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$s^2p^4\,^1S$ and $sp^5\,^1P$ in the S I iso-electronic sequence. B. Edlén (*Physical Rev.*, 1942, [ii], **62**, 434—435 ; cf. Boyce, A., 1936, 537).—The correct identification of the strong line in the extreme ultra-violet spectrum of the series Cl—Sc is $s^2p^4\,^1D$—$sp^5\,^1P$. The former combination appears to be faint, but its location in S I, Cl II, A III, and K IV is provisionally deduced from an examination of available data. N. M. B.

Term analysis of the third spectrum of iron (Fe III). B. Edlén and P. Swings (*Astrophys. J.*, 1942, **95**, 532—554).—The Fe III spectrum in the region 300—6500 A. was measured and analysed. 32 of the possible 34 terms of the $3d^6$ configuration were found, with 64 of the possible 74 terms of the $3d^5\,4s$ configuration, and a corresponding no. for the $3d^5\,4p$ configuration. 320 levels and ~1500 lines are tabulated. The rôle of permitted and forbidden transitions of Fe III in stellar and nebular spectra is discussed. E. R. R.

Spectroscopic observations of 17 Leporis. B. Smith and O. Struve (*Astrophys. J.*, 1942, **95**, 468—488).—142 observations between 1928 and 1942 show 9 non-periodic outbursts, each accompanied by large violet-displacements of the sharp lines of H, Fe II, Ti II, Fe I, Sr II, Ca I, Ca II, Cr II, and Sc II. Lines of the reversing layer (H, Mg II 4481, and Si II) are not masked during these outbursts. The strongest metallic lines sometimes show weak emission borders on their red sides. E. R. R.

Spectrum of $BD + 11°\,4673$ during the years 1937—41. P. W. Merrill (*Astrophys. J.*, 1942, **95**, 386—401).—A detailed résumé of particular and progressive changes in the spectrum since 1915 is given, and the expanding atm. hypothesis is briefly discussed in the light of these changes. E. R. R.

Spectra of ten gaseous nebulæ. A. B. Wyse (*Astrophys. J.*, 1942, **95**, 356—385).—λλ, estimated intensities, and probable identifications of faint nebular lines in nine planetaries and the Orion nebula are tabulated. Additional evidence of metallic elements, especially Fe II and Fe III, in nebulæ is given. Close similarity in chemical composition is observed in all the objects investigated, and earlier conclusions as to the relative abundances of the elements are confirmed. E. R. R.

Spectrographic orbit of the companion to Rigel. R. F. Sanford (*Astrophys. J.*, 1942, **95**, 421—424).—The orbit, determined from 18 spectrograms, is nearly circular. Period = 9·860 days ; m_2/m_1 = 0·767 ; $(a_1 + a_2) \sin i = 7·771 \times 10^6$ km. ; $\gamma = +19·1$ km. per sec. E. R. R.

Spectrographic orbit of 42 Capricorni. R. F. Sanford (*Astrophys. J.*, 1942, **95**, 425—427). E. R. R.

Absolute dimensions of a Wolf–Rayet star and the expanding envelope hypothesis. O. C. Wilson (*Astrophys. J.*, 1942, **95**, 402—420).—The equiv. width of the Hγ absorption line of the *B*-type component of *HD* 193576, during and outside eclipse, the light curve, and spectrographic orbit have been used to determine the abs. dimensions of the system. The Wolf–Rayet star is the larger and brighter, but has the smaller mass. The emission bands of this component are probably not formed in the expanding envelope, but a satisfactory alternative theory is not found. E. R. R.

Luminosities of the *M*-type variables of small range. P. C. Keenan (*Astrophys. J.*, 1942, **95**, 461—467). E. R. R.

Spectral stages of novæ. D. B. McLaughlin (*Astrophys. J.*, 1942, **95**, 428—436).—Spectra of 7 bright novæ are examined in detail.

A table of chronology of a typical nova spectrum is compiled, and the differences of individual objects from averages are discussed. E. R. R.

Material ejected from novæ. (Miss) C. Payne-Gaposchkin and S. Gaposchkin (*Proc. Nat. Acad. Sci.*, 1942, **28**, 482—490).—The day-to-day intensities of the bright lines of the novæ Persei 1901, Aquilæ 1918, Cygni 1920, Pictoris 1925, and Herculis 1934 are summarised. Excitation temp. are very high, of the order of those in the nuclei of planetary nebulæ. Electron temp. are <10,000°. Fluctuations are due to variations in excitation temp. Electron densities decrease from 10^8—10^9 per c.c. at outburst to 10^5—10^6 per c.c. The masses of ejected material (10^{27}—10^{30} g.) are approx. ∝ max. luminosities of novæ. W. R. A.

Summary of X-ray satellites. F. R. Hirsh, jun. (*Rev. Mod. Physics*, 1942, **14**, 45—54).—A review bringing up to date the available theories and relevant facts, with a guide and bibliography to recent data and literature. N. M. B.

Determination of valency from X-ray absorption spectra. E. Weinstein (*Acta Physicochim. U.R.S.S.*, 1942, **16**, 321—330).—The modification of the electron configuration of an atom entering a chemical compound can be determined from an examination of the X-ray absorption curve, as the frequency of the Fermi limit and the selective max. are altered. The electrovalent link is discussed. The rule that the solubility of one metal in another, if a face-centred cubic lattice is formed, is limited by the fact that the electron concn. of the alloy connot be >1·36 does not hold for certain cases, which are discussed. A. J. M.

Velocity distribution of field electrons. G. Richter (*Z. Physik*, 1942, **119**, 406—414).—The theory of field emission is used to obtain the distribution of velocity of field electrons normal and tangential to the emitting surface. The half-val. width in the former case is ~3 times as great as in the latter. This does not agree with the results of Müller (A., 1937, I, 56) or of Henderson *et al.* (A., 1939, I, 229) on W. An explanation is offered. A. J. M.

Electron retardation and recombination radiation in discharges in gases. W. Finkelnburg and O. T. Hahn (*Naturwiss.*, 1942, **30**, 468—469).—Conditions for the testing of a theory governing the continuous spectrum in the discharge through gases, formerly proposed (A., 1934, 577, 711), are put forward. The spark spectra of He, H_2, N_2, O_2, and CO$_2$ have been investigated under different conditions, the results confirming the theory based on the radiation emitted by electron retardation and recombination. A. J. M.

Theory of cathodic sputtering. R. Seeliger (*Z. Physik*, 1942, **119**, 482—492).—Difficulties in theory introduced by recent experimental investigations are considered. A. J. M.

Nature of the gas mixture in self-quenching Geiger–Müller tubes. P. Weisz (*Physical Rev.*, 1942, [ii], **62**, 477—478).—An investigation of the effect of different quantities of the " quenching gas " on the discharge mechanism is briefly summarised. Results are correlated with the general picture of the discharge mechanism. N. M. B.

Conditions favouring the start of an arc discharge between cold activated electrodes at 50 cycles per second. M. Pirani (*Proc. Physical Soc.*, 1943, **55**, 24—34).—The start of the a.c. arc-discharge between two activated electrodes in a rare gas takes place in two stages : a slow discharge with high voltage and low current, and a change-over to the arc-discharge proper with low voltage and high current. The change-over is favoured by electrodes comprising a special pellet producing small amounts of "active Ba." In long tubes, the start of the glow discharge is hampered by wall charges which can be removed by auxiliary devices outside the tube wall. A design dispensing with such devices is described, the wall discharges being removed by glow discharge between auxiliary electrode wires running down the tube. N. M. B.

Conductivity of gases excited by high-frequency discharges. P. Mesnage (*Compt. rend.*, 1942, **214**, 702—704).—The method is described and results are given for H_2 and Ne. The conductivity increases rapidly with increasing intensity of exciting field. The resistances of the discharge tubes are not ohmic. A. J. M.

Suggested revision of the position of thorium in the fourth period of the periodic table. G. E. Villar (*J. Chem. Educ.*, 1942, **19**, 329—330).

—The physical and chemical properties of Th justify its transfer to the position occupied by Ac.   L. S. T.

Actinium and its products in mineral waters.—See A., 1943, I, 104.

Artificial radioactivity of ^{49}Cr. J. J. O'Connor, M. L. Pool, and J. D. Kurbatov (*Physical Rev.*, 1942, [ii], **62**, 413—416).—A newly-observed activity of half-life $41 \cdot 9 \pm 0 \cdot 3$ min. is produced by a-particle bombardment of Ti and by fast-neutron bombardment of Cr; it is assigned to ^{49}Cr. Absorption measurements indicate γ-rays of energies 0·19 and 1·55 Me.v. The end-point of the positron spectrum is 1·45 Me.v. The 33-min. activity in V (cf. Walke, A., 1940, I, 141) is due to ^{47}V, not ^{49}V.   N. M. B.

19-Minute isotope of molybdenum and the isotope of element 43 produced from it. W. Maurer and W. Ramm (*Z. Physik*, 1942, **119**, 334—351).—The 24-min. activity of Mo (cf. Sagane *et al.*, A., 1940, I, 340) is complex, leading to an active isotope of element 43, with half-life $14 \cdot 0 \pm 0 \cdot 3$ min. The parent Mo has half-life $14 \cdot 6 \pm 0 \cdot 3$ min., and is ascribed the mass-no. 101. It has two β-threshold vals. at $\sim 2 \cdot 2$ and 1·0 Me.v. and γ-energies 0·9 and 0·3 Me.v. The element 43 has a β-threshold at $\sim 1 \cdot 3$ Me.v. and γ-energy ~ 300 kv.   L. J. J.

Radiations from radioactive ^{56}Co. C. S. Cook and P. W. McDaniel (*Physical Rev.*, 1942, [ii], **62**, 412—413).—The high-energy 72-day Co activity (cf. Livingood, A., 1941, I, 129) was produced by bombarding a Ni wire with deuterons in a cyclotron. Measurements, following ageing for 2 months, gave identical half-lives of 80 ± 5 days for the β- and γ-rays. The β-ray end-point corresponded with a max. energy of 1·2 Me.v.; the max. γ-ray energy was 2·9, and the average energy 1·74 Me.v. β–γ and γ–γ coincidence data are reported.   N. M. B.

Origin of chemical elements. G. Gamow (*J. Washington Acad. Sci.*, 1942, **32**, 353—355).—The abundance–Z curve for the elements, decreasing exponentially with Z up to $Z = \sim 50$ and then remaining approx. const., may be the result of rapid expansion leading to nuclear fission of superheavy ($Z > 92$) elements into approx. equal fragments in early evolutionary stages of the universe.   L. J. J.

Nuclear structure of the elements. L. H. Sensicle (*Chem. and Ind.*, 1943, 55).—A theory of nuclear structure based on tetrahedra joined by faces, and sometimes by edges, is revived. It is shown how nuclei of elements from $^4_2$He onwards can be built up on this model, the special cases of $^9_4$Be, $^{17}_8$O, and $^{19}_9$F being taken as examples. It is maintained that neutrons do not exist, as such, in the nucleus.   A. J. M.

Disintegration curve of mesotrons. B. Rossi and N. Nereson (*Physical Rev.*, 1942, [ii], **62**, 417—422).—An experimental determination by investigating the delayed emission of disintegration electrons after the absorption of mesotrons by matter gives an exponential curve corresponding with a mean lifetime of $2 \cdot 3 \pm 0 \cdot 2$ μ-sec.   N. M. B.

Scattering of mesons by the matrix method. S. T. Ma (*Physical Rev.*, 1942, [ii], **62**, 403—411).—Mathematical. Relations concerning the simpler ζ- and S- (spin) matrices, derived from the β-matrices, are deduced and applied to the calculation of meson scattering by the Coulomb field and by the nuclear interaction.   N. M. B.

Stellar rotation. M. Schwarzschild (*Astrophys. J.*, 1942, **95**, 441—453).—Equations for the general problem of stellar rotation are deduced and solved in the special case of the standard model in slow rotation. The solution corresponds to solid-body rotation.   E. R. R.

Rotation of stars with convective core. G. Randers (*Astrophys. J.*, 1942, **95**, 454—460).—Even in extremely slow rotation turbulent convective motion takes place preferentially parallel to the axis of rotation. The consequent polar heating in the main body of the star causes increased rotational velocity towards the equatorial plane.   E. R. R.

Statistics of the gravitational field arising from a random distribution of stars. I. Speed of fluctuation. S. Chandrasekhar and J. von Neumann (*Astrophys. J.*, 1942, **95**, 489—531).   E. R. R.

Dynamics of the interstellar medium. III. Galactic distribution. L. Spitzer, jun. (*Astrophys. J.*, 1942, **95**, 329—344).—The effects associated with high galactic masses ($\sim 10^{10}$ M.), especially *NGC* 3115, are investigated. The analysis consists of the determination of the rate of dissipation of energy by interstellar dust particles and atoms at velocities of ~ 20 km. per sec., the determination of a max. mass of interstellar matter from the examination of a gas in a spherical gravitational field, and the investigation of the equilibrium of dust and atoms in systems possessing angular momentum. Interstellar matter, which may constitute a large fraction of the total mass, is highly conc. to the centre or to the equatorial plane.   E. R. R.

Dimensions and constitution of variable stars. (Miss) C. Payne-Gaposchkin and S. Gaposchkin (*Proc. Nat. Acad. Sci.*, 1942, **28**, 490—495).   W. R. A.

Clustering of nebulæ. I. F. Zwicky. **II.** L. Katz and G. F. W. Mulders (*Astrophys. J.*, 1942, **95**, 555—564, 565—568).   E. R. R.

II.—MOLECULAR STRUCTURE.

Theory of vibration of polyatomic molecules. L. S. Majantz (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 119—121).—Mathematical.   L. J. J.

Selection rules for molecular vibration spectra by the classical method. L. S. Majantz (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 122—124).—Mathematical. Selection rules and polarisation properties applicable to Raman spectra are deduced.   L. J. J.

Infra-red emission of the electric discharge in molecular gases and its significance for chemical kinetics. A. N. Terenin and H. G. Neuïmin (*Acta Physicochim. U.R.S.S.*, 1942, **16**, 257—271).—The infra-red emission of the discharge in CO, CO_2, and CH_4, and their mixtures with H_2, N_2, He, A, and O_2, which themselves do not emit in the infra-red, has been investigated in the λ range 1—7 μ., to obtain information about the transfer of vibrational energy in mol. collisions. CO has a band at 7 μ., CO_2 at 4·6 and 2·8 μ., and CH_4 a wide band with a max. at 2·3 μ. The infra-red emission of CO and CO_2 increases with increasing pressure and reaches a max. at 80—100 mm. The infra-red radiation is due to impacts with slow electrons which give up part of their kinetic energy to the mol. vibrations. The relation between intensity of radiation and pressure is obtained. The effect of the added gases on the emission of CO and CO_2 was investigated. He and H_2 cause quenching, N_2 causes increase in emission, and A and O_2 have no effect. CH_4 and $COMe_2$ decompose in the discharge with powerful infra-red emission.   A. J. M.

Near infra-red spectrum of water vapour. II. Parallel bands ν_3, $\nu_1 + \nu_3$, $\nu_2 + \nu_3$ and the perpendicular band ν_1. H. H. Nielsen (*Physical Rev.*, 1942, [ii], **62**, 422—433; cf. A., 1941, I, 29).—Full data and rotational analyses are tabulated and effective vals. of A, B, and C are calc. Revised vals. of ω are $\omega_1 = 3829 \cdot 4$, $\omega_2 = 1654 \cdot 5$, and $\omega_3 = 3940 \cdot 1$.   N. M. B.

Infra-red and Raman spectra of polyatomic molecules. XVII. Trideuteromethyl deuteralcohol and trideuteromethyl alcohol. H. D. Noether (*J. Chem. Physics*, 1942, **10**, 693—699).—Data are recorded for infra-red frequencies of $CD_3 \cdot OD$ and $CD_3 \cdot OH$ in the range 2·5—18 μ., and for Raman frequencies of $CD_3 \cdot OD$. Redeterminations of infra-red frequencies of MeOH and MeOD are recorded. Frequencies are assigned in all four cases to C–D and C–H stretching, Me group bending, Me rocking, C–O stretching, and OH.   L. J. J.

Effect of thermal expansion on the absorption spectrum of insulators. F. Möglich and R. Rompe (*Z. Physik*, 1942, **119**, 472—481).—Thermal expansion of the lattice produces a displacement of absorption bands towards longer $\lambda\lambda$. Theory, based on the Krönig theory of electrons in solids, shows that the effect is $\propto$ coeff. of expansion and abs. temp.   A. J. M.

Spectroscopic studies of the simpler porphyrins. IV. Absorption and fluorescence spectra of ms-tetra-(3' : 4'-methylenedioxyphenyl)-porphine of hydrogen chloride number four and of its silver pyridine, zinc, and nickel complex salts. V. M. Albers, H. V. Knorr, and D. L. Fry (*J. Chem. Physics*, 1942, **10**, 700—705).—Curves showing mol. absorption coeffs. as a function of λ are given for the visible region. The absorption spectra closely resemble those of ms-tetraphenyl-porphine and its corresponding metal complex salts. Fluorescence in the red is found in all four substances (weak in AgC_5H_5N and Ni salts); data are recorded for relative intensity in the case of the parent substance and the Zn salt.   L. J. J.

Theory of colour of organic compounds. M. A. Kovner (*Compt. rend. Acad. Sci. U.R.S.S.*, 1942, **35**, 51—52).—The energy levels and spectrum of hexatriene are determined and the position of the absorption band is calc. by a method due to Sklar (A., 1937, I, 547) to be at 2570 A., in good agreement with experiment (2600 A.). There is a displacement of absorption bands towards longer $\lambda\lambda$ as the no. of conjugated linkings in a series of compounds is increased.   A. J. M.

Constitution of o-carboxylic acids in solution. P. Csokán (*Z. physikal. Chem.*, 1942, **191**, **A**, 164—179).—Ultra-violet absorption spectra of PhOH, PhCHO, and salts and derivatives of o- and m-OH·C_6H_4·CO_2H in various solvents have been measured down to λ 200 mμ. Extinction curves for o-cresol, guaiacol, and veratrole resemble those for PhOH and BzOH closely, and no spectral change accompanies o-substitution as such. The curves for o-OH·C_6H_4·CHO and o-OH·C_6H_4·CO_2H, however, show marked inflexions attributable to the formation of intramol. H bridges; the corresponding m-compounds show none, and the p-compounds give a weak inflexion suggesting formation of weak intermol. H bridges. These effects are suppressed when R is substituted for the H of either OH or CO_2H.   F. L. U.

Ultra-violet absorption spectra of barbituric acid derivatives.—See A., 1943, II, 105.

Absorption spectra of phthal*cyclo*hydrazides at different pH values. V. V. Zelinski and B. J. Sveschnikov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1942, **34**, 252—255).—The absorption spectra of solutions of 3-amino- (I), 3-nitro- (II), 3-methylamino- (III), 3-hydroxy- (IV),

3 : 6-di(acetamido)- (**V**), and 4 : 5-dichloro- (**VI**) -phthalhydrazides in 0·1% NaOH have been measured over the λ range 2500—4000 A. (**I**), (**II**), (**III**), and (**V**) show two absorption max., at ~2900 and 3500 A., differing only slightly in position and intensity, whereas (**IV**) and (**VI**) show only single max. In H_2O, (**IV**) also shows two max. Absorption curves showing one max. at 2900 A. and 3625 A. are obtained with solutions of (**I**) in 10% HCl and 50% NaOH, respectively. The interpretation of the results is discussed.

J. W. S.

Fluorescence of solids in the compact and dispersed states. A. Kuhn (*Kolloid-Z.*, 1942, **100**, 126—135).—For substances that fluoresce with the same colour both in the compact state and in solution, and for those that fluoresce as solids but not in solution, the intensity of fluorescence decreases with increased dispersity (grinding in a machine-driven agate mortar with lactose as diluent). For substances that show different fluorescence colours in the two states and for those that fluoresce in solution but not in the compact state it is possible by continued grinding to change the colour of the fluorescence, or to increase its intensity, to that characteristic of the solution. In this case the solid is considered to be spread in a unimol. layer over the surface of the lactose. Experiments with acridine-orange, which stains living protoplasm green and dead protoplasm red, suggest that this behaviour is related to the particle size, since progressive grinding changes the fluorescence colour of the dye from orange-red to greenish-yellow.

F. L. U.

Mechanism of glowing of crystalline phosphors. M. Schön (*Z. Physik*, 1942, **119**, 463—471).—The probability of $S \to G$ transitions is discussed, and estimated, and an estimation of the lower limit of concn. of activators is advanced. The new emission spectrum which should be observed at low temp. and small activator concn. is probably identical with that obtained by Kröger for sulphides (A., 1940, I, 96). The $S \to G$ transition in phosphors with a no. of different activators is discussed. It is considered that the reverse transition plays an important part in these phosphors.

A. J. M.

Exaggerated phosphorescence of zinc silicate phosphors. H. C. Froelich and G. R. Fonda (*J. Physical Chem.*, 1942, **46**, 878—885).—Quenching Zn_2SiO_4 from 1100° has the effect of giving prominence to the second stage of decay of phosphorescence. Phosphors containing 0·5—1·0 mol. of excess SiO_2 do not show this effect. A similar effect is observed if As_2O_5 is added to phosphors activated with Mn. The intensity levels of the second stage of decay rise with increasing $[As_2O_5]$ to a max. at ~0·05% of As_2O_5 and thereafter decrease. Of other elements investigated only Sb behaved similarly to As. The action of As is the same as that of other agents (*e.g.*, inert materials) and consists in the formation of additional lattice defects which increase the no. of available trapping states.

C. R. H.

Dielectric relaxation as a chemical rate process. W. Kauzmann (*Rev. Mod. Physics*, 1942, **14**, 12—44).—A comprehensive survey covering the derivation of the differential equation for the relaxation of dielectric polarisation and its solution for static and oscillating fields, physical nature of energy losses in dielectrics, Debye's mol. model for dielectric losses, and factors determining transition probabilities. A comparison of theory with experiment examines the existence and probable origin of distributions of relaxation rates; observed data are summarised and interpreted in terms of mol. processes.

N. M. B.

Dielectric constants of polar liquids and dipole moments. J. K. Sirkin (*Compt. rend. Acad. Sci. U.R.S.S.*, 1942, **35**, 43—46).—The formula $\frac{4}{3}\pi N \mu^2/3kT = \{M(\epsilon - 1)/\rho(\epsilon + 2) - [R]\}/\{1 - (\epsilon - 1)^2/(\epsilon + 2)^2\}$ gives good agreement with observation except for strongly associated liquids with H bonding, such as H_2O and EtOH.

F. J. G.

Ionic constant of matter in solid state. M. M. Jakschin (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 132—134).—The ratio (ζ) of total to electronic mol. polarisation has been calc. for a no. of cryst. salts and covalent compounds. ζ is ~3 for fluorides, ~2 for chlorides, 1·8 for bromides, and 1·6 for iodides of alkali and alkaline-earth metals, and characteristically smaller for covalent compounds. For halides, the negative deviation of ζ from the above vals. is an index of their departure from electrovalent character.

L. J. J.

Optical activity of ammonium compounds of quadrivalent platinum. I. I. Tscherniaiev (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 336—339).—The compounds RX (R = [$enNH_3NO_2ClNO_2Pt$], X = Cl, NO_3) have been separated into optical antipodes. The rotatory power and dispersion of the following are given : *d*-R(*d*-$C_4H_5O_6$); *d*- and *l*-RCl; *d*- and *l*-RNO_3; *d*- and *l*-[$enNH_2NO_2ClNO_2Pt$]. The coeffs. of amido-inversion for the reactions *d*- or *l*-RX $\rightleftharpoons$ *l*- or *d*-[$enNH_2NO_2ClNO_2Pt$] have an average val. of ~1·2.

W. R. A.

Optical polarisation experiments with beeswax. W. J. Schmidt (*Kolloid-Z.*, 1942, **100**, 140—151).—Survey and bibliography.

F. L. U.

Quantisation of molecules. K. Fajans (*J. Chem. Physics*, 1942, **10**, 759—760).—Comparison with isoelectronic mols. supports the quantum formula KK; $1^2 2^8$ for N_2.

L. J. J.

Difficulties in valency bond theory. K. Fajans (*J. Chem. Physics*, 1942, **10**, 760—761).—Dissociation energies and ionic properties favour the formula proposed (cf. preceding abstract) for N_2 in comparison with conventional electronic valency formulæ for N_2 and mols. of neighbouring elements.

L. J. J.

Stabilisation and binding of quantised radicals. K. Fajans (*J. Chem. Physics*, 1942, **10**, 761; cf. preceding abstract).—An electron-pair may assume a larger or smaller size without change in principal quantum no., according to the positive field strength, or may differ in quantisation. The diamagnetic isoelectronic compounds $Ni(CO)_4$, $Co(CO)_3(NO)$, $Fe(CO)_2(NO)_2$, and the B hydrides can be explained by stabilisation in binding involving particles with 10 and 18 electrons.

L. J. J.

Valency angle of the carbon atom. P. F. Weatherill (*J. Chem. Educ.*, 1942, **19**, 35; cf. A., 1942, I, 196).—The angle is easily calc. by spherical trigonometry.

L. S. T.

Calculation of the valency angle [of the carbon atom]. W. H. Dore (*J. Chem. Educ.*, 1942, **19**, 29—30).—An alternative method (A., 1942, I, 196) is given.
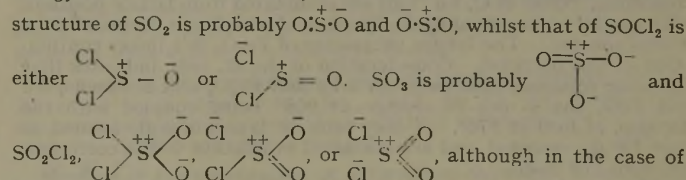
L. S. T.

Velocity of sound as a bond property. R. T. Lagermann and J. E. Corry (*J. Chem. Physics*, 1942, **10**, 759; cf. Rao, A., 1942, I, 14).—The const., $V = v_s {}^{\frac{1}{4}} M/d$, where v_s = velocity of sound, can be treated for any liquid as an additive property of increments characteristic of linkings, *e.g.*, for paraffins $V = (n - 1)V_{C-C} + (2n + 2)V_{C-H}$. Linking increment vals. for C–H, C–C, C–O, O–H, C–Cl, C=C, and C=O are 95·2, 4·25, 34·5, 99·0, 230, 129, and 186, respectively.

L. J. J.

Constitution of hypophosphoric acid and its salts. J. Gupta and A. K. Majumdar (*J. Indian Chem. Soc.*, 1942, **19**, 286—287).—Acid K hypophosphate ($KHPO_3$ or $K_2H_2P_2O_6$) and the free acid, in aq. solution, have similar Raman spectra with 6 lines at <2000 cm.$^{-1}$, suggesting the dimeric *trans*-structure.

F. J. G.

Valency states of sulphur. E. Gurjanova (*Acta Physicochim. U.R.S.S.*, 1942, **16**, 181—194).—The valency states of S in its compounds are investigated from a quantum-mechanical viewpoint. The energies of the main valency states of S are calc. from spectroscopic data. The energy of the S:O bond is calc., and from the val. it is deduced that the structure of SO_2 is probably $\overset{+}{O}:\overset{-}{S}\cdot O$ and $\overset{-}{O}\cdot\overset{+}{S}:O$, whilst that of $SOCl_2$ is

either $\overset{Cl}{\underset{Cl}{>}}\overset{+}{S} - \overset{-}{O}$ or $\overset{Cl}{\underset{Cl}{>}}\overset{+}{S} = O$. SO_3 is probably $\overset{O=\overset{++}{S}-O^-}{\underset{O^-}{|}}$ and

SO_2Cl_2, $\overset{Cl}{\underset{Cl}{>}}\overset{++}{S}\overset{\overset{-}{O}}{\underset{\overset{-}{O}}{}}$ $\overset{Cl}{\underset{Cl}{>}}\overset{++}{S}\overset{\overset{-}{O}}{\underset{O}{}}$, or $\overset{Cl}{\underset{Cl}{>}}\overset{++}{S}\overset{O}{\underset{O}{}}$, although in the case of SO_3 and SO_2Cl_2 there is a considerable difference between the experimental val. of the energy of formation and the energies of the structures. Quantum-mechanical calculations based on Pauling's principle of max. overlapping show that it is unlikely that 4s and 3d electrons take part in the formation of S compounds.

A. J. M.

Potential energy curves in general chemistry. H. N. Alyea (*J. Chem. Educ.*, 1942, **19**, 337—339).

L. S. T.

III.—CRYSTAL STRUCTURE.

Interpretation of *X*-ray diffraction diagrams and evidence of mosaic structures.—See B., 1943, I, 124.

Regular surfaces for space lattice interferences and their most important plane sections as single-crystal diagram curves. H. Seemann (*Z. Physik*, 1942, **119**, 374—396).—The properties of non-circular conical surfaces of high order, arising in the interpretation of interferences produced by single-crystals with convergent or divergent irradiation, are discussed.

L. J. J.

Stoicheiometric calculations on the basis of crystal lattices. A. Silverman (*J. Chem. Educ.*, 1942, **19**, 16).—The effect of isomorphous substitution in the crystal lattice, independent of valency, on stoicheiometric relationships is discussed.

L. S. T.

Influence of geometrical factors on the stoicheiometric formulæ of metallic compounds illustrated by the structure of KNa_2. F. Laves and H. J. Wallbaum (*Z. anorg. Chem.*, 1942, **250**, 110—120).—KNa_2 has the $MgZn_2$ structure (C_{14}) with *a* 7·48, *c* 12·27 A., *c/a* = 1·64. The at. radii are approx. those of the free metals.

F. J. G.

Electronographic determination of the structure of cadmium bromide. Z. Pinsker (*Acta Physicochim. U.R.S.S.*, 1942, **16**, 148—168).—The structure of cryst. films of $CdBr_2$ has been investigated by electron diffraction. Four structures are recognised. When $CdBr_2$ is crystallised from H_2O the lattice type is C_6 or C_{27}. When sublimed in air, and often when crystallised from H_2O, a C_{19} structure may be obtained. The electron method gives more complete results than the X-ray method. The results are not in agreement with those of Bijvoet and Nieuwenkamp (A., 1934, 16).

A. J. M.

Crystal structure of boron carbide, B_4C. H. S. Shdanov and N. G. Sevastianov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 432—434).

—X-Ray examination of B_4C powders and single-crystals, obtained in two ways, shows that only one cryst. modification exists; a_0 5·60, c_0 12·1 A., and probable space-groups are D_{3d}^5, D_3^7, and C_{3v}^5. The crystal structure is illustrated diagrammatically.   L. S. T.

Dihalides of titanium and vanadium. W. Klemm and L. Grimm (*Z. anorg. Chem.*, 1942, **249**, 198—208).—VBr_2, VI_2, and one modification of TiI_2 (which is dimorphic) have the CdI_2 (C_6) structure, with ρ_4^{25} (calc.) = 5·44, 4·58, and 4·99, respectively. $TiCl_2$, $TiBr_2$, and VCl_2 have ρ_4^{25} = 3·13, 4·31, and 3·09, respectively.   F. J. G.

Peroxytitanyl fluorides. Structure of $(NH_4)_3TiO_2F_5$. G. Peyronel (*Gazzetta*, 1941, **71**, 620—626).—X-Ray analysis (powder method) shows that $(NH_4)_3TiO_2F_5$ (Schwarz *et al.*, A., 1929, 39) has a cubic lattice, a_0 9·20 A., isomorphous with that of $(NH_4)_3ZrF_7$. The detailed structure is discussed. In the complex $[TiO_2F_5]'''$, Ti is heptahedral coordination, the heptahedron having random orientation to the ternary cubic axis.   E. W. W.

Lattice constants of red lead. M. Straumanis (*Z. physikal. Chem.*, 1942, **B, 52**, 127—130).—Pb_3O_4 is body-centred tetragonal, with a 8·875, c 6·51 A., c/a = 0·733, and 4 mols. in the unit cell.
                                                                                F. J. G.

Structures of explosive antimony and vitreous selenium. H. Hendus (*Z. Physik*, 1942, **119**, 265—268).—Debye X-radiograms of explosive Sb show interferences which are found by Fourier analysis to correspond to interat. distances 2·87, 3·51, 4·18, and 6·26 A., resembling those of cryst. Sb, but indicating a liquid structure with 4 atoms in the first coordination group and 12 or 14 in the second. In vitreous Se well-defined interat. distances 2·37 and 3·67 A. occur, with 2 atoms in the first coordination group, as in cryst. Se.
                                                                                L. J. J.

Crystal structures of iron, ferrous oxide, and ferroso-ferric oxide and their interrelations. H. J. Goldschmidt (*Iron and Steel Inst.*, Aug., 1942, *Advance copy*, 18 pp.).—The lattice spacings of α-Fe, FeO, and Fe_3O_4, which are all cubic, are in the ratio 1 : 1·5 : 3. This explains the comparatively easy oxidation of Fe or FeO in a limited supply of O_2. The change from FeO to Fe_3O_4 is not regarded as a true oxidation as the no. of O atoms per crystal vol. remains const., only Fe being lost. In solid solutions of the wüstite (FeO) type containing excess of O, $Fe^{..}$ ions are eliminated from lattice positions with partial replacement by $Fe^{...}$ ions, and with linear decrease in the lattice spacing. The lattice parameter of Fe_3O_4 is a linear continuation of this decrease. Consideration of the at. vols. indicates that the same relations exist between α-Fe and Fe_3O_4 and between γ-Fe and FeO, the γ- $\rightarrow$ α-Fe change at 906° being coupled with the decomp. of FeO at 570°. X-Ray tests on layers of scale formed on pure Fe are reported and are discussed in relation to the corrosion-resistance of steel.   J. W. S.

Theory of the normal and ideal magnetisation curve of a polycrystalline ferromagnetic. E. Kondorski (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 323—326).—Mathematical.   W. R. A.

Magnetic structure of iron crystals. W. C. Elmore (*Physical Rev.*, 1942, [ii], **62**, 486—493).—Powder patterns on electrolytically polished surfaces of demagnetised strain-free Si–Fe crystals of known orientation are illustrated and discussed. Since a magnetic field of only 10 oersteds applied normal to the specimens is sufficient to produce patterns, the intensity of the stray fields must be of that order. All evidence indicates a layer magnetisation with alternate layers oppositely magnetised, and of thickness 10—50 μ. in different specimens. Superposed on the primary layer magnetisation is a finer secondary structure, probably localised near the crystal surface, and attributable to dendrite-like regions of reversed magnetisation.
                                                                                N. M. B.

Magnetic and optical anisotropy of selected microscopic crystals and the linear magneto-optical anisotropy of their suspensions. W. Heller, (Miss) G. Quimfe, and Y. Ta (*Physical Rev.*, 1942, [ii], **62**, 479—486).—Superposition of magnetic and orthogonal hydrodynamic orientation is used for measuring the relative magnitude of magnetic anisotropy in para- and dia-magnetic, org. and inorg., microscopic anisometric crystals dispersed in liquids. Some magnetically biaxial crystals show a "two-step" orientation. Optical and magnetic anisotropies are compared. Magnetic double refraction and magnetic dichroism, as observed in dispersed ultramicroscopic V_2O_5 crystals and α-FeO_2H crystals, agree with deductions. Ultra-microscopic α-FeO_2H crystals can orient parallel or perpendicular to the lines of force, depending on temp., and on their size, axial ratio, and magnetic anisotropy. Switching orientation is attributed to a competition between morphic and intrinsic magnetic anisotropy, and is detected, from perpendicular at low temp. to parallel above 25°, by colloidal thixotropy and by the optical effect of "morphic conservative" dichroism.   N. M. B.

Course of disorder–order transition reaction in films of pure metals. R. Suhrmann and H. Schnackenberg (*Z. Physik*, 1942, **119**, 287—317).—The decrease of electrical resistance with time, due to cryst-

allisation, in thin (10—100 mμ.) films of Ni, Fe, Cu, Ag, Au, Pb, and Bi, deposited by condensation in a vac. on a glass support at 64° κ., has been examined at 77·5° κ., 182·5° κ., and room temp. In all cases a hyperbolic resistance–time relation is found. Activation energy vals. for the crystallisation process, calc. from the temp.-dependence of this relation, agree with limiting vibrational lattice energy vals. calc. from the characteristic temp.   L. J. J.

Theory of crystallisation luminescence. C. Racz (*Compt. rend.*, 1942, **214**, 371—374).—When small quantities of NaCl are pptd. the intensity of the luminescence produced passes through two max., the first (F) being of the nature of a fluorescence and appearing after 5—10 sec. whilst the second (P), which occurs 2 min. later, is like a phosphorescence and decays exponentially. It is suggested that a crystal grows by the formation of successive layers and that when a row of ions is completed by the introduction of an ion on a face of the crystal it gives rise to F luminescence, whereas when it is completed on a crystal edge it gives rise to P luminescence. This view is in accord with the energy changes involved, the $\nu\nu$ of the radiation, and with the effects of changes in concn. and agitation of the mother-liquor.   J. W. S.

Induced colour in diamonds. J. M. Cork (*Physical Rev.*, 1942, [ii], **62**, 494).—The colour change by deuteron bombardment (cf. A., 1942, I, 391) does not extend throughout the crystal, but probably only as deep as the deuteron penetration.   N. M. B.

Measurement of atomic radiation fields in crystals. K. H. Hellwege (*Z. Physik*, 1942, **119**, 325—333).—From the polarisation of radiation emitted or absorbed by crystals, the orientation of electric and magnetic dipoles and quadrupoles, assumed fixed with respect to the lattice, can be deduced for certain lattice types. Triclinic or cubic symmetry excludes this possibility, which arises in certain intermediate cases, *e.g.*, monoclinic and rhombic crystals.   L. J. J.

Ultra-violet rotatory power of crystalline nickel sulphate at the temperature of liquid oxygen. W. C. Knopf, jun., and W. C. Gilmore, jun. (*J. Opt. Soc. Amer.*, 1942, **32**, 619—621).—Measurements for the visible spectrum (cf. Rudnick, A., 1941, I, 77) are extended to the ultra-violet. Results in the range $\lambda\lambda$ 2536—4358 A. show changes of rotatory power of $-1·4°$ to $-1·3°$ per mm. The difference due to temp. change is approx. const. throughout the visible and ultra-violet.   N. M. B.

Natural rotatory power of nickel sulphate at low temperature. P. Rudnick and L. R. Ingersoll (*J. Opt. Soc. Amer.*, 1942, **32**, 622—626; cf. preceding abstract).—Revised measurements for the visible and infra-red are reported. The effect of low temp. on rotatory power, circular dichroism, and absorption is plotted and discussed.
                                                                                N. M. B.

Elasticity of a crystal as dependent on temperature. M. Kornfeld and P. Schestichin (*Compt. rend. Acad. Sci. U.R.S.S.*, 1942, **36**, 52—56).—The temp. variation of the rigidity modulus and of the phase angle between deformation and stress has been studied for ice, Sn, and stearin crystals. Observations on polycryst. Sn and ice containing traces of impurities indicate that this variation depends on the crystal lattice itself and is independent of the presence of intercryst. layers.   J. W. S.

Deformation of single-crystals of metals facilitated by adsorption of surface-active substances. P. Rebinder, V. I. Lichtman, and V. M. Maslennikov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 125—129). —Sn and Zn monocrystals show the same decrease of yield-point stress on immersion in surface-active solutions, *e.g.*, oleic acid in paraffin oil, as polycrystals. The effect is due to penetration of the surface-active substance along micro-cracks, and leads to a decrease in electrical conductivity in active media.   L. J. J.

Effect of glide-plane orientation in single-crystals of tin on their adsorption-promoted deformation. V. I. Lichtman and P. Rebinder (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 130—131).—The increase in plasticity of Sn monocrystals (cf. preceding abstract) due to adsorption of oleic acid is max. when the orientation of glide planes to the crystal axis is 45°.   L. J. J.

Peculiarities of the process of plastic deformation in gypsum crystals. E. Vainschtein (*Compt. rend. Acad. Sci. U.R.S.S.*, 1942, **34**, 249—251).—X-Ray diffraction patterns obtained with bent gypsum crystals indicate that the at. planes in the distorted crystal are curved.   J. W. S.

Micellar structure and deformation processes with fibrous materials. X. Extension of the amorphous region by "affine" distortion of a micellar network. B. Baule and O. Kratky (*Z. physikal. Chem.*, 1942, **B, 52**, 142—152; cf. A., 1942, I, 231).—Theoretical. If it is assumed that succeeding micelles are linked together in a network manner it follows that during the extension of cellulose hydrate fibres the spaces between the micelles are stretched. The magnitude of this stretching is calc. on the assumptions that there is an equalisation of tension so that all hinges are equally stretched, and that even over the smallest vols. the distortion is strongly "affine."
                                                                                J. W. S.

Isodimorphism of β-naphthol and naphthalene. A. Kofler (*Ber.*, 1942, **75**, [*B*], 998—1001).—β-$C_{10}H_7$·OH is dimorphous but the two forms are unusually similar in cryst. form and have the same m.p. The direction of greatest rate of growth in them lies in different crystallographical directions. Form *A*, obtained by solidification of the molten material, readily passes on cooling into form *B*, which is much the more stable at room temp. The transition temp. is identical with the m.p. *A* shows complete miscibility with $C_{10}H_8$. *B* can form mixtures only with ~5% of $C_{10}H_8$. By reason of the enhanced stability of *A* at room temp. induced by the presence of $C_{10}H_8$, mixed crystals with up to ~90% of β-$C_{10}H_7$·OH must correspond to the lattice of *A*. $C_{10}H_8$ and β-$C_{10}H_7$·NH_2 do not belong to type III but to type V with almost complete miscibility.   H. W.

Molecular arrangement in the anisotropic liquid phase. V. Zvetkov (*Acta Physicochim. U.R.S.S.*, 1942, **16**, 132—147).—The conditions of existence of the anisotropic liquid state and the transformation from this to the amorphous state have been investigated. An anisotropic liquid is regarded as a system of mols. with axial symmetry with an ordering of the mol. axes extending over considerable distances. The magnetic and optical properties of an anisotropic liquid substance are discussed in connexion with the ordering of mols. The transformation from the anisotropic to the amorphous state is accompanied by a sudden change in the degree of ordering and is a transformation of the first kind, involving a change of heat capacity (an expression for which is given), an increase in vol., and absorption of heat.   A. J. M.

IV.—PHYSICAL PROPERTIES OF SUBSTANCES.

Extreme properties of matter. (Sir) C. G. Darwin (*J. Inst. Civil Eng.*, 1942—3, 207—222).—A lecture dealing with the limits imposed on the strength of materials, the properties of liquids and gases, ρ, and magnetic permeability by the structure of matter and the forces between elementary particles.   A. J. M.

Macromolecular compounds. CCXCIV. Distribution of mol. wt. in degraded celluloses, and a periodic degradation principle in the cellulose molecule. G. V. Schulz and E. Husemann [with H. J. Lohmann] (*Z. physikal. Chem.*, 1942, **B**, **52**, 23—49).—Native cellulose is a uniform material with degree of polymerisation (*P*) ~3100. The mol. contains five equally-spaced linkages which hydrolyse ~1000 times as rapidly as the other linkages, affording six mols. with *P*~510. The chemical nature of these weak linkages is discussed, and certain differences between natural and artificial fibres are interpreted in the light of this finding.   F. J. G.

Macromolecular compounds. CCXCV. Distribution of mol. wts. in the degradation of chain molecules having regularly-placed weak points. G. V. Schulz (*Z. physikal. Chem.*, 1942, **B**, **52**, 50—60).—Theoretical. The distribution of mol. wt. in the degradation products of a long-chain mol. in which a few relatively weak linkages occur at equal intervals is investigated mathematically.   F. J. G.

Measurement of dielectric loss in solids at very high frequencies. M. Divilkovski (*Compt. rend. Acad. Sci.*, 1941, **32**, 249—251).—Details of a method are given.   W. R. A.

Magnetochemical studies. XLI. Magnetic behaviour of the dihalides of titanium and vanadium. W. Klemm and L. Grimm (*Z. anorg. Chem.*, 1942, **249**, 209—218).—Vals. of χ for $TiCl_2$, $TiBr_2$, TiI_2, and VI_2 at −183° to 15° are recorded. They do not obey the Curie–Weiss law, and deviate markedly from the vals. for ionic binding. The magnetic behaviour and mol. vol. relationships of the halides of the transitional elements are discussed in terms of the hypothesis of at. binding between the cations.   F. J. G.

Magnetochemical studies. XLII. Magnetism of the hydrogen halides. P. Ehrlich (*Z. anorg. Chem.*, 1942, **249**, 219—224).—Vals. of $−χ \times 10^6$ at room temp. are as follows : HF, 0·43 ; HCl, 0·61 ; HBr, 0·41 ; HI, 0·374. They are almost independent of temp.   F. J. G.

Fresnel reflexion of diffusely incident light. D. B. Judd (*J. Res. Nat. Bur. Stand.*, 1942, **29**, 329—332).—A table showing the reflecting power for diffuse unpolarised light of each side of a plane surface as a function of the relative *n* of the media bounded by the surface is computed from Fresnel's formula by numerical integration. A range of *n* from 1·00 to 1·60 in steps of 0·01 is covered.   H. J. W.

Dispersion of silicate glasses as a function of composition. II. M. L. Huggins, K. H. Sun, and (Miss) D. O. Davis (*J. Opt. Soc. Amer.*, 1942, **32**, 635—650).—A previously proposed refraction and dispersion equation (cf. A., 1942, I, 84) is improved by the addition, for each component oxide, of a term containing a single new const. (the same for all components) and, for each of the components PbO, CaO, and BaO, of another term containing two additional consts. characteristic of the component. Over the visible range the new equation agrees well with experimental data for simple (cryst. and vitreous) oxides, and for two-, three-, and multi-component glasses.   N. M. B.

Heat capacities of molecular lattices. III. Some simple molecular solids. W. F. Brucksch, jun., and W. T. Ziegler (*J. Chem.*

Physics, 1942, **10**, 740—743).—Vals. calc. from Lord's theory (A., 1942, I, 14) for heat capacities of cryst. Cl_2, CO_2, SO_2, COS, N_2O, C_2N_2, C_6H_6, C_2H_4, and MeBr agree well with experimental data.   L. J. J.

Surface energy and heat of sublimation of solids. R. Fricke (*Naturwiss.*, 1942, **30**, 544—545).—Theoretical. The potential energy of the surface is obtained from considerations of the third law of thermodynamics and the assumption that the crystal is a set of independently vibrating Planck's oscillators.   A. J. M.

Physical properties of alicyclic hydrocarbons. II. B.p. of monocyclic hydrocarbons. G. Egloff and R. C. Kuder (*J. Physical Chem.*, 1942, **46**, 934—945).—From an examination of available data, generalisations on the relation between b.p. and structure of monocyclic hydrocarbons are made.   C. R. H.

B.p. nomograph for *n*-alkyl primary amines. D. S. Davis (*Ind. Eng. Chem.*, 1942, **34**, 1414).—From the data of Ralston *et al.* (A., 1940, I, 388) a nomograph permitting calculation of the v.p. of the compounds n-C_nH_{2n+1}·NH_2 ($n = 6$—18) at 40—35° has been constructed.   J. W. S.

Densities of liquefied petroleum gases.—See B., 1943, I, 56.

Differences in the vapour pressures, heats of vaporisation, and triple points of nitrogen (14) and nitrogen (15) and of ammonia and trideuterammonia. I. Kirschenbaum and H. C. Urey (*J. Chem. Physics*, 1942, **10**, 706—717).—From data obtained with natural N_2 and N_2 containing 34·6% of $^{15}N_2$, v.p. (*P*), heat of vaporisation (*ΔH*), triple point (T_k) and b.p. (T_b) differences are calc. as log $P_{14}/P_{15} = 0·7230/T − 0·005822$, $ΔH_{15} − ΔH_{14} = 3·33$ g.-cal. per g., $T_{k(15)} − T_{k(14)} = 0·058°$, $T_{b(15)} − T_{b(14)} = 0·052°$. Corresponding data for NH_3 (**I**) and ND_3 (**II**) are log $P_I/P_{II} = 49·69/T − 0·1305$ for the solids, log $P_I/P_{II} = 46·25/T − 0·14003$ for the liquids ; $ΔH_{II} − ΔH_I = 227$ g.-cal. per g. for the solids, and 212 g.-cal. per g. for the liquids ; $T_{k(I)} = 195·68°$ K. at $P = 4·557$ cm. and $T_{k(II)} = 198·79°$ K. at $P = 4·822$ cm., $T_{b(II)} − T_{b(I)} = 2·37°$.   L. J. J.

Differences in the vapour pressures and entropies of the liquid nitrogens. I. Kirschenbaum (*J. Chem. Physics*, 1942, **10**, 717—722).—Quantum-mechanical factors affecting the thermodynamic differences between liquid $^{14}N_2$ and $^{15}N_2$ are greater than would be expected from a harmonic oscillator model.   L. J. J.

Evaporation from water drops and wet spherical surfaces. C. S. Karve (*Proc. Indian Acad. Sci.*, 1942, **A**, **16**, 103—114).—The evaporation from wet spheres of porous chalk in the range of Reynolds nos. 600—10,000 has been investigated.   W. R. A.

Kinetics of the evaporation of ammonium chloride. H. Spingler (*Z. physikal. Chem.*, 1942, **B**, **52**, 90—116).—The velocity of evaporation of NH_4Cl in a vac. is ≪ that calc. from the v.p. An intermediate stage in the process of evaporation is the formation of " free " NH_3 and HCl mols. which wander on the surface. In equilibrium with the vapour these are present at high concn., and their evaporation is the rate-determining step, but in a vac. they are at low concn., and the removal of NH_4Cl ion-pairs from the lattice to the surface, where they dissociate, becomes the rate-determining step.   F. J. G.

Statistical theory of liquids. I. G. Jaffé (*Physical Rev.*, 1942, [ii], **62**, 463—476).—The theory developed deduces the elastic and thermal properties of a liquid from the expression of the mutual potential between two mols., considered as centres of force. The two-phase liquid–vapour system is treated as a statistical unit, and thus dynamical expressions for the v.p. and surface tension are obtained. The characteristic parameter of the theory is the mean distance between nearest neighbours.   N. M. B.

Stretching and elasticity of rubber.—See B., 1943, II, 96.

Viscosities of carbon monoxide, helium, neon, and argon between 80° and 300° K. Coefficients of viscosity. H. L. Johnston and E. R. Grilly (*J. Physical Chem.*, 1942, **46**, 948—963).—The η, relative to air at 296·1° K., of CO, He, Ne, and A have been measured over the range 80—300° K. The data are applied to five well-known η–temp. equations, the three-const. equation of Lennard-Jones giving the best agreement.   C. R. H.

Setting temperature of high-molecular glasses and their chemical structure. E. Jenckel (*Kolloid-Z.*, 1942, **100**, 163—170).—Approx. vals. of $θ_s$, the setting temp. (*i.e.*, temp. region above which the coeff. of thermal expansion is large and below which it is small), are tabulated for a no. of high polymerides. A close connexion exists between $θ_s$ and the viscosity, and it is to be expected that increased difficulty in the relative movement of mols. should correspond with a higher $θ_s$. That this is so is shown by the higher $θ_s$ of polymerides in which such movement is hindered by the presence of rings in the side-chains (polystyrene), or by cross-linking through principal valencies (polydivinylbenzene) or through dipole formation (polyacrylic acid), and by the lower $θ_s$ observed when the side-chains are mobile aliphatic chains (polybutadiene) or when the dipole-forming forces are screened (polyacrylic esters). In individual polymerides the effects of substitution on the capacity for internal rotation are

also reflected in the θ_s vals.; *e.g.*, polymethyl acrylate and methacrylate have $\theta_s \sim 0°$ and $\sim 100°$, respectively.   F. L. U.

Simplifications in the statistical analysis of physical chemical data. B. Egloff and R. C. Kuder (*J. Physical Chem.*, 1942, **46**, 926—933).—A simple method of calculating the standard errors of empirically determined polynomial equations and their parameters is described.   C. R. H.

V.—SOLUTIONS, DISPERSIONS, AND MIXTURES.

Additive physical properties in hydrocarbon mixtures. R. M. Deanesly and L. T. Carleton (*J. Physical Chem.*, 1942, **46**, 859—870).—A general equation for the additivity of physical properties has been derived and successfully applied to data for sp. vol., sp. n, and the Watson and Nelson characterisation factor for hydrocarbon mixtures (B., 1933, 995).   C. R. H.

Refractometric properties of aqueous solutions of electrolyte mixtures. G. Spacu, I. G. Morgulescu, and E. Popper (*Z. physikal. Chem.*, 1942, **B**, **52**, 117—126).—Equations are given whereby n for a mixture of two electrolytes in aq. solution can be calc. if the dependence of n on concn. is known. Absence of complex-formation is assumed. For $KNO_3 + NaNO_3$ and $KCl + NaCl$ the equations agree with observation, but deviations occur with $CdCl_2 + KCl$, which indicate the formation of $CdCl_4''$ and perhaps of $CdCl_3'$ and $CdCl_5'''$.   F. J. G.

Absorption spectra of halogen solutions at low temperatures. A. Prichotko (*Acta Physicochim. U.R.S.S.*, 1942, **16**, 125—131).—The absorption spectra of solutions of Br in C_5H_{12} and of I in EtOH have been investigated in order to obtain data for solutions in associating and non-associating solvents, respectively. There is a considerable displacement of the absorption bands to shorter λ at liquid H_2 temp. This is probably due to the alteration of the potential energy curves of the halogen mol. by the " cage " formed by solvent mols.   A. J. M.

Vapour pressures of nitric acid–chloroform and nitric acid–ethyl ether mixtures. J. Desmaroux, R. Dalmon, and R. Vandoni (*Compt. rend.*, 1942, **214**, 352—354).—The system $CHCl_3$–HNO_3 includes a wide region over which the partial pressures of the components vary only slightly with change in composition. This indicates that the solutions are in an intermediate state between true solutions and emulsions. In the system HNO_3–Et_2O the partial pressure of Et_2O decreases rapidly with increasing $[HNO_3]$ and becomes almost zero for equimol. mixtures. This indicates the existence of a compound HNO_3, Et_2O. Mixtures of higher $[HNO_3]$ cannot be studied owing to rapid decomp. even at the temp. of solid CO_2.   J. W. S.

Solubilities of normal saturated fatty acids. A. W. Ralston and C. W. Hoerr (*J. Org. Chem.*, 1942, **7**, 546—555).—The solubilities of the normal, saturated fatty acids from hexoic to stearic inclusive are tabulated in H_2O, EtOH, $COMe_2$, COMeEt, C_6H_6, and glacial AcOH at a no. of temp.   H. W.

Classification of rheological properties. R. Bartlett (*Nature*, 1943, **151**, 198).—A modified table is proposed.   A. A. E.

Thermo-osmosis at ordinary temperatures and its analogy with the thermochemical effect in helium II. B. Derjaguin and G. Sidorenkov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 622—626).—Thermo-osmotic behaviours at ordinary temp. of H_2O, 0·1N-NaCl, MeOH, iso-C_5H_{11}·OH, AcOH, and CCl_4 have been investigated; they are similar to the flow of He II. A theoretical treatment is developed.   W. R. A.

Mol. wt. determinations as a means of physico-chemical analysis. V. V. Udovenko (*Acta Physicochim. U.R.S.S.*, 1942, **16**, 336—347).—The variation of mol. wt. with composition is determined by the cryoscopic method and plotted in the case of MeOH–EtOH, and PhMe–PhEt mixtures in C_6H_6, to represent mixtures of similar mols. where there is no chemical interaction, and for piperidine–PhNCS and NHMePh–PhNCS mixtures, where there is interaction. The mol. wt.–composition curve is a straight line where there is no interaction, but the curve shows a max. coinciding with the composition of the compound where there is interaction.   A. J. M.

Application of Hammick and Andrew's formula for determining the parachor of a solute. W. V. Bhagwat and P. M. Toshniwal (*J. Indian Chem. Soc.*, 1942, **19**, 225—230).—Theoretical. The work of Lakhani and Daroga (A., 1938, I, 299) is criticised. It is shown that the equation of Hammick and Andrews, $P_M = (1 - x)P_P + xP_x$ (A., 1929, 638), is valid whether the total no. of mols. in the solution is equal to the sum of no. of solute and solvent mols., or changes in consequence of solvation, association, etc.   F. J. G.

Glass systems. Refractometric measurements of polar crystals in B_2O_3 glass. S. K. Majumdar and A. K. Sarma (*J. Indian Chem. Soc.*, 1942, **19**, 241—252).—Data on ρ and n_D for solid solutions of alkali chlorides in B_2O_3 glass are recorded, and the vals. are discussed in the light of Fajans' deformation theory.   F. J. G.

Viscosity of aluminium–silicon alloys. E. V. Poljak and S. V. Sergeev (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **33**, 244—247).—η of molten Al–Si alloys containing <19% Si has been investigated. The η of these alloys is increased by addition of Na.   A. J. M.

Ternary systems of aluminium. III. Systems Al–Ni–Si, Al–Mg–Cr, Al–Cu–Ni. H. Hanemann and A. Schrader (*Aluminium*, 1940, **22**, 378—380).—The equilibria at the Al corner of these three systems are shown in ternary diagrams. Al, Al_3Ni, and Si form a ternary eutectic at 568°, Ni 5·20, Si 11·35%. Cr–Al alloys with >2% Mg contain, in addition to Al_7Cr, a ternary phase (T) with Cr 17, Mg 9%. T forms, with Al_3Mg_2 and Al containing 13% Mg in solid solution, a ternary eutectic at 447·4°, Mg 31·1, Cr 1·7%. The two peritectic reactions in the Al–Cr system form valleys in the ternary system terminating at the non-variant points: Mg 12·8, Cr 1·7% (632·7°), and Mg 12·6, Cr 2·3%. At the Al corner of the Cu–Ni–Al system there are 5 ternary phases, three non-variant peritectic temp. (598·8°, Ni 5, Cu 16%; 562·6°, Ni 2, Cu 28%; 551·2°, Ni 1·5, Cu 31%), and a ternary eutectic (546·6°, Ni 0·9, Cu 32·5%).   A. R. P.

Mechanism of phase change in some iron–silicon alloys. H. Lipson and A. R. Weill (*Trans. Faraday Soc.*, 1943, **39**, 13—18).—The behaviour of the η phase in alloys with 25% Si has been studied by powder diagrams. In specimens consisting mainly of α-solid solution with a little ϵ and η, examined at intervals during annealing at 720°, the first change consists in the complete disappearance of the α phase and the formation of more ϵ and η, after which η decomposes slowly into $\alpha + \epsilon$. The decomp. is completed in 2 weeks, and the α phase then has a composition differing from the original. It is inferred that the η phase dissociates into $\alpha + \epsilon$ by both a peritectoid reaction at 1030° and a eutectoid reaction at 825°. An explanation on the basis of free energy differences is offered. The hexagonal unit cell of the η phase has a 6·734, c 4·704 A., d 6·4, with 16 atoms. This indicates a composition Fe_5Si_3 rather than Fe_3Si_2. Probable space-group $C6_3$.   F. L. U.

Law of changes of crystalline lattice parameter of solid solutions. N. V. Grum-Grshimailo (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **33**, 237—240).—Empirical rules for the variation of lattice parameter with composition of alloys are given, taking into account chemical forces participating in the building up of the crystal lattice as well as the at. vol. of the constituents. The formula proposed is satisfactory for solid solutions if the nature of the components present is correctly known. The formula is applied to Fe–Si, Fe–Al, and Fe–Pd alloys.   A. J. M.

Solubility of liquids in compressed gases. Solubility of benzene in compressed nitrogen. I. Kritschevski and D. Gamburg (*Acta Physicochim. U.R.S.S.*, 1942, **16**, 362—375).—The solubility of C_6H_6 in compressed N_2 has been studied at temp. from 35° to 100°, and pressures up to 1100 kg. per sq. cm. The solubility curve shows a min. and a point of inflexion. With increase of pressure the solution acquires a structure.   A. J. M.

The hydrogen bond and hydration of organic molecules. L. A. K. Staveley, J. H. E. Jeffes, and J. A. E. Moy (*Trans. Faraday Soc.*, 1943, **39**, 5—13).—The alteration in the solubility of H_2O in dry C_6H_6 caused by the presence of small concns. of $PhNO_2$, NH_2Ph, $NPhMe_2$, $CHCl_3$, PhBr, and PhOMe has been measured. $CHCl_3$ and PhBr up to mol. fractions 0·15 and 0·175 have no observable effect; the others increase the solubility of H_2O in the order $NPhMe_2 <$ $PhOMe < PhNO_2 < NH_2Ph$. The effect is attributed to the formation of a H bond, the H being derived from the org. substance. PhOH produces a greater increase in the solubility of H_2O in C_6H_6 than does MeOH, EtOH, or AcOH. This is probably due to a parallelism between the acidity of a H atom and its readiness to form a H bond; the fact that AcOH is less effective than PhOH despite its greater acidity may be attributed to the fact that in C_6H_6 it is predominantly in the form of double mols.   F. L. U.

Solubility of kaolin in water. Z. G. Pinsker, L. I. Tatarinova, and V. A. Novikova (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **33**, 231—232).—Electron diffraction experiments indicate that kaolin is slightly sol. in H_2O, forming a true solution.   A. J. M.

Dissolution of soaps in mixed solvents. S. R. Palit (*J. Indian Chem. Soc.*, 1942, **19**, 271—285).—Solubility data for Na stearate in binary mixtures of org. solvents are recorded. The term " mix-solvency " is proposed for the phenomenon that a substance is more sol. in a binary mixture than in either constituent. Mix-solvency for soaps occurs in A–G, G–H, and A–G–H mixtures, but not in A–H mixtures, where A, G, and H represent alcohols, glycols, and hydrocarbons or chlorinated hydrocarbons.   F. J. G.

Solubility of silicon in aluminium. W. D. Treadwell and R. Walti (*Helv. Chim. Acta*, 1942, **25**, 1154—1162).—The solubility of Si in Al has been determined at 300—570° and from the results the heat of dissolution of Si is calc. as 8·67 kg.-cal. per g.-atom.   J. W. S.

Solubility of iron oxide in liquid iron.—See B., 1943, I, 120.

Compounds of aromatic amines with the lower fatty acids. E. Angelescu and R. Giusca (*Z. physikal. Chem.*, 1942, **A**, **191**, 145—

163; cf. A., 1936, 1331; 1940, I, 218).—The solubility of o-$C_6H_4Me\cdot NH_2$ in H_2O rises steeply with increasing concn. of AcOH, less steeply with $EtCO_2H$, and only slightly with $PrCO_2H$. This affords support for the view that in the homologous series the C_3 member marks a transition from ordinary salt formation to the formation of distinctly homopolar compounds. The effect of adding to these systems the Na or K salt of the acid used shows a reversal on passing through the C_3 member. With AcOH the solubility is greatly depressed, whilst with $PrCO_2H$ it is greatly elevated; with $EtCO_2H$ little change occurs. Further confirmation of the change in the character of the compounds is afforded by the effect on the demixing temp. of solutions of o-$C_6H_4Me\cdot NH_2$ in *cyclo*hexane on the addition of the three acids; the temp. is raised by AcOH, lowered by $EtCO_2H$, and lowered more steeply by $PrCO_2H$.   F. L. U.

Solubilities and compositions of the phospho-12-tungstates of di-amino-acids and of proline, glycine, and tryptophan.—See A., 1943, II, 82.

Occlusion of inert gases by metals. R. Seeliger (*Naturwiss.*, 1942, **30**, 461—468).—The velocity of "clean-up" of inert gases in discharge tubes $\propto$ the current, depends strongly on the cathode metal, and decreases with increasing pressure and with increasing time of exposure. With hollow cathodes the inner surface is roughened, metal having been removed from some places and deposited at others, and it is only at the latter that occlusion occurs. Experiments with spherical cathodes show that there is a balance between two processes, viz., diffusion of gas into the metal, and removal of the outer layers of metal.   F. J. G.

Adsorption at solid–liquid interfaces. Determination of adsorption by adhesion-tension and interfacial-tension measurements on binary organic liquid systems. F. E. Bartell and F. C. Benner (*J. Physical Chem.*, 1942, **46**, 847—859).—Adhesion tension (against SiO_2) and interfacial tension (against H_2O) measurements on *iso*-C_8H_{18}–*iso*-$C_8H_{11}\cdot OH$ and *iso*-C_8H_{18}–*cyclo*hexanol mixtures at 25° are recorded. For a given alcohol, adsorption at the SiO_2–*iso*-C_8H_{18} interface is approx. that at the H_2O–*iso*-C_8H_{18} interface. Calculations by three methods show that the adsorption layer of the alcohol is unimol., and that the alcohol mols. are oriented at both interfaces in much the same way as longer-chain alcohols are on H_2O.   C. R. H.

Exchange adsorption of neutral salts by proteins. A. Passinski, Z. Zolotareva, and A. Muchina (*Acta Physicochim. U.R.S.S.*, 1942, **16**, 236—256).—The adsorption of neutral salts by gelatin (Ag_2SO_4, $AgNO_3$, $BaCl_2$), ovalbumin (Ag_2SO_4, $BaCl_2$, NH_4CNS), and casein ($CaCl_2$) has been investigated analytically and potentiometrically with amalgam electrodes. Comparison of the adsorption of the neutral salt by the protein with the change of pH of the medium shows that in a no. of cases there is a partial exchange of metal ions for $H^\cdot$.   A. J. M.

Electro-capillary phenomena for various liquid metals. S. Karpatschov and A. Stromberg (*Acta Physicochim. U.R.S.S.*, 1942, **16**, 331—335).—Electro-capillary curves for Ag, Sb, Bi, Al, Ga, and Te have been determined, the fused eutectic mixtures of KCl and LiCl being used as electrolytes. In a no. of cases, but not for Ag, the max. p.d. in the electro-capillary curve is the same as the val. obtained in aq. solution.   A. J. M.

Disorder–order transition reaction in metal films.—See A., 1943, I, 83.

Contact angles at liquid–liquid–air interfaces. Erratum. W. Fox (*J. Chem. Physics*, 1942, **10**, 743; cf. A., 1943, I, 13).

Solidified water-films. H. Löwy (*Phil. Mag.*, 1943, [vii], **34**, 67—70).—By applying the theory of dielectric mixtures and available vals. of consts. to the system air, desert soil, and solidified (adsorbed) moisture film, a method for evaluating the mean density, vol., and thickness of film is deduced.   N. M. B.

Properties of dialysed hydrous alumina hydrosols. II. Titration with bases and acids. N. P. Datta (*J. Indian Chem. Soc.*, 1942, **19**, 191—203).—Titration curves with acids and alkalis are recorded for dialysed Al_2O_3 sols. With alkalis there is strong buffering at pH ~11, and analysis of ultrafiltrates indicates that at pH >11 Al is present in true solution as AlO_2'. During the first small additions of HCl both $H^\cdot$ and Cl' disappear from solution owing to surface reaction with the colloid. The absorbed Cl' ion may be displaced by addition of H_3PO_4, $H_2C_2O_4$, or H_2SO_4, but not of AcOH.   F. J. G.

Effect of light and ageing on colloidal solutions of ferric hydroxide and thorium hydroxide. R. B. Naimpally, P. M. Barve, and B. N. Desai (*J. Indian Chem. Soc.*, 1942, **19**, 204—206).—Cataphoretic mobility, conductivity, and stability of $Fe(OH)_3$ and $Th(OH)_4$ sols decrease on exposure to sunlight or on ageing.   F. J. G.

Ionic activity in colloidal solutions. III. Donnan effect in ultra-filtration of colloidal solutions of ferric hydroxide. A. J. Rabinovitsch and R. Borodulina (*Acta Physicochim. U.R.S.S.*, 1942, **16**, 348—356). —The sum of pCl and pH required by Donnan's equilibrium holds for $Fe(OH)_3$ sols, the ultrafiltrates, and residues. For all the sols studied there were considerable differences in the ionic composition of the sol and ultrafiltrate.   A. J. M.

Reversible aggregations of colloidal particles. III. Isothermal reversible sol syneresis. W. Heller (*J. Physical Chem.*, 1942, **46**, 783—793).—A thixotropic gel of β-FeOOH changes into a reversibly syneretic system if [FeOOH] is < a limiting val., C_{tr}. The val. of C_{tr} depends on electrolyte concn. and on the diameter (d) of the container. For [NaCl] 30, 38, and 46 millimol. per l. and for d = 1·2 cm., C_{tr} = ~10, 8·8, and 7·2 g. per l., respectively. The degree of syneretic separation into a conc. and dil. phase is a linear function of [FeOOH]. The application of the term "syneresis" to the spontaneous separation of a gel into two phases is considered inadequate since it does not take into account the effect of d before separation, the pre-separation systems being gels when d is large and sols when d is small. Separation is regarded as a syneresis if, in a sol or gel of given vol., a more conc., coherent, and elastic phase of smaller vol. separates and if the phase is limited by a sharp boundary. Syneresis is limited not only by an upper concn. limit, C, but by a lower one below which the conc. phase disappears, *i.e.*, absence of geloid formation. Adhesion of geloid structures to the container walls probably accounts, in part, for the varying effects of d.   C. R. H.

Elasticity of a network of long-chain molecules. I. L. R. G. Treloar (*Trans. Faraday Soc.*, 1943, **39**, 36—41).—The discrepancy between the results obtained by Kuhn (A., 1934, 959; 1936, 1337) and by Wall (A., 1942, I, 204, 326) for the stress–strain relation in the elongation of a three-dimensional network is due to an approximation introduced by the former. Kuhn's treatment when suitably amended leads to a relation identical with Wall's. An extension of Kuhn's method to the calculation of the work required to produce a certain shear deformation is also in agreement with Wall's result.   F. L. U.

Equation of state of synthetic rubbers.—See B., 1943, II, 95

Viscosities of polyester solutions. Application of the melt viscosity-mol. wt. relationship to solutions. P. J. Flory (*J. Physical Chem.*, 1942, **46**, 870—877).—The η of Et_2 succinate (I) solutions of poly-decamethylene adipate (II) at 79° have been determined. The relation $\log \eta = A + C\bar{Z}_w{}^{0\cdot5}$, where $\bar{Z}_w$ = average chain length [taking (I) and (II) into consideration] and A and C are consts., is applicable to solutions containing >10% of (II). In these solutions viscous flow seems to involve successive displacements of comparatively small sections of the chain, whereas in dil. solutions the mols. of (II) move more or less as units.   C. R. H.

Physico-chemical characteristics of glycogens.—See A., 1943, II, 57.

Comparative osmotic and viscosimetric mol. wt. determinations on fractionated and unfractionated nitrocelluloses. E. Husemann and G. V. Schulz (*Z. physikal. Chem.*, 1942, **B, 52**, 1—22).—Measurements of η and of osmotic pressure for degraded introcelluloses are recorded. The Staudinger equation $Z_\eta = K_m.P$ is fulfilled over the mol. wt. range 17,000—400,000, and the vals. of K_m afford a measure of the degree of uniformity of the material.   F. J. G.

General chemistry of colloid–colloid reactions. IX. Very pure hydrophobic colloids and proteins, their protection mechanism. W. Pauli and P. Dessauer (*Helv. Chim. Acta*, 1942, **25**, 1225—1250).—Very pure serum-albumin (I) and ovalbumin (II) show mutual coagulation with very pure Congo-blue, Sb_2S_3, Au, As_2S_3, and FeOOH sols. This flocculation occurs through interionic reaction and is conditioned by the electric field of the hydrophobic colloid and the multivalent zwitterion character of the protein, which thereby loses its charge, H_2O of hydration, and stability. The presence of a uni-univalent neutral salt (NaCl) prevents the mutual coagulation. The coagulation of (I), unlike that of (II), does not tend to disappear at high protein concn., but concns. of both proteins <10^{-3}% cause sensitisation towards pptn. by salts. FeOOH sols coagulated with (I) or (II) can be reconverted into a stable sol by subsequent addition of NaCl, but with As_2S_3 only slight indications of this reversibility are obtained. It is suggested that at very low protein concn. the aggregates comprise a nucleus of protein surrounded by the hydrophobe, whilst at higher protein concn. the aggregates are built from double particles of hydrophobe and protein. The difference in behaviour between (I) and (II) is discussed. Electrophoretic measurements indicate that the NaCl increases the acid dissociation of the protein, thereby increasing the negative charge on the particle. $La(NO_3)_3$, however, produces a positive charge on the particles owing to adsorption of La^{+++}.   J. W. S.

New method for the determination of electrokinetic potential in the flow of a semiconducting liquid through a single capillary. W. G. Eversole and W. W. Boardman (*J. Physical Chem.*, 1942, **46**, 914—926).—A method for obtaining data to be used in calculating true electrokinetic potentials (ζ) is presented. Data for KCl solutions in soft glass, Pyrex, and SiO_2 capillaries and for KOAc solutions in Pt capillaries are tabulated. For a given KCl solution ζ decreases in the order Pyrex > SiO_2 > soft glass. The abnormal course of ζ versus [KCl], where ζ is obtained by means of the usual form of the Helmholtz–Smoluchowski equation, is attributed to surface conductance of the capillary walls.   C. R. H.

VI.—KINETIC THEORY. THERMODYNAMICS.

Solvation of the ions Li·, Na·, K·, Cl′, I′ in methyl alcohol and in acetophenone. (Mlle.) M. Cordier (*Compt. rend.*, 1942, **214**, 707—708).—From ionic mobilities and apparent mol. vol. in solution, with the assumption that I′ ion is unsolvated, the following solvation nos. are computed; in MeOH : Li·, 4; Na·, 2·2; K·, 1·2; Cl′, 1; and in COPhMe : Li·, 1; Na· and K·, ~0·5.   F. J. G.

Indium. VI. Effects of certain hydroxy anions on the precipitation of hydrous indium hydroxide. T. Moeller (*J. Physical Chem.*, 1942, **46**, 794—800).—pH changes during the titration with NaOH of 0·05M-$In_2(SO_4)_3$ in presence of equimol. quantities of alkali citrates, tartrates, and malates have been investigated. At these and higher concns. of org. salt, hydroxide pptn. is inhibited. Hydronium ion is released to the extent of 1·25, 1·50, and 1·50 mols. per mol. of In··· for these salt solutions respectively. Reference is made to the possibility of volumetrically determining In by titrating the liberated hydronium ion. Alkali lactate does not inhibit hydroxide pptn.   C. R. H.

Ionic concentration gradients and their biochemical significance. III. F. Almasy (*Helv. Chim. Acta*, 1942, **25**, 1255—1284; cf. A., 1942, I, 366).—The problem of non-stationary diffusion fields is discussed theoretically. The results are discussed in relation to biological problems, in particular to ionic exchange between blood and urine through the kidney, and to protein synthesis.   J. W. S.

Activity of the chloride ion in concentrated solutions of hydrochloric acid containing alkaline chlorides. M. Duboux and C. Vuilleumier (*Helv. Chim. Acta*, 1942, **25**, 1319—1328).—The e.m.f. of cells of the type Pt,H₂|HCl with or without MCl₂|Hg₂Cl₂|Hg and Pt,H₂|HCl with or without MCl₂|KCl (saturated)|Hg₂Cl₂|Hg (M = Ca, Sr, or Ba) have been measured at 25° and at total chloride concns. 0·825M. and 4·1M. On the assumption that the difference between the liquid junction potentials HCl(m) + MCl₂(m_1)|KCl (saturated) and HCl(m)|KCl (saturated) is independent of the nature of M it is shown that the free energy of transfer of Cl′ from HCl(m) to the solution HCl(m) + MCl₂(m_1) is also independent of the nature of M and hence in these solutions the activity of the Cl′ is independent of the cation.   J. W. S.

Hydrogen ion activity and the hydrolysis of sucrose and methyl acetate in concentrated hydrochloric acid containing alkaline-earth chlorides. M. Duboux and C. Vuilleumier (*Helv. Chim. Acta*, 1942, **25**, 1329—1344; cf. preceding abstract).—In solutions containing HCl (concn. m) and MCl₂ (concn. m_1) (M = Ca, Sr, or Ba) the mean activity coeff. of HCl (γ_{HCl}) is shown to increase only slightly with increasing [HCl] for solutions where $m + m_1 = 0.825$M., but to show a greater increase with increasing [HCl] for solutions where $m + m_1 = 4.1$M. In each series of dil. solutions γ_H decreases with increasing [HCl] but in the conc. solutions it passes through a min. at $m = 2$M. In each series of mixtures the velocity coeff. (k) of the hydrolysis of sucrose or MeOAc varies according to log (k/m) = α + βm, where α and β are consts., and is approx. ∝ the H· activity. This relationship, however, is exact only for the hydrolysis of MeOAc in the dil. solutions. The anomalies observed are attributed to variations in the activity of H_2O which affects the two reactions differently.   J. W. S.

Ionic activity in colloidal solutions.—See A., 1943, I, 89.

Phenolic behaviour of buchu-camphor, etc.—See A., 1943, II, 97.

Phase equilibria in hydrocarbon systems. Methane–decane system. H. H. Reamer, R. H. Olds, B. H. Sage, and W. N. Lacey (*Ind. Eng. Chem.*, 1942, **34**, 1526—1531).—From the sp. vol. of five mixtures of CH₄ and $C_{10}H_{22}$ established at 7 temp. between 38° and 238° and at pressures up to 10,000 lb. per sq. in. the dew-point pressures and the properties of the coexisting phases have been established.   C. R. H.

Binary systems involving ethylene chlorohydrin. Vapour–liquid equilibria. H. B. Snyder and E. C. Gilbert (*Ind. Eng. Chem.*, 1942, **34**, 1519—1521).—Vapour–liquid equilibria for binary mixtures of Cl·[CH₂]₂·OH (**I**) with Pr$^\beta_2$O, Bu$^\beta$OH, Bu$^\alpha$OH, Bu$^\alpha_2$O, C₆H₆, PhMe, and (Cl·[CH₂]₂)₂O (**II**) are recorded. Azeotropes were observed in three cases, viz., with Bu$^\alpha_2$O at 123·0° for 68 mol.-% of (**I**), with PhMe at 106·9° for 27 mol.-% of (**I**), and with (**II**) at 128·2° for 91·8 mol.-% of (**I**). None of the systems gave evidence of the formation of immiscible pairs.   C. R. H.

Equilibria in ethanol–water system at pressures less than atmospheric. A. H. Beebe, jun., K. E. Coulter, R. A. Lindsay, and E. M. Baker (*Ind. Eng. Chem.*, 1942, **34**, 1501—1504).—The complete equilibrium relations in the system EtOH–H_2O at 95, 190, and 380 mm. Hg abs. pressure have been ascertained. For a liquid composition of 0·21 mol. fraction of EtOH, the equilibrium is independent of pressure within the pressure range examined. There is a lowering of the relative volatility of EtOH with lowered pressures at liquid compositions <0·21, and an increase of relative volatility at compositions >0·21, mol. fraction of EtOH. The significance of the data is discussed with reference to commercial rectification at pressures < atm.   C. R. H.

Boric acid and hydroxy-compounds. I. Complex formation of boric acid with salicylic acid in aqueous solution. H. Schäfer (*Z. anorg. Chem.*, 1942, **250**, 82—95).—The equilibria OH·C₆H₄·CO₂′ + H₃BO₃ ⇌ 2H₂O + C₆H₄$<^O_{CO_2}>$BO′ (**I**) and (**I**) + OH·C₆H₄·CO₂H ⇌ H₂O + C₆H₄$<^O_{CO_2}>$B$<^O_{CO_2}>$C₆H₄′ (**II**) in aq. solution have been studied, and vals. for the equilibrium consts. are recorded as follows : K_1 = [(**I**)]/[H₃BO₃][OH·C₆H₄·CO₂′] = 23; K_2 = [(**II**)]/[(**I**)][OH·C₆H₄·CO₂H] = 134. (**I**) exists at pH ~3—9, (**II**) only in a small range at pH ~3.   F. J. G.

Systems phenol–glucose β-penta-acetate, phenol–cellobiose α-octa-acetate, and p-nitrophenol–cellobiose α-octa-acetate. R. J. B. Marsden, J. M. Bainbridge, and A. Morris (*Trans. Faraday Soc.*, 1943, **39**, 1—5).—F.p.–composition curves show that PhOH and glucose β-penta-acetate form a simple eutectic at −4·8° and 81·8 mol.-% PhOH with no indication of compound formation. PhOH and cellobiose α-octa-acetate (**I**) also form a simple eutectic at ~17° and 92 mol.-% PhOH, and a slight indication of compound formation observed near 20 mol.-% PhOH is rendered uncertain by a small amount of decomp. The p-OH·C₆H₄·NO₂–(**I**) system exhibits two well-defined compounds with mol. ratios 1 : 2 and 2 : 1. The latter can be readily explained by a H-bond structure, and its existence supports the view that the swelling of cellulose acetate in aq. phenols is due in part to the formation of a H-bond complex, especially since p-OH·C₆H₄·NO₂ shows higher swelling activity than PhOH (cf. B., 1942, II, 399).   F. L. U.

System ethyl alcohol–glycerol–carbon tetrachloride at 25°. H. J. McDonald, A. F. Kluender, and R. W. Lane (*J. Physical Chem.*, 1942, **46**, 946—948).—Data for the system within the immiscibility region are recorded in tabular and triangular diagrammatic form.   C. R. H.

Constitution diagram of the reciprocal system of fluorides and carbonates and of chlorides and carbonates of sodium and potassium. N. N. Volkov and A. G. Bergman (*Compt. rend. Acad. Sci. U.R.S.S.*, 1942, **35**, 47—50).—Equilibrium data for the systems NaF–KF–Na₂CO₃–K₂CO₃ and NaCl–KCl–Na₂CO₃–K₂CO₃ are recorded.   F. J. G.

Double decomposition in the absence of a solvent. Singular irreversible-reciprocal systems without separation into layers from potassium and calcium chlorides and fluorides and sodium and calcium chlorides and fluorides. I. E. Krauze and A. G. Bergman (*Compt. rend. Acad. Sci. U.R.S.S.*, 1942, **35**, 20—24).—The systems Na, Ca|F, Cl and K, Ca|F, Cl in which double decomp. tends to occur with the formation of CaF₂ and NaCl and CaF₂ and KCl, respectively, have been studied. The *compound* KF,CaF₂, m.p. 1070°, has been shown to exist.   J. W. S.

Thermal data. XV. Heats of combustion and free energies of some compounds containing the peptide bond. H. M. Huffman (*J. Physical Chem.*, 1942, **46**, 885—891).—The heats of combustion have been obtained for *dl*-alanyl- (626·40), glycyl- (471·48), hippuryl- (1246·38), and *dl*-leucyl-glycine (1093·09 kg.-cal. per mol.). The respective free energies of formation are −116·85, −117·10, −118·07, and −112·13 kg.-cal. per mol. For hippuric acid the val. is −88·63 kg.-cal. per mol.   C. R. H.

Empirical equation for thermodynamic properties of light hydrocarbons and their mixtures. II. Mixtures of methane, ethane, propane, and n-butane. M. Benedict, G. B. Webb, and L. C. Rubin (*J. Chem. Physics*, 1942, **10**, 747—758; cf. A., 1940, I, 248).—The authors' empirical equation for pure hydrocarbons is generalised for mixtures. The fundamental equation for free energy leads to equations of state and for fugacity, isothermal variation of enthalpy, and isothermal variation of entropy. Parameters are determined from vals. for pure CH₄, C₂H₆, C₃H₈, and n-C₄H₁₀, applicable to mixtures. Agreement with observed volumetric properties and liquid–vapour equilibria is satisfactory.   L. J. J.

Proton affinities of NH₃, H₂O, and OH′. G. Briegleb (*Naturwiss.*, 1942, **30**, 469—470).—By means of cycles the proton affinities of NH₃, H₂O, and OH′ are found to be 214, 184, and 392 kg.-cal. respectively and the heat of hydration of H· 277 kg.-cal.   F. J. G.

VII.—ELECTROCHEMISTRY.

Potential of the ozone electrode. E. Briner and A. Yalda (*Helv. Chim. Acta*, 1942, **25**, 1188—1202).—By assuming that the free energy change of the decomp. of O₃ into O₂ is wholly converted into electrical energy the e.m.f. of the cell O₃ (1 atm.)|solution|O₂ (1 atm.) is calc. to be 0·83 v. at 0° and 0·84 v. at 20°. The fact that the experimental vals. determined under various conditions differ considerably from this val. is attributed to factors of irreversibility, particularly the thermal decomp. of O₃. The effects of the [O₃] (in O₂), temp., dimensions and surface of the Pt electrodes, and concn. of the H₂SO₄ or KOH used as electrolyte on the potential of the O₃ electrode have been investigated. The fact that the observed difference between the potentials of the O₃ and O₂ electrodes is ≫ the

theoretical val. is attributed to an improvement in the reversibility of the O_2 electrode owing to the presence of O_3.   J. W. S.

Theory of galvanic cells subject to fields of force. II. Electric and magnetic field. F. O. Koenig and S. W. Grinnell (*J. Physical Chem.*, 1942, **46**, 980—1005; cf. A., 1940, I, 258).—A mathematical analysis of the thermodynamics of galvanic cells subject to stationary electric or magnetic fields is presented.   C. R. H.

Theory of electrolytic reduction. R. Audubert and (Mlle.) M. Quintin (*Compt. rend.*, 1942, **214**, 704—705).—A more satisfactory theory of electrolytic reduction than that put forward by Haber and Russ takes into account the energy of activation of the ion. An equation for the current strength is deduced.   A. J. M.

Retardation phenomena in the electrolytic formation of metallic crystals and their growth. A. Samartzev (*Acta Physicochim. U.R.S.S.*, 1942, **16**, 206—235).—Certain impurities in electrolytes, acting like protective colloids, can hinder the growth of crystals of metals deposited electrolytically on a cryst. cathode. Such substances may be definite additions to the electrolyte, or they may be hydroxides formed at the cathode. Colloids are adsorbed by the electrodes and hinder the formation of new crystal nuclei and the growth of crystals. The separation of Ag from $AgNO_3$ was particularly studied, and the growth of a single crystal of Ag was investigated. The growth of a surface can occur only if the c.d. is < a certain val. Places where the c.d. is > this val. become covered with an adsorbed layer and are rendered passive.   A. J. M.

VIII.—REACTIONS.

Velocity of phase transformations. N. Akulov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 340—343).—The temp.-dependence of the velocity of phase transformations is discussed mathematically.   W. R. A.

Mathematical theory of thermal explosions. A. A. Frank-Kamenetzki (*Acta Physicochim. U.R.S.S.*, 1942, **16**, 357—361).—Crit. explosion conditions for spherical and infinite cylindrical vessels are worked out.   A. J. M.

Explosion limit of $2H_2 + O_2$ mixtures at atmospheric pressure. M. S. Ziskin (*Compt. rend. Acad. Sci. U.R.S.S.*, 1942, **34**, 256—258).—The explosion temp. of $2H_2 + O_2$ mixtures in Mo-glass vessels varies from 531° to 595° as the diameter of the explosion vessel is decreased from 30 mm. to 5·5 mm. The velocity of flow of the gas has little effect on the explosion temp. The results are in accord with the theoretical vals. calc. by Frank-Kamenetzki (A., 1939, I, 614).   J. W. S.

Activation characteristics of the thermal cracking of methane. N. I. Kobozev and E. N. Eremin (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **33**, 223—226).—The kinetics of the cracking of CH_4 at low pressures, and when mixed with H_2, have been investigated. Decrease of pressure accelerates the cracking processes: $2CH_4 \rightarrow C_2H_4 + 2H_2$ and $C_2H_4 \rightarrow C_2H_2 + H_2$. Dilution of CH_4 fourfold has approx. the same effect as a nine-fold decrease of pressure. The kinetic consts. obey the Arrhenius equation over a wide temp. range.   A. J. M.

Electronic theory of the English school.—See A., 1943, II, 77.

Rates of pyrolysis and bond energies of substituted organic iodides. I. E. T. Butler and M. Polanyi (*Trans. Faraday Soc.*, 1943, **39**, 19—36; cf. A., 1940, II, 321).—The influence of substitution on the C–I bond strength has been studied by measuring the rates of pyrolysis of org. iodides RI (R = Me, Et, Pr^α, Bu^α, $CH_2{:}CH$, $CH_2{:}CH{\cdot}CH_2$, Ac, CH_2Ac, Ph, CH_2Ph, Bz), present at low partial pressures in a carrier gas (H_2, N_2), the amount of decomp. being kept small to minimise secondary reactions. The results show marked variations, and for a no. of simple hydrocarbons the activation energy (Q) of the reaction RCl + Na is $\propto$ the bond energy R–I, with a proportionality factor 0·28 in fair agreement with theory. Negative substituents depress Q below the val. corresponding with the bond energy.   F. L. U.

Application of synionic reactions to the quantitative separation of the steric and polarity effects. C. Prévost (*Compt. rend.*, 1942, **214**, 357—359).—It is suggested that the velocity of a reaction is determined by a mobility factor M, associated with the electrostatic effects of the substituents, and a steric hindrance effect S, so that the velocity coeff. can be expressed by $k = CM/S$, where C is a const. characteristic of the type of reaction involved. This view is confirmed by measurement of the relative rates of reaction of $Bu^\alpha Cl$, $CHMe{:}CH{\cdot}CH_2Cl$, $Bu^\beta Cl$, and $CHMeCl{\cdot}CH{:}CH_2$ with aq.-EtOH solutions of $AgNO_3$ or NaOAc, EtOH solutions of NaOEt, C_5H_5N, or NH_3, and with H_2O in $COMe_2$.   J. W. S.

Study of the mechanism of the Beckmann rearrangement by the isotopic method.—See A., 1943, II, 94.

Viscosimetric and volumetric analysis of the addition of oxygen to the triglycerides.—See A., 1943, II, 80.

Kinetics of development of individual grains of a photographic emulsion. A. J. Rabinovitsch, A. N. Bogojavlenski, and J. S. Zuev

(*Acta Physicochim. U.R.S.S.*, 1942, **16**, 307—320).—The kinetics of development of individual grains of AgBr have been determined experimentally, the case of regular development, beginning from one of the edges of the crystal and rapidly spreading over the whole surface as a more or less circular zone, being particularly examined. The radius of the zone of darkening varies exponentially with time. With increasing temp. the rate of darkening is increased and the induction period shortened.   A. J. M.

Reaction of gases on the surface of a single crystal of copper. I. Oxygen. A. T. Gwathmey and A. F. Benton (*J. Physical Chem.*, 1942, **46**, 969—980).—The reaction between O_2 and Cu has been examined by photographing the surface of a single Cu crystal, spherically ground and polished. After heating in air definite patterns are formed depending on the crystal plane which is exposed on the spherical surface. The rate of oxidation is greatest on the (100) and (210) planes and least on the (311) plane.   C. R. H.

Reduction of water vapour by aluminium in presence of traces of mercury. L. Hackspill and R. Rohmer (*Compt. rend.*, 1942, **214**, 490—493).—Between 20° and 90° the speed of the reaction between Al and H_2O vapour in presence of Hg diminishes with rise of temp., evolution of H_2 ceasing at the latter temp. The Al_2O_3, nH_2O formed is amorphous with $n > 3$. At 210° evolution of H_2 recommences, Al_2O_3 being formed. The behaviour is more complex than that observed in similar experiments with Mg (cf. *Bull. Soc. chim.*, 1939, [v], **6**, 458).   C. R. H.

Influence of nitrogen peroxide on the low-temperature ignition of diethyl ether. G. P. Kane and M. G. Pandit (*Proc. Indian Acad. Sci.*, 1942, A, **16**, 87—94).—The direct oxidation is increased, the min. pressures for ignition are decreased, the cool flame reaction is inhibited, and the induction lag is increased. As $[NO_2]$ is increased the $[MeCHO]$ in the pre-cool flame reaction decreases. MeCHO is considered to be of primary importance in the formation of cool flames.   W. R. A.

Organic catalysts. XXIV. Aldol condensation in the presence of secondary amino-acids.—See A., 1943, II, 82.

Reactions of solid substances. CXXIX. Reducibility of iron oxide with hydrogen in presence of small amounts of foreign gases. K. Sedlatschek (*Z. anorg. Chem.*, 1942, **250**, 23—35).—The velocity of reduction of Fe_2O_3 by H_2 at 300—600° is not affected by small additions of NH_3, NO, or SO_2, but is increased by HCl, Cl_2, HBr, or Br_2. In certain temp. ranges the effect of Cl_2 (or Br_2) is > that of HCl (or HBr), owing to raising of the surface temp. by catalytic combination with H_2.   F. J. G.

Reactions of solid substances. CXXVIII. Influence of foreign gases on the thermal decomposition of calcium sulphate in presence of silica. F. von Bischoff (*Z. anorg. Chem.*, 1942, **250**, 10—22).—The reaction between $CaSO_4$ and SiO_2 at 1050—1150° in presence of various gases has been studied. The rates in A and N_2 are nearly equal, and as compared with these O_2 has a slight and SO_2 a marked retarding effect, whereas H_2O greatly accelerates the reaction. The product is $CaSiO_3$ in all cases, and the Arrhenius equation is obeyed.   F. J. G.

Activation of catalysts by electric waves. J. A. Hedvall and G. A. Ahlgren (*Kolloid-Z.*, 1942, **100**, 137—140).—Electrolytic Ni in the form of Fe-free filings 0·3—0·6 mm. long, packed in a spiral tube 22 cm. long and of 5 mm. bore, was used as catalyst in the decomp. of N_2O at 304°. When the tube is exposed to waves from a 4-w. radiotransmitter or from a large induction coil the decomp. is increased by 14—38%. This behaviour is related to that of the "coherer" formerly used for detecting electromagnetic waves, the action of the waves being to modify the surface of the metal particles so that they become conducting. The formation in this manner of interparticulate metal "bridges" provides conditions favourable to an incomplete lattice structure corresponding with an increase in the no. of active centres. Tapping the tube (whereby the bridges are broken) leads in every case to decreased catalytic activity.   F. L. U.

Influence of the transition from ferromagnetism to paramagnetism on catalytic activity. G. Cohn and J. A. Hedvall (*J. Physical Chem.*, 1942, **46**, 841—847).—The activation energy of the decomp. of HCO_2H at 130—180° catalysed by Co–Pd alloy containing 85 at.-% of Pd is increased ~30% on transition of the catalyst from the ferroto the para-magnetic state. At the same time the temp.-independent const. of the Arrhenius equation increases 1000-fold. The increased activity is due to a state of higher electronic order in the catalyst.   C. R. H.

Catalytic activity of intermetallic compounds in the vapour-phase reduction of nitrobenzene. II. B. Berk and O. W. Brown (*J. Physical Chem.*, 1942, **46**, 964—968; cf. A., 1939, I, 424).—Cu–Zn, Cu–Sn, and Cu–Sb compounds have been examined for suitability as catalysts for the vapour-phase reduction of $PhNO_2$ to NH_2Ph. The Cu–Zn catalyst has the same general properties as pure Cu, Cu–Sn has the properties of Cu and Sn, and Cu–Sb has properties quite different from those of Cu and Sb, the temp. of max. activity being > that for Cu or Sb alone.   C. R. H.

Rearrangement of phenyl octoate with ferric chloride, titanium tetrachloride, stannic chloride, and zinc chloride.—See A., 1943, II, 93.

Proton transfer during the electrolytic discharge of hydrogen ions. O. Essin and V. Kosheurov (*Acta Physicochim. U.R.S.S.*, 1942, **16**, 169—180).—The mechanism of the reaction $H_3O^+ + e(Me) \rightarrow H_2O + H$ (Me), by which the val. of the overvoltage of H is determined, is discussed. The distance between the electron cloud of the surface atoms of the metal and the min. of the potential energy curve for different models and orientations of H_3O^+ is discussed.   A. J. M.

Electrolytic antimony.—See B., 1943, I, 125.

Chemical action of electric discharges. XXX. Production of acetylene and other hydrocarbons by means of the continuous and alternating arc (high- and low-frequency) operating between carbon electrodes in an atmosphere of hydrogen. J. J. Kündig and E. Briner (*Helv. Chim. Acta*, 1942, **25**, 1251—1255).—The use of a high-frequency arc (10^7 cycles per sec.) at low intensity, the optimum conditions for the synthesis of NO, NH_3, and HCN, gives only low yields of C_2H_2 ($\div 0.5$ g. per kw.-hr.). The best yields (>1 g. per kw.-hr.) are obtained with a low-frequency (50 cycles per sec.) arc of relatively high intensity, suggesting that the formation of C_2H_2 is a thermal reaction and is independent of the action of electrons.
                                                                    J. W. S.

Cyclotron targets. Preparation and radiochemical separations. I. Arsenic and germanium. J. W. Irvine, jun. (*J. Physical Chem.*, 1942, **46**, 910—914).—Radio-As has been made by a (d, n) reaction involving cyclotron bombardment of a Ge–Cu alloy on a probe target : $^{72}_{32}Ge + ^2_1H \rightarrow ^{74}_{33}As + ^1_0n$. The product has a 16-day half-life. An isotope with half-life 50 hr. is formed at the same time. The prep. of As-free radio-Ge is described.   C. R. H.

Photochemical oxidation of carbonyl sulphide. V. N. Kondrateev (*Acta Physicochim. U.R.S.S.*, 1942, **16**, 272—281).—Mixtures of COS vapour and O_2 were illuminated with light, from a H discharge tube, of $\lambda > 2300$ A. Determinations were made from room temp. to 100° with mixtures of different compositions and pressures (12—46 mm.), and with different intensities of radiation. The mechanism of the reaction is considered to be : $COS + hv = CO + S$; $S + COS = CO + S_2$; $S_2 + O_2 = SO_2 + S$; $S + SO_2 = S_2O_2$; $S_2O_2 \rightarrow$ (wall) $SO_2 + [S]$. It was found that $[SO_2] = k_0 \sqrt{(It)}.e^{-3000/RT}[COS]$, where k_0 is const., I = intensity of discharge, and t = time of irradiation.
                                                                    A. J. M.

Theory of chemical development. V. Anastasevitsch (*Acta Physicochim. U.R.S.S.*, 1942, **16**, 296—306).—The chemical development of photographic films is discussed. A theory is based on the conception that development is similar to the formation of F-centres in crystals of alkali halides when exposed to the vapours of the alkali metals. The velocity of reduction of the Ag halides is obtained. The theory explains the selective development of exposed AgBr grains and the ultimate development of AgBr that has not been exposed. It also explains the retarding action of KBr and oxidation products of the developer on the velocity of reduction.
                                                                    A. J. M.

Olefine–oxygen–hydrogen bromide photo-reaction.—See A., 1943, II, 78.

Photo-addition of hydrogen bromide to olefinic linkings.—See A., 1943, II, 78.

Photo-addition of hydrogen sulphide to olefinic linkings.—See A., 1943, II, 80.

Effect of specific poisons on photo-reduction with hydrogen in green algæ. Fermentative and photochemical production of hydrogen in algæ.—See A., 1943, III, 217, 218.

IX.—PREPARATION OF INORGANIC SUBSTANCES.

Separation of helium from neon. E. K. Gerling and G. M. Ermolin (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 641—643).—He and Ne are quantitatively separated by adsorbing Ne on coal at −225°. The amount of He adsorbed is not great.   W. R. A.

Acids and bases. Their relationship to oxidising and reducing agents. W. F. Luder (*J. Chem. Educ.*, 1942, **19**, 24—26).—An electronic interpretation, and an extension of views previously advanced (*Chem. Rev.*, 1940, **27**, 547).   L. S. T.

Hydrogen peroxide formation on the adsorption of acids by activated charcoal. R. Burschtein and A. Frumkin (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 327—329).—10 c.c. of aq. H_2SO_4 were added to 0.5 g. of charcoal, and O_2 was passed through the mixture. After filtration through a glass filter the adsorbed anion was determined by titration with standard alkali and H_2O_2 by $KMnO_4$. As $[H_2SO_4]$ is increased the yield of H_2O_2 rises. H_2O_2 is, however, formed only when gaseous O_2 is present; in the cathodic reduction of O_2 with C electrodes the rate of formation of H_2O_2 depends on the c.d.
                                                                    W. R. A.

Boric acid and hydroxy-compounds. II. Salts of monosalicylyl-boric acid. H. Schäfer (*Z. anorg. Chem.*, 1942, **250**, 96—109).—The

following *monosalicylylborates* and *disalicylyltriborates* are described : $LiR,1.75H_2O$; $KR,2H_2O$; $MgR_2,4H_2O$; $CoR_2,4H_2O$; $NiR_2,4H_2O$; $ZnR_2,4H_2O$; $Na_2R_2,HBO_2,6H_2O$; $BaR_2,HBO_2,2H_2O$; $CdR_2,HBO_2,5H_2O$ ($R = C_6H_4 <^O_{CO}> BO$). The solubilities of some salicylates are recorded as follows ($X = OH \cdot C_6H_4 \cdot CO_2$) : $CoX_2,4H_2O$, 0.42 ; $NiX_2,4H_2O$, 0.38 ; $ZnX_2,2H_2O$, 0.24 ; $CdX_2,2H_2O$, 0.063 ; PbX_2,H_2O, 0.011 ; AgX, 0.004 equiv. per l.   F. J. G.

Mechanism of copper passivation in alkaline solutions of oxidisers. A. G. Samartzev (*Compt. rend. Acad. Sci. U.R.S.S.*, 1942, **35**, 38—42). —The passivation of Cu in alkaline $K_2S_2O_8$ is due to a film of CuO deposited on the surface by decomp. of Na_2CuO_2 at first formed in solution.   F. J. G.

Polymorphism of calcium carbide. M. A. Bredig (*J. Physical Chem.*, 1942, **46**, 801—819).—S- and N-free CaC_2 I, II, and III have been prepared in the electric arc furnace and their thermal conditions of stability have been investigated. Samples quenched from temp. $>450 \pm 10°$ and held at that temp. gave CaC_2 III whether mechanically deformed by grinding or not. After grinding at lower temp. neither CaC_2 III nor II was obtained except in minor quantities. When ground at room temp. the samples acquired the CaC_2 II structure, when ground at 350—450° 80% of CaC_2 I was obtained, and when ground at $>500°$ CaC_2 III was the product. Experiments with the high-temp. X-ray camera reveal the existence of CaC_2 IV which has a face-centred cubic space lattice with $a_0 = 5.92$ a. at 480°, the unit cell containing 4 mols. of CaC_2. A phase diagram has been constructed and is discussed, and comparison is made with SrC_2 and BaC_2. The influence of impurities has been examined.   C. R. H.

Change in properties of zinc oxide and chromic oxide during their combination. G. F. Hüttig and H. Theimer (*Kolloid-Z.*, 1942, **100**, 162—163).—Equimol. mixtures of ZnO and Cr_2O_3, preheated at different temp., show an increased tendency to be oxidised to chromate over a temp. range $<600°$ to $>1000°$ for those temp. of preheating which have been shown to be effective in enhancing the activity of the oxides (cf. A., 1942, I, 274).   F. L. U.

Active substances. LV. Physical inhomogeneity of active solids. R. Fricke (*Kolloid-Z.*, 1942, **100**, 153—158 ; cf. A., 1942, I, 404).— Preps. of active ZnO and Fe_2O_3 were caused to undergo a partial reaction (ZnO with aq. KOH, Fe_2O_3 with aq. HF, and with H_2O to give $FeO \cdot OH$), during which the most active portions would be expected to react preferentially. Determinations of the heat of dissolution of the specimens before and after reaction showed the activity of the original specimen to be $>$ that of the residue in each case. The effect was proved to be not due to differences of particle size.   F. L. U.

Extraction of rare earth and beryllium compounds from gadolinite. W. Fischer [with P. Herbach, H. Plempe, and G. Wirths] (*Z. anorg. Chem.*, 1942, **250**, 72—81).—The mineral is broken up by evaporation with HCl, and after filtration from SiO_2 the greater part of the rare earths is pptd. by $H_2C_2O_4$. Then after oxidation of $H_2C_2O_4$ with $KMnO_4$ and reduction of Fe^{III} to Fe^{II} with SO_2, the rest of the rare earths and the Be are pptd. by NH_3 in a H_2 atm. and the Be is separated by distillation as basic acetate.   F. J. G.

Preparation of pure scandium compounds. W. Fischer and R. Bock (*Z. anorg. Chem.*, 1942, **249**, 146—197).—Methods for the separation of Sc from the rare earths, Al, Fe, Th, and Zr have been critically studied. Pptn. reactions are all unsatisfactory because of incomplete separation or loss of Sc. Sublimation methods are troublesome and require complicated apparatus. $Sc(CNS)_3$ is extracted from H_2O by Et_2O, and this affords a good separation.
                                                                    F. J. G.

Rare earth metal amalgams. III. Separation of ytterbium from its neighbours. J. K. Marsh (*J.C.S.*, 1943, 8—10).—YbOAc readily forms a very reactive amalgam which is more electropositive than Sm amalgam ; since LuOAc and TmOAc solutions do not form amalgams this property has been used to separate Yb from Lu and Tm and to obtain it in a pure state.   J. L. E.

Yttrium-group oxalates. J. K. Marsh (*J.C.S.*, 1943, 40—41).— Some hydrates of the oxalates of Dy, Y, Er, and Yb are described, including the *hydrates* $Y_2(C_2O_4)_3,6$ and $10H_2O$ and $Yb_2(C_2O_4)_3,6H_2O$. The commonly cited nonahydrate of $Y_2(C_2O_4)_3$ is a complex NH_4 salt.   J. L. E.

Reduction of carbon dioxide coupled with oxyhydrogen reaction in algæ.—See A., 1943, III, 218.

Reaction between nitric oxide and vanadous salts. L. Malatesta (*Gazzetta*, 1941, **71**, 615—620).—$VSO_4,(NH_4)_2SO_4,6H_2O$ and $VSO_4,K_2SO_4,6H_2O$ [new prep. from V_2O_5, H_2SO_4, aq. SO_2, and electrolysis, followed by $(NH_4)_2SO_4$ or K_2SO_4] with NO and diluted at 0—40° undergo the reaction : $5V'' + NO + 5H'' \rightarrow 5V''' + NH_3 + H_2O$. The intermediate formation of $[V(NO)]''$ is suggested ; in presence of $NEt_2 \cdot CS_2Na$ the unstable diamagnetic *compound*, $V(NO)(CS_2NEt_2)_2$, is formed.   E. W. W.

Lower vanadium oxides. W. Klemm and L. Grimm (*Z. anorg. Chem.*, 1942, **250**, 42—55).—Contrary to the findings of Mathewson

et al. (*Trans. Amer. Soc. Steel Treat.*, 1932, **20**, 357) the lattice of V is tetragonally deformed by absorption of O. VO has *a* 4·11. At lower temp. it decomposes to V and a higher oxide.   F. J. G.

Polythionic acids and their formation. V. Reactions of the sulphur chlorides. M. Goehring and H. Stamm [with U. Feldmann] (*Z. anorg. Chem.*, 1942, **250**, 56—71).—The hydrolysis of S_2Cl_2 and SCl_2 and their reactions with H_2SO_3 and $H_2S_2O_3$ have been studied. In addition to S, SO_3'', and S_2O_3'', the hydrolysis of S_2Cl_2 in acid but not in alkaline solution affords much polythionic acids, especially $H_2S_5O_6$. The reaction between S_2Cl_2 and H_2SO_3 in strongly acid solution affords chiefly $H_2S_4O_6$, but in less acid medium this is increasingly broken down to $H_2S_3O_6$ and $H_2S_2O_3$ by further reaction with H_2SO_3. With $H_2S_2O_3$, S_2Cl_2 affords primarily $H_2S_5O_6$. Hydrolysis of SCl_2 in acid solution affords $H_2S_3O_6$ and higher polythionic acids, in alkaline solution $H_2S_2O_3$ and H_2SO_3, and always some free S. The chief product of reaction between SCl_2 and H_2SO_3 is $H_2S_3O_6$, as in the reaction between $S(NEt_2)_2$ and H_2SO_3. With SCl_2 and $H_2S_2O_3$ the chief product is $H_2S_5O_6$. It is concluded that the chief intermediate product in Wackenroder's solution is $H_2S_2O_2$, and that H_2SO_2 plays at most a minor part in the side reactions.   F. J. G.

Dioxanate of iodine pentafluoride.—See A., 1943, II, 102.

Reactions of solid substances. CXXX. Outgassing of iron powders of different origin and history. G. F. Hüttig and H. H. Bludau (*Z. (Z. anorg. Chem.*, 1942, **250**, 36—41).—The amounts of gases present in various samples of Fe powder, and the course of their evolution on heating, depend greatly on the origin and history of the sample. In general gas is evolved preferentially at 200°, 400°, and 710°.   F. J. G.

Reactions of solid substances. CXXVI. Outgassing of solid substances. G. F. Hüttig [with H. Theimer and W. Breuer] (*Z. anorg. Chem.*, 1942, **249**, 134—145).—The evolution of volatile impurities from powdered Fe, Cu, Sn, and α-Al_2O_3 at various temp. has been studied. It occurs chiefly in the regions $\alpha \sim 0.29$ and $\alpha \sim 0.43$ (α = temp. expressed as fraction of the m.p. in °K.), which correspond with the activation (loosening) of the surface and of the interior of the lattice.   F. J. G.

Iridium amminosulphite compounds. V. V. Lebedinski and M. M. Gurin (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **33**, 241—243).—Na_3 *Ir triamminosulphite*, $Na_3Ir(SO_3)_3(NH_3)_3,7H_2O$ (I), has been prepared by the action of aq. NH_3 on $Na_7Ir(SO_3)_4Cl_2$. The displaced Cl atoms are made labile by the presence of (SO_3) groups in the *trans*-position. (I) gives three ions, and its structure is probably $Na_2[NaSO_3\,Ir(SO_3)_2,(NH_3)_3],7H_2O$. It closely resembles the corresponding Rh salt. With $Zn(NO_3)_2$ (I) gives $Zn[NaSO_3\,Ir(SO_3)_2,(NH_3)_3],5H_2O$.   A. J. M.

Reactions with thiosulphate as a method for determining the nature of isomerism of platinum complex compounds. D. I. Riabtschikov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 344—346).—When a mixed tetrammine of Pt is treated in solution with 1 mol. of $Na_2S_2O_3$ to each atom of Pt, the *cis*-isomeride yields [Pt $2NH_3\,S_2O_3$] whilst the *trans*- gives [Pt $2NH_3\,(S_2O_3,H_2O)$]. With excess of $Na_2S_2O_3$ *cis*- gives $Na_6[Pt(S_2O_3)_4]$, and *trans*- gives $Na_2[Pt\,2NH_3\,(S_2O_3)_2]$ unless a very great excess of $Na_2S_2O_3$ and prolonged vigorous heating are used, when complete substitution of (S_2O_3) groups takes place. The reaction has been tested with the following isomeric compounds : [Pt $2NH_3\,X_2$] (X = Cl,Br,I, NO_2); [Pt $(C_5H_5N)_2\,Cl_2$]; [Pt $2NH_3\,C_2O_4$]; [Pt $2NH_3\,(HC_2O_4)_2$]; *cis*-[Pt $2NH_3\,Cl\,NH_2SO_3$].   W. R. A.

Mechanism of oxidation of thiosulphate compounds of platinum. D. I. Riabtschikov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **33**, 233—236).—The oxidation of $K_2[Pt,2NH_3,(S_2O_3)_2]$ (I) and $K_2[Pt\,S_2O_3\,Cl_2]$ (II) by $KBrO_3$ has been investigated, the compounds being chosen because the (S_2O_3) is linked in them in two distinct ways. The process was followed by electrometric titration. In the oxidation of $Na_2S_2O_3$ itself by $KBrO_3$ there are two stages : (1) $2Na_2S_2O_3 + O + 2HCl = Na_2S_4O_6 + H_2O + 2NaCl$; (2) $2Na_2S_4O_6 + 14O + 6H_2O = 2Na_2SO_4 + 6H_2SO_4$. When (I) is oxidised with $KBrO_3$, S separates at first, after which the Pt is oxidised. Finally the S is oxidised to H_2SO_4 : $K_2[Pt,2NH_3,(S_2O_3)_2] + 9O + 6HCl + H_2O = [Pt,2NH_3,Cl_4] + 4H_2SO_4 + 2KCl$. (II) is oxidised as follows : $K_2[Pt\,S_2O_3\,Cl_2] + 5O + 4HCl = K_2PtCl_6 + 2H_2SO_4$.   A. J. M.

Hydroxylamine compounds of platinum and palladium. V. I. Goremikin (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 633—636).—Interaction of 10% HF, HCl, HBr, and HI with [Pt$(NH_2OH)_4$]$(OH)_2$ and of 1% solutions of the acids with [Pd$(NH_2OH)_4$]$(OH)_2$ has been studied. HF yields tetrammines, HCl gives a tetrammine with Pt and a mixture of a tetr- and di-ammine with Pd, HBr gives a mixture of ammines with Pt but only the diammine with Pd, and HI gives the mixture with Pt but no ammine with Pd, only PdI_2 and NH_2OH,HI. The following *compounds* have been prepared and their principal reactions are discussed : [Pt(or Pd)$(NH_2OH)_4$]$(HF_2)_2,2H_2O$; [Pt$(NH_2OH)_4$]Br_2(or I_2); [Pd$(NH_2OH)_4$]Cl_2; trans-[Pd$(NH_2OH)_2Br_2$]. The nature of reaction products appears to be related to the strength of the Pt (Pd)$\cdots NH_2OH$ bond.   W. R. A.

Hydrazine compounds of platinum and palladium. V. I. Goremikin (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **33**, 227—230).—When K_2PtCl_4 and K_2PdCl_4, either solid or in dil. aq. solution, are added to a saturated solution of $N_2H_4,2HCl$, compounds $[PtCl_2,2N_2H_5]Cl_2,2H_2O$ (I) and $[PdCl_2,2N_2H_5]Cl_2,2H_2O$ (II) are formed. (I) forms yellow or orange plates. When an aq. solution of (I) is mixed with aq. NH_3, reduction to Pt takes place. Treatment of (I) with C_5H_5N gives $[PtCl_2,2N_2H_4]$. Excess of C_5H_5N causes reduction to Pt. $[PdCl_2,2N_2H_4]$ crystallises in orange-coloured square laminæ, and combines with HCl to form (II), which gradually loses H_2O on exposure to air, but is not greatly affected by temp. Heating at 105° converts it into the *compound* $[PdCl_2,N_2H_4,N_2H_5]Cl$. If dil. aq. K_2PdCl_4 is treated with $N_2H_4,2HCl$, an amorphous, orange yellow *ppt.* is formed which is probably $[PdCl_2,N_2H_4]$. It is possible that this compound may be associated as follows :

$$\begin{bmatrix} Cl \\ Cl \end{bmatrix} Pd \begin{matrix} -NH_2-NH_2- \\ -NH_2-NH_2- \end{matrix} Pd \begin{bmatrix} Cl \\ Cl \end{bmatrix}.$$ The *compound* $[PtCl_2,N_2H_4,N_2H_5]Cl$ has also been obtained. A *cis*-configuration is ascribed to all these compounds.   A. J. M.

X.—ANALYSIS.

Precision in spectrochemical analysis. H. B. Vincent and R. A. Sawyer (*J. Opt. Soc. Amer.*, 1942, **32**, 686—692).—Statistical methods for the separation and treatment of uncertainties entailed in various steps of the analytical process are developed and illustrative data are tabulated.   N. M. B.

Quantitative molecular spectral analysis.—See A., 1943, I, 51.

Spot tests in the teaching of chemistry. F. Feigl (*An. Assoc. Quím. Brasil*, 1942, **1**, 234—242).—A review.   F. R. G.

Analytical reactions involving ignition with manganous nitrate. M. J. Preising, O. F. Slonek, and J. H. Reedy (*Ind. Eng. Chem. [Anal.]*, 1942, **14**, 875—877).—Many anions are oxidised when evaporated with conc. aq. $Mn(NO_3)_2$ and ignited. MnO_2 is the oxidising agent. ClO_4' is detected as Cl' by heating with 50% aq. $Mn(NO_3)_2$; 0·1 mg. of ClO_4' in presence of 100 mg. of ClO_3' or Cl' can be identified by the procedure described. Reduction to Cl' is quant. Reduction to Cl' by Ti''' (A., 1909, ii, 434) is incomplete. Cl' in presence of CNS' can be detected after oxidation of CNS' by similar treatment with $Mn(NO_3)_2$. The test is sensitive to 35·5 μg. of Cl' in presence of 3·5 mg. of CNS', and is better than oxidation of CNS' by HNO_3, which results in loss of Cl, or removal of CNS' as CuCNS.   L. S. T.

Preparation of "N/10-bromine." A. G. Fishburn and M. J. Smith (*Pharm. J.*, 1943, **150**, 76).—A solution containing $KBrO_3$ (3 g.) + KBr (10 g. per l.) satisfactorily replaces the B.P. proportion for the determination of NH_2-compounds. For PhOH, 5 g. of KBr suffices.   A. A. E.

Determination of Hanus iodine value [of benzine] by arsenometric titration.—See B., 1943, I, 100.

Colorimetric determination of fluorine in simple and complex fluorides by means of zirconium–alizarin lake. I, II. F. Richter (*Z. anal. Chem.*, 1942, **124**, 161—192, 192—216).—The effect of various factors on the course of the reaction has been investigated, and methods for determining F in sol. and insol. fluorides have been worked out. Data for samples of both types are recorded. In the F'–lake reaction the liberated alizarin (I) stands in a definite relationship to [F']. The colloidally-dispersed lake coagulates during the reaction at diminishing [Zr], especially in presence of NaCl. The coagulated lake is removed by filtration through a layer of kieselguhr on a sintered glass mat, and the liberated (I) determined photometrically. Liberation of (I) depends on [HCl]. SO_4'' is removed by aq. $BaCl_2$. The reaction depends also on the kind and duration of heating, and a suitable heating schedule is given. Dissolution of insol. fluorides containing >15% F is accomplished by heating with $Na_2B_4O_7$ and HCl in a specially-designed flask. Sol. fluorides are distilled with $HClO_4$ in a special apparatus, and the F is obtained as SiF_4 or HF. A correction for interference due to SiO_2,nH_2O in the gel form is necessary. The distillation process is recommended as an umpire method.   L. S. T.

Determinations of low concentrations of oxygen in gas. J. A. Shaw (*Ind. Eng. Chem. [Anal.]*, 1942, **14**, 891—892).—A method for determining several thousandths of 1% of O_2 in gases is described. The sample is shaken in a flask of special design with $Fe(OH)_2$ freshly pptd. by NaOH from O_2-free acid $Fe^{II}\,NH_4$ sulphate. The $Fe^{\cdots}$ is determined colorimetrically by means of KCNS. The method is suitable for gases containing highly unsaturated or easily condensed hydrocarbons.   L. S. T.

Micro-determination of sulphur and halogens by melting with potassium. II. K. Bürger (*Chemie*, 1942, **55**, 245—247).—The author's method (A., 1942, I, 276) is simplified and described in detail. Minerals must be very finely ground, but the method is suitable for S and halogen determinations on all types of org. and inorg. compounds. Na is preferred to K for treating org. compounds rich in N to minimise CN' formation. The method is accurate to ± 0.1% S and ± 0.3% Cl with 5—10-mg. samples.   M. H. M. A.

Determination of sulphur in acid-soluble sulphides. H. C. Froelich (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 900).—H₂S is liberated by the action of 50% H₂SO₄ and distilled into ammoniacal AgNO₃. The excess of Ag˙ is determined by titration either with alkali cyanide solution (indicator AgI) or with alkali chloride (fluorescein) in neutral solution.   L. S. T.

Determination of selenium, tellurium, and arsenic in commercial copper.—See B., 1943, I, 124.

Determination of tellurium in lead and in antimony–lead alloys.—See B., 1943, I, 125.

Rapid Kjeldahl digestion method using perchloric acid. L. P. Pepkowitz, A. L. Prince, and F. E. Bear (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 856—857).—After the usual digestion of plant materials and fertilisers with H₂SO₄, SeOCl₂, and Na₂SO₄, 0·5—1 ml. of 35% aq. HClO₄ is added, and the digestion continued at < b.p. to prevent loss of N. With soils, the Na₂SO₄ is omitted to prevent the same loss. The average digestion time for a 1-g. sample is 30 min. The results obtained for 33 materials other than soils agreed with those obtained by independent analysts using the A.O.A.C. method.
                                                                                      L. S. T.

Kjeldahl nitrogen determination. Rapid wet-digestion method. L. P. Pepkowitz and J. W. Shive (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 914—916).—HClO₄ (35%) is added after digestion with H₂SO₄ and SeOCl₂ as catalyst, or if nitrates are to be included, after treatment with salicylic acid–H₂SO₄ solution, aq. Na₂S₂O₃, and SeOCl₂. Addition of HClO₄ at the beginning of the digestion always results in loss of N. Digestion must be completed at temp. < b.p. Data for N in pure compounds and for N in org. material are recorded. The latter show agreement with results obtained by the A.O.A.C. method. For 10-mg. samples, time of digestion is reduced from 2 hr. by the A.O.A.C. method to 12 min. by the new method.   L. S. T.

Diffusion micro-method for [determination of] nitrogen. R. C. Hawes and E. R. Skavinski (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 917—921).—An ordinary test-tube is used as digestion and diffusion vessel. Digestion is effected by H₂SO₄ containing SeO₂ and CuSO₄, and H₂O₂ is added near the end. The diffusion receiver is a helix of Pt wire carrying a drop of 1·0M-NaH₂PO₄ as absorbent, and is held in the test-tube by a grooved rubber stopper. The final titration is electrometric, or with bromocresol green–Me-red as indicator, which is preferred to methylene-blue–Me-red.   L. S. T.

Elimination of fluoride interference in the molybdenum-blue reaction [for phosphate]. L. T. Kurtz (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 855).—Interference is prevented by adding H₃BO₃. Neither excess of H₃BO₃ nor BF₄′ interferes with the Dickman–Bray procedure for determining PO₄‴ (A., 1942, I, 71).   L. S. T

Determination of pyrophosphate by precipitation with cadmium and polarographic measurement of cadmium in the precipitate. G. Cohn and I. M. Kolthoff (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 886—890).—Cd₂P₂O₇ is pptd. at pH 3·6. It can be weighed in the anhyd. form after drying to const. wt. at 250°, or dissolved in dil. HCl and Cd˙˙ determined polarographically. Details of procedure and of the effect of conditions on pptn. are given. A method for determining 0·002—0·01N-pyrophosphate in presence of 4—16 times the M. concn. of PO₄‴ and from 8 to 32 times that of Ca˙˙ is described. Polarographic determinations show that the solubility of Cd₂P₂O₇ in H₂O is negligible; it is appreciable in 0·1M-KCl and in 0·1M-KCl + AcOH–NaOAc buffer (pH 6·1)   L. S. T.

Rapid determination of total phosphorus in soil and plant material.—See B., 1942, III, 45.

Spectrochemical determination of silicon, iron, and aluminium in mineral powders with a high-voltage direct-current arc. H. I. Oshry, J. W. Ballard, and H. H. Schrenk (*J. Opt. Soc. Amer.*, 1942, **32**, 672—680).—The technique described is adapted for the determination of atm. contamination; it requires 1—12 mg. of the sample, can be used for concns. of ∼1—100% of the elements determined, and is accurate to ∼5% of the total components. The sample is diluted in a known amount of specially purified NiO, and the SiO₂, Fe₂O₃, and Al₂O₃ are determined as impurities in the NiO. Illustrative data for various samples are compared with those obtained chemically.   N. M. B.

Analytical studies on some 12-heteropoly-acids. I. Determination of silicon in presence of molybdic acid. A. R. Tourky and H. K. El Shamy (*Analyst*, 1943, **68**, 2—5).—Excess of H₂C₂O₄ prevents the formation of silicomolybdate complexes and permits the determination of SiO₂ in presence of Mo.   S. B.

Photometric determination of silica in presence of phosphates. M. C. Schwartz (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 893—895).—In the procedure described, interference due to phosphomolybdic acid is removed by adding oxalic acid. Under the conditions specified, K₂CrO₄ standards provide a good colour match for the silicomolybdic acid solutions at λλ >410 mμ.   L. S. T

Colorimetric determination of silicon in aluminium alloys.—See B., 1943, I, 128.

Application of the polarising microscope [to the qualitative study of reactions]. G. W. Thiessen and L. F. Beste (*J. Chem. Educ.*, 1942, **19**, 331—332).—The formation of KClO₃ or KBrO₃ during electrolysis of aq. KCl or KBr, respectively, can be followed by microscopical examination of drops of solution removed at intervals during the electrolysis.   L. S. T.

Determination of potassium [as perchlorate] in calcareous Nitrophoska.—See B., 1943, I, 111.

Quantitative separation of calcium from strontium using acetone as a solvent. M. M. Tillu and M. S. Telang (*J. Indian Chem. Soc.*, 1942, **19**, 231—232).—The solubility of Sr(NO₃)₂ in COMe₂ at 25° is ∼1 : 15,000, whereas Ca(NO₃)₂ is readily sol. This affords a quant. separation of Ca from Sr.   F. J. G.

Agar-agar as coagulant for barium sulphate. E. J. Bogan and H. V. Moyer (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 849—850).—The positively-charged BaSO₄ obtained when SO₄″ is pptd. by an excess of Ba˙˙ is coagulated by addition of agar (1 mg. per 0·1 g. of BaSO₄). The charge on the particles is reversed in sign. BaSO₄ obtained by pptg. Ba˙˙ with SO₄″ is not appreciably improved. Creeping is eliminated by addition of agar. Data showing the effect of agar on time of settling of ppts. of BaSO₄, and the mobilities of the particles, are recorded graphically.   L. S. T.

Determination of magnesium in solution of citrate of magnesia.—See B., 1943, III, 61.

o-Dianisidine as internal indicator for zinc–ferrocyanide titrations. H. F. Frost (*Analyst*, 1943, **68**, 51).—o-Dianisidine in H₂SO₄ gives a sharp end-point colour change from red-brown to pale blue-green in presence of sufficient Fe(CN)₆‴′.   S. B.

Micro-determination of lead by dithizone, with an improved lead-bismuth separation. K. Bambach and R. E. Burkey (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 904—907).—Modifications of the method previously described (A., 1939, I, 488) are discussed. The time-consuming Bi test is eliminated by working at pH 3·4, when Pb and Bi are separated. Details of procedure for determining Pb in biological materials, including prep. of samples and purification of reagents, are given. Standard dithizone solutions can be preserved without apparent deterioration in glass-stoppered Pyrex bottles, in the dark and in a refrigerator.   L. S. T.

Detection and semi-quantitative estimation of group I cations. S. S. Leikind, R. Maurmeyer, and M. Cutler (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 871).—PbCl₂ is extracted by means of NH₄OAc + AcOH, the residue is treated with aqua regia, and after dilution with H₂O, AgCl is removed from the HgCl₂ in solution. The method is suitable for detecting 100 mg. of metal as max., with the lower limit of 0·2 mg. for Ag and Hg, and 15 mg. of Pb, each metal alone or in presence of each other.   L. S. T.

Determination of copper with quinoline-8-carboxylic acid. J. R. Gilbreath and H. M. Haendler (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 866—867).—Cu˙˙ is pptd. in neutral or slightly acid (AcOH) solution by means of aq. quinoline-8-carboxylic acid, and weighed as (C₉H₆N·CO₂)₂Cu after drying at 110—120°. In presence of Cd or Zn, pptn. is effected at pH 3·5—4·0 (litmus and 0·1N-AcOH). With 50 mg. of Cu and a four-fold excess of Cd the accuracy is 0·1—0·15%. Ag and Au give insol. ppts. and must be absent; Pb, Ni, Hg, and Co do not interfere under the conditions described.   L. S. T.

Stability of the cupric–ammonia colour system. J. P. Mehlig (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 903).—The colour of this system was found to be practically unchanged after 57 weeks (cf. A., 1941, I, 483). When Pyrex containers are used, any action of NH₃ on the glass is negligible.   L. S. T.

New precipitant for group II ions. S. Gaddis (*J. Chem. Educ.*, 1942, **19**, 327—328).—In semi-micro-analyses a resin, Amberlite IR-4, saturated with H₂S, is introduced into the 0·35N-HCl solution obtained after removal of group I.   L. S. T.

Simplified technique in the use of liquid amalgam reductors. G. F. Smith and L. T. Kurtz (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 854—855).—After shaking the solution and amalgam for 2 min., CCl₄ is added and separates the amalgam completely from the solution being analysed, which is then titrated in presence of CO₂. The chief difficulty encountered in the Nakazona–Someya methods is thus eliminated. Procedure and data for determining Fe, and Fe + Ti, are given.   L. S. T.

Analytical chemistry of rhenium. A. Voigt (*Z. anorg. Chem.*, 1942, **249**, 225—228).—Working details are given for electrolytic determination of Re from ammoniacal solution, and for a rapid separation of Re from Mo by pptn. with H₂S.   F. J. G.

Colorimetric determination of iron with 2 : 2′-dipyridyl and with 2 : 2′ : 2″-tripyridyl. M. L. Moss with M. G. Mellon (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 862—865).—Max. absorption in the o-phenanthroline-, 2 : 2′-dipyridyl-, and 2 : 2′ : 2″-tripyridyl-Fe˙˙ complexes occurs at 510, 522, and 552 mμ., respectively. Working ranges of pH are 3—9, 3—9, and 3—10, respectively. At max. absorption Beer's law holds for the di- and tri-pyridyl systems

NH_2OH,HCl is used to reduce $Fe^{\cdots}$; good results are also obtained with $TiCl_3$, quinol, and ascorbic acid, but N_2H_4, and SO_2 are not recommended. The effects of numerous ions on both methods are listed, and a procedure for the colorimetric determination of Fe is detailed. L. S. T.

Detection of ferrocyanide ion with quinone chloroimide. E. W. Blank (*J. Chem. Educ.*, 1942, **19**, 321).—EtOH–benzoquinone chloroimide gives an emerald-green colour or a dark brown ppt. Strong oxidising agents, but not $Fe(CN)_6^{\cdots}$, interfere. The test will detect 5 μg. of $Fe(CN)_6^{\cdots\cdots}$. L. S. T.

Colorimetric determination of cobalt. R. J. DeGray and E. P. Rittershausen (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 858—859).—The ammoniacal $Fe(CN)_6^{\cdots}$ method is modified to control the nature and concns. of salts present, and to give a precision of 0·06 mg. of Co without exact measurement of the vols. of reagents added. The method is suitable for 0·5—4·0 mg. of Co. L. S. T.

Use of phosphate for separating cobalt from iron. V. North and R. C. Wells (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 859—860).—In the analysis of rocks, minerals, and ores, SiO_2 and group II metals are removed as usual, and then $Fe^{\cdots}$ is pptd. as $FePO_4$ from an AcOH solution at pH 3·5. Co in the filtrate is pptd. by α-nitroso-β-naphthol and weighed as Co_3O_4, or determined colorimetrically with CNS'. Ca, Mg, Al, and the alkalis do not interfere. Bi, Ti, Zr, and Hf are completely pptd. with Fe, but do not retain Co. Ca, Ni, Ba, and Sr are not pptd. with the Fe. Cr is incompletely pptd. Al is incompletely pptd., but does not interfere with the determination of the Co. Typical data for synthetic mixtures and representative ores are given. L. S. T.

Sodium perborate as a replacement for sodium peroxide in the chemical laboratory. C. F. H. Allen and J. H. Clark (*J. Chem. Educ.*, 1942, **19**, 72).—$NaBO_3,4H_2O$ can, with advantage, replace Na_2O_2 in separating $Cr^{\cdots}$ and $Al^{\cdots}$ from $Fe^{\cdots}$. It can be used for the cleavage of α-diketones. L. S. T.

Analytical studies on 12-heteropoly-acids. II. Potentiometric titration of molybdate in presence of silicic or phosphoric acid. A. R. Tourky and H. K. El Shamy (*Analyst*, 1943, **68**, 40—44).—Mo^{VI} is titrated in an atm. of CO_2 with $TiCl_3$ or $CrCl_2$, giving a sharp inflexion at the transformation into Mo^V. H_3PO_4 and silicic acid do not interfere when in presence of sufficient $H_2C_2O_4$. S. B.

XI.—APPARATUS ETC.

Identification of very small amounts of liquids. R. Fischer (*Chemie*, 1942, **55**, 244—245).—Determination of b.p. by the Emich micromethod is improved by using a capillary containing powdered glass to entrap several air bubbles. The liquid is further characterised by immersion in it of glass powder of (known) n slightly $<$ that of the liquid at room temp. Optical disappearance of the glass on heating gives vals. of n_{liquid} which may be used directly or calc. (from results with two different glasses) to n_{liquid} at 20°. NaF, LiF, or cryolite can be used for liquids of low n, and Na light should always be used. B.p. and n can both be determined with $\sim$2 cu. mm. of liquid. M. H. M. A.

Resonance thermocouples used for the investigation of complete radiation in the ultra-Hertz band. A. A. Glagoleva-Arkadieva and N. A. Sokolov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 543—545).—Air-filled and evacuated thermocouple units designed for detection of electromagnetic waves of $\lambda \sim 0·03$—19 cm. are described. Typical measurements of λ by an interference method, on radiation from a mass-oscillator (cf. A., 1943, I, 46), are reported. A. J. E. W.

Resolving power of light screens. H. Hinderer (*Z. Physik*, 1942, **119**, 397—405).—The resolving power of various multi-cryst. light screens and a single-crystal screen when excited by ultra-violet light has been determined. It depends on the roughness of the surface and the scattering of the exciting and emitted light in the material. The vals. lie between 5 and 15 μ., and agree with those obtained by other methods. A. J. M.

Polarising accessories for microscopes. C. D. West (*J. Chem. Educ.*, 1942, **19**, 66—70). L. S. T.

Plate holder for double exposures with the Siemens ultramicroscope. F. Frey (*Z. tech. Physik*, 1942, **23**, 176—177).—The plate is replaced by two superposed films in a slightly modified holder, so that two successive exposures can be made without intermediate use of the vac. lock. A. A. E.

Van der Kolk method of determining refractive indices. R. C. Evans and N. F. M. Henry (*Min. Mag.*, 1942, **26**, 267—271).—The side illumination of crystal fragments immersed in a liquid under the microscope is described for different positions of the sub-stage condenser and of a side screen. L. J. S.

Colour nomenclature in qualitative analysis. II. ISCC–NBS colour names. L. P. Biefield and M. Griffing (*J. Chem. Educ.*, 1942, **19**, 307—312; cf. A., 1942, I, 374). L. S. T.

Infra-red spectrograph with means for direct registration of absorption ratio and with linear wave-length scale. E. Lehrer (*Z. tech. Physik*, 1942, **23**, 169—176).—The spectrograph for use in the region 1—14 μ. operates by means of a compensation method. Absorption curves are given for Δ^α-butylene, and data are given for the analysis of a mixture of n- and iso-C_4H_{10}. A. A. E.

Grating spectrograph of fabricated steel. J. W. Forrest and H. W. Straat (*J. Opt. Soc. Amer.*, 1942, **32**, 669—671).—The mechanical structure of a welded Wadsworth-type instrument, free from vibration, is described. The unit uses a 4-m.-radius grating, 100 mm. long, ruled with 10,000 lines per cm. N. M. B.

Stigmatic grating spectrograph for industrial laboratories. R. F. Jarrell (*J. Opt. Soc. Amer.*, 1942, **32**, 666—669).—A Wadsworth-type mounting is described and discussed. N. M. B.

Corrections for residual impurity and background in spectro-chemical analysis. J. Cholak and R. V. Story (*J. Opt. Soc. Amer.*, 1942, **32**, 502—505).—The background effect in spectroscopic analysis is eliminated by the method of Pierce and Nachtrieb (A., 1942, I, 117) with the additional precaution of using for comparison a standard Bi line in the same intensity range as the test line. The effects of residual impurities in the standard mixture and reagents are deduced by determination of the intensity ratios of the test line and comparison line at various known concns. of the metal in question and the comparison metal (Bi). J. W. S.

Significance of stray light in photo-electric filter photometers. M. N. States and J. C. Anderson (*J. Opt. Soc. Amer.*, 1942, **32**, 659—666).—A theoretical analysis and experimental data show that variations in the shape of the analytical curves, relating concn. of material in solution to indications of the instrument, are due to the presence, variation in spectral region, and magnitude of stray light components. Conclusions on calibration and technique are summarised. N. M. B.

Testing of magnetic materials using a cathode-ray oscillograph with electrostatic deflexion only. K. Kreielsheimer (*J. Sci. Instr.*, 1943, **20**, 32).—An addendum (cf. A., 1942, I, 378). A. A. E.

Electron microscope. Calibration and use at low magnifications. C. J. Burton, R. B. Barnes, and T. G. Rochow (*Ind. Eng. Chem.*, 1942, **34**, 1429—1436).—The use of the electron microscope and optical and non-optical methods of calibration are discussed. C. R. H.

Intensity relations with the electron microscope. III. Suitability and limits of sensitivity of photographic plates for electron microscope photographs. B. von Borries (*Z. Physik*, 1942, **119**, 498—521).—The suitability of photographic plates for electron microscope work is examined from the point of view of sensitivity, resolving power, and gradation. The energy necessary to cause blackening of a nucleus on development is calc., and the least possible exposure of the object to the electron beam in order to obtain a photograph is discussed. The heating and ionisation effects in the object, and the application to living objects, are considered. A. J. M.

Resolving power of the emission microscope. J. Dosse and H. O. Müller (*Z. Physik*, 1942, **119**, 415—422).—The lower limit of the resolving power is obtained by consideration of the velocity distribution of electrons. If the field strength (E) in front of the cathode is increased, the resolving power at first decreases with $1/E$, but at high E it becomes const. and independent of E. The resolving power for a plane cathode is better than for a spherical one. A. J. M.

Simplified electron microscope. C. H. Bachman and S. Ramo (*Physical Rev.*, 1942, [ii], **62**, 494).—The instrument is a combined electron and light microscope with unipotential electrostatic electron lenses. Advantages are briefly summarised. N. M. B.

Electron diffraction at small aperture in the universal electron microscope (method and results). M. von Ardenne, E. Schiebold, and F. Günther (*Z. Physik*, 1942, **119**, 352—365).—Electron-optical arrangements for the exploration of minute regions in the object-plane of the universal electron microscope by means of a constricted electron beam are described. L. J. J.

Operation of proportional counters. S. A. Korff (*Rev. Mod. Physics*, 1942, **14**, 1—11).—A survey of the theory, construction, and use of counters. Illustrative data and curves are given. N. M. B.

The coincidence method and its use in problems of nuclear physics. H. Maier-Leibnitz (*Physikal. Z.*, 1942, **43**, 333—362).—A detailed report, with bibliography, on the construction, characteristics, operation, and application of coincidence counters and their associated apparatus. A. J. E. W.

Magnetic field of great homogeneity for the Wilson cloud chamber. K. Sauerwein (*Naturwiss.*, 1942, **30**, 494—495).—Apparatus is described. F. J. G.

Measurement of dielectric constant in the centimetre band. A. N. Soos (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **33**, 210—212).—The method depends on the observation of the interference pattern between a source of monochromatic radiation (λ 5 cm.) and the speci-

men in the form of a plate. The method is applied to various dielectrics, including semi-conductors.   A. J. M.

Expedients in laboratory glass working. R. H. Wright (*J. Chem. Educ.*, 1942, **19**, 71—72).   L. S. T.

Insulation for necks of wash bottles. J. Mizroch (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 845).—Asbestos strip lacquered with Bakelite lacquer is used.   L. S. T.

Pressure wash bottle for volatile solvents. L. W. Charkey and D. V. Zander (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 857).   L. S. T.

Chromatographic analysis in reverse. A. Lowman (*Science*, 1942, **96**, 211—212).—Equal, measured amounts of the finely-powdered adsorbent are allowed to fall through a long column of the solution to be analysed. The adsorbent settling out contains the most strongly adsorbed substances at the bottom, and the least strongly adsorbed substances at the top.   E. R. R.

Leakproof stopcock for regulation of take-off during distillation. M. S. Newman (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 902).   L. S. T.

Tilting arc flow divider suitable for reflux ratio control. S. Palkin and S. A. Hall (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 901—902).   L. S. T.

Separation of gas mixtures by thermal diffusion. B. Leaf and F. T. Wall (*J. Physical Chem.*, 1942, **46**, 820—826).—Thermal diffusion data for the gas pairs N_2O–CO_2, C_3H_6–*cyclo*propane, C_3H_8–CO_2, A–C_2H_6, and CO_2–*cyclo*propane are applied to equations based on the kinetic theory of non-uniform gases and on the theory of the thermal diffusion column. There is fair agreement, except for A–C_2H_6, between observed and calc. thermal diffusion coeffs.   C. R. H.

Simple large-capacity extraction apparatus. E. Smallwood (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 903).   L. S. T.

Surface replicas for microscopic observation. V. J. Schaefer (*Physical Rev.*, 1942, [ii], **62**, 495—496; cf. A., 1942, I, 378).—Three methods, not involving immersion in H_2O, are described for the removal of the replicas from metallographic specimens which might form corrosion products with H_2O.   N. M. B.

Properties of organic circulating materials for diffusion pumps in technical operation and a new form of oil diffusion pump. R. Jaeckel (*Z. tech. Physik*, 1942, **23**, 177—186).—For a given liquid the final vac. observed depends markedly on the method of measurement, even when the same type of apparatus is employed; Knudsen's abs. manometer is preferred. The effects of the working conditions and the oxidisability and thermolability of the oil are considered. Hickman's pump, in which self-purification of the oil takes place, is improved.   A. A. E.

Glass safety valve for water vacuum-pump circuit.—See B., 1943, I, 87.

High-vacuum technique. G. Burrows (*J. Sci. Instr.*, 1943, **20**, 21—28).—A review relating to pumps, vac. pipe lines, detachable joints and jointing media, vac. gauges and indicators, leaks, and surface treatment.   A. A. E.

Transparent phase rule model. L. S. Ts'ai (*J. Chem. Educ.*, 1942, **19**, 2).   L. S. T.

Optical linear dynamodilatometer, a universal instrument for the thermodynamic analysis of highly elastic changes of state. E. Wöhlisch (*Kolloid-Z.*, 1942, **100**, 151—153).—The instrument described (details not given) combines a device for measuring the temp. coeff. of linear expansion at const. tension with one for measuring the temp. coeff. of tension at const. length.   F. L. U.

Laboratory bellows pump [delivering 5—2500 c.c. at ~1 atm.]. B. B. Corson and W. J. Cerveny (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 899—900).   L. S. T.

Apparatus for small-scale catalytic hydrogenation. C. R. Noller and M. R. Barusch (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 907—908).   L. S. T.

Examination of spectrographic plates taken in forensic work.—See A., 1943, III, 296.

Nomogram for the law of direction-cosines. S. I. Tomkieff (*Min. Mag.*, 1942, **26**, 272—273).—A simple nomogram for the equation $\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma = 1$, for use as a check in optical and crystallographic measurements and calculations, is given.   L. J. S.

XII.—LECTURE EXPERIMENTS AND HISTORICAL.

Demonstration of an induced, or coupled, reaction. J. B. Sumner (*J. Chem. Educ.*, 1942, **19**, 70).—Directions for demonstrating the coupled oxidation of carotene, which occurs when a trace of un-saturated fat, soap, or free fatty acid is peroxidised by lipoxidase, are given.   L. S. T.

Measurement of surface tension. Laboratory experiment. T. H. Hazlehurst (*J. Chem. Educ.*, 1942, **19**, 61—65).   L. S. T.

Unimolecular film demonstrations. A. L. Kuehner (*J. Chem. Educ.*, 1942, **19**, 27—28).   L. S. T.

Mercury vapour made visible. H. C. Froelich (*J. Chem. Educ.*, 1942, **19**, 314).—Ultra-violet light will reveal dark clouds arising at room temp. from a drop of Hg covered by a thin layer of a fluorescent powder.   L. S. T.

Christopher Glaser. C. de Milt (*J. Chem. Educ.*, 1942, **19**, 53—60).   L. S. T.

Liebig and proteins. H. B. Vickery (*J. Chem. Educ.*, 1942, **19**, 73—79).   L. S. T.

Joseph Priestley (1733—1804). A. Kent (*Chem. and Ind.*, 1943, 71—72).   L. S. T.

Edwin Emery Slosson. D. Barton (*J. Chem. Educ.*, 1942, **19**, 17—20).   L. S. T.

John Maclean, Charles Macintosh, and an early chemical society in Glasgow. J. A. V. Butler (*J. Chem. Educ.*, 1942, **19**, 43—44).   L. S. T.

Johann Rudolf Glauber, 1604—70, his chemical and human philosophy. E. V. Armstrong and C. K. Deischer (*J. Chem. Educ.*, 1942, **19**, 3—8).   L. S. T.

Development of alchemy in Bohemia. G. Druce (*Chem. and Ind.*, 1943, 51—53).

XIII.—GEOCHEMISTRY.

Separation of electricity in clouds. J. A. Chalmers (*Phil. Mag.*, 1943, [vii], **34**, 63—67; cf. Simpson and Scrase, *Proc. Roy. Soc.*, 1939, A, **161**, 309).—Theory of rain formation suggests that sudden freezing of H_2O drops occurs from 0° down to —15° to —20° in thunderclouds, the temp. around which the supercooled drops and ice particles co-exist. Investigations show a separation of charge at about these temp., indicating an association of the two phenomena. It is suggested that a separation of charge might be expected on sudden freezing by a mechanism similar to that which accounts for the separation of charge on the breaking of a drop.   N. M. B.

Content and determination of actinium and its products in mineral waters. V. I. Baranov and S. G. Zeitlin (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 563—565).—Contents of Ac-*X*, Ac, Ra, and Th-*X* in two Caucasian spring waters and a ferruginous sediment from one of the springs are recorded, and discussed in relation to the mechanism of the removal of the radioelements from underlying deposits. Ra and Ac are conc. in the sediment.   A. J. E. W.

Sounding in the Tanezrouft. N. Menchikoff (*Compt. rend.*, 1942, **214**, 379—380).—A boring at Bidon 5 (Sahara) to a depth of 160 m. shows the presence of H_2O rich in Cl′, $SO_4′′$, Na˙, and Ca˙˙. The existence of these salts is attributed to penetration of the H_2O through a stratum of gypsum, but the presence of H_2O suggests that deeper borings might reach sandstone where a purer H_2O might be expected.   J. W. S.

Fundamental parameter of salt discharge for a clear river bed. B. N. Fortsch (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 278—281).   W. R. A.

Mean geochemical data in relation to oceanic evolution. E. J. Conway (*Proc. Roy. Irish. Acad.*, 1942, **48**, B, 119—159).—Mean compositions of sedimentary rocks and of ocean H_2O are tabulated, and a quant. relationship between oceanic substances and weathered rock is deduced. Geochemical relationships are shown by curves of river H_2O composition plotted against salinity. Geochemical data for Cl′ are discussed for river and surface waters, and equations relating the distance of an isochlor from the sea coast are developed. Data for the mean composition of rain H_2O, and mean loses of bases from rock in a weathering cycle, are discussed. The mean quantities of weathered rock carried by 10^6 parts of river H_2O and their distribution as sediment and dissolved material are calc. A discussion of the geochemical data for $SO_4′′$ indicates that the main source of $SO_4′′$ in river H_2O is from a diffusion of volatile compounds from the shallow seas on the continental shelves.   L. S. T.

Sedimentary origin of cone-in-cone structure. A. Bonte (*Compt. rend.*, 1942, **214**, 498—500).—The primary cause of cone-in-cone structure is the decomp. of organisms which have been buried as a result of rapid sedimentation. The products of decomp. diffuse through channels in the enveloping sedimentary deposit and, as a result of chemical action, a hard concretion is formed around the fossil.   C. R. H.

Theory of the formation of cone-in-cone structure. R. Gay (*Compt. rend.*, 1942, **214**, 500—502).—A physico-chemical interpretation of Bonte's theory (cf. preceding abstract) is offered. The buried organism sets up around itself a series of concentric spherical diffusion regions of $CO_3′′$ which meet and react with parallel diffusion regions of Ca˙˙. Pptn. of $CaCO_3$ takes place in a conic form with the cone pointed to the org. centre and open towards the side of increasing [Ca˙˙]. The colloidal nature of the sedimentary deposit renders the $CaCO_3$ pptn. periodic, the resulting cone-in-cone structure having some analogy with Liesegang rings.   C. R. H.

Meteors. T. E. Sterne (*Astrophys. J.*, 1942, **95**, 437—440).—Rayleigh's and Taylor and Macoll's treatments of shock waves are used to estimate the temp. ($1 \cdot 5$—2×10^6 °) in a meteor moving at 60 km. per sec. through air initially at 180° K., and in the air (7×10^4 °) after subsequent expansion. The actual temp. are lower in each case because of ionisation and dissociation. E. R. R.

Age of the earth according to radioactivity data. E. K. Gerling (*Compt. rend. Acad. Sci. U.R.S.S.*, 1942, **34**, 259—261).—Previous calculations of the age of the earth from the relative abundance of U, Th, and Pb are probably in error owing to the assumption that all Pb is of radioactive origin. The observed isotope ratio for Pb is not in accord with this view. By assuming the galena from Ivigtut, Greenland, which is of relatively low ^{206}Pb, ^{207}Pb, and ^{208}Pb content, to be almost entirely of non-radioactive origin the admixtures of the various isotopes from radioactive sources in other sources of Pb are calc. From these data the average age of the Pb samples is calc. to be 130×10^6 years and the age of the earth 3—4×10^9 years. J. W. S.

Distribution of helium and radioactivity in rocks. IV. Helium age investigations of diabase and granodiorites from Yellowknife, N.-W. Territories, Canada. N. B. Keevil, A. W. Jolliffe, and E. S. Larsen (*Amer. J. Sci.*, 1942, **240**, 831—846).—He indices of a diabase and its constituent minerals are generally > those for the granodiorites that are cut by the diabase. For purposes of correlation the results are untrustworthy. Concentrates containing 75% of magnetite from diabase specimens gave abnormally high results due, probably, to magmatic He trapped during crystallisation, or to deuteric solutions that may have introduced the ilmenite and leucoxene. Pyroxene and olivine were less contaminated by He. Mafic minerals are, in general, more radioactive than felsic minerals. L. S. T.

Radioactivity and helium content of beryllium, boron, and lithium minerals of the U.S.S.R. V. G. Chlopin and S. A. Abidov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 637—640).—The amount of He in cu. mm. per g. of mineral has been determined for 25 Be, 10 B, and 3 Li minerals and also the amounts of Ra and Th present in some Be and B minerals. The amount of He present in the minerals does not depend on the radioactivity of the mineral, the amount of Be, B, or Li, or on the age of the mineral. Tourmalines, spodumenes, and zinnwaldite contain a measurable quantity of He. The most probable explanation of the high He content of these minerals appears to be that, during crystallisation, the minerals captured quantities of relatively short-lived radioactive elements or that He dissolved in the magma was selectively occluded. W. R. A.

Nitre formation in deserts. S. V. Odintzova (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 578—580).—The nature of nitrate deposits in cavities and saline soils in the West Pamir mountains is discussed. The deposits are attributed to N fixation by algæ; blue-green algæ can be grown on Knop and Geitler's medium seeded with rock specimens from the region, and *Gloeocapsa minor* is identified in the growths. The ability of *G. minor* to fix N is confirmed by N determinations before and after cultivation on Bortels' medium. A. J. E. W.

New fluorine mineral occurring in the sublimates of the Klyuchevsky volcano. S. I. Naboko (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **33**, 140—143).—The *mineral*, analysis = $(Na,K)_5(Ca,Mg)_{12}Al_{16}F_{67},22H_2O$, forms a yellow crust on the lava blocks. Spectroscopic amounts of Be, Cu, Co, V, Cr, Zr, Ga, Ba, and Sr are present. The mineral is decomposed by conc. HCl; it is isotropic, with n $1 \cdot 383$. The heating curve shows endothermal terraces at 170°, 710°, and 810°, and an exothermal terrace at 880°. L. S. T.

Chemical composition of the Lovozero loparite, and a method for its analysis. V. S. Bikova (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **33**, 136—139).—Chemical analyses of loparites from malignite, luyavrite, and urtite of genetically-different horizons are recorded. L. S. T.

Deposits of metasomatic contact reaction. D. S. Korjinski (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **33**, 133—135).—Petrological. The composition–paragenesis diagram for metasomatic rocks of the phlogopite deposits of the South Near-Baikal region is reproduced. L. S. T.

New mineral from the region of Lake Inder. G. S. Gorshkov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **33**, 254—256).—The new mineral, *inderborite*, has the formula $CaO,MgO,3B_2O_3,11H_2O$, and is analogous to hydroboracite. It is sparingly sol. in H_2O and cold acids, but dissolves readily in hot HCl. $d = 1 \cdot 928$—$1 \cdot 930$; hardness = $2 \cdot 5$. Optical and crystallographic properties are recorded. A. J. M.

New borate—metahydroboracite. N. J. Ikornikova and M. N. Godlevski (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **33**, 257—258).—The *mineral* has the formula $CaO,MgO,3B_2O_3,11H_2O$; hardness $3 \cdot 5$, d $2 \cdot 00$. (Cf. preceding abstract.) A. J. M.

Bentonite clays of Changhyr-Tash. S. M. Jusupova (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **33**, 259—261).—The composition of bentonite clays has been investigated by the X-ray method. The swelling of the clays in H_2O, EtOH, and kerosene has been studied. A. J. M.

Absolute geological age of the granites of the Podnebesny pluton in the Kuznetsk Alatau. V. K. Monitsch (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **33**, 262—265).—Radiological investigation gives 240—250×10^6 years for the age of these granites. A. J. M.

Relationship between $K[AlSiO_4]$ (low sphalerite), $Ba[Al_2O_4]$, $K[LiSO_4]$, $Na[AlSiO_4]$ (nepheline), and $[Si_2O_4]$ (β-tridymite). W. Nowacki (*Naturwiss.*, 1942, **30**, 471—472).—The lattice structures are compared. F. J. G.

Goyazite in the carboniferous limestones of the Donetz basin. N. V. Logvinenko (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 267—268).—Goyazite belongs to the aluminophosphate group ($2SrO_3,Al_2O_3,2P_2O_2,7H_2O$) and occurs in regular rhombohedral crystals with barite and secondary quartz in carboniferous rocks in the N.E. part of the Donetz basin to $\sim$10—13%. It is colourless, optically uniaxial, positive, birefringence low. It occurs in organogenous limestones and its paragenesis with secondary quartz shows that its formation is connected with hydrothermal processes. W. R. A.

Dolomite flour in the rocks of the Middle Cambrian of the Lena-Baikal watershed. N. V. Frolova (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 413—415).—The occurrence of beds and lenses of dolomite flour is described. The origin of the flour by the preferential dissolution, by dil. acid, of calcite from dolomitic limestone is discussed. L. S. T.

Microcrystalline dolomites, their origin and pseudomorphoses of anhydrite and gypsum after dolomite rhombohedra in the lower Permian deposits of Tataria. L. M. Miropolski (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 572—574).—The genesis of the deposits is discussed, and analyses of nine bore-hole specimens from different depths are recorded and calc. to % of $CaSO_4,2H_2O$, $CaSO_4$, $CaCO_3$, and $MgCO_3$. A. J. E. W.

Essential features of the petrology of the intrusive complex in the neighbourhood of the Yatyrgvarta mountain in the Northern Caucasus. V. A. Zatokovenko (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 651—653).—Geological and petrographic study of the intrusive complex indicate that the intrusion of magma occurred successively from gabbro through intermediate types to granitoids and that all the rocks of the complex belong to the same magmatic cycle. W. R. A.

Complex paragenetic diagram of the Dashkesan [cobalt] deposit. M. A. Karasik (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 401—405).—The diagram shows the processes of mineral formation and the accompanying tectonic movements, magmatic and postmagmatic processes, and the metamorphism of enclosing rocks and metasomatic phenomena. A geochemical table of elements of the Dashkesan intrusive complex is also given. L. S. T.

Free gold in the basic rocks of the district of Kaya (Upper Ivory Coast). L. Baud (*Compt. rend.*, 1942, **214**, 380—382).—Of 87 samples of basic rock from this district examined, 58 contained $0 \cdot 5$—$32 \cdot 75$ g. of free Au per ton. The neighbouring strata of granite contain much less Au and it is inferred that the Au originates from the basic magma. J. W. S.

Dendritic structure of crystallites of native gold. A. I. Fastalovitsch (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 430—431).—In many Au particles and nuggets the crystallites composing them have a dendritic structure, which is described. The dendritic structure is revealed by electrolytic etching of the polished surface of a nugget by 20% aq. KCN containing 1% of NaOH. Dendritic growth of Au crystals render the conditions of formation of ore deposits is widespread. L. S. T.

Morphology and structure of " new " gold. N. V. Petrovskaja (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 427—429).—Au redeposited in a placer occurs frequently in Au placers of the Aldan, Lena, and Djalinda-Urkan regions, affecting the size, shape, and composition of the placer Au. The morphology of this " new " Au is described. L. S. T.

Sulvanite from the Lebedinoye gold ore deposit (Aldan). N. V. Petrovskaja (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 424—426).—Aldan sulvanite (**I**) contains V $3 \cdot 60$, As $7 \cdot 16$, Cu $49 \cdot 40$, S $31 \cdot 66$, SiO_2 not determined, total $94 \cdot 30$%, and spectroscopic amounts of Pb, Bi, Sb, and Ag; a is $5 \cdot 37$ A. Aldan (**I**) is a variety representing an isomorphous mixture of sulvanite and a green modification of enargite. L. S. T.

Zeolites of the Mama-Vitim mica-bearing region. M. N. Schkabara (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 420—423).—A chemical analysis [E. A. Sturm] of chabazite (**I**) is recorded is discussed. The crystallography of (**I**), heulandite, and epidesmine is described. The zeolites of this region belong to hydrothermal segregations which form the subsequent stage of the pegmatite process. L. S. T.

Clarke of mercury in the earth's crust. A. A. Saukov and M. C. Aidinjan (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 358—360).—

From analytical data on 46 Hg-containing rocks from different sources the clarke of Hg in the earth's crust is derived as $7.7 \times 10^{-6}\%$.

W. R. A.

Types of cinnabar crystals from High Ratcha and Abkhasia (Great Caucasus). E. K. Vezirischvili (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 416—419).—Results of goniometric measurements of crystals from Akhei, Boko, and Talakhiani are recorded; the last two form an independent type—the Boko type.

L. S. T.

Chemical composition of leucoxene in Cainozoic bauxite from Boolarra, Victoria. A. B. Edwards (*Min. Mag.*, 1942, **26**, 273—274).—Yellow grains pseudomorphous after ilmenite are abundant in some of the bauxites, which are derived mainly from olivine-basalt. In this highly aluminous matrix it seemed that the mineral might be little-known Al titanate, xanthitane. Analysis, however, gave TiO_2 86·6, Fe_2O_3 + FeO 3·6, SiO_2 1·2, Al_2O_3 0·5, H_2O+ 8·0%, indicating leucoxene, for which the formula is given as TiO_2,nH_2O.

L. J. S.

Datolite and other minerals in a contact-altered limestone at Chapel quarry, near Kirkcaldy, Fife. J. Phemister and A. G. MacGregor (*Min. Mag.*, 1942, **26**, 275—282).—Limestone of Carboniferous age (SiO_2 21·72, TiO_2 0·40, Al_2O_3 4·26, Fe_2O_3 1·00, MnO 0·09, MgO 1·90, CaO 38·82, Na_2O 1·82, K_2O 0·25, H_2O+ n.d., H_2O– 0·41, P_2O_5 0·08, CO_2 26·68, B_2O_3 2·00, FeS_2 0·21, total 99·64%) in contact with a quartz-dolerite sill shows a development of microscopic grains of garnet, datolite, apophyllite, pectolite, and steatite, some of which replace fossils.

L. J. S.

Comparative migration capacity of radium and meso-thorium I. I. E. Starik, N. M. Segel, and V. V. Vereschtschagin (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 252—253).—Comparative leaching of Ra and meso-Th I from selected specimens of chlopinite over 8 years gives a ratio of ~1.

W. R. A.

Ferrithorite in North Kirghizia. I. E. Starik, L. L. Kravtschenko, and O. S. Melikova (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 254—255).—The discovery of ferrithorite (I) in N. Kirghizia and provisional analytical data are reported. (I) has hardness 4·5, fracture conchoidal, lustre pitch-dull, streak brown, xenomorphic, habit columnar. It is confined to the greisenised portions of the aplitic facies of Variscian granites. It is rarely pure and usually has inclusions of quartz, micas, and fluorite. All the SiO_2 is combined with Th and Fe is assumed to be present as a hydroxide.

W. R. A.

"Farinaceous" scheelite from the sub-Polar Urals. V. Vakar (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 265—266).—The occurrence of a scheelite in the sub-Polar Urals is described. It appears to result from frost weathering.

W. R. A.

Essential geological features of the intrusive complex in the neighbourhood of the Yatyrgvarta mountain in N. Caucasus. V. A. Zatokovenko (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 269—271).

W. R. A.

Possible age of allanite from Whiteface mountain, Essex Co., N.Y. J. P. Marble (*Amer. J. Sci.*, 1943, **241**, 32—42).—Age determinations from the ratio Pb/(U + 0·36Th) give a val. of 12×10^8 years for allanite (I) occurring in anorthosite pegmatite near the summit of this mountain. Field investigations indicate that the pegmatite is pre-Cambrian and post-Grenville. Similar determinations for (I) from Cook Shaft, Mineville, N.Y., gave inconclusive results. Chemical analyses of both samples of (I) are recorded.

L. S. T.

Occurrence of mineralisation in Caledonian deposits. C. P. Guimarães (*Ann. Acad. Brasil. Sci.*, 1942, **14**, 207—223).—Brazilian (Cantinho) deposits of willemite have been produced by hydrothermal action on Zn blende.

F. R. G.

Constituents of surface of formations. B. Brajnikov (*Compt. rend.*, 1942, **214**, 374—377).—The factors which determine the stability of surface rocks are classified as sp. (chemical composition, cryst. or colloidal state and its degree of ageing, dimensions and form of the particles, and the electrostatic charge of the rock particles) or due to the medium (composition, pH val., and temp., and the presence or otherwise of organisms). The relative effects of these properties are discussed.

J. W. S.

Granitisation of hornsfelsed sediments in the Newry granodiorite of Goraghwood Quarry, Co. Armagh. D. L. Reynolds (*Proc. Roy. Irish Acad.*, 1943, **48**, B, 231—267).—Petrological. Geochemical migrations occurring in the granitisation are summarised and represented diagrammatically. Numerous chemical analyses are recorded.

L. S. T.

Lueneburgite from the Stebnik potassium salt deposit. M. N. Godlevski and A. A. Ivanov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 351—353).—Preliminary analytical data are given and discussed.

W. R. A.

New sulphates from the Blyava sulphate deposit (South Urals). T. N. Schadlun and J. S. Nesterova (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 354—357).—The presence of sosmolnskite, roemerite, and potash alum in the Blyava deposit has been established and what was previously thought to be barite has been shown to be anglesite.

W. R. A.

Newly-discovered minerals in the pegmatites of Adun-Cholon (Transbaikalia). E. I. Nefedov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 361—364).—The following additional minerals have been found in the pegmatites of Adun-Cholon: bismuth, bismuthine, cassiterite, zircon, rutile, brookite, stuverite, psilomelane-wad, opal, calcite, yttroparisite (a new mineral), scheelite, apatite, kaolinite, chlorite, phlogopite, and orthite.

W. R. A.

Relationships of the higher arsenides of cobalt, nickel, and iron, occurring in nature. R. J. Holmes (*Science*, 1942, **96**, 90—92).—Minerals have been examined microscopically and by X-rays, and in some cases synthesised. The isometric diarsenides, RAs_2 (smaltite, chloanthite, and arsenoferrite), are discredited, since they have the same crystal structure as, and are considered identical with, the triarsenides (skutterudites). A revised classification includes safflorite [$(Co,Fe)As_2$], rammelsbergite ($NiAs_2$), pararammelsbergite ($NiAs_2$), and löllingite ($FeAs_2$) as orthorhombic arsenides, and skutterudite ($CoAs_3$), Ni-skutterudite [$(Co,Ni)As_3$], and Fe-skutterudite [$(Fe,Co)As_3$] as isometric triarsenides.

E. R. R.

Dolomitisation in the eastern massif of the Ishimbaevo oil region. G. I. Teodorovitsch (*Compt. rend. Acad. Sci. U.R.S.S.*, 1942, **34**, 199—201).—The deposits of the central shallow bay of this massif are characterised by an alternation of anhydrite-bearing dolomites, spotted anhydrite-dolomitic rocks, dolomitic limestones containing anhydrite, and occasionally pure limestones. The process of dolomitisation suggested by a petrographic examination of core samples of these deposits is discussed.

L. S. T.

Goethite and lepidocrocite. M. A. Peacock (*Trans. Roy. Soc. Canada*, 1942, [iii], **36**, IV, 107—118).—Goethite (I), α-FeO·OH, and lepidocrocite (II), γ-FeO·OH, are the only hydrates of Fe oxide entitled to rank as mineral species. (I) from Steeprock Lake, Ontario, has a_0 4·587, b_0 9·937, c_0 3·015 A.; space-group $D_{2h}^{16} - Pbnm$; $\rho_{calc.}$ 4·264, $\rho_{obs.}$ 4·264 and 4·266. (II) from Eiserfeld, Siegen, Westphalia, has a_0 3·86, b_0 12·50, and c_0 3·06 A.; space-group $D_{2h}^{17} - Amam$; $\rho_{calc.}$ 3·97, $\rho_{obs.}$ 3·854. Morphological, form, and X-ray data are recorded.

L. S. T.

Paragenetic groups of minerals in the principal types of soils. I. D. Sedletzki (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 435—438).—The mineralogical composition of thin fractions $< 0.2 \mu$. of different types of soil formed on country rocks of the Soviet Union is tabulated and discussed.

L. S. T.

Röntgen-mineralogical study of the loess soils in the vicinity of Tashkent. S. M. Jesupova (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 575—577).—The particle-size distribution for soils from different depths is studied, and the composition [including montmorillonite (I), kaolinite (II), quartz, muscovite-sericite, and halloysite] of fractions of particle-size $\not> 2 \mu$. is determined qualitatively from X-radiograms. Non-settling loess contains much (I), whereas in settling loess (II) predominates.

A. J. E. W.

Modern concepts of the physical constitution of coal. G. H. Cady (*J. Geol.*, 1942, **50**, 337—356).—A review.

L. S. T.

Optical dispersion for coals. C. G. Cannon and W. H. George (*Nature*, 1943, **151**, 225).—Curves are given for isotropic and anisotropic coals. It appears that the refracting material varies but little with the rank of the coal. The results for the latter would be consistent with a large-scale structure in which anisotropic units occur with preferred orientation.

A. A. E.

Refractive index of coals. C. G. Cannon and W. H. George (*Nature*, 1943, **151**, 53—54).—Vals. of n parallel and perpendicular to the bedding plane of the coals are tabulated for λ 7000 A. The latter increase with geological age to a const. max. of ~1·9 for anthracitic coals; the former first increase with "rank" and then decrease. The development of optical anistropy coincides with the disappearance of coking properties.

A. A. E.

Vanadium, nickel, and copper in petroleum of the Urals and Volga region. L. A. Guliaeva, E. S. Itkina, and I. I. Romm (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **32**, 406—409).—Data showing the V, Ni, and Cu content in the ash of oils from the Second Baku are recorded and discussed in relation to those for oils from other districts. V_2O_5 + NiO + CuO constitute $>50\%$ of the ash, and are part of the org. substance of the oil. The contents are V $12.7 \times 10^{-3}\%$, Ni $4.3 \times 10^{-3}\%$, and Cu $2.48 \times 10^{-4}\%$. V and Ni, but not Cu, are most intimately connected with the S and asphaltene contents.

L. S. T.

Surface energy relationships in petroleum reservoirs. H. K. Livingston (*Amer. Inst. Min. Met. Eng. Tech. Publ.* 1526, 1942, 6 pp.).—Data for surface and interfacial tensions, spreading pressures, and contact angles for H_2O, C_7H_{16}, and SiO_2 are presented, and their application to the evaluation of capillary rise (r) and displacement pressure (p) in oil fields is discussed. r and p and rate of fluid flow are affected by the presence of certain surface-active substances, *e.g.*, org. acids, N and S compounds, that may exist naturally or may have been added in the course of oil production.

T. C. G. T.

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