtures are discussed. C. R. H.

Potential of the Ag(s), AgI(s), I' electrode. J. Y. CANN and A. C. TAYLOR (J. Amer. Chem. Soc., 1937, 59, 1484—1486).—E.m.f. measurements of the cell Ag(s), AgCl(s)|aq. KCl(m), aq. KI(m)|AgI(s), Ag(s) at 25° give the normal electrode potential of Ag(s), AgI(s), I' as $E^0 = +0.1510$ and $\Delta F^\circ = -3485$ g.-cal. E. S. H.

Potential difference between solid silver halides and aqueous solutions. B. P. NIKOLSKI and V. M. VDOVENKO (Compt. rend. Acad. Sci. U.R.S.S., 1937, 16, 99—102).—Cells of the type Ag|AgX(saturated), solution Y|AgX solid membrane| solution Z|calomel electrode (I), where X = Cl or I, Y = KCl, KI, or $AgNO_3$, and $Z = AgNO_3$, KCl, or KI, have been studied. K halide (if $Z = AgNO_3$) All, have been studied. A handle (if $Z = \text{Ag}(\text{N}O_3)$) and AgNO_3 (if Z = KCl or KI) were added gradually to Z. A chloridised or iodised Ag electrode was also immersed in Z. The e.m.f. of the cell Ag|AgX (saturated), solution Y|AgX solid membrane| solution Z, AgX (saturated)|Ag was not 0, but mounted to 4, 0 mm provided with a difference amounted to 4-9 mv., possibly owing to a difference between the inner and outer surfaces of the membranes. The solubility products of AgCl and AgI are 1.3×10^{-10} and 1.2×10^{-16} at 18° . HgNO₃, Pb(NO3)2, AuCl3, and LiCl (using AgCl membranes), and KBr (using AgI membranes) have no influence on the e.m.f. of the cell (I) when added to solution Z, but TINO₃ gives a marked change, probably due to the formation of solid solutions of AgCl and TICI. In general the results agree with Haber's R. S. B. theory.

Influence of certain gases on the potential of copper in solutions of copper sulphate and sulphuric acid. J. KAMECKI (Rocz. Chem., 1937, 17, 319—326).—The highest positive potentials are found for Cu in N-CuSO₄, in absence of H₂SO₄, and in a N₂ atm.; the vals. are lower in H₂, and still lower in O₂. In presence of N-CuSO₄ the vals. are practically const. for H₂SO₄ of 0—1N, whilst with 0·01N- and 0·1N-CuSO₄ they vary inversely with the [H₂SO₄]. R. T.

Electromotive behaviour of nickel in presence of hydrogen. B. FORESTI (Gazzetta, 1937, 67, 399-407).—Suitably prepared electrodes of brass covered with a deposit of active Ni behave, in the presence of H₂, like Pt-black. At $p_{\rm H} > 4.53$ such electrodes are equiv. to an ordinary H₂ electrode and give potentials ∞ the $p_{\rm H}$ of the liquid medium. With $p_{\rm H} < 4.53$ the electrode potential is < that of a ${\rm H}_2$ electrode, and the difference increases with decreasing $p_{\rm H}$ and depends also on the presence of salts in the solution. The results are discussed. O. J. W.

Potential measurements, with exclusion of the diffusion factor in formation of alloys. N. S. FORTUNATOV and V. I. MICHALLOVSKAJA (Mem. Inst. Chem. Ukrain. Acad. Sci., 1937, 4, 41-47).--The e.m.f. of the element Al|AlBr₃-KBr|Cu at 525-545° varies according to the composition of the alloy formed at the Cu electrode. Diffusion effects are eliminated by the inclusion of an appropriate resistance in the outer circuit. R. T.

Local current theory of metal potential. III. Potential establishment of various metals on solution in iodine-potassium iodide solutions. W. J. MULLER and E. Low (Z. Elektrochem., 1937, 43, 561-569; cf. this vol., 139).—Potential measurements and rates of dissolution of various metals in I-KI solutions support Muller's theory of the influence of surface films on metal potentials.

J. W. S. Normal Volta potential $\Delta \psi_0$ of the most important electrochemical two-phase systems, especially of metal-metal salt solution electrodes. O. KLEIN and E. LANGE (Z. Elektrochem., 1937, 43, 570-584).—Direct determinations of Volta potential are complicated by the difficulty of producing uncontaminated metal surfaces, but it can be deduced indirectly from e.m.f. data and photoelectrically determined vals. of the energies of evaporation of electrons from the metals. The vals. for a no. of metal-metal salt electrodes are calc. The significance of the data for the calculation of the energies of solvation of the ions is discussed.

J. W. S.

Diffusion potential. A. AIROLA (Suomen Kem., 1937, 10, B, 18).—Preliminary. Closer agreement between the observed and calc. vals. of the diffusion potential at the boundary 0.025N-HCl|0.001N-HCl is obtained by assuming a linear relation between mobility and concn. than when the mobility is assumed const. F. L. U.

Thermodynamical treatment of diffusion potentials. J. J. HERMANS and L. J. OOSTERHOFF (Phil. Mag., 1937, [vii], 24, 304-312).—Theoretical. By means of an analogy between a cell with diffusion and a short-circuited cell, it is shown that the thermodynamic treatment and the kinetic theory yield the same result for ideal solutions. The extension of the treatment to non-ideal solutions is proved to be impossible. C. R. H.

Decomposition potentials of metallic chlorides and bromides in $SnCl_2$ and $SnBr_2$ as solvents. V. A. IZBEKOV and E. M. SKOBETZ (Mem. Inst. Chem. Ukrain. Acad. Sci., 1937, 4, 85–98).—Low vals. found for the decomp. potentials of halides in solution in Sn^{II} halides are due to depolarisation at the anode by formation of SnCl₄ or SnBr₄. The orders found are : Sn, Co, Cu, Ni, Ag, Bi (in SnCl₂) and Sn, Cu, Ag, Co, Ni, Bi (in SnBr₂). The vals. for pure SnCl₂ and SnBr₂ agree with those calc. from the heat of formation when allowance is made for depolarisation. F. J. G.

Decomposition potentials of fused salts. I— III. R. C. KIRK (Res. Stud. State Coll. Washington, 1937, 5, 79—80; cf. A., 1936, 430, 1467).

H. J. E. Decomposition potentials of fused halides and their binary systems with a common cation. V. A. IZBEKOV and N. G. TSCHOVNIK (Mem. Inst. Chem. Ukrain. Acad. Sci., 1937, 4, 71—83).—The decomp. potential of a halide is scarcely changed by the addition of another halide of the same metal. The decomp. potentials of halides of Sn and Sb, and to a smaller extent of Bi, are altered by the addition of AlCl₃ or AlBr₃. Mixtures of two halides of the same metal do not conduct if their components are nonconductors, but the systems AlX_3 -Sb X_3 and AlX_3 -Hg X_2 (X = Cl, Br) are conductors, although their components are not. F. J. G.

Decomposition potentials of metallic chlorides in fused AlCl₃ and AlCl₃,KCl as solvents. V. A. IZBEKOV and N. G. TSCHOVNIK (Mem. Inst. Chem. Ukrain. Acad. Sci., 1937, 4, 57—70).—The decomp. potentials of CdCl₂, SnCl₂, ZnCl₂, AgCl, SbCl₃, and BiCl₃ in fused AlCl₃ and in fused AlCl₃,KCl have been determined. The order found in these two solvents is Al, Cd, Ag, Sb, Sn, Bi; in AlBr₃ Sn stands before Sb, the order being otherwise unchanged. The large difference in the vals. for SnCl₂ or SnBr₂ in different solvents is due to secondary reactions such as depolarisation by formation of SnCl₄ at the anode.

F. J. G. Effect of ultrasonic waves on electrolytic deposition potentials of gases. G. SCHMID and L. EHRET (Z. Elektrochem., 1937, 43, 597-607; cf. this vol., 415).—Low-intensity ultrasonic waves have a slight polarising effect and higher intensities a strongly depolarising effect on cathodic liberation of H_2 . The polarising effect is dependent on the nature of the cathode metal and sets in slowly, but persists for some time after the vibration ceases. This is caused by surface changes in the metal and can be removed by abrasion. The depolarising action of ultrasonic waves is so great that in some cases H_2 is liberated at potentials < the reversible equilibrium potential. With increasing wave intensity a sudden decrease in electrode potential is observed, the magnitude of which appears to be independent of the cathode metal and for $0.465 \times aq$. Na₂SO₄ is about $0.800 \times v$. With increasing c.d. the potential jump decreases and disappears at about 10 ma. per sq. cm. With intense radiation the H_2 liberation potential becomes independent of $p_{\rm H}$. At Mg cathodes the potential is increased at high radiation intensities. Preliminary investigations indicate that similar steps occur in the anodic potentials for liberation of Cl_2 and O_2 , but in the latter case the effect is less marked.

J. W. S. Normal elements and lead accumulator as almost ideal cells. E. LANGE and K. NAGEL (Z. Elektrochem., 1937, 43, 584-585).—The requirements of completely reversible cells are stated and discussed with reference to the standard Cd cell and the Pb accumulator. J. W. S. Nature of the electrolytic depolarisation effect with a high-frequency current. I. RANZI and R. RICAMO (Nuovo Cim., 1937, 14, 1-7).—The depolarisation effect produced at a small Pt wire electrode (cathode or anode) by superimposing a high-frequency a.c. during the d.c. electrolysis of $0.1N-H_2SO_4$ is shown to be a purely thermal effect and is not due to an increase in the rate of diffusion of the polarising substance (cf. A., 1932, 915). The depolarisation is the same when the heating of the electrode is effected by means other than an a.c. O. J. W.

Influence of the composition of the electrolyte on the electrodeposition of iron. E. S. SARKISOV (Bull. Acad. Sci. U.R.S.S., 1937, 421–433).—The rise in polarisation potential E with increasing c.d. during electrolysis of N-Fe^{II} solutions, at $p_{\rm H}$ 4·88 and 16°, is greatest in the case of FeCl₂–CaCl₂ solutions, and then diminishes in the order (NH₄)₂SO₄–FeSO₄, FeSO₄, FeCl₂. At 70° the val. of E rises very little with increasing c.d., for all the systems, the order now being FeSO₄>FeCl₂>(NH₄)₂SO₄–FeSO₄> FeCl₂–CaCl₂. The vals. of E obtained in presence of Fe^{III} are \gg when Fe^{II} alone is present. The structure of the deposits of Fe varies with change in the composition of the electrolyte. R. T.

Passivity of iron and steel in nitric acid solution. Y. YAMAMOTO (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 428–444).—The voltage required to make an Fe anode passive when immersed in HNO_3 is in general raised by addition of HCl, and lowered by addition of H_2SO_4 . F. J. L.

Hydrogen overvoltage at mercury and the ζ -potential. I. S. LEVINA and V. SARINSKI (Acta Physicochim. U.R.S.S., 1937, 6, 491-504; cf. A., 1936, 1467).—The H overvoltage (V) on a stirred Hg cathode has been determined for c.d. $(I) = 10^{-8}-10^{-3}$ amp. per sq. cm. at 22° in 0.001N, 0.01N, and 0.1N aq. HCl. V is independent of H[•] and over the range investigated $V = a + b \log I$, where a and b are consts. and at 22° b = 0.119, in accord with theory (A., 1930, 1376). J. W.S.

Overpotential of metals in presence of colloids. M. I. ZILBERFARB and M. A. RABINOVITSCH (Trav. Inst. Chim. Charkov, 1935, 1, 87–98).—The overpotential observed in the electrolysis of 0-1N- or N-AgNO₃ (Ag, Au, or Pt electrodes) is increased in presence of colloids (gelatin, dextrin, gum arabic) in the electrolyte; the effect is inversely ∞ c.d.

R. T.

Interferometric observations of streaming anomalies at cathodes. H. J. ANTWEILER (Z. Elektrochem., 1937, 43, 596—597).—C.d.-p.d. curves obtained in electrolysis between a large, almost unpolarisable anode and a dropping Hg cathode show a sudden increase in c.d. at a definite p.d.; this falls to a normal val. on further raising the p.d. Interferometric observations of the cathode region indicate that the abnormality is due to a stirring effect. When the deposition potential of the cation $(V_{\rm M})$ is more positive than the electrocapillary zero potential of the Hg $(V_{\rm Hg})$ (as with Hg₂", Cu", or Fe") streaks are observed which, although of material lighter than the solution, fall away from the tip of the capillary. If $V_{\rm M}$ is more negative than $V_{\rm Hg}$ (Ni^{**} or Mn^{**}) only a whirling of the diffusion film is observed. The phenomena are the more marked the lower is the conductivity of the solution relative to the cation conen. J. W. S.

Spray electrification. S. CHAPMAN (Physical Rev., 1936, [ii], 49, 206).—The mobility spectrum of spray-electrified salt solutions has been investigated. Data relative to dil. solutions of LiCl, KCl, and NaI are recorded. L. S. T.

Mechanism of chemical reactions. R. AUDU-BERT (Chem. Listy, 1937, 31, 277-281).—A lecture. R. T.

Theory of L_p . IV. L_p and the direction of chemical processes. N. A. TANANAEV (J. Appl. Chem. Russ., 1937, 10, 1102—1111).—Theoretical. R. T.

Hydrogenation of nickel carbonyl. E. E. LIT-KENHOUS and C. A. MANN (Ind. Eng. Chem., 1937, 29, 934—938).—The reaction between Ni(CO)₄ and H₂ (1:4) has been studied at 25—400° and at 1— 75 atm. At 1 atm. it decomposes completely at approx. 100° and at >200° reaction begins with the formation of H₂O, CH₄, and CO₂. The % of H₂O = 58—60 vol.-% of the exit gas at 250°, and decreases with fall of temp. The % of CH₄ and CO₂ increases to a max. at 300—350° and then decreases. At 5 atm. decomp. is complete at approx. 200°. The ratio CO₂: CH₄ is < at 1 atm. At 10—75 atm. Ni(CO)₄ is increasingly stable. The yield of H₂O is a max. at 250—300° for all cases. With max. CH₄ and CO₂ the unchanged CO and H₂ are a min. The amount of unaltered C decreases with rise in temp. The reaction depends on the formation of H₂O and its subsequent reaction thus: $2C + 2H_2O = CO_2 + CH_4$, for which the equilibrium const. (K) is const. over the entire reaction range, in contrast to other possible reactions, which give const. vals. of K only at 300— 400°. R. S. B.

Equilibria and kinetics of ammonia synthesis at ultra-high pressures.—See B., 1937, 902.

Reaction of sulphur dioxide and oxides of nitrogen under conditions of intense mixing. I.N. KUZMINICH, E. I.SURKOV, V. I. JUDINA, and E. A. ANDREEVA (J. Appl. Chem. Russ., 1937, **10**, 1020— 1031).—The velocity of reaction in a baffle tube between $SO_2-N_2-O_2$ mixtures and N_2O_3 in $H_2SO_4 \propto$ (i) $[N_2O_3]$ of the H_2SO_4 , (ii) the $[SO_2]$ and $[O_2]$ of the gas mixture, (iii) the height of the column of acid, and (iv) the temp.; it is inversely \propto the $[H_2SO_4]$. R. T.

Properties of nitrogen oxides. VI. Flame propagation in the system nitric anhydrideozone. (The late) T. M. LOWRY and R. V. SEDDON (J.C.S., 1937, 1461—1468; cf. A., 1936, 281).—The speed of travel of flame in a 90-cm. column of N_2O_5 - O_3 - O_2 at const. temp. has been measured. The influence of $[N_2O_5]$, $[O_3]$, age of the mixture, temp., total pressure, diameter and position of the reaction tube, and nature and concn. of the inert gas has been determined. The flame is propagated by the diffusion of "hot" mols. from the flame front into the unburnt gas, causing activation and further Reaction

E. S. H.

Combustion of aromatic and alicyclic hydrocarbons. I. Slow combustion of benzene, toluene, ethylbenzene, n-propylbenzene, n-butylbenzene, o-xylene, m-xylene, p-xylene, and mesitylene. J. H. BURGOYNE (Proc. Roy. Soc., 1937, A, 161, 48-67).-Correlation of pressure change with the course of the reaction shows that the rate of slow combustion can be measured by mano-The influence of temp., metric observations. concn., dilution by N_2 , and surface factors is studied. C_6H_6 differs from its derivatives in exhibiting evidence of chain mechanisms. Comparison of energies of activation establishes three classes: (1) C_6H_6 and derivatives with a single side-chain, (2) isomeric xylenes, (3) hydrocarbons with symmetrical mols. The reaction mechanisms are based on a different classification : (1) C_6H_6 , (2) derivatives with Me groups attached to the nucleus, (3) derivatives with a single side-chain containing > one C. G. D. P.

Inflammation of acetaldehyde. J. BARON and P. LAFFITTE (Compt. rend., 1937, 205, 52—54).— Ternary mixtures of MeCHO and O_2 with N_2 , A, or CO_2 have been investigated. The addition of N_2 to a given MeCHO- O_2 mixture lowers the inflammation temp. The effect of CO_2 or A in place of N_2 is similar, but is more pronounced in the case of A. If the partial pressure of N_2 is kept const., an increase in the ratio partial pressure of MeCHO/partial pressure of O_2 lowers and finally raises slightly the inflammation temp. C. R. H.

Limits and velocity of formation of pyromucanilide.—Sce A., Π , 403.

Kinetics of thermal polymerisation reactions. J. W. BREITENBACH and W. JORDE (Z. Elektrochem., 1937, 43, 609; cf. this vol., 249, 366, 367, 416).— Formation of highly polymerised compounds is best explained as a chain reaction. The mean chain length in polymerisation of styrene in the liquid phase is independent of the area of the containing vessel. The reaction occurs more rapidly in air than in N_2 or high vac. J. W. S.

Highly-polymerised compounds. CLVIII. Kinetics of chain polymerisation. II. Thermal polymerisation of styrene out of contact with Oxygen, and chain-breaking process. G. V. SCHULZ and E. HUSEMANN (Z. physikal. Chem., 1937, B, 36, 184-194).—In a N₂ atm. the poly-merisation of styrene at 100° and 132° follows the unimol. law up to a conversion of 90%, and the degree of polymerisation, P, remains more nearly const. during the reaction than in the polymerisation in air. Atm. O₂ accelerates the reaction at the start and retards it later, but does not materially affect the chain length of the branching of the mols. Experiments on the polymerisation in PhMe show that, as the theory of the chain-breaking process previously advanced (this vol., 86) would require, the val. of P/\sqrt{c} (c = concn. of the monomeric mols.) is approx. const. at a given temp. Dilution with highly polymerised polystyrene does not affect P. R. C.

Reaction kinetics of chain polymerisations. H. DOSTAL (Monatsh., 1937, 70, 409-419).--A theoretical treatment of the rate of polymerisation as a function of nucleus formation, chain growth, stabilising processes, and steric factors. H. J. E.

Thermal decomposition of azomethane. E. W. RIBLETT and L. C. RUBIN (J. Amer. Chem. Soc., 1937, 59, 1537—1540).—Velocity coeffs. calc. from the amount of Me_2N_2 decomposed at 340° are about 50% > those calc. by following the pressure change. The decomp. is complex; the products are N_2 , CH₄, C_2H_6 , and a compound of higher mol. wt. containing N. In spite of the complexity, the decomp. at 340° is apparently unimol. E. S. H.

Mechanism of homogeneous thermal decomposition of gaseous acetaldehyde. M. LETORT (J. Chim. phys., 1937, 34, 355–385; cf. this vol., 416).—The hypothesis that the reaction proceeds by way of several independent quasi-unimol. decomps. (cf. A., 1933, 910) is criticised and is shown to be in disagreement with some of the data. A reaction mechanism involving free radicals is advanced whereby all of the existing data are interpreted. J. G. A. G.

Formation and decomposition of polyoxymethylene.—See A., II, 399.

Formation of anilides of acids. B. Z. AMITIN, N. V. ZAGORIANSKAJA, and N. A. POGORELSKAJA (Trav. Inst. Chim. Charkov, 1936, 2, 33-40).—The velocity of the reaction $NH_2R + R' \cdot CO_2H \Longrightarrow$ $R' \cdot CO \cdot NHR + H_2O$ at 100°, 155°, and 212° rises in the order $R = o \cdot tolyl < Ph < p \cdot tolyl$, and R' = $Pr^a < Et < Me$; $Ph < Pr^{\beta} < Pr^{a}$. The velocity of the reaction rises with rise of temp., but the equilibrium point is shifted to the left. R. T.

Steric factor in reactions in solutions. W. BRENSCHEDE (Z. physikal. Chem., 1937, 179, 457— 460).—Polemical against Hückel (this vol., 86). R. C.

Influence of the solvent on the course of chemical reactions. XIII. Heat of dissolution and energy of activation in reactions of which one component serves as solvent. K. LAUER and R. ODA (Ber., 1937, 70, [B], 1707-1709).-Experiments on the sulphonation of 1:9-benzanthrone confirm the view that the energy of activation of a reaction in solution cannot be regarded as identical with the theoretical energy of activation of the change in the gas phase. If the solvent participates in the change it is possible to determine the true energy of activation of the change by determining the heat of dissolution of all the participants and addition of the heats of dissolution of the products and subtraction of those of the initial materials from the experimentally determined energy of activation; this is const. for all concns. for any defined reaction and is equal to the energy of activation in the gas phase.

H. W.

Kinetics of thermal decomposition of oxalic acid in solution. A. DINGLINGER and E. SCHRÖER (Z. physikal. Chem., 1937, 179, 401-426).—The decomp. in aq. solution at 100-170° follows the unimol. law. The products are CO_2 , CO, and HCO_2H and the ratio of HCO_2H formed to $H_2C_2O_4$ decomposed

reaction.

does not vary with temp., suggesting the mechanism $H_2C_2O_4 = CO_2 + HCO_2H$, $H_2C_2O_4 = CO_2 + CO + H_2O$. It is only the undissociated mols. which decompose. The energy of activation is high but falls with rising temp. and approaches the val. for the decomp. in dioxan or H_2SO_4 solution, presumably due to desolvation. There is no primary salt effect, but K_2SO_4 and $K_2C_2O_4$ retard the reaction owing to formation of KHC_2O_4 . HCO_2H has no effect. For each $H_2C_2O_4$ mol. activated at least three decompose, suggesting that rupture of the C·C linking yields radicals. The decomp. of $H_2C_2O_4$ in dioxan solution at $120-150^{\circ}$ follows the unimol. law and the velocity coeff. is given by $7.6 \times 10^{11}e^{-29.450/RT}$. The energies of activation of monosubstituted malonic acids are < those of the disubstituted acids. R. C.

Kinetics of thermal polymerisation of dissolved styrene. H. SUESS, K. PILCH, and H. RUDORFER (Z. physikal Chem., 1937, 179, 361-370; cf. this vol., 416).-The gross reaction velocity, k, in PhMe, PhCl, and dil. CCl_4 solutions at 80–120° follows the bimol. law. For the first two solutions k is almost the same as for pure styrene, but for CCl_4 solutions it is much smaller. The mean degree of polymerisation, P, of the product is related to the styrene concn., c, by P = Ac/(Bc + D), where the const. B is negative for CCl₄. These results may be explained by supposing that there is equilibrium between the reactive form of double linking in the growing chains and the inactive form in mono- and poly-styrene and that the position of equilibrium, which determines k, is largely independent of diluents, whilst the rate at which equilibrium is established, which determines P, is considerably influenced by added substances. R. C.

Velocity of hydrolysis of formaldehyde acetals. —See A., II, 399.

Rate of hydration of *trans*-crotonaldehyde.— See A., II, 399.

Heterogeneous combustion of mixtures of carbon monoxide, hydrogen, and oxygen on a vitreous surface. M. PRETTRE (Compt. rend., 1937, 204, 1734—1736).—A very small addition of H_2 to a mixture of CO and O_2 greatly increases the speed of oxidation on vitreous surfaces at 500—600°, but for higher [H₂] the speed is a linear function of the quantity of combustible not yet oxidised. For the majority of mixtures of CO, O_2 , and H_2 the speed of combustion is independent of the pressure of CO and O_2 , and varies only with the initial pressure of H₂, as for the combination of O_2 and H₂. It follows that of the reactions $H_2 + 0.5O_2 = H_2O$; $H_2O + CO =$ $CO_2 + H_2$, the second is faster than the first, which controls the rate of oxidation. Mixtures of CO, O_2 , and H_2 oxidise at the same speed as corresponding mixtures in which H_2O vapour is replaced by an equal vol. of H₂. R. S. B.

Velocity coefficient of dissolution of silica and glassy substances. S. K. TSCHIRKOV (J. Chem. Ind. Russ., 1937, 14, 845—846).—An expression for the velocity coeff. of the reaction between SiO₂ and NaCl is derived. R. T.

Stathmographic and kinetic investigation of the thermal decomposition of limestone. J. SPLICHAL, S. SKRAMOVSKY, and J. GOLL (Coll. Czech. Chem. Comm., 1937, 9, 302-314).-The loss in wt. of finely ground calcite (I) in a vertical furnace at 680-830° was recorded automatically and continuously (cf. A., 1932, 1227). The rate of decomp. decreases as the thickness of the layer of (I) is increased and, for equal wts. of (I), as the grain size is increased. By extrapolation, decomp. in the atm. commences at 653°, and the 700-830° temp. coeff. leads to the heat of activation 37,300 g.-cal., which is close to the heat of decomp. An "incubation period " precedes the decomp., which is of the 1 order with respect to CO, in the sample and is interpreted as the evaporation of CO_2 from the sample. J. G. A. G.

Rate of oxidation of metals at elevated temperatures.—See B., 1937, 923.

Transformation kinetics of austenite.—See B., 1937, 920.

Dissociation of peroxides and the cold flame of hydrocarbons. M. NEUMANN and P. TOUTAKIN (Compt. rend., 1937, 205, 278–280).—The crit. pressures at which Et_2O_2 induces the formation of "cold flames" in $C_4H_{10} + O_2$ are equal to those for spontaneous explosion of Et_2O_2 . Et_2O_2 diminishes the induction period for the appearance of the "cold flame" in $C_5H_{12} + O_2$. F. J. G.

"Catalytically polar" materials. H. SCHMID (Z. Elektrochem., 1937, 43, 626—629; cf. A., 1937, II, 188).—Whereas increase of the $[H_2SO_4]$ decreases the reaction velocity (v) in diazotisation processes, addition of HBr increases it. Addition of HCl causes first a decrease in v and then an increase in v with increasing [HCl]. It is concluded that H^{*} is the negative and Cl' the positive catalyst. The result is in accord with the author's mechanism of the diazotisation process. J. W. S.

Decomposition of hydrogen peroxide in presence of a cobalticitric complex as catalyst. M. BOBTELSKY and (MLLE.) M. RAPPOPORT (Compt. rend., 1937, 205, 234—236).—In presence of H_2O_2 , a mixture of aq. solutions of CoCl₂ and Na citrate (in excess) gives a green complex containing a cobalticitric anion, which catalyses the decomp. of H_2O_2 . The best conditions for the catalysis have been investigated, and a mechanism is proposed. A. J. E. W.

Thermal transformations of potassium and sodium formate in presence of alkali hydroxides. L. C. FREIDLIN and A. I. LEBEDEVA (J. Appl. Chem. Russ., 1937, 10, 1086—1094).—HCO₂M may react in presence of MOH as follows: (1) $2\text{HCO}_{2}M \rightarrow$ $M_{2}C_{2}O_{4} + H_{2}$; (2) $\text{HCO}_{2}M + \text{MOH} \rightarrow M_{2}CO_{3} + H_{2}$; (3) $M_{2}C_{2}O_{4} + 2\text{MOH} \rightarrow 2M_{2}CO_{3} + H_{2}$. Reaction (1) does not take place in presence of 3—4 equivs. of MOH, when reactions (2) and (3) commence at 210° when M = Na, and at 270° when M = K. In presence of <0.1 equiv. of MOH reaction (1) is realised at 330—350° (M = Na), and at 410—430° (M = K). $\text{Na}_{2}C_{2}O_{4}$ is thus obtained in 94% yield. R. T.

Heats of activation in the mutarotation of glucose. II. Catalysis by water, acids, and bases. G. F. SMITH and (in part) M. C. SMITH (J.C.S., 1937, 1413-1420; cf. this vol., 89).-Catalytic coeffs. and heats of activation have been determined. Slight deviations from the Arrhenius equation exist for the reaction catalysed by H₂O, but not by acids or bases. The results are considered from the viewpoint of the kinetic equation k = $PZe^{-E/RT}$. The heats of activation sp. to the various catalysts differ only slightly and variations in kare due mainly to changes in P. P ranges from 10^{-4} for H₂O catalysis to nearly 10¹ for OH' catalysis, and for acid and base catalysis can be correlated with the corresponding dissociation consts. by a relation of the form $P \sim \text{const.} \times K^n$, where n is const. for a series of catalysts. The validity of the assumptions made in computing P is questioned, as vals. of $P \gg 1$ have been obtained. E. S. H.

Kinetic study of the ammonolysis of phenylacetic esters in methanol solution. R. L. BETTS and L. P. HAMMETT (J. Amer. Chem. Soc., 1937, 59, 1568—1572).—The rates of reaction of $CH_2Ph \cdot CO_2Me$ and its *p*-Cl- and *p*-NO₂-derivatives with NH₃ in MeOH have been determined at 25°. The reaction deviates considerably from the second-order course, is retarded strongly by NH₄Cl, and accelerated markedly by NaOMe. The quant. data indicate an uncatalysed reaction of ester with NH₃ and a parallel base-catalysed reaction, possibly of ester with amide ion. Linear relations exist between the logarithms of the rates of both catalysed and uncatalysed reactions and the rates of hydrolysis of the same esters. E. S. H.

Rôle of redox potentials in inhibitor action. K. WEBER (Z. Elektrochem., 1937, 43, 633-636; cf. A., 1935, 588).—In the extinction of fluorescence of quinine sulphate and æsculin and retardation of the fading of thionine by alkali halides, and the deactivation of $H_2C_2O_4$ by dyes and quinine, the log of the half val. concns. changes linearly with the redox potential. Such inhibitor action is due to deactivation of the active carrier of the reaction. J. W. S.

Inhibition of the velocity of dissolution of aluminium in hydrochloric acid by pyridine derivatives. E. JENCKEL and F. WOLTMANN (Z. anorg. Chem., 1937, 233, 236—256).—The "poisoning" effects of a number of org. bases on the rate of dissolution of Al in 3n-HCl have been studied and correlated with their constitutions, their effects on the cathodic polarisation current, and with d and the rate of dissolution of their hydrochlorides. There is a rough parallelism between these three properties and the poisoning effect, and this is in agreement with the view that the effect is due to electrolytic pptn. of the hydrochloride on local cathodic areas. Some additional observations in support of this view are described. F. J. G.

Reactions in concentrated sulphuric acid. X. Molecular oxidation velocities. J. MILBAUER (Chem. Obzor, 1937, 12, 57–60).—By passing C_2H_2 , C_2H_4 , H_2 , CS_2 , COS, and CO through H_2SO_4 at 237° without a catalyst, SO₂ was liberated in amounts diminishing in this order. There is no action with CCl₄ below this temp., and the result of the action with CHCl₃ can be expressed : $H_2SO_4 + CHCl_3 \rightarrow SO_2 + CO_2 + 3HCl$. This action is not affected by Pd, which accelerates the oxidation by H_2SO_4 of PH₃ to H_3PO_4 , HCN and C_2N_2 to NH₃, and McSH to S. SeO₂ accelerates the H_2SO_4 oxidation of C, and HgSO₄ that of Fe, whilst both these reagents accelerate the action with S, P, Ag, and Sn. The oxidation of As, Sb, Bi, Hg, Fe, Ni, Co, and Cu was retarded by SeO₂. The rate of oxidation of metals with H_2SO_4 alone decreases in the order : Sn, Hg, Co, Fe, Ni, Cu, Al, Ag, Zn, and Cd. F. R.

Effect of small amounts of iron, cobalt, and nickel etc. on the behaviour of zinc towards sulphuric acid.—See B., 1937, 923.

Catalysis in the manufacture of sulphuric acid.—See B., 1937, 901.

Contact oxidation of sulphur dioxide to sulphur trioxide under pressure.—Sce B., 1937, 906.

Ferromolybdenum catalysts of ammonia synthesis.—See B., 1937, 901.

Iron catalysts for ammonia synthesis.—See B., 1937, 902.

Platinum-rhodium and platinum catalysts for oxidation of ammonia.—See B., 1937, 902.

Characteristics of a copper catalyst activated by magnesium oxide. H. S. TAYLOR and G. G. JORIS (Bull. Soc. chim. Belg., 1937, 46, 241-252).— The catalyst, prepared by reducing washed and dried co-pptd. Cu(OH)₂ and Mg(OH)₂ in H₂, retains its activity after being heated at 560°. The rate of hydrogenation of C₂H₄ at 0-40° is $-dp/dt = k[H_2]/[C_2H_4]$ approx. The temp. coeff. leads to the apparent energy of activation 7.3 kg.-cal. per mol. The hydrogenation of C₆H₆ reaches a max. at approx. 225° and is retarded by C₆H₆. The reaction C₂H₆ + H₂ \rightarrow CH₄ at 380-470° in presence of excess of H₂ is slow; with low [H₂], C is deposited and the catalyst loses activity (cf. A., 1936, 1346). Dehydrogenation of cyclohexane begins at about 335°, but at >460° " cracking" becomes significant and the catalyst loses activity. The apparent activation energy is 8.3 kg.-cal. At 475°, C₇H₁₆ undergoes cracking, C is deposited, and the catalyst loses activity. At room temp., C₉H₂ in H₂ is polymerised, and at higher temp. the H₂ also disappears. J. G. A. G.

Hydrogenation of acetylene and ethylene with palladium as catalyst. M. FISCHER and C. A. KNORR (Z. Elektrochem., 1937, 43, 608).—The rate of charge of a Pd wire by H₂ at room temp. ∞ the H₂ pressure over the range 36—720 mm. In a vac., part of the H₂ is evaporated rapidly but the remainder is only slowly liberated. The discharge of the wire by C₂H₄ is more rapid and increases with the C₂H₄ pressure, but is not ∞ the C₂H₄ pressure over the range 120—720 mm. The rate of discharge by C₂H₂ is independent of the C₂H₂ pressure over the range 30—720 mm. It is concluded that C₂H₂ is the more strongly adsorbed by the Pd. In each case the rate of dehydrogenation decreases with time according to the equation $d^2[H]/dt^2 + ad[H]/dt + b = 0$. J. W. S. Destructive catalytic hydrogenation of xylene and solvent naphtha.—See B., 1937, 875.

Kinetics of the synthesis of methyl alcohol. G. NATTA and G. PASTONESI (Chim. e l'Ind., 1937, 19, 313-318).—The formation of MeOH is assumed to occur in two consecutive stages, viz., $CO + H_a \implies$ CH_2O (slow) and $CH_2O + H_2 \implies$ MeOH (very fast). The variation of the velocity coeffs. with temp. is calc. and the heat of activation of the first stage is found to be 21,000 g.-cal. for a catalyst consisting almost entirely of ZnO. The reaction isotherms which determine the variation of the partial pressure of MeOH as a function of the time of contact with the catalyst for total pressures of 180 and 240 atm. are calc. From these data it is possible to calculate the yield of MeOH for a given vol. of catalyst, when the pressure, gas velocity, and the variation of the temp. of the catalyst as a function of its thickness are known. O. J. W.

Iron-aluminium mixed oxide catalysts for water-gas synthesis.—See B., 1937, 863.

Oxidation of phenols by hydrogen peroxide in presence of inorganic catalysts.—See A., II, 413.

Polarographic studies with the dropping mercury cathode. LXIX. Hydrogen overpotential in light and heavy water. J. HEYROVSKY (Coll. Czech. Chem. Comm., 1937, 9, 273-301; cf. this vol., 414).—Existing data contradict the hypothesis that H' and D' are deposited at the cathode at different rates, but are consistent with the view that H. and D' are deposited indifferently and reversibly, and that H₂ and D₂ are formed by way of the union of the deposited H (and D) atoms with the H[•] (and D[•]) of the solvent. The rate of the latter reaction in D_2O is 5.4 fold < in H_2O since the ionic product and therefore the rate of dissociation of D_2O is 5.4-fold < in H₂O. The separation coeff. is deduced in terms of the ionisation consts. of H₂O, HOD, and D₂O, and a formula, which takes into account the adsorption of freshly formed H_2 and D_2 at the interphase, is deduced for the overpotential current-voltage curves; it leads to val. for the difference between the overpotentials in H_2O and D_2O consistent with the observed val. According to the theory, the factor b of the $b \log i$ term of the overvoltage relation varies from 1.5RT/F to 2RT/F as found experimentally. The changes of electroreduction potential of maleic acid and of H_2O_2 when the solvent is changed from D_2O to H_2O are interpreted. J. G. A. G.

Electrolysis of iodine monochloride in various solvents. C. SANDONNINI and N. BORGHELLO (Atti R. Accad. Lincei, 1937, [vi], 25, 46—52).—The electrolysis of ICl and of I in AcOH and in PhNO₂ with Pt electrodes is described. The cathode and anode compartments were separated by porous glass diaphragms. With ICl in AcOH the conen. of both halogens increases at the anode, but the ratio I: Cl decreases. The results agree with the view that the solution contains a small amount of I and (ICl)₂' ions, the latter having a much higher migration velocity. In PhNO₂ solutions, however, the results cannot be explained in this way. In the electrolysis of I in these solvents the transport of I to the anode is confirmed. O. J. W.

Electrolytic formation of persulphate. III. Electrodes. R. MATSUDA and T. NISHIMORI (Bull. Chem. Soc. Japan, 1937, **12**, 331–335; cf. this vol., 37).—The current efficiency for the electrolysis of $15N \cdot H_2SO_4$ is increased by igniting the Pt anode in flames of $C_2H_2 > coal gas > H_2$. The total current efficiency increases, and that relative to Caro's acid decreases, as the length of the Pt cathode is decreased, and both rise to max. as the current increases. A C anode is disintegrated during electrolysis of aq. $(NH_4)_2SO_4$ alone or with H_2SO_4 or NH_2 . A PbO₂ anode affords a low current efficiency. J. G. A. G.

Production of coloured rings in a mass of a salt by electrolysis. T. PECZALSKI (Compt. rend., 1937, 205, 120—121; cf. A., 1928, 113).—Coloured layers concentric with a cylindrical cathode are formed in masses of NaCl or KCl on electrolysis at 680°. The coloration is independent of the nature of the electrodes used. A. J. E. W.

Electrolysis in phosphate melts. III. Electrolysis of molybdic acid in fused phosphoric acid and fused alkali phosphates. H. HARTMANN and U. CONRAD (Z. anorg. Chem., 1937, 233, 313–320).—The electrolysis was studied in melts of varying compositions, with varying temp. and e.d. In acid melts ($P_2O_5: Na_2O > 1$) and at low c.d. the product was Mo^{III} and Mo^{IV} phosphates; at higher c.d. MoP was also formed. In alkaline melts ($P_2O_5: Na_2O < 1$) MoO₂ was obtained, and at higher temp. the metal was deposited in fine needles. F. J. G.

Electrochemical production of sodium chlorate.—See B., 1937, 902.

Electrodeposition of iron from ferrous chloride baths.—See B., 1937, 918.

Electrodeposition of tin from acid sulphate solutions.—See B., 1937, 924.

Electrochemical study of corrosion of metals. --See B., 1937, 928.

Electrolytic oxidation of aspartic acid and malonic acid. Formation of aldehydes by the electrolytic oxidation of α -amino-acids.—See A., II, 402.

"Active oxalic acid." E. ABEL [with R. JORISCH, R. LARISCH, and H. SASSMANN] (Z. Elektrochem., 1937, 43, 629-632).—Mixtures of aq. $H_2C_2O_4$ and I which have been irradiated react much more rapidly when subsequently stored in the dark than do solutions kept in the dark throughout (A., 1935, 587). The effect gradually disappears but persists for several hr. The production of the active material, but not its stability, is dependent on the presence of I. The decrease of active material is independent of the [I] at const. [KI] and inhibited by increased [KI] at const. [I]. The effect is attributed to an intermediate product of undetermined nature. J. W. S.

Continuous absorption spectrum of chlorine and the photo-synthesis of hydrogen chloride. N. S. BAYLISS (Trans. Faraday Soc., 1937, 33,

..,

1339—1342).—From the continuous absorption of Cl_2 (this vol., 485) it is deduced that the only primary process which need be assumed in the photosynthesis of HCl in the absence of O_2 is photo-dissociation of Cl_2 mols. into atoms, and in accordance with this view the quantum yield, temp. coeff., and energy of activation of the reaction are almost independent of the λ of the exciting radiation. The slight change of quantum yield with λ observed at low pressures is attributed to a difference between Cl $(^2P_4)$ and Cl $(^2P_{14})$ atoms, either in initiating chains or in reacting with inhibitors. J. W. S.

Theory of the latent image. G. NADJAKOFF (Naturwiss., 1937, 25, 475-476).-It is considered that Ag₂S mols. render AgBr passive to the action of photographic developers, since pure AgBr in absence of gelatin is reduced by developer at the same rate whether it has been exposed to light or not. This theory explains the fogging produced by pressure and chemical action, the latter being caused by the production of new, non-passive crystal surfaces. The blackening effect of supersonic waves can be similarly explained. The increase of sensitivity during ripening of the emulsion is due to the fact that Ag₂S mols. become photochemically activating. The ripening process consists of the increase of photochemically active mols. on the surface of the AgBr crystals. A. J. M.

Photographic development and the latent image. R. M. Evans and W. T. HANSON, jun. (Phot. J., 1937, 77, 497-515) .- A new theory of the latent image and development is proposed. It is largely based on Webb's work on the quantum mechanics of the action of light on a Ag halide crystal (cf. this vol., 254). It is suggested that light action lifts electrons from low levels (4P or U) to the 5S level, whence they travel to impurity specks which permit them to drop to the slightly lower F level. The concn. of electrons at these spots is identified with the sensitivity specks of earlier theories, i.e., the latent image centre, having increased developability. Developers are reducing agents of given range of reduction potential, and have characteristic adsorptive isotherms for Ag halide crystals, being considered as reduced dye forms. The various substances in an emulsion are considered as adsorbed on the crystal in exchange equilibrium; the formation of an F level concn. decreases the surface work function of the crystal. Adsorbed developing agent attains a definite re-duction potential. If this is > the surface potential, electrons enter the lattice and metallic Ag is released ("chemical development"). "Chemical-physical de-velopment" is due to the solvent action of the developer on Ag halide, forming Ag complexes which are immediately reduced, giving a supersaturated solution which deposits Ag on any Ag nuclei already present. Solarisation will be the formation of so large a concn. of electrons at a sensitivity speck that metallic Ag and Br are released and the lattice is ruptured, and readjusts itself to the original surface conditions, giving a crystal free to repeat the cycle. The Ag released is chemical-physically developable, but not chemically. A print-out image is postulated

to be such that solarisation centres become sufficiently numerous to be visible. The importance of the type of developer in relation to theories of the latent image is stressed, and numerous effects, *e.g.*, desensitisation, the action of oxidising agents, effects of Br acceptors, etc., are shown to be predictable from the theory. J. L.

Influence of light and carbon dioxide on photosynthesis.—See A., III, 367.

Interstitial and "Bertholide" compounds. J. S. ANDERSON (Chem. and Ind., 1937, 766—769).— A review. J. S. A.

Active hydrogen, oxygen, and nitrogen at pressures up to 20 mm. A. KLEMENC (Z. physikal. Chem., 1937, 179, 393—394).—Comments on Harteck and Roeder's paper (this vol., 316). R. C.

Preparation of pure water in the laboratory. F. RIMATTEI and J. PETIT (Bull. Soc. Chim. biol., 1937, 19, 1129—1133).—The H₂O is distilled with suitable columns through two flasks containing $K_2Cr_2O_7$ —H₂SO₄ and Ba(OH)₂ respectively. The use of distilling columns, chemical reagents, and a technique not involving intermediary manipulations is indispensable in order to obtain H₂O of which the conductivity is $> 10^{-6}$. P. W. C.

Precipitation in the cold of a cupric salt by an alkali carbonate. (MLLE.) S. HÉMAR (Compt. rend., 1937, 204, 1739-1740).—Ppts. amorphous to X-rays have been prepared by mixing mainly equiv. quantities of $CuCl_2$, $CuSO_4$, or $Cu(NO_3)_2$ with H carbonates and carbonates of Na and K. With H carbonates the ppt. is 3CuCO₃,2CuO,x1H2O (solutions 0.05N and 0.125N) and $3CuCO_3, CuO_3, x_2H_2O$ (solutions 0.25— 1.0N). With carbonates the ppt. is a definite compound only when mols. of Cull salt/mols. of carbonate >0.6; with solutions 0.025-0.05N the ppt. is $3CuCO_3, 5CuO_4, \mu_1H_2O$, and with solutions 0.125-1.0N $CuCO_3, CuO, \tilde{y}_2H_2O$. With H carbonates the ppt. changes in contact with the mother-liquor to CuCO₃,CuO,1.5H₂O (malachite), sometimes via CuCO3, Na2CO3, 3H2O (I), or 5CuCO3, CuO, K2CO3, 12H2O In some cases (II) changes to (II). 2CuCO3,CuO,1.5H2O (azurite). With carbonates the

ppt. becomes CuO, malachite, or $CuCO_3, Na_2CO_3, nH_2O$ (III). The K salt corresponding with (III) is unstable. Under 50 atm. of CO₂ the usual transformation is to azurite via malachite or (II) (H carbonates), or malachite, (I), and (II) (carbonates). R. S. B.

Displacement reactions in fused pyridinium hydrochloride solutions. A. F. SCOTT and C. S. COE (J. Amer. Chem. Soc., 1937, 59, 1576—1577).— The order in which metals displace one another in pyridinium hydrochloride is : Cu, H, Ag, Sb, Bi, Hg, As, Au, Pt. E. S. H.

Magnesium arsenates. H. GUÉRIN (Compt. rend., 1937, 204, 1740—1741; cf. A., 1936, 439).— $Mg_2(AsO_4)_2$, $10H_2O$ (I), $Mg_2H_2(AsO_4)_2$, $14H_2O$ (II), and $MgH_4(AsO_4)_2$ have been prepared. On dehydration (I) and (II) give the hydrates 6, 5, 3, 2, and $1H_2O$ and 4, 3, 2, and $1H_2O$, respectively. $Mg_3(AsO_4)_2$ (III), $Mg_2As_2O_7$ (IV), and $Mg(AsO_3)_2$ (V) have been heated in a vac. at 400—1200°. (V) decomposes at

 $600-800^{\circ}: 2(V) = (IV) + As_2O_5; As_2O_5 = As_2O_2 + O_2.$ Above $800^{\circ} 3(IV) = (III) + As_2O_3 + O_2$, and above 1100° (III) = $3MgO + As_2O_3 + O_2$. (III) differs from the alkaline-earth arsenates, which are stable at $1455-1635^{\circ}$, but (IV) and (V) resemble in their decomp. the corresponding alkaline-earth salts. R. S. B.

Mechanism of dehydration of calcium sulphate hemihydrate. II. Observations with large crystals. H. B. WEISER and W. O. MILLIGAN (J. Amer. Chem. Soc., 1937, 59, 1456—1458; cf. A., 1936, 1078).—Dehydration curves and X-ray analysis confirm that the hemihydrate is a true compound, not a zeolite. E. S. H.

Decomposition of water by metals and metallic couples. A. OLIVERIO and O. BELFIORI (Annali Chim. Appl., 1937, 27, 284—292; cf. A., 1932, 1099).—The decomp. of H_2O by the Zn-Ni couple increases with rise in temp. and is greatest when the ratio Zn : Ni = 1:0.25. From the metals which follow Zn in the electrochemical series only couples containing Fe decompose H_2O . From a study of the Zn-Ni, Zn-Cr, Zn-Fe, Zn-Cd, Zn-Co, Zn-Pb, Zn-Cu, Zn-Pt, Fe-Cd, Fe-Cu, and Fe-N couples it is concluded that decomp. depends more on the overvoltage of the nobler element with respect to H than on its position in the electrochemical series. L. A. O'N.

Improved method for igniting thermite reactions. O. C. KLEIN (J. Chem. Educ., 1937, 14, 320).—A mixture of $KMnO_4$ and glycerol, used to replace the usual Mg ribbon, reduces the risk of accident. L. S. T.

Gallium. II. Extraction of gallium and germanium from germanite. III. Electrodeposition, purification, and dissolution of gallium. F. SEBBA and W. PUGH (J.C.S., 1937, 1371-1373, 1373-1374; cf. this vol., 473).—II. Ga and Ge are extracted from germanite by treatment with conc. aq. NaOH. Accompanying metals, but not As, remain as insol. sulphides. The separation of Ga and Ge from each other and from As is described.

III. The conditions for obtaining molten Ga by electrolysis of warm aq. solutions of $Ga(OH)_3$ in NaOH are described. The deposit contains traces of Pb, Sn, and Pt, which are removed completely by washing with hot aq. HCl and then HNO₃. The action of HCl, H₂SO₄, and HNO₃ on Ga is described. E. S. H.

Preparation of ytterbous sulphate and its elimination from lutecium sulphate. J. K. MARSH (J.C.S., 1937, 1367—1368).—Yb₂(SO₄)₂ is reduced to YbSO₄ (95% yield) at a cathode of Pb amalgam. YbSO₄ is stable when pure, but decomposes rapidly in presence of salts of heavy metals. Purity of the electrolyte and Pb amalgam is a crit. factor. E. S. H.

Oxidation action of graphitic oxide and active carbon plus oxygen on aromatic amines.—See A., II, 409.

Pneumatolytic synthesis of silicates. C. J. VAN NIEUWENBURG (Chim. et Ind., 1937, 38, 226232).—The author's work is summarised (cf. A., 1931, 322, 1381; 1932, 906; 1934, 614; 1935, 441). G. H. C.

Explosiveness of ammonium nitrate-ammonium sulphate mixtures.—Sce B., 1937, 903.

Reversible action of iodine vapour on dry potassium nitrite. Influence of the miscibility of this salt with the corresponding nitrate. M. DODÉ (Compt. rend., 1937, 205, 137–139; cf. this vol., 81, 463).—The variation of the NO pressure in the system KNO_3 - KNO_2 -KI-I with the composition of the KNO_3 - KNO_2 phase, at const. temp., is in agreement with theory, assuming this phase to be an ideal solution. A. J. E. W.

Alkali phosphates and arsenates. IV. Secondary sodium arsenate. H. MENZEL and W. HAGEN (Z. anorg. Chem., 1937, 233, 209-235).-The system Na₂HAsO₄-H₂O has been studied by means of solubility and v.p. measurements and X-ray analysis. Besides the known dodeca- and hepta-hydrates, penta- and mono-hydrates, but not a hemihydrate, exist. The anhyd. salt is very easily obtained as metastable solid phase in the region of the monohydrate, and in the system Na₂HAsO₄-H₂O vapour the transition anhyd. \rightarrow monohydrate could not be observed, and the transition penta- \rightarrow mono-hydrate could be observed only when the previous history of the specimen was such as to ensure the presence of nuclei of the monohydrate. Transition points are : anhyd. \Rightarrow 1H₂O, 99·5°; anhyd. (metastable) \Rightarrow 5H₂O, 68·0°; 1H₂O \Rightarrow 5H₂O, 67·4°; 5H₂O \Rightarrow 7H₂O, 56·3°; 7H₂O \Rightarrow 12H₂O, 20·5°. The cryohydric point F I C is -1.138° F. J. G.

Non-existence of bismuthous bromide $BiBr_2$. A. BARONI (Atti R. Accad. Lincei, 1937, [vi], 25, 195—196).—X-Ray investigations show that $BiBr_2$ is not formed by the direct combination of the elements (cf. A., 1936, 946). The product appears to be a mixture of Bi and $BiBr_3$. O. J. W.

Chemistry in liquid sulphur dioxide. VI. Oxidation and reduction reactions, the formation of complex compounds, and the amphoteric behaviour of sulphites in liquid sulphur dioxide. G. JANDER and H. IMMIG (Z. anorg. Chem., 1937, 233, 295-306).—Reactions in liquid SO₂ which are analogous to those in H₂O include oxidation of KI by FeCl₃ and SbCl₅, reduction of I by SO₃" ions, and formation of complex salts, e.g., K₃SbCl₆ and KSbCl₆. SOCl₂ forms complex "acids," e.g., (SO)₃(SbCl₆)₂. Al₂(SO₃)₃ behaves as a sparingly sol. amphoteric electrolyte in liquid SO₂. F. J. G.

Uranyl phosphites. A. CHRETIEN and J. KRAFT (Compt. rend., 1937, 204, 1736—1738).—On adding aq. H_3PO_3 to aq. $UO_2(OAc)_2$ the electrical resistance becomes a max. with equimol. proportions. A yellow gelatinous ppt. of $UO_2HPO_3, 2H_2O$ (I) is deposited slowly, but with rapid mixing of the reactants an elastic, gummy mass is formed. Aq. $UO_2(OAc)_2$ with excess of HPO_3 in sunlight deposits a green ppt of variable composition, but with light from a Hg lamp the composition is const. at $UO_2/PO_3 = 1.7$. This green ppt. gives a green solution in HCl which becomes yellow with H_2O_2 , KMnO₄, or HNO₃; the

ppt. consists of a mixture of (I) and U^{IV} phosphite. (1) in presence of H_3PO_3 is rapidly reduced by light with the formation of H_3PO_4 and U^{IV} phosphite.

R. S. B.

Chemical state of uranium- X_1 which accompanies uranyl salts. R. DE and A. DAS (J. Chim. phys., 1937, 34, 386-400).-A fraction of the radioactive material (I) in aq. uranyl salts is removed by filtering, and this fraction increases with dilution. The fraction of (I) pptd. by $Fe(OH)_3$ sols decreases with increasing conen. of added alkali salts. It is inferred that $U-X_1$ is present as the $(U-X_1)O_2^{-1}$ ion derived directly from UO_2 . $U-X_1$ salts are easily hydrolysed giving negatively charged colloids, but the sign of the charge is reversed when the U-X, becomes quadrivalent. J. G. A. G.

Explosiveness of potassium and sodium chlorates.—See B., 1937, 903.

Preparation of hydrobromic acid solution of constant b.p. G. DRUCE (J. Chem. Educ., 1937, 14, 394).—A reply to criticism (this vol., 373). No H_2SO_4 or Sn sulphide has been observed in the HBr prepared by Druce's procedure (A., 1923, ii, 65). L. S. T.

Ethoxides and isopropoxides of manganese and rhenium.-See A., II, 396.

Amorphous and crystallised oxide hydrates and oxides. XXXIII. Amorphous ferric hydroxide as inorganic "oxidation ferment." Catalysed oxidation of acetic and other aliphatic acids by hydrogen peroxide and their combustion to carbon dioxide at 20°. A. KRAUSE and Z. JANKOWSKI (Ber., 1937, 70, [B], 1744-1749; cf. this vol., 252).-Complete oxidation of AcOH to CO_2 is effected at 20° by H_2O_2 in presence of Fe^{III} orthohydroxide (I). Since indefinite amounts of AcOH can thus be oxidised, the change is truly catalytic. Reaction is of the first order and is expressed : $\overset{\circ}{O}: Fe \cdot O \cdot Fe (OH) \cdot O \cdot Fe (OH) \cdot O \cdot Fe (OH)_2 + H_2 O_2^2 \rightarrow \\ O: Fe \cdot O \cdot Fe \cdot O \cdot Fe \cdot O \cdot Fe (OH)_2 \quad (II) + 2H \cdot O \cdot (II)_2 + 2H \cdot O \cdot (II)_$

$$(\text{UII})_2$$
 (II) + 2H₂O; (II) -

 $AcOH \rightarrow (I) + CO_2 + :CH_2$. :CH₂ is converted into CHO, which gives HCO₂H oxidised to CO₂ (loc. cit.). Sorption of AcOH by (I) proceeds simultaneously with the oxidation. Similar oxidation is observed with lactic acid and the sorption is relatively strong; at no period of the change are Fe ions present in the solution. $H_2C_2O_4$ is unsuitable for investigation in heterogeneous system since it dissolves (I) in a relatively short time; its behaviour towards cryst. goethite preps. is similar although these are generally difficultly sol. Bu^{\$}CO₂H is oxidised with great difficulty and the course of the change is influenced by the partial dissolution of (I). d-Tartaric acid behaves analogously. H. W.

Ferroamminopentacyanides. R. UZEL and K. FUNK (Coll. Czech. Chem. Comm., 1937, 9, 254-264).-The following salts were pptd. by adding aq. $Na_3[Fe(CN)_5NH_3]$ (= $Na_3[R]$) to solutions of the nitrates and chlorides of the metals: $Hg_3[R], 3H_2O$; $Bi[R], 4H_{2}O;$ $Cd_3[R]_2, 5H_2O; Co_3[R]_2, 10H_2O;$ $\operatorname{Zn}_{3}[R]_{2}, 12\operatorname{H}_{2}O; \operatorname{Pb}_{3}[R]_{2}, 5\operatorname{H}_{2}O; \operatorname{Cu}_{3}[R]_{2}, 10\operatorname{H}_{2}O;$ $Tl_3[R], 4H_2O;$ $Mn_3[R]_2, 8H_2O.$ By heating aq.

 $Na_{a}[R]$ with the appropriate amines, the following salts were prepared : Na₃[Fe(CN)₅NHMe₂].2H₂O; Na₃[Fe(CN)₅NMe₃]; Na₃[Fe(CN)₅NH₂Et],2H₂O; Na₃[Fe(CN)₅NHEt₂],2H₂O; Na₃[Fe(CN)₅NEt₃],2H₂O; Na₃[Fe(CN)₅NH₂Pr^a],2H₂O;

Na₃[Fe(CN)₅NH₂Bu^a],2H₂O;

Na₃[Fe(CN)₅NH₂·CH₂Ph],2H₂O. J. G. A. G.

Isothermal decomposition of the peroxides of nickel. F. FRANCOIS and (MLLE.) M. L. DELWAULLE (Compt. rend., 1937, 205, 282-284).-Compositiontime curves indicate that Ni₂O₃ and a higher peroxide are present at first. The latter decomposes rapidly affording Ni_2O_3 and this more slowly forms Ni_3O_4 , which is stable up to 40° but at higher temp. decomposes further giving Ni(OH)2. F. J. G.

Dipolar complex salts.—Sec A., II, 389.

Iridium and rhodium selenides and tellurides. W. BILTZ (Z. anorg. Chem., 1937, 233, 282-285).-The highest Rh telluride is Rh₂Te₅, and not RhTe₂, and the highest Ir selenides and tellurides have the composition Ir : (Se or Te) = 1 : 2.89 (cf. A., 1934, 45). These compounds and Rh₂Se₅ all have pseudopyrite structures. d_4^{25} are: Rh₂Se₅, 6.96; Rh₂Te₅ 8.43; "IrSe_{2.89}," S.05; "IrTe_{2.89}," 9.5. F. J. G.

Affinity. LXXIV. Iridium sulphides. W. BILTZ, J. LAAR, P. EHRLICH, and K. MEISEL (Z. anorg. Chem., 1937, 233, 257–281).—The system Ir-S has been studied using various methods of prep. in conjunction with v.-p. measurements and X-ray analysis. The only compounds formed are Ir₂S₃, IrS₂, and Ir₃S₈, although solid solutions exist up to Ir: S = 1:5 approx. Ir_3S_9 has a pseudo-pyrite structure. No indications of the existence of IrS or IrS_3 (A., 1934, 45) could be obtained. d^{25} are: Ir₂S₃, 9.64; IrS₂, 8.43; Ir₃S₈, 7.18. F. J. G.

Co-ordination compounds of semicarbazide, phenylsemicarbazide, m-tolylsemicarbazide, and aminoguanidine.-See A., II, 404.

Emission spectrum analysis as physical method in analytical chemistry. A. SCHLEICHER (Z. anal. Chem., 1937, 110, 94-102).-A lecture. J. S. A.

Qualitative-semi-quantitative evaluation of spectrograms in spectral analysis. K. BENNE-WITZ and H. ROTGER (Angew. Chem., 1937, 50, 724-725).—A series of comparison spectra is taken, under standardised conditions, of graded concns. of the pure elements sought (e.g., 0.1, 0.01, 0.001M) between spectroscopically pure C electrodes. Spectra of solutions to be analysed are taken similarly, and are compared with a positive print of the comparison J. S. A. spectra.

New photometric principle for quantitative spectral analysis. W. GERLACH and W. ROLL-WAGEN (Naturwiss., 1937, 25, 570).—A method for determining the relative intensities of lines in the spectrum furnished by an alloy, when the lines due to one component are considerably brighter than those due to the other, is given. A. J. M.

Index of the efficiency of the methods of quantitative analysis. E. REICHEL (Z. anal. Chem.,

1937, 109, 385—391).—The errors of analysis are discussed, and an index of accuracy is defined as $G = 1/(\text{wt. of material} \times \% \text{ error})$. G = 20-100 for most micro-analytical methods, but with exceptional sensitivity may rise to 2×10^7 , as in the determination of Au by Haber and Jaenicke's method (A., 1925, ii, 997). R. S. B.

Inorganic chromatography. II. Separation of acids. G. M. SCHWAB and G. DATTLER (Angew. Chem., 1937, 50, 691–692).—Anions may be separated and detected by preferential adsorption on a column of Al_2O_3 which has been treated with dil. HNO₃. The order is OH', $PO_4^{\prime\prime\prime}$, F', $CrO_4^{\prime\prime}$ and $Fe(CN)_6^{\prime\prime\prime}$, $SO_4^{\prime\prime}$, $Cr_2O_7^{\prime\prime}$ and $Fe(CN)_6^{\prime\prime\prime}$, Cl', NO_2^{\prime} , MnO_4^{\prime} , ClO_4^{\prime} , S''. F. J. G.

Inorganic analysis by chromatography. G. M. SCHWAB and K. JOCKERS (Z. Elektrochem., 1937, 43, 610).—Cf. A., 1936, 810, 1218; this vol., 150. J. W. S.

Importance of hydrogen-ion concentration in volumetric analysis. T. T. COCKING (Ind. Chem., 1937, 13, 238—241).—The change in $p_{\rm ir}$ during titration of strong and weak acids with strong alkalis is illustrated graphically and the choice of suitable indicators is discussed. A. R. P.

Electrotitration of acids in benzene solution. M. A. RABINOVITSCH (Trav. Inst. Chim. Charkov, 1935, 1, 99—107).—In the titration of $CH_2Cl \cdot CO_2H$ (I) or $CCl_3 \cdot CO_2H$ (II) by NPhMe₂, in C_6H_6 solution containing NEt₄I and quinhydrone, the potential rises to a max. and then falls. Addition of (I) to (II), both in C_6H_6 , leads to a more negative potential, due to the reaction (I) + (II) \Longrightarrow $CH_2Cl \cdot CO_2H_2^*$ + $CCl_3 \cdot CO_2'$; when considerable excess of (I) is present the potential again becomes positive. On the other hand, addition of (II) to (I) raises the positive potential, irrespective of the (I)/(II) ratio. R. T.

Colorimetric detection of metallic corrosion by means of p_{π} indicators.—See B., 1937, 929.

Volumetric electro-analysis of gases. Apparatus for determination of hydrogen and for separation from methane. A. DASSLER (Angew. Chem., 1937, 50, 725—728).—The absorption vessel contains a heavily Pd-coated Ni gauze electrode, immersed in aq. KOH, and connected through a reversing switch to a Ni-Cd accumulator. When cathodically polarised, the electrode absorbs O_2 (up to 20 c.c. for 3 g. of Pd) and catalyses the union of $2H_2 + O_2$ mixtures. When anodically polarised, the electrode absorbs H_2 from gases containing no O_2 . CO slows down the absorption of H_2 ; in the presence of traces of CO H_2 is best determined by adding O_2 , and exposing to the cathodically polarised electrode, whereby CO and H_2 are burned simultaneously. The excess of O_2 is then absorbed in the same way. CH_4 and other hydrocarbons are inert, and are recovered quantitatively. J. S. A.

Microanalytical determination of water in inorganic substances. I. F. HECHT (Mikrochim. Acta, 1937, 1, 194-204).— H_2O (e.g., in minerals) is determined by ignition in a current of dry air, using a modified Pregl C-H combustion apparatus. SO₂, HCl, etc. are removed by a filling of PbO + PbO₂, maintained at 180–190°, at the exit end of the combustion tube. J. S. A.

Determination of water in superphosphate.— See B., 1937, 955.

Manganese as a catalyst for the determination of hydrogen peroxide with potassium bromate. L. SZEBELLÉDY and W. MADIS (Z. anal. Chem., 1937, 109, 391–396).—Approx. 20 c.c. of the neutral solution of $0\cdot1n\cdotH_2O_2$ are made up to 25 c.c., treated with 1 g. pf MnCl₂ and 25 c.c. of $n\cdotHCl$, and titrated with $0\cdot1n\cdotKBrO_3$ until a yellow colour is obtained (at $0\cdot5-1\cdot0$ c.c. from the equiv. point). After heating at 40° the titration is continued until a permanent yellow colour is obtained : $3H_2O_2 +$ $HBrO_3 = 3H_2O + HBr + 3O_2$; $5HBr + HBrO_3 =$ $3Br_2 + 3H_2O_3$; $2MnO + Br_2 + H_2O = Mn_2O_3 +$ 2HBr; and $Mn_2O_3 + H_2O_2 = 2MnO + H_2O + O_2$. MnSO₄ may also be used as catalyst, but the solution requires preheating to 40° , and remains colourless up to the equiv. point. R. S. B.

Fractional reaction for chlorate, bromate, and iodate. N. A. TANANAEV and M. S. VOSCHTSCHIN-SKAJA (J. Appl. Chem. Russ., 1937, 10, 1118-1121).-Excess of N-AgNO₃ is added to 5 ml. of solution, which is filtered, Zn and H_2SO_4 are added to the filtrate, followed after 1-2 min. by 3-4 ml. of HNO_3 , and the solution is boiled. A ppt. of AgCl is obtained in presence of < 0.0076 mg. of KClO₃. The residue from the above filtration is washed, and boiled for 1 min. with 5 ml. of aq. KI, the suspension is filtered, and the filtrate is boiled with 2-3 ml. of HNO_3 and 1 ml. of saturated aq. $Mn(NO_3)_2$; a ppt. of MnO_2 is obtained in presence of < 0.83 mg. of KBrO₃. 5 ml. of solution are boiled with 5 ml. of saturated aq. BaCl₂ and 1 drop of aq. NaOH, and the ppt. is collected, washed, and dissolved in hot 30% HCl. 1 ml. of 20% H_2SO_4 and 2 ml. of 0.05N-NH₄CNS are added to the solution; a coloration due to liberated I develops (<0.13 mg. of KIO3). Cl', Br', I', and SO₄" do not interfere with the above reactions. R. T.

Detection of bromide and iodide in the presence of large quantities of chloride. R. G. AICKIN (J. Proc. Austral. Chem. Inst., 1937, 4, 267—269).—The specimen is dissolved in H₂O (0·2 c.c.) in a tube 6—8 cm. long and 1 cm. diameter, and 0·2 c.c. of 25% H₂CrO₄ is added. A moist paper impregnated with fluorescein is placed over the end of the tube while the solution is warmed for 5 min. The colour produced (due to eosin) is compared with standards. 1×10^{-6} g. of Br' can be detected in presence of large amounts of Cl'. Successive extraction of a solution of a chloride with H₂O₂ and CHCl₃ and with CHCl₃ and aq. HNO₂ permits detection of 1×10^{-5} g. of I' and Br', respectively.

J. W. S.

Mercurimetric determination of iodides in presence of diphenylcarbazide as indicator. A. JfLEK and G. KOUDELA (Coll. Czech. Chem. Comm., 1937, 9, 265—272).—When I' is titrated with Hg" in the presence of diphenylcarbazide (I), the violet colour developed at the end-point is obscured by the colour of HgI₂ pptd., but if C_5H_5N is present under sp. conditions the HgI₂ gives a white substance and the end-point is sharp and stoicheiometric. <130 mg. of I' in 50—100 c.c. containing 2 c.c. of 0.5N-HNO₃, 7 c.c. of 10% aq. C₅H₅N, and 3—6 drops of 2% alcoholic (I) is determined by means of slightly acid 0.02N-Hg(NO₃)₂ (4 c.c. of 1 : 1 NO₃' per litre) in presence of Li, Na^{*}, K^{*}, NH₄^{*}, Mg^{**}, Ca^{**}, Sr^{**}, Ba^{**}, Cd^{**}, and Fe^{**}. I' is determined in presence of Cl' when 1—1.5 c.c. of 10% aq. C₅H₅N is added for each 10 c.c. of 0.02N-Hg(NO₃)₂ required. J. G. A. G.

Determination of iodine in soil.—See B., 1937, 954.

Detection and determination of minute amounts of fluorine. E. R. CALEY and J. M. FERRER, jun. (Mikrochim. Acta, 1937, 1, 160—163).— 0.05 mg. of CaF₂ may be detected by the etching of an unwaxed cover glass in a covered Pb capsule of small vol., maintained at 140—150°. J. S. A.

Determination of fluorine in foods.—See B., 1937, 975.

Determination of small quantities of oxygen in gases and liquids. I. J. W. MACHATTIE and J. E. MACHONACHIE (Ind. Eng. Chem. [Anal.], 1937, 9, 364—366).— O_2 is absorbed by Cu wetted with aq. NH₂ and NH₄Cl. the resulting oxide is washed off with the same solution, and Cu is determined in the washings by colorimetric titration. The accuracy is 3% for 0.02—2 ml. of O_2 . E. S. H.

Sensitive test for sulphur with nascent hydrogen. E. SCHRÖER (Mikrochem., 1937, 22, 338-344).—S, in sulphates and all other S compounds, is reduced by nascent H to H_2S , which may be best detected by the blue luminosity conferred on the flame of burning H_2 . Org. compounds may be reduced to mercaptans, detectable in minute amounts by their odour. SO₂ and other S compounds in gases may be detected by bubbling successively through Zn + 20% HCl and aq. Cd(OAc)₂. The limit of detection is about 0.0001 mg. of S.

J. S. A.

Determination of sulphur and silicon in iron and steel.—See B., 1937, 921.

Quantitative oxidation of colloidal selenium and its application in the volumetric determination of small amounts of selenium. W. C. COLEMAN and C. R. MCCROSKY (J. Amer. Chem. Soc., 1937, 59, 1458—1460).—Standard solutions of KBrO₃, ICl, or KIO₃ can be used for the titration of colloidal SeO₂ solutions in presence of a strong acid. The error is about 0.3%. The reactions involved are discussed. E. S. H.

Photometric determination of ammonia. R. CRISMER (Bull. Soc. Chim. biol., 1937, **19**, 1000–1009).—The colorimetric method of Borsook (A., 1935, 1140) is modified, the NH₃ being distilled and the colour developed with $p-C_6H_4Me\cdotSO_2\cdot NHCl$ being measured with a spectrophotometer. The method is used for 3 to 5×16^{-6} g. of NH₃ and is suitable for determinations in urine and perfusion fluids but is not sensitive enough for determinations in blood. P. W. C.

Determination of nitrogen in soils and plant materials.—See B., 1937, 954.

Determination of nitrous and nitric nitrogen in soils.—See B., 1937, 954.

Rapid determination of nitrite in meat extracts.—See B., 1937, 973.

Quantitative drop analysis. VIII. Determination of phosphorus. R. LINDNER and P. L. KIRK (Mikrochem., 1937, 22, 300—305).—Simple $PO_4^{\prime\prime\prime}$ solutions containing 0.0005—0.01 mg. of P are treated with an equal vol. of $HNO_3 + H_2SO_4$, and pptd. with 4 vols. of $(NH_4)_2SO_4 + NH_4$ molybdate reagent at room temp. The ppt. is washed with 50% EtOH, and dissolved in a measured excess of 0.1N-NaOH at 100°. The excess of NaOH is then titrated back with 0.1N-HCl. Biological materials are ashed dry with Na₂CO₃ at 450°, and the residue is dissolved in H₂SO₄ + HNO₃. J. S. A.

Elimination of the phosphate radical in qualitative analysis. L. W. N. GODWARD and A. M. WARD (J.C.S., 1937, 1337—1338).—A concise scheme is based on the elimination of $PO_4^{\prime\prime\prime}$ as NH_4 phosphomolybdate by means of NH_4 molybdate. The scheme includes the detection of Ca as $CaMoO_4$. E. S. H.

Separation of the phosphoric ion and its volumetric determination. E. CATTELAIN and P. CHABRIER (Compt. rend., 1937, 205, 49–52).— $PO_4^{\prime\prime\prime}$ is pptd. as $Pb_3(PO_4)_2$ from a solution slightly acidified with AcOH. The ppt., after washing, is dissolved in N-HNO₃ and PbSO₄ pptd. by addition of N-H₂SO₄. The mixed acids are titrated with N-NaOH using Me-orange as indicator, the titration being continued with 0·1N-NaOH using phenolphthalein. The amount of NaOH required for the second stage of the titration corresponds with the H₃PO₄ content of the solution. C. R. H.

Determination of small amounts of arsenic. G. G. KARANOVITSCH (Trud. Inst. Tschist. Chim. Reakt., 1935, No. 14, 93–95).—The method of Martin and Pien (A., 1930, 1144) serves for determination of amounts of As of the order of 10^{-7} g.

R. T.

Osmic acid as redox indicator in volumetric determination of arsenite with potassium bromate. L. SZEBELLÉDY and W. MADIS (Mikrochim. Acta, 1937, 1, 226—230).—OsO₄ gives with AsO₂''' in dil. H_2SO_4 solution an immediate bluish-black coloration of colloidal Os, which is oxidised and decolorised by any excess of BrO₃'. 2 c.c. of 0.25% OsO₄ are used for 50 c.c. of solution containing 5 c.c. of 0.1N- H_2SO_4 . The method may be used microanalytically. J. S. A.

Determination of arsenic as magnesium pyroarsenate. I. SARUDI (VON STETINA) (Z. anal. Chem., 1937, 110, 117—122).—MgNH₄AsO₄ is pptd. very slowly from a solution containing NO₃'. After pptn., conc. aq. NH₃ is added. The ppt. is redissolved in 4N-HNO₃, and repptd. by the same method. It is finally washed with 10% aq. NH₃ containing 3% of NH₄NO₃. J. S. A.

Detection of silicic and boric acids. A. REIOH (Chem.-Ztg., 1937, 70, 707; cf. A., 1896, ii, 544).— The material is mixed with a 2:1 mixture of H_2SO_4 and HF and the vapours are allowed to impinge on a drop of H_2O on a watch glass. The white film is studied for solubility and the drop by turmeric paper. R. S. B.

Determination of small amounts of cyanide in foodstuffs after fumigation.—See B., 1937, 975.

Iodometric determination of alkali. G. S. SMITH (Analyst, 1937, 62, 590-596).—Walker and Gillespie's method (A., 1899, ii, 326) is modified by refluxing the reaction mixture, to which C_6H_6 is added until the reaction is judged to be complete, in which circumstances sol. or freshly pptd. carbonates react quantitatively. Excess of I is removed either by boiling or, more rapidly, by addition of PhOH. The alkali of Na₃AlO₃ and Na₂SiO₃, but not that of Na₂B₄O₇, may be determined by this method.

E. C. S.

Micro-determination of potassium. B. NOR-BERG (Mikrochim. Acta, 1937, 1, 212—219).—K is pptd. as K_2PtCl_6 by means of 0·02N-H₂PtCl₆ from 0·1 c.c. of solution. The whole is evaporated to dryness at 90—95°, and washed twice with 0·1 c.c. of abs. EtOH. The ppt. is collected centrifugally, dried at 95°, and dissolved in 0·045 ml. of phosphate buffer solution ($p_{\rm H}$ 6·98). 0·015 ml. of 2N-KI is added, forming K_2PtI_6 , which is titrated directly with 0·02N-Na₂S₂O₃. The method is suitable for 0·001—0·01 mg. of K, especially in biological tissues. J. S. A.

Photo-electric determination of potassium in serum.—See A., III, 373.

Determination of total alkalis and microgravimetric determination of sodium as sodium magnesium uranyl acetate. (Micro-analysis of mineral waters.) R. DWORZAK and A. FRIEDRICH-LIEBENBERG (Mikrochim. Acta, 1937, 1, 168—193).— Li, K, and Na sulphates are stable at 700°, and are non-hygroscopic, and suitable for determining total alkalis. 5 c.c. of mineral H₂O are evaporated with HCl to render SiO₂ insol. The residue is dissolved in H₂O and filtered into a Ca(OH)₂ suspension, which is boiled for 20—30 min. to ppt. all other ions. Ca is pptd. from the resulting solution by treatment with $(NH_4)_2CO_3$ and then $(NH_4)_2C_2O_4$. The residue is evaporated with H₂SO₄, and ignited at 700°. Na may be pptd. directly as Na Mg UO₂ acetate from most mineral waters without interference from other ions in the relative concns. usually found. The influence of other ions on the pptn. of Na is discussed. J. S. A.

Determination of lithium. H. GROTHE and W. SAVELSBERG (Z. anal. Chem., 1937, 110, 81-94).— The determination of Li by pptn. as LiF and Li₃PO₄ is critically reviewed. Li is best pptd. as aluminate, which is ignited to $2\text{Li}_2\text{O},5\text{Al}_2\text{O}_3$. The acidified Li solution (p_{H} 3) is treated at room temp. with a solution of KAl(SO₄)₂,12H₂O + an excess of NaOH and brought to p_{H} 12.6, whereby Li aluminate is pptd. In determining Li in Al alloys, Al is pptd. as AlPO₄ from AcOH solutions to avoid co-pptn. of Li as with aq. NH₃. J. S. A.

Quantitative drop analysis. VII. Determination of calcium. R. LINDNER and P. L. KIRK (Mikrochem., 1937, 22, 291-300; cf. A., 1933, 1262).—Ca is pptd. as CaC₂O₄ by digesting 1 drop NN (A., I.) of solution, acidified with HCl, with an equal vol. of 4% aq. $(NH_4)_2C_2O_4 + 0.1$ ml. of saturated aq. NaOAc. The ppt. is collected, dissolved in $6N-H_2SO_4$, and treated with an excess of $0.01N-Ce(SO_4)_2$. The excess is finally titrated back with $0.01N-FeSO_4$. Biological materials are ashed at 450° , the residue being dissolved in HCl. The method is applicable to $0.5-12 \times 10^{-6}$ g. of Ca. J. S. A.

Rapid determination of calcium and magnesium. N. A. FREZE (Zavod. Lab., 1937, 6, 756–758).—Ca is determined by pptn. as CaC_2O_4 , and Mg by pptn. as $Mg(OH)_2$. R. T.

Analysis of soda-lime glass.-See B., 1937, 911.

Determination of primary calcium phosphate in mixtures of the calcium orthophosphates. H. V. TARTAR, I. S. COLMAN, and L. L. KRETCHMAR (Ind. Eng. Chem. [Anal.], 1937, 9, 384–386).— $Ca(H_2PO_4)_2$ is determined by titrating to p_{Π} 5.15 with 0.2N-NaOH. E. S. H.

Determination of metals by the hydroxyquinoline method. S. L. TZINBERG (Zavod. Lab., 1937, 6, 499—501).—The ppt. obtained by adding ammoniacal 8-hydroxyquinoline (I) to aq. Be salts is Be(OH)₂ and is also obtained in absence of (I). Mg may be separated from Ca by pptn. from ammoniacal solution with (I); the ppt. adsorbs Ca when this is present in high concn. Ag is quantitatively pptd. from aq. NH₃ solution as $Ag(C_9H_6ON)_2$.

Fractional detection of magnesium in presence of barium, strontium, and calcium. N. A. TANANAEV and R. A. LOVI (J. Appl. Chem. Russ., 1937, 10, 1112—1117).—Slight excess of aq. NH₃ is added to the solution, which is boiled, aq. $(NH_4)_2CO_3$ is added, and the solution is filtered from the ppt. of Ba, Ca, and Sr carbonates. The filtrate is boiled with excess of aq. CH₂O, made alkaline (phenolphthalein) with NaOH, and excess of aq. NH₃ is added, when a ppt. of Mg(OH)₂ is obtained in presence of < 0.3 mg. of Mg in 5 ml. of solution. Alternatively, Mg(OH)₂ is pptd. by 5% Ca saccharate; NH₄, but not Ca", Ba", or Sr", interferes. R. T.

Analysis of magnesium alloys.—See B., 1937, 925.

Determination of magnesium in fertilisers.— See B., 1937, 956.

Detection and determination of heavy metals in cider.—See B., 1937, 968.

Determination of cadmium by internal electrolysis. J. J. LURIE and M. I. TROITZKAJA (Zavod. Lab., 1937, 6, 507).—The method previously described (B., 1937, 49) gives low results when the H_2O used contains Cl; a few drops of aq. $Na_2S_2O_3$ should then be added. R. T.

Photo-electric determination of copper. J. HEYES (Z. Elektrochem., 1937, 43, 560; cf. A., 1936, 1222).—Cu can be determined by the intensity of its 3247 Λ . line in a compressed air-C₂H₂ flame, measured by means of a photo-electric cell.

J. W. S.

Rapid micro-determination of copper and cobalt. I. M. KORENMAN, A. M. LISENKO, and C. V. MORDUSCHENKO (Zavod. Lab., 1937, 6, 682– 684).—The reactions described by Korenman (A., 1934, 49, 1192) are applied to determination of Co (<0.004 mg.) and Cu (<0.01 mg.), by comparing the intensity of coloration of the ppt. of ZnHg(CNS)₄ with that obtained from solutions of known Co and Cu content. Ni, Zn, Cd, Cr, Mn, Pb, Al, Ag, Bi, and Sn^{IV} do not interfere. Should Fe be present the reaction is performed in presence of NaF. The method is applied to analysis of 1–2 mg. of alloys. R. T.

Action of hydrogen on the oxides and sulphides of copper, and determination of copper as cuprous sulphide. V. G. GALLO (Annali Chim. Appl., 1937, 27, 269-284; cf. B., 1928, 56).-The reduction of CuO by H₂ commences at 102-105° and proceeds continuously through the stage of Cu₂O to Cu. Reduction is complete after 9 hr. at 135° or 3 hr. at 380°. The reduction of CuS by H₂ commences at $200-300^{\circ}$ and proceeds through a series of solid solutions of CuS and Cu₂S to Cu₂S. The dimorphism of the Cu₂S then determines whether it remains unaltered on continued heating at elevated temp., or whether further reduction takes place as a consequence of the reaction $Cu_2S = CuS + Cu$, yielding Cu. If H_2 is replaced by H_2S , Cu_2S is always the final product. In the light of these results the Rose method for the determination of Cu as Cu₂S is modified by strongly heating the pptd. CuS for 10-15 min., without addition of S, in a current of dry H₂S, and cooling in a current of H₂. Results are thereby obtained which do not vary with the time of heating. L. A. O'N.

Reaction between aqueous silver nitrate and cuprous thiocyanate. Indirect argentometric method for the determination of copper and a "spot" test for silver. V. J. OCCLESHAW (J.C.S., 1937, 1438—1440).—Aq. AgNO₃ reacts with CuCNS yielding an equimol. mixture of Ag and AgCNS. The reaction has been adapted to the determination of Cu in neutral or NH₃ solution; the error in determining 0·3—0·5 g. of CuSO₄,5H₂O is about \pm 0·3%. The reaction can be used as a drop test for Ag. E. S. H.

Microchemical determination of cupric cation with ammonia, tartaric acid and fructose, potassium ferrocyanide, and potassium ferrocyanide in presence of ammonia. S. AUGUSTI (Mikrochem., 1937, 22, 329–338).—The sensitivity of the Cu-NH₃ coloration is improved by testing the dried residue of the solution, or by inserting a cotton fibre, which turns blue or green, into the solution. The most sensitive test is with aq. NH_3 + solid K₄Fe(CN)₆, giving characteristic crystals of Cu₂Fe(CN)₆, NH_3 , H_2O with 0.00015 mg. of Cu. J. S. A.

[Polarographic] determination of copper, nickel, and cobalt in steels.—See B., 1937, 921.

Rapid photometric determination of copper and nickel in steels.—See B., 1937, 921.

Determination of copper in foods.—See B., 1937, 975.

Molecular spectra and spectroscopic analysis. V. Detection of gadolinium. VI. Detection of samarium. G. PICCARDI (Atti R. Accad. Lincei, 1937, [vi], 25, 44–46, 86–87; cf. A., 1933, 1102).– V. The mol. emission spectrum of GdO is described and some new bands are recorded. The method can be used to detect < 0.05% of Gd₂O₃ in solution.

VI. The spectrum of SaO in the range 4300— 6700 A. is described. The detection of Sa is somewhat less sensitive than that of Gd. O. J. W.

Determination of aluminium by precipitation with carbamide. H. H. WILLARD and N. K. TANG (Ind. Eng. Chem. [Anal.], 1937, 9, 357–363).—Al is pptd. quantitatively at $p_{\rm H}$ 6·5—7·5 in boiling solutions of its salts containing CO(NH₂), NH₄Cl, and (NH₄)₂SO₄. If (NH₄)₂SO₄ is replaced by succinic acid the pptn. is quant. at $p_{\rm H}$ 4·2—4·6. A single pptn. gives effective separation from relatively large amounts of Ca, Mg, Mn, Ni, Co, Zn, and Cu. E. S. H.

Determination of aluminium in presence of fluorine compounds by means of hydroxyquinoline. K. A. VASILIEV (Zavod. Lab., 1937, 6, 432– 434).—Pptn. of Al by 8-hydroxyquinoline is incomplete in presence of F', which forms insol. salts of the type Na₃AlF₆. Theoretical results are obtained by adding 0.14 g. of H₃BO₃ per mg, of F present.

R. T. Determination of alumina in presence of metallic aluminium.—See B., 1937, 926.

Detection of traces of permanganate, persulphate, dichromate, and ferricyanide, present together. L. M. KULBERG (J. Appl. Chem. Russ., 1937, 10, 1130—1134).—Reduced phenolphthalein (I) is oxidised by MnO_4' , S_2O_8'' , and $Fe(CN)_6'''$, but not Cr_2O_7'' . Should the solution give a coloration with (I), 1% NiSO₄ is added, the solution is filtered, and the ppt. is treated with NaOH and leuco-malachite-green (II) in 2% H₂SO₄; a green coloration indicates $Fe(CN)_6'''$. The filtrate gives a positive reaction with (I) in presence of MnO_4' or S_2O_8'' , in which case it is heated with EtOH-NaOH, filtered, and the residue is treated with (II); a green coloration indicates MnO_4' . 0.1% H₂O₂ and 1% AcOH are added to the filtrate, and (I) is added after a few sec.; a red coloration is given by S_2O_8'' . The reactions are adapted to detection of traces of any three ions in a solution of the fourth, and their sensitivity has been determined under such conditions. R. T.

Use of sulphinic acids for determination of iron. J. V. DUBSKY, E. ORAVEC, and A. LANGER (Chem. Obzor, 1937, 12, 41-45).—These acids are not recommended for the gravimetric or volumetric determination of Fe^{***} since results are not reproducible, or for testing with the micro-qual. spotting technique. F. R.

Use of the reaction between formaldehyde and alkali hydrogen sulphite in oxidimetry. Oxidimetric determination of iron. D. TSCHAVDAROV (Z. anal. Chem., 1937, 109, 396–402).—The solution of FeCl₃ or Fe₂(SO₄)₃ is treated with HCl or H₂SO₄, boiled, and treated with sulphite in a vessel closed by a valve. The solution is cooled and 35% CH₂O added. After 10–15 min. MnSO₄ and H₃PO₄ are added and the solution is titrated with KMnO₄, excess of SO_2 having been removed by the CH_2O (which does not react with $KMnO_4$ in presence of sufficient $MnSO_4$). Cations are without influence, but NO_3' is clearly deleterious, OAc' hinders reduction, and PO_4''' , present before reduction, gives $FePO_4$. If no Cl' is present 1—2 g. of NH_4Cl must be added before reduction, and solutions of unknown acidity must first be treated with slight excess of aq. NH_3 followed by 8—10 c.c. of 2N-HCl. The method with $K_2Cr_2O_7$ using NHPh₂ is similar. R. S. B.

Thiocyanate reaction for iron. T. N. KARSKAJA (Trud. Inst. Tschist. Chim. Reakt., 1937, No. 14, 81-87).—The reaction with CNS' serves for detection of Fe in sol. alkali, alkaline-earth, and Mn chlorides, nitrates, and sulphates, but not in Pb, Hg, Cd, and Zn salts. R. T.

Ferric thiocyanate equilibria. R. DUBOIS (J. Chem. Educ., 1937, 14, 324-326).-The decolorising effect of the addition of NH₄Cl on the red colour produced when NH₄CNS is added to aq. FeCl₂ is not a valid illustration of the law of mass action. It is due primarily to the addition of charged ions (salt effect), and an equiv. effect is produced by solutions of NH4Cl, NH4NO3, NaCl, and NaNO3 of the same concn. At low concns. the salt effect in the reaction $Fe''' + 6CNS' \Longrightarrow Fe(CNS)_6'''$ is positive, i.e., with increasing salt concn., the apparent dissociation of the coloured complex is increased. The salt effect is important at low concns., and is the more pronounced the higher is the valency type, since the relative magnitudes of the decolorising effect of equimol. concns. of KCl, K_2SO_4 , MgCl₂, AlCl₃, and H_3PO_4 on 0.00375M solutions of Fe^{III} thiocyanate are in the order of the ionic strengths of the solutions. The decolorising action of the higher valency type salts is pronounced at a concn. 0.01M and increases rapidly. The effects of HCl and H₂SO₄ are < those of KCl and K₂SO₄, the difference being attributed to the reversal of the hydrolysis of Fe" by H^{*}. Chloride solutions have a decolorising effect which is slightly > that of the corresponding nitrates, possibly on account of the formation of FeCl₆^{'''}. L. S. T.

Dimethylglyoxime as an indicator in volumetric analysis. [Determination of ferrous iron.] K. KOMÁRER (Coll. Czech. Chem. Comm., 1937, 9, 247—253).—When aq. K₃Fe(CN)₆ is added to conc. aq. Fe[°] containing a little NH₃, much Rochelle salt, and dimethylglyoxime as indicator, the colour change red to yellowish-green occurs when all but about 2% of the Fe[°] has reacted thus : $Fe(CN)_6^{''} +$ Fe[°] = $Fe(CN)_6^{'''} +$ Fe^{°°}. J. G. A. G.

Spectrographic determination of alloying constituents in steels.—See B., 1937, 921.

Organic reagents in analytical chemistry. XI. Cobalt. J. V. DUBSKY and A. LANGER (Chem. Obzor, 1937, 12, 8).—In neutral or alkaline media 1:2- (I) and 2:1-NO·C₁₀H₆·OH give reddish coloured ppts. of complex salts, insol. in dil. mineral acids, with Co^{**} and Co^{***} salts. Conditions for the determination of Co with (I) as $[C_{10}H_6(NO)\cdot O]_3Co,2H_2O$ are given. These reactions are evidence for the existence of the nitrosonaphthols in two tautomeric forms. F. R. Polarographic determination of molybdate and phosphate ions. F. A. UHL (Z. anal. Chem., 1937, 110, 102-117).-MoO₄", in presence of lactic acid, gives a polarographic step which is independent of the acid concn. The molybdate solution, containing HNO₃, is treated with a 1.5M-K₂C₂O₄ + M-KCl solution, and neutralised (bromothymolblue). 10 c.c. of 2N-lactic acid are added, and then 2N-HNO₃, and the solution is polarographed. For the determination of PO₄"', a measured excess of MoO₄" is added, and the excess is determined polarographically. J. S. A.

Arsenate method for determination of zirconium. W. C. SCHUMB and E. J. NOLAN (Ind. Eng. Chem. [Anal.], 1937, 9, 371-373).—The conditions for quant. pptn. of $Zr_3(AsO_4)_4$ by adding $(NH_4)_3AsO_4$ to $ZrOCl_2$ in aq. HCl have been determined. The interference of Ce^{IV} is eliminated by double pptn.; if Ti is present, a correction must be applied. The ppt. is ignited directly to ZrO_2 under reducing conditions. E. S. H.

Peroxide method for [determination of] vanadium. Spectrophotometric study. E. R. WRIGHT [with M. G. MELLON] (Ind. Eng. Chem. [Anal.], 1937, 9, 375—376).—The optimal conditions for the determination have been investigated spectrophotometrically. The recommended concn. of H_2SO_4 , HNO₃, or HCl is 0.6—6N, and the solutions should contain 0.5—3 c.c. of 3% H₂O₂ per 100 c.c. The limiting concns. of interfering ions have been determined. E. S. H.

Micro-determination of gold. W. B. POLLARD (Analyst, 1937, 62, 597-603; cf. B., 1932, 511).--Pptd. Au is dissolved in aq. Br-HCl and titrated as described previously, except that o-dianisidine is substituted for o-tolidine as a reducing agent. Solutions of Au in aqua regia are freed from NOCl by passing a current of air over the surface. Interfering metals are removed by pptn. of the Au with a reducing agent, filtering in a special micro-filter, and dissolving and titrating as above. For pptn. of Au in presence of Pd, "metol" or $p-C_6H_4(NH_2)_2$ is recommended. Cu, Ag, Fe, Ni, Zn, Cd, Al, and Sn do not interfere in the titration, but Pb interferes unless the solution in aqua regia is diluted with H₂O. Minute quantities of Au are "collected" by co-pptn. with Te. In this way 0.01-0.10 mg. of added Au was quantitatively recovered from 10 litres of tap H₂O. E. C. S.

Separation of gold from tellurium and selenium. J. SEATH and F. E. BEAMISH (Ind. Eng. Chem. [Anal.], 1937, 9, 373—374).—Quinol ppts. Au quantitatively in presence of Te and Se. The filtrate can be analysed for Te and Se by the usual procedure. E. S. H.

Electric heating apparatus. F. BREUER (Ind. Eng. Chem. [Anal.], 1937, 9, 363).—The apparatus is designed for heating volatile solvents for reflux or distillation. E. S. H.

Electric heater for a water still. F. R. PRATT (Rev. Sci. Instr., 1937, [ii], 8, 286—287).—In the heater described, used for operating a small multiple still, the H_2O to be heated serves, instead of resistance coils, as the resistance element. N. M. B.

X, XI

M.p. bath. H. P. BROWN (J. Chem. Educ., 1937, 14, 380).— $o \cdot C_6 H_4(CO_2 Bu)_2$ can, with advantage, replace $H_2 SO_4$. In a Thiele tube or similar device exposing a small area of liquid surface in a relatively tall container, m.p. up to 300° can be taken with safety. L. S. T.

Detection of f.p. by dielectric measurements. L. T. ALEXANDER, T. M. SHAW, and R. J. MUCKENHIRN (Proc. Soil Sci. Soc. Amer., 1936, 1, 113—119).—The material to be investigated forms a condenser in a tuned radio-frequency circuit with a vac.-tube voltmeter. Variations in ϵ are compensated by a calibrated variable condenser. The material is immersed in a refrigerated const.-temp. bath and the temp. varied from -20° to room temp. ϵ is plotted against temp. and the f.p. depression read. The results are more accurate than those given by the Beckmann technique. A. M.

Apparatus for the determination of the elevation of the b.p. in hydrogen fluoride. W. KLATT (Z. anorg. Chem., 1937, 233, 307-312).—Improved apparatus is described. F. J. G.

Constant-temperature bath for molecular stills. O. A. NELSON and H. L. HALLER (Ind. Eng. Chem. [Anal.], 1937, 9, 402).—Two forms of apparatus are described. E. S. H.

Thermocouple. R. C. MASON (Rev. Sci. Instr., 1937, [ii], 8, 265).—Thermocouples with elements of W-Kovar (Co-Ni-Fe alloy) can be sealed through glass, are not attacked by Hg, and are of high thermoelectric power. N. M. B.

Alternating current bridge in laboratory temperature control. M. BENEDICT (Rev. Sci. Instr., 1937, [ii], 8, 252—254).—A simple portable circuit with amplifier for continuous temp. control of furnaces and thermostats to within 0.03° per hr. is described. N. M. B.

Thermo-regulator. P. GESTEAU (J. Pharm. Chim., 1937, [viii], 26, 105—111).—In the thermostat described the regulator consists of a tube of Hg, the expansion of which controls the phase difference between the grids and anodes of two thyratron valves, and thus determines the anode currents of the latter which operate the heating elements. A temp. const. to about 0.01° is thus conveniently obtained. W. O. K.

Succinic acid as a secondary standard for the calibration of combustion bombs. W. A. ROTH and G. BECKER (Z. physikal. Chem., 1937, 179, 450—456).—This acid is a trustworthy secondary standard, the heat of combustion for isothermal combustion at 20° and const. vol. being 3025_{7} g.-cal.₁₅ per g. (reduced to vac.). R. C.

Calorimetric investigations of organic reactions. I. Apparatus and method. Inversion of sucrose and decomposition of diacetone alcohol. J. M. STURTEVANT (J. Amer. Chem. Soc., 1937, 59, 1528—1537).—Apparatus and technique for determining the velocities and heats of slow reactions with an accuracy of about 2% are described. Investigation of the inversion of sucrose by this means confirms that the reaction is strictly unimol. Determinations of the velocity of decomp. of diacetone alcohol are in agreement with those of French (A., 1930, 42) and Murphy (A., 1931, 573). E. S. H.

Objective spectral colorimeter. E. LANDT and H. HIRSCHMÜLLER (Z. Wirts. Zuckerind., 1937, 87, 449—460.)—Monochromatic light of λ 436, 546, or 578 mµ. traverses one or other of two twin glass cells containing the liquids to be compared (e.g., solvent and solution), and its intensity is measured by means of a photo-electric cell of Se barrier-layer type, the current from which is read on the 20-cm. scale of a Lange multiflex galvanometer The instrument (Schmidt & Haensch) is convenient in use and of high precision; over the range of extinction coeffs. 0·1—1, results are reproducible to within 0.5% of the mean val. J. H. L.

Preparation of colour filters. V. A. SUCHICH and T. B. PERELMAN (Zavod. Lab., 1937, 6, 738— 739).—The filters are prepared by spraying dye solutions on to glass surfaces. R. T.

Physical basis of colour measurement. A. C. HARDY (J. Appl. Physics, 1937, 8, 233-238).—A general survey of the interpretation of colour and of the use and scope of the spectrophotometer and colorimeters. N. M. B.

Application of the Pestemer polarisation photometer in photographic absorption spectrophotometry. G. SCHMIDT (Z. Elektrochem., 1937, 43, 690).—See this vol., 152. J. W. S.

Measurement of the angular region of reflexion of X-rays in polycrystalline substances by a new statistical method. A. REIS (Compt. rend., 1937, 205, 369—371).—Two Debye–Scherrer spectrograms are photographed on the same film, the orientation of the specimen being varied to a small known extent between the exposures. The variation in the no. of spots on the resulting photographs with change in orientation permits the determination of the mean region of angular reflexion.

J. W. S. Determination of orientation of crystallites in fibrous substances. R. HOSEMANN (Z. physikal. Chem., 1937, 179, 356—360).—A photometric method of measuring the degree of orientation of the crystallites is described. R. C.

Globar support for infra-red spectrometry. L. G. BONNER (Rev. Sci. Instr., 1937, [ii], 8, 264– 265).—Electrical contact with the carborundum rod (globar) radiation source is effected by Ag soldering into hollows in thick Cu rod fitted with radiating fins. N. M. B.

Collapsible X-ray tube and vacuum table for structural and spectral analysis. V. A. ZUKER-MAN (Zavod. Lab., 1937, 6, 465–470).—Apparatus is described. R. T.

X-Ray double spectrometer with stationary source and ion chamber. P. KIRKPATRICK and P. A. Ross (Physical Rev., 1936, [ii], 49, 209).—An experimental arrangement is described. L. S. T.

Rotating spark contact for comparative spectroscopy. S. VAN DER LINGEN (S. African J. Sci., 1937, 33, 197—198).—Two spark gaps, operated by a rotating contact, are projected on to the spectrometer slit so as to overlap. H. J. E. Stereoscopic photomicrography. S. SHIMADzu (Mem. Coll. Sci. Kyoto, 1937, A, 20, 1-2).—A simple method of taking stereoscopic photomicrographs by inclining the object on both sides of the optical axis of an ordinary microscope is described.

High dispersion linear scale mass spectrograph with velocity and direction focussing. K. T. BAINBRIDGE and E. B. JORDAN (Physical Rev., 1936, [ii], 49, 421).—High resolving power, sensitivity, and dispersion have been combined in a spectrograph for the investigation of isotopes. L. S. T.

Refractometer for the near infra-red. R. KINGSLAKE and (MISS) H. G. CONRADY (J. Opt. Soc. Amer., 1937, 27, 257—262).—The apparatus for measuring n on a 60° prism is essentially a double Wadsworth mirror monochromator, the first half calibrated in $\lambda\lambda$, and the second to read angular rotations of the table carrying the unknown prism. Measurements for 0.365—2 μ . on 11 optical glasses are tabulated. N. M. B.

Objective photometry. P. KRUMHOLZ (Mikrochim. Acta, 1937, 1, 205-211).—A photo-electric photometer using 5 c.c. of solution is described. The instrument may be used for kinetic measurements on colour reactions. J. S. A.

Universal nephelometer with selenium photoelements. B. E. SEMEIKIN (Zavod. Lab., 1937, 6, 736—738).—Apparatus is described. R. T.

Photo-electric comparator. R. ROURE, L. QUEVRON, and R. GENSE (Compt. rend., 1937, 205, 131-133).—Objects to be measured are placed between two parallel plane surfaces; one is fixed, movement of the other changing the effective aperture of a photo-cell. Sensitivity to at least 0.1 µ. is claimed. A. J. E. W.

Photo-electric determination of extinction coefficients of solutions. A. FUJITA and T. SAKA-MOTO (J. Biochem. Japan, 1937, 25, 193—205).— The use of a photo-cell and valve amplifier, applicable to a λ range of 190—730 m μ ., is described.

F. O. H.

Use of photo-elements with blocking layer for radioactive measurements. P. BONET-MAURY (Compt. rend., 1937, 204, 1641—1643).—Se cells with a layer of CuO give rise to a p.d. when irradiated by α - and β - but not γ -rays, as for photons. The study of radioactive rays, with and without the use of ZnS screens, is described, and the effects of α -rays and photons are compared. R. S. B.

Copper sulphide photo-cell. J. J. BRADY and W. F. SFRENGNETHER, jun. (Physical Rev., 1936, [ii], 49, 420).—In the cell described the amount of S used to form sulphide is controlled by a mol. beam. The sulphide is formed by depositing S atoms on a Cu plate heated by electronic bombardment in a high vac. L. S. T.

Series of filters for the quartz mercury lamp. C. WINTHER (Z. Elektrochem., 1937, 43, 691—695).— Instructions are given for the prep. of solutions for use in filters to transmit characteristic frequencies of the Hg lamp, but with low transmission for other frequencies. J. W. S. Collodion filter for K_{α} chromium radiation. S. S. SIDHU (Rev. Sci. Instr., 1937, [ii], 8, 308).— The prep. of collodion filters of NH_4VO_3 is described. N. M. B.

Breaking arc with high-frequency ignition. K. PFEILSTICKER (Z. Elektrochem., 1937, 43, 719– 721).—A new form of the Gerlach breaking arc, for use in spectral analysis, is described; ignition is carried out by a separate high-frequency circuit. A modified form of interrupter is also described. The method is claimed to avoid mechanical vibration of the electrodes and scattering of substances under analysis. J. W. S.

Use of the glass electrode without valve amplification. J. F. KEFFORD and A. L. G. REES (J. Proc. Austral. Chem. Inst., 1937, 4, 269–270).— The glass electrode with an ordinary galvanometerpotentiometer circuit permits determination of $p_{\rm H}$ vals. to ± 0.05 . Thorough insulation of the cell parts and galvanometer leads, e.g., with paraffin blocks, is necessary to prevent leakage currents. The glass electrode rapidly develops an asymmetry potential in alkaline solutions containing Na', and requires frequent recalibration. J. W. S.

Electrometric determination of $p_{\rm H}$ of media of high viscosity. F. A. SANTALOV (Zavod. Lab., 1937, 6, 760-761).—The $p_{\rm H}$ of liquids of high η is conveniently determined in a Leman H₂ microelectrode chamber. R. T.

Air-turbine stirrer for electrolysis and electrotitration. N. J. CHLOPIN (Zavod. Lab., 1937, 6, 768).—An air turbine is described. R. T.

Proportional (Geiger-Klemperer) counter. G. BRUBAKER and E. POLLARD (Rev. Sci. Instr., 1937, [ii], 8, 254—258).—Investigations with H_2 , N_2 , air, CH_4 , CO_2 , O_2 , A, He, and BF_3 in a wire form counter show that the linearity of response across the counter opening varies markedly with the nature and pressure of the gas, being very poor for gases which readily form negative ions and improving for almost all gases as the pressure is reduced. A qual. explanation in terms of formation of negative ions is given. N. M. B.

Torch ion counter. A. PROKOFIEV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 16, 41-43).-When the torch-like effluence produced on the circuit conductor of a short-wave generator, described by Zilitinkevitsch, is quenched by applying a sufficient p.d. between plates placed on each side of the conductor, which for this purpose is made to end in a sphere of 2 mm. radius, stray ions in the space between the plates produce flashes on the sphere, so that the apparatus can act as an ion counter. It gave, in a comparative test, results similar to those obtained with a Geiger-Muller counter, when exposed to a 0.078 mg. Ra prep., but was somewhat less sensitive. It will detect slow ions, e.g., those produced by passing a flame in front of the sphere, as well as fast ones. R. C. M.

Compensating circuit for blocking-layer photo-electric cells. B. A. BRICE (Rev. Sci. Instr. 1937, [ii], 8, 279–285).—The circuit, consisting of two blocking-layer cells in parallel with a galvano-

N. M. B.

meter and potentiometer-rheostat, and its performance under different conditions are described.

N. M. B.

High potential apparatus for nuclear disintegration experiments. H. R. CRANE (Physical Rev., 1937, [ii], 52, 11–17).—A 10⁶-volt transformer and vac. tube giving a focussed ion beam of 250 μ a. at the target are described. The operation of cloud chambers is synchronised with 0.5 sec. energisation of the ion source and transformers.

N. M. B.

Alternating current arc source for the Zeeman effect. L. LIEBERMAN and G. S. MONK (Rev. Sci. Instr., 1937, [ii], 8, 263—264).—An a.c. arc perpendicular to the field obviates many disadvantages of a parallel d.c. arc. N. M. B.

Mechanical method for computing the energy values to be associated with a fork in a cloud chamber caused by disintegration of a nucleus by a neutron. F. N. D. KURIE and J. J. LIVINGOOD (Physical Rev., 1936, [ii], 49, 208).—The device reduces the time needed for a complete analysis of a disintegration fork to a few min. L. S. T.

Separation of isotopes. J. BERNAMONT and M. MAGAT (Compt. rend., 1937, 205, 367-368).—An intense pencil of positive ions produced at low potential is accelerated by a d.c. potential into a space between two plates, perpendicular to the pencil, between which an a.c. potential is applied. The magnitude and frequency of the latter are adjusted until one at. species leaves the a.c. field at the velocity of entry, whilst the other is alternately accelerated and retarded. An electrode opposite the outlet at a potential lower than the accelerating potential then collects only the accelerated ions. J. W. S.

Continuously sensitive cloud chamber. A. LANGSDORF, jun. (Physical Rev., 1936, [ii], 49, 422).—A chamber designed to overcome certain difficulties inherent in the Wilson expansion chamber is described. L. S. T.

Magnetic electron microscope. J. H. MCMILLEN and G. H. Scott (Rev. Sci. Instr., 1937, [ii], 8, 288— 290).—A simple one-stage 50 diameters max. magnification instrument with fluorescent screen image formed by thermionic emission from surfaces with small current yield is described. N. M. B.

Electron diffraction apparatus and its application to the determination of the internal potential of ionic crystal lattices. P. A. THIESSEN and T. SCHOON (Z. physikal. Chem., 1937, B, 36, 195— 215).—An apparatus for electron diffraction measurements with solids is described; in investigations of lattice structure it is capable of a precision approaching that of normal X-ray methods. Measurements of the diffraction spectra of KCl have been used to determine the internal potential, Φ . The form of the graph of Φ against the order of the interference points to a contraction of the lattice distances in the outermost lattice planes in the sense of Lennard-Jones and Dent's theory (A., 1929, 17). R. C.

Astatic magnetometer for measuring susceptibility. E. A. JOHNSON and W. F. STEINER (Rev. Sci. Instr., 1937, [ii], 8, 236-238).---A durable

instrument of adjustable sensitivity range 2×10^{-8} . 1×10^{-5} e.m.u. per scale division is described. The range covers almost any material, and data for 10 substances are tabulated. N. M. B.

Automatic pipette. I. LIN (J. Chinese Chem. Soc., 1937, 5, 230—231).—Into the suction tube of an ordinary pipette is fitted by means of a rubber sleeve a tube having its lower end at the mark. For delivery air is admitted by uncovering a hole lying above the mark. R. C.

(A) Apparatus for direct titration of reduced solutions, without access of air. (B) Apparatus for reduction of solutions and their potentiometric titration. C. J. RABINOVITSCH and M. V. OZOLINA (Zavod. Lab., 1937, 6, 509-510, 510-511).—Apparatus is described. R. T.

Apparatus for determination of traces of hydrogen sulphide in gases. N. KAMINSKI (Maslob. Shirn. Delo, 1937, No. 3, 32—33).—An iodometric method is described. R. T.

Qualitative analyses and colorimetric estimates with the aid of Jena glass drop test plate. H. SCHAFER (Mikrochim. Acta, 1937, 1, 144—153).— With a transparent glass plate, drop reactions can be carried out against white or black backgrounds according to the coloration or ppt. concerned. By means of comparative tests with graded standard solutions, the tests can be made semi-quant.

J. S. A.

Instrument suspensions. L. WALDEN (J. Sci. Instr., 1937, 14, 257-268).—Details are given of the "shooting" of SiO_2 fibres, and of numerous processes, including the distillation of metals in a vac., whereby such fibres are given electrically conducting coatings. The manipulation of these fibres and metal filaments in instrument construction is described. J. G. A. G.

Simple super-centrifuge for continuous treatment of liquids. E. J. JEFFERIES (J. Sci. Instr., 1937, 14, 282-284).—The air-driven spinning top has been developed into a centrifuge which treats 5 litres of fluid per hr. at 500-850 revs. per sec. in an Al rotor 1.5 in. in diameter. J. G. A. G.

Enclosed apparatus for laboratory crystallisations. J. D. PIPER and N. A. KERSTEIN (Ind. Eng. Chem. [Anal.], 1937, 9, 403-404). E. S. H.

Safety tube for use with a water pump. F. J. NELLENSTEYN (Chem. Weekblad, 1937, 34, 546).— The pump is attached to the lower end of a wide, sealed, vertical glass tube, which acts as a reservoir, fitted with a stopcock at the upper end for the release of the vac. when necessary, and a narrow glass tube, which passes through the wall at the lower end and ends inside and as near the upper end of the reservoir as possible. This glass tube is connected at its lower end, outside the reservoir, to the apparatus to be evacuated. Any H_2O sucked back from the pump rises in the wide vertical tube to a higher level with no risk of its siphoning into the apparatus. S. C.

Trap for use with oil diffusion pump. K. R. MORE, R. F. HUMPHREYS, and W. W. WATSON (Rev. Sci. Instr., 1937, [ii], 8, 263).—An efficient solid CO_2 trap to prevent oil vapour from diffusing back into the evacuated apparatus is described.

N. M. B.

Esparto pulp antiaerosol filters. Puncturing of antiaerosol filters by ageing tests with water vapour. Their subsequent regeneration. L. DAUTREBANDE, E. DUMOULIN, and P. ANGENOT (Compt. rend., 1937, 205, 156—158).—The filters were permeable to a methylene-blue (I) aerosol after 20 min. of treatment with humid air. Punctured filters can be rendered impermeable by treatment with a conc. (I) aerosol drawn through at a rapid rate. A. J. E. W.

Esparto pulp antiaerosol filters. Influence of the relative humidity on the puncturing of antiaerosol filters. Influence of the time of passing of the humid atmosphere. L. DAUTREBANDE, P. ANGENOT, and E. DUMOULIN (Compt. rend., 1937, 205, 240—243).—The puncturing of the filters by damp air (cf. preceding abstract) occurs only with the R.H. >92% at room temp., and is independent of the duration of aspiration of the air. The resistance to puncturing decreases with increasing rates of aspiration. A. J. E. W.

Modification of the Jaeger surface tension apparatus. S. VAN DER LINGEN (S. African J. Sci., 1937, 33, 203—204).—An apparatus which combines determinations by the capillary-ascent method and the Jaeger method is described. H. J. E.

Methods of measurement of surface tension, and their application. K. F. SHIGATSCH (Zavod. Lab., 1937, 6, 699-709).—Known methods are described. R. T.

Simple appliance for sedimentometric analysis. N. A. FIGUROVSKI (J. Appl. Chem. Russ., 1937, 10, 1142—1148).—The rate of sedimentation of suspensions or emulsions is derived from the change in position of a glass rod or balance pan suspended in the solution on a flexible glass rod.

Improved chemical [laboratory] hood. E. C. BINGHAM (J. Chem. Educ., 1937, 14, 310-312).-Plans are reproduced. L. S. T. Automatic filtering set-up. D. H. WEST (J. Chem. Educ., 1937, 14, 395). L. S. T.

Fractional vacuum distillation of solid substances. K. HAUSCHILD (Chem. Fabr., 1937, 10, 375).—A simple apparatus for collecting the distillate in portions without interrupting the distillation is described. R. S. B.

Rationalisation of apparatus for the distillation method of determining water content of solids. A. G. BOGDANTSCHENKO (Zavod. Lab., 1937, 6, 762-763).—The Dean-Stark apparatus is recommended. R. T.

Laboratory "double effect" [condenser]. P. BOURCET (Bull. Sci. Pharmacol., 1937, 44, 120-122).—A condenser for use in the distillation, under reduced pressure, of solutions inclined to frothing is described. L. D. G.

Mercury manometer with high multiplication factor for differential pressure measurements. R. M. SUTTON (Physical Rev., 1936, [ii], 49, 414).

L. S. T. Manganin resistance pressure gauge. L. H. ADAMS, R. W. GORANSON, and R. E. GIBSON (Rev. Sci. Instr., 1937, [ii], 8, 230–235).—Measurements were made of the effect of winding, heat-treatment, and pressure-seasoning on the resistance and pressure coeff. of various coils and the effect of temp. on the pressure coeff. of manganin was determined. Equations applicable to the fixed bridge method of measuring small resistance changes are given.

N. M. B.

Universal gas-pressure apparatus. S. VAN DER LINGEN (S. African J. Sci., 1937, 33, 193-196).—A students' apparatus for studying the gas laws and the behaviour of vapours is described.

H. J. E.

[Apparatus for] measurement of gas pressures.—See B., 1937, 855.

[Apparatus for] determination of particle size of powdered materials.—See B., 1937, 852.

Baumé hydrometer correction table for sodium hydroxide solutions. J. GRISWOLD (Ind. Eng. Chem. [Anal.], 1937, 9, 388).—The table includes a correction for temp. and for thermal expansion of the glass instrument. E. S. H.

Semi-quantitative visual method for comparing electrolytic conductivities in lecture demonstrations. F. E. BROWN and W. G. BICKFORD (J. Chem. Educ., 1937, 14, 384–385). L. S. T.

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Geochemistry.

Variations in temperature of atmospheric ozone according to its origin. D. BARBIER, D. CHALONGE and E. VASSY (Compt. rend., 1937, 204, 1665—1667; cf. A., 1935, 561).—The temp. of the O_3 layer has been calc. from the absorption spectrum at 3100—3300 A. For air of polar origin the temp. at the centre of gravity of the O_3 layer is > that for air of subtropical origin. R. S. B. Geology of the iron deposits in the lower Yangtze region. C. Y. HSIEH, C. C. SUN, Y. C. CHENG, and K. CHERN (Mem. Geol. Survey China, 1935, A, No. 13, 191 pp.). CH. ABS. (e)

High iron tourmaline from the Marquette iron range. C. B. SLAWSON (Amer. Min., 1936, 21, 195).—Fe tourmaline is a characteristic mineral in the quartz veins of this range. Chemical and optical data have been obtained for high-Fe tourmaline from the Champion Fe mine. L. S. T.

Weathering of igneous rocks. IV. Photochemical method of determining free iron oxide. MITURU HARADA (Bull. Agric. Chem. Soc. Japan, 1937, 13, 383—391; cf. *ibid.*, 1936, 12, 142).—Under the action of light, free Fe_2O_3 can be extracted from hæmatite and limonite by solutions less acid than those previously used. Recommended solutions are : for hæmatite, $H_2C_2O_4$ 0.025 and $K_2C_2O_4$ 0.025 g.-mol. per litre, and for limonite $H_2C_2O_4$ 0.005 and $K_2C_2O_4$ 0.015 g.-mol. per litre. The solutions are allowed to act on the finely powdered mineral for 8 hr. in sunlight or for 20 hr. at 10 cm. from a 100-watt metal-filament lamp. J. W. S.

Hydrothermal leaching of iron ores. S. ROYCE (Econ. Geol., 1937, 32, 389-392).—A criticism (cf. this vol., 382). L. S. T.

Theory of desilicification of granitic pegmatites. K. A. VLASOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, **15**, 189—192).—The principal rôle in the desilicification is attributed to the action of HF, HBF₄, and H₂SiF₆ on the Mg and Fe of basic and ultra-basic rocks. Hydrolysable products are thereby formed, the active material being regenerated and transmitted through the rock mass. Aq. H₂SiF₆, HF, and MgSiF₆ heated at 250° under pressure in SiO₂ formed silicic acid, the amount being \propto the time of heating. J. S. A.

Pegmatites and hydrothermal veins. K. K. LANDES (Amer. Min., 1937, 22, 551-560).—A discussion. The important metals that may occur in commercial amounts in pegmatites are practically confined to Sn, W, and Mo. The pegmatite occurrences of these metals merge with typical hydrothermal veins. Granitic magmas produce pegmatites and these in turn produce hydrothermal solutions which may ppt. ores of these metals both in the pegmatite and in veins in the country rock. Intermediate magmas during their crystallisation pass through a minor pegmatite phase before entering the hydrothermal phase.* During the latter Au, sulphides, and similar ore minorals are deposited mainly in hydrothermal veins in the overlying rocks.

L. S. T.

Sphalerite from a pegmatite near Spruce Pine, N. Carolina. C. S. Ross (Amer. Min., 1937, 22, 643-650).—Descriptive, with a chemical analysis. L. S. T.

Etch tests on calaverite, krennerite, and sylvanite. M. N. SHORT (Amer. Min., 1937, 22, 667– 674).—The etching patterns obtained with HNO_3 of different conces. are illustrated. Other common etching reagents give no definite patterns. With HNO_3 , sylvanite can usually be distinguished from krennerite and calaverite. These two minerals, however, are difficult to differentiate from each other by this means. L. S. T.

Relationship between the structural and morphological elements of krennerite, calaverite, and sylvanite. G. TUNELL and C. J. KSANDA (Amer. Min., 1936, **21**, 203).—The Weissenberg X-ray goniometer reveals a close and simple relationship between the structural lattices of these minerals in spite of their different space-groups and unit cells. L. S. T.

Space-group and unit cell of sylvanite. G. TUNELL and C. J. KSANDA (Amer. Min., 1937, 22, 728-730).—X-Ray measurements give a_0 8.94, b_0 4.48, c_0 14.59 A. (all ± 0.02 A.), β 145° 26' $\pm 20'$, $d_{\text{calc.}}$ 8.17; probable space-group $P2/c - C_{2A}^{4}$. The unit cell contains 2AuAgTe₄. L. S. T.

Paragenesis of cookeite and hydromuscovite associated with gold at Ogofau, Carmarthenshire. A. BRAMMALL, J. G. C. LEECH, and F. A. BANNISTER (Min. Mag., 1937, 24, 507-520).—The ore-bodies are mainly sheet- and saddle-like masses of pyritic quartz with mispickel, blende, galena, etc., along bedding planes on the flank of an anticline in Lower Palæozoic shales. Cookeite as finely scaly masses is monoclinic (pseudo-hexagonal) with a 5·13, b 8·93, c 28·30 A, β near 90°; the unit cell contains $4\text{LiAl}_4\text{Si}_3\text{AlO}_{10}(\text{OH})_8$. The silvery-white flakes of hydromuscovite have $a 5\cdot185, b 9\cdot025, c \sin \beta 20\cdot20 \text{ A}$, and the (OH)₈K₄ group in muscovite here becomes (OH)_{8+m}K_{4-n}. Detailed chemical analyses [by H. BENNETT] are given. L. J. S.

Age of the Great Bear Lake pitchblende. J. P. MARBLE (Amer. Min., 1937, 22, 564—566).— Analyses of the pitchblende-SiO₂ ore give the mean vals. Pb 5.877, U 29.386, Th (impure) <0.002 to < 0.011%, Pb/U 0.199, and the calc. age of the pitchblende 1368 × 10⁶ years, in satisfactory agreement with the ages obtained from other samples (cf. A., 1936, 584) from different veins and levels, L. S. T.

Determination of the mineral composition of mine dust by means of X-rays. T. L. WALKER (Amer. Min., 1936, 21, 193).—A method for the determination of the amount of quartz in mine dust, accurate to within 5%, has been developed. A mixture of cryst. substances can also be quantitatively analysed. L. S. T.

Origin of oil as indicated by the composition of organic constituents of sediments. P. D. TRASK (U.S. Geol. Surv., 1937, Prof. Paper 186-H, 147-157).-Petroleum originates mainly from org. matter in marine sediments derived from plankton in overlying H₂O. The amount of org. material diminishes greatly before, and more slowly after, deposition and becomes more complex in composition as the sediment lithifies, owing to deficiency in O. of environment. Petroleum originates from complex proteins and non-nitrogenous matter rather than from cellulose, fats, and simple proteins. Liquid hydro-carbons when formed may dissolve other org. substances which may then interact. Repeated dissolution and subsequent reaction eventually lead to the formation of petroleum. H. C. R.

Geological description of the Kivdo-Raichichin brown coal deposit. A. T. PONOMARENKO (Razvedka Nedr., 1935, 5, No. 3, 10-15). CH. Abs. (e)