BRITISH CHEMICAL
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A I—GENERAL, PHYSICAL, AND INORGANIC CHEMISTRY

CONTENTS

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BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS

A I—General, Physical, and Inorganic Chemistry.

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I.—SUB-ATOMICS.

Direct derivation of Balmer spectra. D. D. Kosambi (*Current Sci.*, 1944, **13**, 71—72).—Mathematical. N. M. B.

Energy transport by radiation in resonance lines of gases. R. Mannkopff (*Z. Physik*, 1943, **120**, 301—317).—The transference of energy between different portions of a gas at different temp. by radiation and absorption in resonance $\lambda\lambda$ is calc. for limited and unlimited vol. The result is applied to energy transference in the electric arc. L. J. J.

Structure of the second spark spectrum of bromine, Br III. K. R. Rao (*Current Sci.*, 1944, **13**, 72).—Many intercombination lines in the optical and vac.-grating region have been identified. The interval $4p^4S_{3/2}$—$4p^2D_{3/2}$ is 15042 cm.$^{-1}$ and $4p^2D_{5/2}$—$4p^2P_{1/2}$ is 10613 cm.$^{-1}$ N. M. B.

Quadrupole moment of the atomic nucleus $^{181}_{73}$Ta. T. Schmidt (*Z. Physik*, 1943, **121**, 63—72).—The hyperfine structure of the terms $5d^36s^2$, $^4F_{3/2,\ 5/2,\ 9/2}$ and $^4P_{3/2}$ of the Ta I spectrum is studied by means of a Fabry–Perot interferometer, and the coupling consts. are found. The mathematical method for calculating the quadrupole moment (involving the use of matrices) is presented and the val. of the moment is found to be $+6 \times 10^{-24}$. L. S. G.

***K* Absorption spectra of elements with atomic numbers 71 (Lu), 70 (Yb), 68 (Er), 66 (Dy), 64 (Gd), and 63 (Eu).** (Mlle.) I. Manescu (*Compt. rend.*, 1943, **217**, 69—71).—The *K* absorption spectra of the above elements have been investigated, and the principal discontinuities determined. A. J. M.

Auger transitions and widths of *X*-ray energy levels. J. N. Cooper (*Physical Rev.*, 1944, [ii], **65**, 155—161).—Since rapid variations of line width with at. no. are to be expected when sudden changes in Auger transition probabilities occur, at. no. ranges where large variations might be expected were studied. Part of the width variation of $L\beta_3$ for elements 73—92 is attributed to the Auger transitions $M_{III} \rightarrow M_{V}N_{IV,\ V}$. The transitions $N_{II} \rightarrow N_{III}O_{II,\ III}$, $N_{II} \rightarrow N_{IV,\ V}N_{IV,\ V}$, and $N_{III} \rightarrow N_{IV,\ V}N_{IV,\ V}$ explain an intensity anomaly of $M\zeta$ for elements 38—58. Other irregularities are correlated. Evidence supports the theory that Auger transitions are primarily responsible for anomalous changes in line width. N. M. B.

Ionisation cross-section of the silver L_{III} state. J. J. G. McCue (*Physical Rev.*, 1944, [ii], **65**, 168—175).—Measurements were obtained by observing the intensity of the $L\alpha$ doublet radiation from a thin Ag target bombarded by cathode rays of energy $\geqslant 9$ times the excitation energy of the L_{III} state, and correcting for effects of diffusion, rediffusion, and retardation of the cathode rays. Cross-sections agree fairly well with calculations based on the Born approximation, but are outside estimated experimental error. N. M. B.

***L X*-Ray spectrum of radium-*D*.** M. Valadares (*Portugaliae Physica*, 1944, **1**, 73—75).—Apparatus for the investigation of the *X*-ray spectrum of Ra-*D* is described. 0·04 g. of Ra is used. A. J. M.

Photo-electric primary current in crystals of alkali halides. F. Domanic (*Ann. Physik*, 1943, [v], **43**, 187—192).—The photo-electric primary current in KCl and KBr crystals, measured by the product of quantum yield and electron path in unit field, shows approx. the same dependence on temp. and concn. of *F*-centres when *F'*-centres are taken as electron sources as when *F*-centres act as such sources. A. J. M.

Secondary emission of films of pure metals in ordered and disordered states and their transparency to electrons. R. Suhrmann and W. Kundt (*Z. Physik*, 1943, **120**, 363—382).—The yield of secondary electrons at 83° K. from thin films of Cu, Ag, Au, and Be condensed on glass has been studied as a function of the primary electron acceleration voltage. The films pass from a disordered to an ordered at. configuration on heating momentarily to room temp. In the ordered state the yield of secondary electrons is smaller, particularly from fast primary electrons. The effect is correlated with an increase in the electron-transparency of the films, particularly for fast electrons, on passing to the ordered state, but this effect is insufficient to account for the difference in yield, which is partly due to a decrease in the no. of secondarily-emitting centres. L. J. J.

Conversion factors from international to absolute electrical units. U. Stille (*Z. Physik*, 1943, **121**, 34—53).—The vals. of the conversion factors are studied as a preliminary to a discussion of the vals. of the at. consts. (the latter being derived from new and precise measurements of e, e/m_0, and h/e; see following abstract). The best vals. at present are found to be 1 international ohm = $1{\cdot}00049 \pm 0{\cdot}00002$ abs. ohms and 1 international amp. = $0{\cdot}9999 \pm 0{\cdot}0001$ abs. amp. L. S. G.

The atomic constants e, e/m_0, and h. U. Stille (*Z. Physik*, 1943, **121**, 133—200).—The experimental data available for the determination of at. consts. are collected and discussed. The following vals. are taken as established for velocity of light in vac. (c_0), induction const. (μ_0), influence const. (ε_0), sp. mol. no. (N_L) and sp. ionic charge (F): $c_0 = 2{\cdot}99777 \pm 0{\cdot}00020 \times 10^8$ m. per sec., $\mu_0 = 1{\cdot}25602 \pm 0{\cdot}00002 \times 10^{-6}$ v. sec./amp. m., $\varepsilon_0 = 8{\cdot}8594 \pm 0{\cdot}0014 \times 10^{-12}$ amp. sec./v. m., $N_L = 6{\cdot}0243 \pm 0{\cdot}0048 \times 10^{26}$ k.-mol.$^{-1}$, and $F = 9{\cdot}6520_3 \pm 0{\cdot}0006 \times 10^7$ A. sec./k.-equiv.; the last two vals. refer to the physical at. wt. scale. The vals. found for the electronic charge (e), sp. electronic charge (e/m_0), and the Planck const. (h) are: $e = 1{\cdot}6022 \pm 0{\cdot}0014 \times 10^{-19}$ coulomb, $e/m_0 = 1{\cdot}759_3 \pm 0{\cdot}002 \times 10^{11}$ coulomb per kg., and $h = 6{\cdot}619 \pm 0{\cdot}010 \times 10^{-34}$ w. sec.^{2} Vals. for the Rydberg const. (R_∞) and the Sommerfeld fine structure const. (α), calc. from the best available data, are: $R_\infty = 10{,}973{,}730{\cdot}4 \pm 7{\cdot}8$ m.$^{-1}$ and $\alpha = (136{\cdot}95 \pm 0{\cdot}13)^{-1}$. There is no ground for assuming any deviation from the fundamental theoretical laws on the basis of existing experimental data. L. J. J.

Atomic-reaction apparatus for potential differences up to 1 million volts. M. von Ardenne (*Z. Physik*, 1943, **121**, 236—267).—The apparatus is described in detail. A van de Graaff band-generator working at atm. pressure and a multi-stage discharge tube are employed. The discharge tube operates with electrons, protons, or deuterons at will, with a beam strength of ~35 μa., and gives a Ra–Be equiv. for the Li + D reaction of ~65 g. of Ra. The energy consumption is minimised by the use of beam focussing by means of a directing electrode. The pumping speed required is 30 l. per sec. and 20% of the generator current is available in the beam. L. J. J.

New type of electron. A. Proca (*Portugaliae Physica*, 1944, **1**, 59—65).—Relativity considerations suggest the existence of a particle differing from the Dirac electron. Though it has the same mass, charge, and spin as the Dirac electron, its energy varies. A. J. M.

Mobilities of electrons in helium. F. L. Jones (*Proc. Physical Soc.*, 1944, **56**, 239—248).—Mobilities are calc. over the range Z/p = 0·5—3·0 v. per cm. per mm. Hg on the basis of an energy distribution formula previously found applicable to the electron energy range for excitation and ionisation in the uniform positive column in He (cf. A., 1936, 771). When the observed variation of at. cross-section with electron velocity is taken into account, the calc. mobilities show good agreement with accepted measured vals. N. M. B.

Mobility of free electrons in argon. P. Herreng (*Compt. rend.*, 1943, **217**, 75—77).—A method of determining the velocity of free electrons in a gas under the action of a uniform electric field consists in ionising a thin section of the gas by very short periodic bursts of *X*-rays, and studying the variation of current in the chamber circuit by means of an oscillograph. Results agree well with those of other workers. The mobility is a function of the ratio E/p (E = intensity of field, p = pressure of gas). The mobility is plotted against E/p and the results are discussed. A. J. M.

Scattering and polarisation of fast electrons by heavy elements. C. B. O. Mohr (*Proc. Roy. Soc.*, 1943, **A, 182**, 189—199).—The results of a previous paper (A., 1941, I, 191) are applied to the calculation of the scattering and polarisation of electrons with 5·4 to 1060 ke.v. energy by the at. field of Au. Even at the highest energies the angular distribution of the scattering does not exhibit a monotonic fall with increasing angle. The asymmetry in double scattering reaches a max. val. which is large at angles >90°. In connexion with the discrepancies between different observers for the scattering and polarisation at 90°, it is shown that the addition of a long-range repulsive field to the field of the atom reduces the asymmetry in double scattering by a large factor. G. D. P.

Influence of adsorbed oxygen on the secondary emission of evaporated metallic layers at 293° and 83° K. R. Suhrmann and W. Kundt

(*Z. Physik*, 1943, **121**, 118—132).—Layers of Cu, Ag, Au, Cd, and Be are evaporated onto glass in a vac. and then exposed to O_2 for a short time at room temp. The layers are then placed in a vac. and the variation of the secondary emission with the energy of the primary electrons, both at room temp. at liquid air temp. is studied. The yield is only slightly changed in the case of Cu, Ag, and Au at room temp., but at 83° K. the yield with primary electrons of 100 e.v. increases reversibly by 100% and the max. yield is given for smaller primary electron energy. The effect decreases after several hr. In the case of Be and Cd the yield at room temp. is greatly increased by adsorption of O_2 but the increase on cooling to 83° K. is negligible. L. S. G.

Application of *X*-ray impulses for the determination of the probability of the attachment of electrons to oxygen molecules. P. Herreng (*Compt. rend.*, 1943, **217**, 135—137).—The principle of the method is to ionise a thin section of the gas in a sealed tube by periodic intense *X*-ray impulses. Each impulse gives rise to a brief current in the chamber circuit due to the displacement of electrons and positive ions under the action of the field between the electrodes. This current is amplified and studied by means of an oscillograph. Mixtures of A and O_2 were used. The method has the advantage of being direct and involving no hypothesis concerning the rate of decrease of the no. of electrons. The curve of the probability, *h*, of the taking up of an electron against the kinetic energy of the electrons agrees with that obtained by other workers. The theoretical curve of Bloch *et al.* (A., 1935, 1439) does not show the observed min. and max. The discrepancy is explained qualitatively. A. J. M.

Velocity distribution of electrons in field-emission. E. W. Müller (*Z. Physik*, 1943, **120**, 261—269).—The velocity distribution of field electrons is calc. on the basis of the tunnel-effect hypothesis and quantitatively computed for a W cathode. Experimental data obtained by the action of an opposing p.d. are in agreement. L. J. J.

Resolving power of the field electron microscope. E. W. Müller (*Z. Physik*, 1943, **120**, 270—282).—The diffuseness of the image produced by the field electron microscope is largely due to variable electronic velocity. The radius of curvature of the emitting point of the cathode and the lateral magnification can be calc. from the emission law and the diffuseness due to velocity variation computed. At high magnifications and small cathodic radii of curvature the effect of diffraction of the electron beam becomes appreciable. The highest resolution so far attained (10 A.) is limited by cathode surface defects. L. J. J.

Resolution of the electron microscope for emitting sources. A. Recknagel (*Z. Physik*, 1943, **120**, 331—362).—The electronic emission microscope was replaced by a homogeneous accelerating field and an aberration-free electron lens for calculation of the resolution limit by the Schrödinger wave equation. The effects of spherical and chromatic aberration and wave characteristics on the resolution can be calc. The resolvable dimension is of the order of the wave-length reaching the cathode, and decreases with increasing field strength. The Mecklenburg microscope should give a resolution of ~5 mμ. Cutting off the boundary rays does not improve resolution, but makes focussing less crit. L. J. J.

Apertures of transmission-type electron microscopes using magnetic lenses. L. Marton and R. G. E. Hutter (*Physical Rev.*, 1944, [ii], **65**, 161—167).—Mathematical. Optimum conditions for size and location of apertures are stated for magnetic lenses of the axial field distribution $H(z) = H_0/[1 + (z/a)^2]$. The behaviour of the condenser lens–objective lens system with respect to the angular aperture of the illuminating electron beam is discussed. N. M. B.

The positive column with a curved discharge path. T. Wasserrab (*Z. Physik*, 1943, **121**, 54—57).—Density distributions are determined in the case where the discharge takes place in the space between two concentric cylinders. The density is given in terms of Bessel functions and the results are presented in graphical form. L. S. G.

Refractive index of an ionised medium. II. (Sir) C. Darwin (*Proc. Roy. Soc.*, 1943, **A**, **182**, 152—166).—A formula obtained previously (A., 1934, 1137) is confirmed by analysis of the perturbation of the path of an electron by the light during a collision with a proton. The result is believed to be generally true although it is not proved for unsymmetrical charges arbitrarily oriented. G. D. P.

Origin of the *E* layer of the ionosphere. J. Gauzit (*Compt. rend.*, 1943, **217**, 179—181).—A mechanism by which a considerable no. of electrons might be produced at an altitude corresponding to the *E* layer is proposed. Two metastable ^1S atoms of O could combine by double collision to form an ionised mol. and an electron. This would give an energy of 13·5 e.v., which is > the energy of ionisation of the mol. formed. The complete mechanism is thus photochemical dissociation of O_2, excitation by triple collision of the O atoms to the ^1S state, and the combination of the ^1S atoms with liberation of an electron. This last stage could proceed throughout the night. Ionisation during the night could also be explained by a combination of the last stage with the mechanism proposed by Martyn *et al.* (A., 1936, 816). There is probably some connexion between the ionisation of the *E* layer and the intensity of the green line of the night-sky spectrum, since they both depend on the concn. of ^1S atoms of O in the upper atm. A. J. M.

Experiments on and theory of the action of the Geiger point counter. J. Morgan and J. L. Bohn (*J. Franklin Inst.*, 1944, **237**, 371—384).—The relationship between the p.d. of the electrodes and the distance of the point electrode from the end of the cylinder has been investigated for a no. of different cylinders and caps. The relationship between p.d. and counter gas pressure has also been investigated. The efficiency of various points was studied. Unprepared Cu points would not function for >1—2 hr. Steel needles ground down to points behaved similarly. A ground steel point did not retain its sensitivity after use but had to be re-ground. Smooth darning needles were the most satisfactory. The theory of the counter is discussed on the basis of Zeleny's view that a high-resistance layer of adsorbed gas exists at the point. It is also assumed that the field at the point at the onset of "self-counting" is sufficient to produce auto-electronic emission. Probability considerations account for selective counting of different ionising agents in certain voltage ranges, for the dependence of counting on the path of ionising rays through the chamber, and for the increase of counts with increase of voltage from the threshold of counting to the point where all rays are registered. A. J. M.

Polygonal surface and the periodic classification of the elements. G. Haenzel (*Z. Physik*, 1943, **120**, 283—300).—The representation of the periodic system as a series of points on a geometrical surface corresponding with the wave-mechanical characteristics of the elements is described. L. J. J.

Micro-balance determination of the at. wt. of nitrogen enriched in ^{15}N. K. Clusius and E. Becker (*Z. anorg. Chem.*, 1943, **251**, 92—95).—By means of the micro-balance, an at. wt. of 14·06 has been found for N enriched in ^{15}N by the NH_4^+–NH_3 exchange reaction. This corresponds with 5·6% of ^{15}N. F. J. G.

Masses of ^{35}Cl and ^{37}Cl. A. Gibert, F. Roggen, and J. Rossel (*Portugaliae Physica*, 1944, **1**, 43—46).—The bombardment of Cl_2 by rapid neutrons gives evidence of a no. of reactions which are difficult to identify. If slow neutrons are used only one reaction occurs, viz., $^{35}_{17}Cl + ^1_0n = ^{35}_{16}S^* + ^1_1H + q$. The max. val. for the energy, *q*, of this reaction is 1·16 me.v., and this fixes the upper limit for the mass of ^{35}Cl as 34·98054. A. J. M.

Spectrography of γ-rays emitted by the active deposit in the slow evolution of radon. L. Salgueiro (*Portugaliae Physica*, 1944, **1**, 67—71).—The results of investigations of the γ-radiation emitted in the transmutation Ra-*D* → Ra-*E* by absorption, magnetic spectrography, and crystal diffraction are compared. The spectrographic method has been further investigated and γ-rays of λ 267 X. have been detected. Rays of λ 285—295 X., identified by Rasetti and Amaldi, could not be detected after 240 hr. exposure. A new ray, λ 396 X., has been found. A. J. M.

γ-Rays and the nuclear excitation levels of the active deposit of actinium. J. Surugue (*J. Phys. Radium*, 1942, [viii], **3**, 71—77).—Available data on the radiations of disintegration products of Ac are summarised. γ-Rays from successive disintegrations are analysed and conclusions as to the excitation states of the product nuclei and the nature of the radiations arising from their return to the fundamental state are discussed. N. M. B.

Behaviour of disintegration recoil particles in a gaseous medium. A. Berthelot and (Mlle.) T. Yuasa (*J. Phys. Radium*, 1942, [viii], **3**, 96—104).—The tracks of recoil products from the disintegration of Ac and Ac-*A* were studied by the Wilson-chamber method at very low pressure. The at. impact cross-section is 10^{-17} sq. cm. A study of H atom recoil particles gives the velocity–range relation for low-energy protons. The possible rôle of H_2O micro-drops in various observed phenomena is discussed. N. M. B.

β-Radiation of actinium. M. Lecoin and (Mlle.) M. Perey (*Compt. rend.*, 1943, **217**, 106—108).—The upper limit of the β-spectrum of Ac, given by Hull *et al.* (A., 1935, 558, 1295) as 220 ke.v., has been re-investigated, using a Wilson chamber at low pressure. At 20 cm. pressure, no β-rays of energy >100 ke.v. were found. Of 1150 tracks, 240 had energy >20 ke.v., 650 had energy between 10 and 20 ke.v., and 240 <10 ke.v. One β-ray is emitted per 12 atoms of Ac disintegrating. The β-rays must be of secondary origin and correspond to an internal conversion of a γ-ray of energy 30—40 ke.v. at the *L*-level. It is probable that the primary β-radiation from Ac has energy <5 ke.v. A. J. M.

γ-Radiation of actinium and actinium-*K*. M. Lecoin, (Mlle.) M. Perey, and S. T. Tsien (*Compt. rend.*, 1943, **217**, 146—148).—γ-Rays emitted from Ac + Ac-*K* are investigated. The absorption curve in Al shows the presence of three groups of rays, γ_A, γ_B, γ_C, of energies 15·6, 36, and 98 ke.v., and relative intensities 140 : 1 : 5. When pure Ac-*K* is used, a similar method shows the existence of only two components of energy 15·3 and 95 ke.v. respectively, the

ratio of intensities being 2 : 1. The intensity of the 95-ke.v. component is ~70% of the intensity of γ_C, and it is probable that the original γ_C component arises from Ac-*K* in the mixture. The γ_A group can be ascribed to the *X*-ray *L*-spectra of radio-Ac and Ac-*X*, disintegration products of Ac and Ac-*K*. The γ_B group is due to Ac alone. The existence of the weak γ_B group is confirmed by investigating the γ-ray absorption from Ac + Ac-*K* by various elements of at. no. 48—62. The energy of γ_B is thus found to be $38{\cdot}8 \pm 0{\cdot}7$ ke.v., and absorption experiments with Ac-*K*, radio-Ac, and Ac-*X* confirm that it arises from Ac alone. A. J. M.

Absorption of slow neutrons in rare earths and in cadmium. H. Bomke and H. Reddemann (*Z. Physik*, 1942, **120**, 56—68).—Effective cross-sections of 13 rare earth elements for thermal neutrons have been determined in very pure preps., giving the vals. Y 4, La 10, Tb 15, Nd 72, Sm 7040, Eu 2700, Gd 22,550, Dy 780, Ho 52, Er 185, Tu 114, Yb 50, Cp 165 sq. cm. $\times 10^{-24}$. The absorption cross-section of Cd for C-neutrons gave the val. 2640 $\times 10^{-24}$ sq. cm. L. J. J.

Activation cross-section of iodine in different forms, with neutrons. F. Knauer (*Z. Physik*, 1942, **120**, 103—106).—The effective cross-section of I, for activation by slow neutrons, is the same within 2—3% in I^-, IO_3^-, I (solid), and HIO_3 (solid). L. J. J.

Effective cross-sections for absorption of slow neutrons. H. Volz (*Z. Physik*, 1943, **121**, 201—235).—Existing methods of measuring effective collision cross-sections with slow neutrons are critically reviewed. A new method is described, in which plane laminæ are immersed in H_2O in which a const. concn. of thermal neutrons is maintained. The concn. in the immediate neighbourhood of the surface of the lamina is measured by means of a thin thermal-neutron indicator, and compared with that in the original uniform neutron field. Measurements of the effective collision cross-sections of 49 elements show a completely random distribution of vals. as a function of at. wt. Where the present method gives results differing from earlier vals., the present vals. are nearer those obtained from activity data. An additional absorption process is indicated in only a few cases, *e.g.*, Ta and Bi. L. J. J.

Effective cross-section of technical aluminium for the capture of slow neutrons. J. Gehlen (*Z. Physik*, 1943, **121**, 268—284).—The effective cross-section of technical Al for capture of slow neutrons, determined by absorption measurements in paraffin, gives the val. $q_{Al} = 0{\cdot}43 \pm 0{\cdot}07 \times 10^{-24}$ cm.^{2}, and determined by comparison with the known val. for Ag gives $0{\cdot}19 \pm 0{\cdot}02 \times 10^{-24}$ cm.^{2} The half-val. periods for the nuclear processes involved are determined, viz., Ag, short period $33{\cdot}2 \pm 2$ sec., long period $148{\cdot}5 \pm 1{\cdot}5$ sec.; Al, 140 ± 2 sec. The ratio of intensities of short to long Ag periods is $3{\cdot}8 \pm 0{\cdot}6$ for saturation with slow neutrons. L. J. J.

Approximation formula for the effective cross-section, $\sigma_{eff.}$, of slow neutrons for a $1/v$ absorber. N. Koyenuma (*Ann. Physik*, 1943, [v], **43**, 279—283).—Mathematical. A. J. M.

Preliminary determination of the intensity of a neutron generator. M. Morand and E. Cotton (*Compt. rend.*, 1943, **217**, 145—146).—The generator employs bombardment of LiOH by deuterons, and gives an intensity of neutrons equiv. to that from 96 millicuries of Rn + Be. A. J. M.

Neutron emission of the uranium nucleus as a result of its spontaneous disintegration. W. Maurer and H. Pose (*Z. Physik*, 1943, **121**, 285—292).—Measurements with 9 kg. of U showed a spontaneous neutron emission with a half-val. period of $2{\cdot}5 \times 10^{15}$ years for ^{238}U. L. J. J.

Spontaneous neutron emission from uranium and thorium. H. Pose (*Z. Physik*, 1943, **121**, 293—297).—Measurements of spontaneous neutron emission by U and Th were carried out in a mine in order to avoid cosmic-ray effects. Half-val. periods of $3{\cdot}1 \times 10^{15}$ years and $1{\cdot}7 \times 10^{17}$ years were found for ^{238}U and ^{232}Th, respectively. L. J. J.

Spontaneous disintegration of uranium and its neighbouring elements. S. Flügge (*Z. Physik*, 1943, **121**, 298—300).—For U isotopes, life periods are calc. as $9{\cdot}1 \times 10^{19}$ sec. for ^{234}U, $8{\cdot}7 \times 10^{20}$ sec. for ^{235}U, $8{\cdot}3 \times 10^{23}$ sec. for ^{238}U, giving for the relative activities in normal U 6%, 82%, and 12%, respectively. Th, Io, and Pa give $8{\cdot}5 \times 10^{25}$, $8{\cdot}1 \times 10^{23}$, and $8{\cdot}9 \times 10^{20}$ sec., respectively. For elements of mass. no 239, vals. are $8{\cdot}1 \times 10^{24}$ sec. for $Z = 92$, $7{\cdot}8 \times 10^{20}$ sec. for $Z = 93$, and $8{\cdot}3 \times 10^{16}$ sec. for $Z = 94$. L. J. J.

Coefficients of internal conversion in the isomeric transition, $^{80}Br^* \rightarrow {}^{80}Br$. A. Berthelot (*Compt. rend.*, 1943, **217**, 44—46).—1·39 conversion electrons are emitted per transition. This indicates that there are two types of transition involved, two different quanta, of energy 49 and 37 ke.v., being emitted. It is the transition of energy 49 ke.v. which determines the half-life of $^{80}Br^*$. A. J. M.

Simultaneous emission of two conversion electrons in the isomeric transition $^{80}Br^* \rightarrow {}^{80}Br$. A. Berthelot (*Compt. rend.*, 1943, **217**, 108—110).—The two emissions of energy of 49 and 37 ke.v. (see preceding abstract) are shown to occur simultaneously by the use of coincidence counters. A. J. M.

β-Decay. E. J. Konopinski (*Rev. Mod. Physics*, 1943, **15**, 209—245).—A comprehensive survey, with bibliography, of theory, with illustrative available data, covering allowed and forbidden spectra and transitions, life times, selection rules, and *K* capture. N. M. B.

Production of penetrating showers. L. J. Jánossy and G. D. Rochester (*Proc. Roy. Soc.*, 1943, **A**, **182**, 180—188).—It is shown that about one third of the radiation producing penetrating showers is non-ionising and more penetrating than photons. The intensity of this non-ionising (*N*-)radiation is ~0·001% of the full cosmic radiation near sea level. It is suggested that the *N*-radiation consists of neutrons and that it is the energetic part of the penetrating non-ionising component of cosmic radiation. G. D. P.

Anomalous rate of nuclear disintegration effected by cosmic rays. A. P. Zhdanov, N. A. Perfilov, and M. Y. Deisenrod (*Physical Rev.*, 1944, [ii], **65**, 202—203).—A preliminary report of disintegrations, reaching 10^3 times the normal rate, observed in the period 23 Nov.—1 Dec., 1942, on unradiated, thickly-coated photographic plates developed 3 days after prep. Possible explanations are suggested. N. M. B.

Method of shower anticoincidences for measuring the meson component of cosmic radiation. V. Sarabhai (*Physical Rev.*, 1944, [ii], **65**, 203—204).—A method is described for estimating the intensity of slow mesons which would be liable to be cut out by absorbers filtering the soft electronic component. Preliminary results for various altitudes are reported and discussed. N. M. B.

Spin of the meson. S. K. Chakrabarty and R. C. Majumdar (*Physical Rev.*, 1944, [ii], **65**, 206).—Mathematical. N. M. B.

Impact of a wave-packet and a reflecting particle. H. E. Ives (*J. Opt. Soc. Amer.*, 1943, **33**, 163—166).—Using only the Newtonian principles of conservation of mass, momentum, and energy and classical wave theory, a general study is made of the impact of wave-packets, *i.e.*, wave-trains of definite length, on reflecting particles, and the variation of mass with velocity is derived. It thus seems probable that all behaviours characteristic of the restricted theory of relativity may be obtained from earlier principles. W. J.

Impact of a wave-packet and an absorbing particle. H. E. Ives (*J. Opt. Soc. Amer.*, 1944, **34**, 222—228).—The more complicated problem of an absorbing particle is treated in the same general way as the case of a reflecting particle (see preceding abstract). By considering the production of heat, *i.e.*, kinetic energy of the atoms or sub-particles of which the absorbing particle is composed, and the change of mass of these atoms due to their motion, the overall change of mass of the absorbing particle is obtained, and the equation of motion derived. The present study deals with a stationary absorbing particle, a system in uniform motion, and pressure of radiation on an absorbing particle. B. S. C.

Representation of interactions between neutrons and protons brought about through the intermediary of a particle of spin 2. G. Petiau (*Compt. rend.*, 1943, **217**, 103—104).—Mathematical. A. J. M.

Theory of hysteresis curves. A. Hempin (*Compt. rend.*, 1943, **217**, 137—139).—Two magnetisation processes are considered: (1) reversible magnetisation, and (2) magnetisation by irreversible displacement of the boundaries separating the areas of influence of Weiss magnetons at 180° to each other. A peculiarity in the Barkhausen effect is discussed. A. J. M.

Finite self-energies in radiation theory. III. A. Landé and L. H. Thomas (*Physical Rev.*, 1944, [ii], **64**, 175—184; cf. A., 1942, I, 37).—Mathematical. N. M. B.

II.—MOLECULAR STRUCTURE.

Theory of intensity distribution. [Standardisation of photographs of continuous spectra.] G. Wilkens (*Ann. Physik*, 1943, [v], **43**, 73—90).—The conditions necessary for a projected spectrum (*e.g.*, on a photographic plate) to reproduce the true relation of intensity to ν are formulated. A plane projection is unsuitable for intensity measurements on a continuous spectrum. L. J. J.

Application of new analysis of molecular spectra to interesting molecules. Study of a new series of low frequencies. H. Deslandres (*Compt. rend.*, 1943, **217**, 92—96).—Published data on infra-red spectra are considered. In the case of 7 mols. investigated at −180°, the low frequencies are simple fractions of the universal const. 1062·5. Three rules are laid down: (1) the mol. can be divided into parts (often only 2), each of which activates the electrons of another part, and the frequency of each part is given by $\nu = qd_1/s'r'$ (s' = no. of activated electrons, $d_1 = 1062{\cdot}5$, q and r' are integers); (2) the electrons are not activated singly, but in rings, or parts of rings; (3) the $\nu\nu$ of the parts are equal or nearly so. The $\nu\nu$ of 47 mols. are considered on this basis and satisfactory agreement is obtained. A. J. M.

Flame spectrum of carbon monoxide. III. The cool flame. A. G. Gaydon (*Proc. Roy. Soc.*, 1943, **A**, **182**, 199—206).—Spectra of

cool flames, or pre-ignition glows, of CO with O_2 and N_2O are photographed with small dispersions. The banded structure is more clearly developed in the cool than in the normal flame. The OH bands are absent from the cool flame, which shows strong Na emission. CuCl appears very readily as an impurity and the band systems of CuCl show a different intensity distribution in the cool flames with O_2 and N_2O. The application of the results to the theory of combustion is discussed. (Cf. A., 1941, I, 362.) G. D. P.

New forbidden transition of the neutral nitrogen molecule. (Mme.) R. Herman (*Compt. rend.*, 1943, **217**, 141—143).—In the N_2 spectrum there are three band systems, the existence of which indicates that the Lyman bands could be excited by fluorescence. It follows that one of the systems must be forbidden. Bands belonging to a new system, for which the lower state is $a^1\Pi_u$ (the upper state of the Lyman system) and the upper state is at 112781 cm.$^{-1}$ (the upper state of the Watson–Kuntz system), contradict the symmetry relation rule. Anomalies arising when a gas is under a moderate pressure are discussed, the Lyman system being entirely modified; the sequences $v'' - v' = 9$ and 10 are extended and the effect attributed at low pressures to dissociation disappears. This is probably due to excitation by ionic collision, and forced emission. A. J. M.

Light absorption of polynuclear inner-complex compounds. IV. Nickel complexes. Á. von Kiss and R. Szabó (*Z. anorg. Chem.*, 1943, **252**, 172—184; cf. A., 1942, I, 385).—Extinction curves (200—700 mμ.) are recorded for a no. of polycyclic inner-complex Ni compounds. There is no additivity, the absorption curves showing resemblances to those of the org. constituent but little to that of the Ni ion. F. J. G.

Absorption spectra of some hydrated salts of dysprosium. A. M. Rosa (*Ann. Physik*, 1943, [v], **43**, 161—181).—The absorption spectra of $Dy_2(SO_4)_3,8H_2O$, $Dy(EtSO_4)_3,9H_2O$, and $Dy(NO_3)_3,5H_2O$ have been investigated. The Stark splitting of the ground term could be obtained only with the sulphate. At liquid-air temp. the components are removed 21 cm.$^{-1}$ and 53 cm.$^{-1}$ from the lowest component. The intensity of absorption lines produced by superposition of lattice vibrations and electron transitions, and the mean val. of the splitting in the crystal electric field, correspond to the small coupling between the 4*f*-electrons and the crystal lattice. The width of the lines varies considerably within the spectrum. The character of various groups of lines is discussed. A. J. M.

Vibrational spectra of the vinyl halides. P. Torkington and H. W. Thompson (*J.C.S.*, 1944, 303—305).—The infra-red absorption spectrum of $CH_2{:}CHI$ has been measured between 3 and 20 μ. Infra-red and Raman νν have been correlated, the contours of the infra-red bands examined, and magnitudes assigned to the 12 fundamental νν. Variation in magnitude of the various modes with the mass of the halogen atom in these halides is discussed. With three exceptions, the frequency of a given vibration decreases as the mass of the halogen atom increases. W. R. A.

Ultra-violet absorption spectra of solutions of yohimbine, corynanthine, corynantheine, and some of their derivatives. R. Goutarel and A. Berton (*Compt. rend.*, 1943, **217**, 71—72).—The mol. extinction coeffs. of these alkaloids and some of their derivatives have been determined in 0·0005M. solution in EtOH at 95°. The spectra of yohimbine and corynanthine are almost identical. There is a min. in the extinction coeff. at λ 2480 A. The spectra resemble closely that of cinchonamine, and can be compared with that of indole. Corynantheine shows a displacement towards longer λλ, and the min. at 2480 A. could not be observed. The min. does not exist for diacetyl-yohimbine or -corynanthine, although monoacetylcorynanthine shows it. The min. is much less intense for corynantheic acid than for corynanthic acid. The spectra of corynanthic and yohimbic acids are almost identical, and show the same characteristics as those of the alkaloids themselves. A. J. M.

Quinoidation of triaryl compounds [absorption spectra].—See A., 1944, II, 258.

Synthesis and absorption spectra of the ionylideneacetones and related compounds.—See A., 1944, II, 261.

Spectroscopic study in the stereoisomeric capsanthin set. *cis*-Peak effect and configuration.—See A., 1944, II, 223.

Structure and symmetry of metallic dithionates, deduced from molecular spectra (infra-red absorption and Raman effect). C. Duval and J. Lecomte (*Compt. rend.*, 1943, **217**, 42—44).—The absorption spectra of 9 metallic dithionates and 5 complexes containing $(S_2O_6)''$ have been examined over the range 500—1650 cm.$^{-1}$ The strong characteristic absorption bands are at 520, 580, 985, 1200, and 1500—1600 cm.$^{-1}$ The comparison of this spectrum with the Raman spectrum confirms the formula $(S_2O_6)''$ for the radical. It consists of two pyramidal SO_3 groups with a common ternary axis of symmetry, C_3^3, on which are placed the two S atoms. There are 6 simple and 6 double degenerate vibrations. The absorption and Raman spectra taken together agree with the symmetry D_{3d}. The usual structural formula for a univalent dithionate, $[MO{\cdot}S(:O)_2]_2$, is not in accord with the spectral data, which indicate no frequency corresponding to S=O. The SO groups are identical and there is resonance between the O and S atoms. A. J. M.

Raman effect. G. Glockler (*Rev. Mod. Physics*, 1943, **15**, 111—173).—A review and bibliography of recent work. W. R. A.

Raman effect. CXLVI. Triatomic and tetratomic molecules (SO_2, COS, BrCN, BCl_3, and BBr_3). J. Wagner (*Z. physikal. Chem.*, 1943, **A**, **193**, 55—63).—Polarisation measurements in the Raman spectrum and isotope splitting of Raman lines are recorded. The data correspond to a valency angle of 135° for SO_2, and agree with a linear mol. for BrCN but not for COS. Data for BCl_3 and BBr_3 agree with a plane centro-symmetric mol. L. J. J.

Raman spectra of dihalogen derivatives of methane, and identification of the nine frequencies of methylene dibromide. (Mlle.) M. L. Delwaulle (*Compt. rend.*, 1943, **217**, 172—174).—The polarisations of the Raman lines of CH_2Br_2, CH_2BrCl, and CH_2BrF have been investigated, and the frequencies assigned to the various mol. vibrations. A. J. M.

Raman spectrum of dimethylnitrosoamine. J. M. G. Barredo and J. Goubeau (*Z. anorg. Chem.*, 1943, **251**, 2—13).—The Raman spectrum of $NMe_2{\cdot}NO$ has been recorded and the frequencies identified by comparison with those for mols. having comparable structures. The results indicate mesomerism between $NMe_2{\cdot}N{:}O$ and $N^+Me_2{:}N{\cdot}O^-$. F. J. G.

Excitation of luminous zinc sulphide. M. Curie (*Compt. rend.*, **217**, 110—112).—The brilliance of the luminescence of a no. of substances (particularly ZnS) under conditions of const. excitation agrees with the hypothesis of Riehl (A., 1937, I, 444) that luminosity does not depend on the presence of foreign substances, but that (in the case of ZnS) the exciting radiation is absorbed indifferently by all the Zn atoms, or at least those in a large portion of the lattice perturbed by the presence of a luminous centre. This would not, however, explain the emission of phosphorescence of long duration, which appears only in the presence of a luminogenic impurity. A. J. M.

Viscosity dispersion of dielectric constants of organic liquids for comparatively long waves. P. Mehler (*Ann. Physik*, 1943, [v], **43**, 225—243).—A resonance method is used to determine the real dielectric const. (ε) of org. substances for waves of λ 15, 60, and 109 m., and the effect of temp. on ε over the range 8—50°. The viscosity dispersion of ε of polar mols. is investigated for $PhNO_2$, $1\text{-}C_{10}H_7{\cdot}NO_2$, and $MeNO_2$ in a mineral oil (Shell K 20) of high η. The effects of both frequency and temp. show anomalies in the viscosity dispersion. There is good agreement with Debye's theory in the case of the slope and length of the individual dispersion stages for an 11% $PhNO_2$ solution. A. J. M.

Selective heating of small particles in the ultra-short-wave condenser field. H. Schaefer and H. Schwan (*Ann. Physik*, 1943, [v], **43**, 99—135).—The heating of small suspended particles in a medium with different electrical properties, under the influence of ultra-short wave fields, is discussed theoretically for stationary and non-stationary temp. conditions. Excess temp. in the dispersed particles are significant only when the conductivity is ≫ that of the medium, and in the favourable case of H_2O-in-oil suspensions has a max. val. of 60° at 5—10 kv. per cm. for particles 2 mm. in diameter. A selective particle breakdown by boiling is thus possible. Experimental data obtained with the condenser of a powerful transmitter at λ 11 m. are in agreement. For microscopic and colloid particles, excess temp. are ≪0·001°. L. J. J.

Constitution of compounds of the type SR_2X_2, SeR_2X_2, and TeR_2X_2. K. A. Jensen (*Z. anorg. Chem.*, 1943, **250**, 245—256).—Dipole moments are recorded as follows: $(CH_2Ph)_2SI_2$, 4·4; $SePh_2Cl_2$, 3·21; $SePh_2Br_2$, 3·40; $(p\text{-}C_6H_4Me)_2TeCl_2$, 2·98; $(p\text{-}C_6H_4Me)_2TeBr_2$, 3·21; $[(p\text{-}C_6H_4Me)_2TeCl]_2O$, 6·1; $TeCl_4$, 2·57 D. The results indicate that in compounds SR_2X_2 (X = halogen) and their analogues the halogen atoms are equiv. and their linkages strongly polar with an electron density of ~1 electron. This is illustrated by resonance formulæ. The suggested space configuration is a trigonal bipyramid with the fifth point occupied by a lone electron-pair. A *compound* $(CH_2Ph)_2SI_3$ is described F. J. G.

Spatial configuration of compounds of the type PR_3X_2, AsR_3X_2, SbR_3X_2, and BiR_3X_2. K. A. Jensen (*Z. anorg. Chem.*, 1943, **250**, 257—267).—The mol. polarisation of $SbPh_3Cl_2$ and $BiPh_3Cl_2$ in C_6H_6 is independent of temp. They have zero dipole moment but unusually large at. polarisation, consistent with the configuration of a trigonal bipyramid, and with the linkages between the central atom and Cl being strongly polar. $SbPh_3(OH)_2$ also has $\mu = 0$; for $BiPh_3(NO_3)_2$, $\mu = 3{\cdot}26$ D. The Raman spectrum of $SbCl_5$ has six interferences, corresponding with a trigonal bipyramidal configuration. NPhICl has $\mu = 8{\cdot}20$ D. F. J. G.

Dipole moments of the higher isologues of the sulphoxides and amine oxides. K. A. Jensen (*Z. anorg. Chem.*, 1943, **250**, 268—276).—Vals. of μ are recorded as follows: $SePh_2O$, 4·44; $(p\text{-}C_6H_4Me)_2TeO$, 3·93; PPh_3O, 4·31; PPh_3S, 4·74; PPh_3Se, 4·83;

PPh_3:NPh, 4·45; $AsPh_3O$, 5·50; $SbPh_3S$, 5·40; $(p\text{-}C_6H_4Me)_3SbO$, 2·0; PPh_3O,H_2O, 4·56; $AsPh_3O,H_2O$, 5·81; $AsPh_3Cl{\cdot}OH$, 9·2; $SbPh_3Cl{\cdot}OH$, 2·8 D. The constitutions of these compounds are discussed. F. J. G.

Dielectric constants and dipole moments of acetylenic ethers. T. L. Jacobs, J. D. Roberts, and W. G. MacMillan (*J. Amer. Chem. Soc.*, 1944, **66**, 656—657).—Dielectric consts. (determined by the heterodyne beat method) and dipole moments (calc. by Onsager's equation) at 25° for CH:C·OR are R = Et 8·05, 1·98, Bu 6·62, 2·03, and Ph 4·76, 1·141, and CPh:CH 2·98, 0·78, respectively. High vals. of μ for the alkyl ethers may be due to contributions from resonance forms of the type CH⁻:C:OR⁺. Onsager's equation is fairly accurate for CPh:CH, PhOMe, PhOEt, Ph_2O, and $Pr^a{}_2O$, but not for Et_2O (cf. Bottcher, A., 1939, I, 126). R. S. C.

Influence of polarisation on electric breakdown strength and its dependence on temperature. G. Malmlöw (*Arkiv Mat. Ast. Fys.*, 1944, **30, B**, 8 pp.).—Apparatus and methods for measuring the breakdown strength are described and measurements are made on mica and KBr with d.c. and a.c. The results show that the vals. obtained with d.c. are influenced by polarisation. The electric breakdown strength of KBr is independent of temp. between 220° and 300° K. L. S. G.

Refractive indices in the ultra-violet. M. Bayen (*J. Phys. Radium*, 1942, [viii], **3**, 57—68).—An improved method of determination is described, and data for H_2O, ^2H_2O, and aq. solutions of NaCl are tabulated. A discussion of results for electrolytic solutions with reference to extinction coeffs. and mol. refraction shows that the deformation of ions increases with the concn. N. M. B.

"Detachment" of optical activity and absorption. R. Servant (*J. Phys. Radium*, 1942, [viii], **3**, 90—96).—The distinction, in an absorption band, between the "active" part and the whole band is discussed with reference to available data, theories, and interpretations. Typical illustrations are given by quartz. N. M. B.

Relation of the dispersion of refraction in the infra-red to that in the visible and ultra-violet. L. Amy (*Compt. rend.*, 1943, **217**, 227—229).—The curve representing the variation of n^2 as a function of log λ is symmetrical. A new formula giving the dispersion of n is proposed. A. J. M.

Orientation of molecules at boundary surfaces and in associated molecules by electrostatic forces. H. Dunken (*Z. physikal. Chem.*, 1943, **A, 193**, 40—54).—Theoretical. Mutual orientation of dipoles and quadrupoles and their arrangement at metallic boundary surfaces are discussed, and the corresponding effect in adsorption is considered. L. J. J.

Characteristic frequency of double bonds in conjugated systems. A. Kirrmann (*Compt. rend.*, 1943, **217**, 148—150).—The lowering of the characteristic frequency due to the double bond when it is conjugated is not a general phenomenon. Deviations can be explained on the basis of mesomerism. A. J. M.

Linear flow of perfect gases. J. Villey (*J. Phys. Radium*, 1942, [viii], **3**, 79—80).—Mathematical. N. M. B.

Energy- and order-states of the atoms in the surfaces of liquids and solids. R. Haul (*Z. physikal. Chem.*, 1943, **B, 53**, 331—361).—Theoretical. The relation of surface energy (γ) to the heat of sublimation or vaporisation is discussed. With He, Ne, A, Hg, Na, Pb, Ag, and Au as examples of simple liquids, conclusions are drawn as to the arrangement of the surface atoms. From crystallographic considerations, the total surface energy (Σ) of the above elements in the solid state is calc., for various temp. and crystal faces, from the internal heat of sublimation. A method is given for determining the temp. coeff. of γ for solids. The surface entropy so obtained can be used to calculate γ from Σ. As no reliable experimental method is available for the determination of γ for solids, theoretical methods must be used. J. F. H.

Cross-sectional areas of molecules adsorbed on solid surfaces.—See A., 1944, I, 199.

III.—CRYSTAL STRUCTURE.

Diffraction of *X*-rays by quartz in supersonic vibration. J. Surugue and T. T. Ouang (*Compt. rend.*, 1943, **217**, 177—179).—When quartz is set into supersonic vibration the intensity of the Laue spots is increased (Fox *et al.*, *Physical Rev.*, 1931, [ii], **37**, 1622). This phenomenon is reinvestigated. The relative increase in intensity is $\propto$ voltage applied to the quartz, and therefore $\propto$ the amplitude of the vibrations. The explanation is discussed. A. J. M.

Ambiguities in the *X*-ray analysis of crystal structures. A. L. Patterson (*Physical Rev.*, 1944, [ii], **65**, 195—201).—The problem of uniqueness in the *X*-ray analysis of a crystal structure depends on the uniqueness of the determination of the arrangement of a periodic set of points in space by its vector distance set. A large no. of cases is presented in which 2, 3, or 4 non-congruent sets of points are homometric, *i.e.*, have the same vector distance set. The significance of these results for practical crystal analysis is discussed. N. M. B.

Character tables for two space-groups. C. Herring (*J. Franklin Inst.*, 1942, **233**, 525—543).—Character tables (irreducible representations of the space-group) are given for the close-packed hexagonal and the diamond type lattice, in which no point of space possesses the symmetry of the point group. A. J. M.

Crystal forms of tungsten in growth and decay and the direct-current effect. R. W. Schmidt (*Z. Physik*, 1942, **120**, 69—85).—W crystals grow in the form of rhombic dodecahedra. Octahedra are produced by etching with alkaline $K_3Fe(CN)_6$. The (110) faces have the greatest speed of dissolution in $HF-H_2SO_4$ mixtures. Recrystallisation in drawn wires gives layers ~1 μ. thick, parallel to one of the cubic planes of W. The d.c. effect is due to the wandering of ions, and leads to a building up of regular steps on the (111) regions, and to a smaller extent on the (110), but not at all on the (100). The steps have a max. size of ~15 μ. at 2400° K., and diminish in size with temp. L. J. J.

Thomson–Gibbs equation and the so-called theory of growth conglomerates. I. N. Stranski (*Z. Krist.*, 1943, **105**, 91—123).—The Thomson–Gibbs equation is deduced and its applications are discussed. In particular the work of Balarev is criticised as being founded on erroneous applications of the equation. A. J. M.

Wulff's law for the equilibrium form of crystals. M. von Laue (*Z. Krist.*, 1943, **105**, 124—133).—Various deductions of Wulff's law are discussed, including thermodynamic methods. A. J. M.

Oriented growth of quinol on mica. J. Willems (*Z. Krist.*, 1943, **105**, 144—148).—When solutions of α-quinol (I) in solvents of low dielectric const. (*e.g.*, C_6H_6 and $CHCl_3$) crystallise on a mica surface, the crystals are oriented in definite directions. As in other cases (A., 1944, I, 99) this appears to be due to a H bond between the O of (I) and O of the mica. The oriented growth of (I) on mica is of particular interest since succinic acid, of which the lattice dimensions are more favourable for this growth, does not behave in the same way. A. J. M.

Oriented growth of quinol on heavy spar and celestine. J. Willems (*Z. Krist.*, 1943, **105**, 155—156).—The conditions necessary for oriented growth of quinol (crystal type C_{3i}^1) from solvents of low dielectric const. are present in the case of heavy spar and celestine. Oriented growth of α-quinol from C_6H_6 has been observed on the (001) surfaces of the above minerals. A. J. M.

Oriented growth of urotropin on gypsum. Forces involved in the oriented growth of crystals of organic substances. J. Willems (*Z. Krist.*, 1943, **105**, 149—154).—$(CH_2)_6N_4$ (I) crystallises on the (010) surface of gypsum (II) with (110) of (I) parallel to (010) of (II), and [110] of (I) parallel to [301] of (II). The forces involved in the production of oriented growth are discussed. In this case there is probably a combination of van der Waals forces with homopolar linkings, either between (I) and the ions of $CaSO_4$, or with the H_2O. A. J. M.

Lattice constants and expansion coefficients of iodine. M. Straumanis and J. Sauka (*Z. physikal. Chem.*, 1943, **B, 53**, 320—330).—The lattice consts. of I were determined at 10—40° by the rotating-crystal method. At 18° $a = 4{\cdot}7761$, $b = 7{\cdot}2501$, $c = 9{\cdot}7711$ A. Linear expansion coeffs. parallel to the axes a, b, and c are $133{\cdot}4 \times 10^{-6}$, 95×10^{-6}, and $35{\cdot}1 \times 10^{-6}$ respectively; hence the cubic expansion coeff. is 264×10^{-6}. At 18° $\rho = 4{\cdot}9520$, in best agreement with the results of Gay-Lussac (*Ann. Chim. Physique*, 1814, **91**, 7) and Stas (*Mém. Acad. Belg.*, 1865, **35**, 3). Although the crystals of I were prepared at 27—30° and 70—80° only rhombic I was obtained, indicating that the transition point of Kurbatow (A., 1908, ii, 31) does not exist. J. F. H.

Crystal structure of cadmium iodide. G. Hägg and E. Hermansson (*Arkiv Kemi, Min., Geol.*, 1943, **17, B**, No. 10, 4 pp.).—CdI_2 has a *C*27 structure if cryst. slowly from solution. If cryst. quickly (*e.g.*, from SO_2 or MeOH at ordinary pressure or from H_2O, EtOH, or $COMe_2$ under reduced pressure) a random layer structure is obtained. At intermediate rates of crystallisation disordered structures giving powder photographs corresponding with a *C*6 structure are obtained. If cryst. from a melt a *C*27 structure is obtained even at high crystallisation rates. C. R. H.

Crystal structures of $SrMg_2$, $BaMg_2$, and $CaLi_2$. E. Hellner and F. Laves (*Z. Krist.*, 1943, **105**, 134—143).—The existence of *compounds* $SrMg_2$, $BaMg_2$, and $CaLi_2$ is demonstrated. They crystallise in the $MgZn_2$ type, with the following lattice consts.: $SrMg_2$, a 6·426, c 10·473 A., c/a 1·628; $BaMg_2$, a 6·636, c 10·655 A., c/a 1·606; $CaLi_2$, a 6·248, c 10·23 A., c/a 1·637. The at. separation in $CaLi_2$ is somewhat > in $CaMg_2$, although the Li atom is smaller than Mg in the elementary state. The apparent radii of Li, Mg, Ca, Sr, Ba, Al, La, and Ce in this type of compound are discussed. The rule that $R_A/R_B = (1{\cdot}5)^{1/2}$ (R_A, R_B are at. radii of A and B in the compound AB_2) holds fairly well for these compounds. Deviations from this

rule found by Nowotny (*Z. Metallk.*, 1942, **34**, 247) for the types $MgCu_2$, $MgZn_2$, $MgNi_2$, and $CeNi_2$ are due to the erroneous use of the radii of the atoms in the elementary state. A. J. M.

Configurations of a binary mixed crystal. R. Eisenschitz (*Physical Rev.*, 1944, [ii], **65**, 204—205).—Mathematical. An alternative treatment of the work of Ashkin and Lamb (cf. A., 1944, I, 6). N. M. B.

***X*-Ray studies on oxides and oxyhalides of tervalent bismuth.** L. G. Sillén (*Dissert., Stockholm*, 1940, 140 pp.).—A complete account of researches already recorded (A., 1938, I, 501, 560; 1939, I, 412, 457; 1940, I, 349; 1941, I, 153, 246; 1942, I, 46, 136, 259, 260; 1943, I, 67, 146, 129). A. J. M.

***X*-Ray analysis of $FeSn_2$ and Fe_3Sn.** O. Nial (*Arkiv Kemi, Min., Geol.*, 1943, **17, B**, No. 11, 5 pp.).—$FeSn_2$ belongs to the space-group D_{4h}^{18}—$I4/mcm$ with lattice consts. (±0·003) *a* 6·520, *c* 5·312 A. It is isomorphous with $CoSn_2$ and $MnSn_2$, the consts. for the latter being *a* 6·646, *c* 5·425 A. Fe_3Sn belongs to the space-group D_{6h}^{4}—$C6/mmc$ with *a* 5·447, *c* 4·352 A., and is isomorphous with Ni_3Sn. C. R. H.

***X*-Ray studies on ABO_4 compounds of rutile type and AB_2O_6 compounds of columbite type.** K. Brandt (*Arkiv Kemi, Min., Geol.*, 1943, **17, A**, No. 15, 8 pp.)—The prep. of numerous compounds of rutile and columbite structures is described. *X*-Ray examination gives the following lattice consts. (*a* and *c* respectively in A.): $CrTaO_4$ 4·626, 3·009; $FeTaO_4$ 4·672, 3·042; $RhTaO_4$ 4·684, 3·020; $CrNbO_4$ 4·635, 3·005; $FeNbO_4$ 4·68, 3·05; $RhNbO_4$ 4·686, 3·014; $AlSbO_4$ 4·510, 2·961; $CrSbO_4$ 4·577, 3·042; $FeSbO_4$ 4·623, 3·011; $RhSbO_4$ 4·601, 3·100; $GaSbO_4$ 4·59, 3·03; $RhVO_4$ 4·607, 2·923; $MgNb_2O_6$ 5·017, 5·665; $NiNb_2O_6$ 5·013, 5·661; $CoNb_2O_6$ 5·036, 5·701; $FeNb_2O_6$ 4·992, 5·616; $ZnNb_2O_6$ 5·036, 5·715; $MnNb_2O_6$ 5·081, 5·766; $ZnTa_2O_6$ 5·058, 5·682; $MnTa_2O_6$ 5·092, 5·750; $MnSb_2O_6$ 5·106, 5·736; columbite 5·082, 5·730. The first twelve of these compounds have space-group D_{4h}^{14}—$P4/mnm$ (rutile structure); the remainder have the columbite structure. C. R. H.

Structure of transparent soap. J. W. McBain and S. Ross (*Oil and Soap*, 1944, **21**, 97—98).—The similar *X*-ray diffraction patterns of a 20-year-old and of a fresh sample of Pears' transparent soap prove that the soap has not a glassy or amorphous structure as has been hitherto supposed, but consists of ultra-microscopical crystallites arranged completely at random. The Bragg spacings resemble those of the most stable cryst. form (the γ-form, also termed ω-form by Ferguson *et al.*; A., 1943, I, 306) of a Na soap at room temp. The pattern of glycerol (typically a liquid or amorphous glass) is also visible. E. L.

Space lattice of codeine and β-methylmorphimethine. L. Castelliz and F. Halla (*Z. Krist.*, 1943, **105**, 156—157).—Codeine (**I**) has *a* 27·70, *b* 29·80, *c* 7·59 A.; 16 mols. in the unit cell; space-group V^3—$P2_12_12$. β-Methylmorphimethine has *a* 16·88, *b* 29·60, *c* 12·90 A.; 16 (~17) mols. in the unit cell; same space-group as (**I**). The relation between the two cells appears to be that the cell of one is divided into two, and the halves are reunited in another direction. A. J. M.

Phenylcarbamyl derivatives of alkylated phenols. M.p. and *X*-ray powder diffraction data.—See A., 1944, II, 256.

Suitability of poorly bound photolayers for use in the electron microscope. M. von Ardenne (*Z. Physik*, 1943, **121**, 1—6).—Such photolayers are considered with reference to the conditions existing in the electron microscope and they are found to be quite suitable. L. S. G.

Electron diffraction by amorphous polymers. D. G. Coumoulos (*Proc. Roy. Soc.*, 1943, **A, 182**, 166—179).—The diffraction patterns of the polyvinyl acetate and the acrylate and methacrylate polymers suggest a zig-zag C-atom chain with the side-chains alternately to the right and left of the zig-zag chains and in planes approx. perpendicular to the main chain. These side-chains are subject to lateral cohesive forces which group them into clusters. In films, prepared by evaporation of a solution on a H_2O surface, the clusters consist of a small no. of side-chains without any special orientation. With multilayers, prepared by the usual technique, some orientation of the side-chains is indicated. The patterns indicate an amorphous character which is attributed to the tendency of the side-chains to close packing in clusters, producing distortion of the main chain. The elastic properties of the polymers are discussed. G. D. P.

Electron diffraction investigation of monomerides and dimerides of formic, acetic, and trifluoracetic acids and the dimeride of deuterium acetate. J. Karle and L. O. Brockway (*J. Amer. Chem. Soc.*, 1944, **66**, 574—584).—The electron diffraction of monomerides and dimerides of HCO_2H (**I**), AcOH (**II**), and $CF_3{\cdot}CO_2H$ (**III**) and of the dimeride of AcOD (**IV**) has been determined. A nozzle, independently heated to ~160°, has been used for the monomeride photographs. Parameter vals. are: (**I**), C—O = 1·42 A., C=O = 1·24 A., angle O–C=O = 117°; $(\mathbf{I})_2$, C—O = 1·36 A., C=O = 1·25 A., OH—O = 2·73 A., angle O–C=O = 121°, angle C··C=O = 58°; (**III**), C—O = 1·43 A., C=O = 1·24 A., C—C = 1·54 A., angle O–C=O = 122—138°, angle C–C=O = 113—128°; $(\mathbf{II})_2$, C—O = 1·36 A., C=O = 1·25 A., OH—O = 2·76$_2$ A., C—C = 1·54 A., angle O–C=O = 130°, angle C··C=O = 60°; (**III**), C—F = 1·36 A., angle F–C–F = 110°; $(\mathbf{III})_2$, C—F = 1·36 A., C—C = 1·47 A., OH—O = 2·76 A., mean of C—O and C=O = 1·30 A., angle F–C–F = 109°, angle O–C=O = 130°, angle C··C=O = 60°. Quantitatively identical parameters have been obtained for the dimerides of (**II**) and (**IV**). Approx. measurements have been made of the v.d. and dissociation consts. of the dimeride of (**III**). These vals. of the parameters show that the C–O bonds differ in both monomeride and dimeride, and that the H atoms are not symmetrically placed with respect to the OH–O bonds. The CF_3 group in (**III**) is free to rotate or oscillate with a large amplitude about the C–C axis. W. R. A.

Structures of methylene*cyclo*butane and of 1-methyl*cyclo*butene. W. Shand, jun., V. Schomaker, and J. R. Fischer (*J. Amer. Chem. Soc.*, 1944, **66**, 636—640).—Methylene*cyclo*butane (**I**) and 1-methyl*cyclo*butene (**II**), prepared from pentaerythritol tetrabromide, have the following properties; (**I**), b.p. = 41·39°/750 mm., $n_D^{10,15,20}$ = 1·4266, 1·4236, 1·4210, $\rho_4^{20,25}$ = 0·7401, 0·7349; (**II**), b.p. = 37·1°/750 mm., n_D^{18} = 1·4088, $\rho_4^{20,25}$ = 0·7244, 0·7188. Electron diffraction of (**I**) and (**II**) confirms the previously postulated structures; with: (**I**), C—C = 1·55±0·02 A., C=C = 1·34±0·03 A., and angle C_4–C–C_2 = 92·5±2° (C carrying the :CH_2 group); (**II**), C—C = 1·54±0·03 A., C=C = 1·34±0·03 A., angle C_5–C–C_2 = 125±4° (the double bond lying between C and C_2). W. R. A.

Residual magnetostriction of polycrystalline iron and nickel. M. Kornetzki (*Ann. Physik*, 1943, [v], **43**, 203—219).—The theory of magnetostriction remanence is discussed. For a slightly strained polycrystal with a cubic lattice there are always some crystallographically equiv. directions which are more readily magnetised than others. From the connexion between magnetisation and magnetostriction it is shown that there are two distinct cases of magnetostriction remanence. The first corresponds to the example where an isotropic substance has a magnetic remanence of 50% of the saturation magnetisation, the magnetism being taken up in the state of lowest energy. There is no magnetostriction remanence in this case. The other corresponds to a magnetic state of higher energy, and a magnetic remanence of ~83%. Here the magnetostriction remanance amounts to about half the saturation val. of a single crystal in the direction of easiest magnetisation. The softness of the crystal will affect the magnetostriction remanence. The determination of magnetostriction of Fe and Ni wires with a small shearing factor shows that soft samples have considerable remanence, amounting to 40—50% of the saturation val. A considerable portion of the magnetisation does not go into the position of lowest energy. Hard Ni has only a small magnetostriction remanence. The magnetostriction is discussed in connexion with resistance changes in a magnetic field. A. J. M.

Crystal-optical constants of organic dyes. Polymorphism of dyes caused by solvents. III. I. Riskin (*J. Appl. Chem. Russ.*, 1943, **16**, 201—205).—I : 2-*p*-$NO_2{\cdot}C_6H_4{\cdot}N{:}N{\cdot}C_{10}H_6{\cdot}OH$ forms dark red crystals from PhMe and orange-red crystals from quinoline (or, in some conditions, from C_5H_5N). Hansa-yellow 3R (constitution unknown) gives orange and yellow crystals from PhMe and C_5H_5N, respectively. The optical consts. of these crystals are given. J. J. B.

Hardness of metals in relation to atomic structure. H. O'Neill (*Metallurgia*, 1944, **29**, 243—247).—In pure metals, indentation hardness corresponds generally with the reciprocal elastic compressibility when both are plotted against at. no.; exceptions can be attributed to complex crystal structures. The influence of valency electrons and of variations in the nature of at. linkings in metallic alloys is briefly discussed. J. C. C.

Structural premises of strain-hardening and precipitation. C. H. Mathewson (*Trans. Amer. Soc. Met.*, 1944, **32**, 38—87).—Campbell memorial lecture. An account is given of existing theories of the nature of slip and twinning in metals. The Taylor theory of fault propagation fails to explain the formation of wide twin lamellæ on straining Zn, Sn, Fe, and some other metals, and to account for the variations between metals of the same crystal form in their susceptibility to work-hardening. A modification of the slip-interference theory of strain-hardening is advanced in which slip is considered to be far more complicated than is usually assumed and to follow a devious course in which the atoms find paths of lower potential than the direct route over barriers set up by their own vol. requirements. Measurements (by W. R. Hibbard) of the slip and rotation of the grains in tensile specimens of Cu, (by J. A. Collins) of the lattice rotation of crystallites in a strained single crystal of Al, and (by R. G. Treating) of the axis shift of the grains in α-brass and Al (*Yale Diss.*, 1942, 1939, and 1942) are described and shown to be in accord with theory. J. C. C.

Manner of nucleus formation of new phases. I. N. Stranski (*Z. Ver. deut. Ing., Beih. Verfahrenstech.*, 1941, 39—43; *Chem. Zentr.*, 1942, I, 407).—Volmer's formula for the frequency of nucleus formation is discussed, and the nature of crystal nuclear formation of new phases is examined with reference to some examples of growth of rounded single crystals. R. B. C.

IV.—PHYSICAL PROPERTIES OF SUBSTANCES.

New attempt to interpret the Meissner–Ochsenfeld effect, and the nuclear theory of superconduction. K. M. Koch (*Z. Physik*, 1942, **120**, 86—102).—The Meissner–Ochsenfeld effect can be explained on the assumption that superconduction depends on the formation of growth centres which are formed spontaneously below a crit. temp. The question whether such centres participate in normal conduction is discussed. L. J. J.

Law of magnetisation in weak fields. K. Sixtus (*Z. Physik*, 1943, **121**, 100—117).—The permeability (μ) is measured for Fe alloys having respectively 3% Si; 40% Ni; 76% Ni, 2% Cr, and 5% Cu (Mumetal), and 20% Cr. The alloys are all first heated to incandescence and the field strength (H) is < 35 oersted. Graphs drawn of μ against H have curvature showing a departure from the Rayleigh law for weak fields, $\mu = \mu_0 + cH$. A generalised law, $\mu = H^{\alpha}(\mu'_0 + C'H)$, where $0<\alpha<1$, is proposed; it fits the data over a large range of the field strengths, but not at the lowest vals. This is explained. L. S. G.

Absolute measurement of large magnetic fields by a null method. H. Mikhail and Y. L. Yousef (*Proc. Physical Soc.*, 1944, **56**, 249—250).—The condenser method described is based on the simultaneous passage through a fluxmeter of a charge equal and opposite to the charge that would flow if a search coil were removed from the field. N. M. B.

Acoustical tables for air and sea water. W. L. Woolf (*J. Acoust. Soc. Amer.*, 1943, **15**, 83—86).—The tables given show the relations between pressure level, sound pressure, intensity level, particle velocity, and particle displacement × frequency. Equations and other data are presented. N. M. B.

Use of the Pierce interferometer for measuring the absorption of sound in gases. H. C. Hardy (*J. Acoust. Soc. Amer.*, 1943, **15**, 91—95).—The empirical Pielemeier equation method, based on the theory of the Pierce interferometer, is justified by a more rigorous treatment of the effect of sound resonance on the oscillator. N. M. B.

Absorption measurements in the ultrasonic region. H. Born (*Z. Physik*, 1943, **120**, 383—396).—The existence of interference fields in the neighbourhood of a vibrating quartz crystal has been demonstrated by measurements of the energy distribution with the quartz probe described. A correction function is derived for the elimination of interference effects in absorption measurements. L. J. J.

The Kritschevski–Kazarnovski equation of state for gas mixtures. M. Temkin (*J. Phys. Chem. Russ.*, 1943, **17**, 269—270).—The equation (cf. A., 1939, I, 516) can be derived theoretically if the behaviour of the gases does not deviate too much from that of perfect gases. J. J. B.

Thermal repulsion. M. K. Paranjape (*Current Sci.*, 1944, **13**, 72—73).—Measurements at 0—1 atm. of the gas surrounding a mica vane suspended between hot and cold faces and subject to thermal repulsion (F) show that F increases only slightly as the pressure falls 71—1 cm. of Hg. Below 1 cm. there is first a gradual and then a very rapid increase in F to a max. of ~0·27 dyne per sq. cm. at ~10^{-2} cm. of Hg. As the pressure is further reduced F decreases rapidly. N. M. B.

Direct determination of the slip coefficients, s_{44}, s_{55}, s_{66}, for substances of rhombic symmetry and low rigidity. H. Hörig (*Ann. Physik*, 1943, [v], **43**, 285—295).—A method of determining the slip coeffs. (Vogt's moduli) directly is described. Results are given for a no. of woods, and are compared with the vals. for steel and celluloid calc. from existing data. A. J. M.

Liquid state. J. H. Hildebrand (*Proc. Physical Soc.*, 1944, **56**, 221—239).—Guthrie lecture. N. M. B.

V.—SOLUTIONS, DISPERSIONS, AND MIXTURES.

Theory of diffusion of binary mixtures and interpretation of diffusion measurements. O. Lamm (*Arkiv Kemi, Min., Geol.*, 1943, **17, A**, No. 9, 21 pp.).—Mathematical. The theory of unidimensional diffusion has been developed for the general case of a homogeneous two-component mixture. C. R. H.

Diffusion of highly concentrated salt solutions: potassium fluoride in water. O. Lamm (*Z. anorg. Chem.*, 1943, **250**, 236—244).—Vals. of D and η for KF in H_2O over the concn. range 34—48% are recorded. The product $D\eta$ is ~5 × 10^{-7} c.g.s. F. J. G.

Diffusion equations, their representation by models, and diffusion experiments on silicic acid gels. II. Diffusion in a confined space with constant initial concentration. A. Dobrowsky (*Kolloid-Z.*, 1943, **105**, 56—70).—The general solution of the diffusion equation is developed and applied to the cases of diffusion from a cylinder open at one end, and open at both ends, the initial concn. being const. throughout the cylinder. The mathematical treatment leads to expressions for the concn. at any point after a given time, the quantity diffusing through any section, and the quantity diffusing out of the cylinder. Experiments are carried out on silicic acid gels, prepared by acidifying water-glass solutions, the diffusing substance generally being $Na_2Cr_2O_7$. Gels have advantages over liquids for diffusion experiments. Diffusion from the sides of the cylindrical gels was prevented by immersing them in xylene and exposing only the ends to H_2O. The formulæ could be verified by analysing sections of the cylinders after diffusion had taken place. The evaluation of the diffusion coeff. from the resulting curves is described. The phenomena can also be simulated by a hydraulic model. R. H. F.

Rapid method for the determination of Ludwig–Soret coefficients. N. Riehl (*Z. Elektrochem.*, 1943, **49**, 306—309).—The hot solution is contained in a vessel into which dips a cylinder either made of thick glass or constructed as a Dewar vessel. This cylinder is closed at the bottom by a Cellophane membrane and contains the cold solution in which is immersed a Cu cooling coil. With this apparatus temp. differences of 60° can be attained. With 0·1N-KOH equilibrium is attained in ~2½ hr. and the Ludwig–Soret coeff. deduced is in accord with previous data. With $BaCl_2$ the time required for establishment of equilibrium is much longer and the coeff. deduced from the results is ≫ the previously reported val. (Chipman, A., 1926, 1206). It is suggested that many recorded vals. of this coeff. are too low owing to the mixing of the solutions. J. W. S.

Variation with temperature of the velocity of sound in mixtures of water and methyl alcohol. G. Goudet (*Compt. rend.*, 1943, **217**, 65—66).—The coeff. $\mu = -(1/v)(dv/d\theta)$ (v = velocity of sound, θ = temp.) is positive for all liquids except H_2O. It should therefore be possible to obtain a mixture of H_2O and another liquid for which $\mu = 0$. For this purpose, the velocity of sound in mixtures of H_2O and MeOH has been determined at ~30°. A direct method of measuring μ using ultrasonic waves is described. μ is zero for a mixture of 30 c.c. of MeOH with 100 c.c. of H_2O. A. J. M.

Hygroscopicity, properties in boric acid solution, and specific viscosities of mixtures of diastereoisomeric butane-$\beta\gamma$-diols. T. M. Lees, E. I. Fulmer, and L. A. Underkofler (*Iowa Sta. Coll. J. Sci.*, 1944, **18**, 359—367).—The prep. of *meso*-(CHMe·OH)$_2$ from the mixture produced by the action of *Aërobacter aërogenes* on glucose is described. Both this and the *l*-glycol are extremely hygroscopic. Sp. viscosities of mixtures of the *meso*- and *l*-forms at 30° give a continuous curve, the val. of η for the *meso*- being 3 times that for the *l*-glycol. Sp. conductivities (κ) of 10% solutions of mixtures in 0·5M-H_3BO_3 at 25°, and their pH vals., are recorded. κ is the higher, and pH the lower, the greater is the proportion of the *l*-glycol in the mixture. The κ measurements offer a convenient method of analysis of mixtures containing *meso* and active forms. F. L. U.

Cryoscopic constant of camphor. J. E. Ricci (*J. Amer. Chem. Soc.*, 1944, **66**, 658—658).—Deviation of the cryoscopic const. of camphor from constancy below 0·2M-solute, observed by Meldrum *et al.* (A., 1944, I, 33), is considered to be due to a decrease in the m.p. of the camphor on melting and grinding. 0·005M. concn. of impurity formed during this process would result in a hyperbolic deviation of the observed magnitude. W. R. A.

Density of melts in the system boric oxide–silica. A. A. Leontieva (*J. Phys. Chem. Russ.*, 1943, **17**, 264—268).—d of 5 melts between B_2O_3 100 and B_2O_3 85, SiO_2 15 wt.-% is determined between 530° and 1325°. Although d was expected to be additive, it shows max. at B_2O_3 98, SiO_2 2%; at $[SiO_2]$ > 10% the deviation from additivity is small. The coeff. of thermal expansion increases with $[B_2O_3]$. J. J. B.

The α–($\alpha + \gamma$) phase boundary in the copper–beryllium system. H. Borchers and H. J. Otto (*Metallwirts.*, 1942, **21**, 215—217).—Six alloys containing 0·3—2·45% of Be were investigated dilatometrically, and it was found that the α–($\alpha + \gamma$) boundary occurred at 379°, 466°, and 500°, in alloys containing 0·3, 0·7, and 1·0% Be, respectively. The α–($\alpha + \beta$) boundary in the higher-Be alloys could not be determined as the effects observed were too small. C. E. H.

Influence of various elements on the position of the eutectoid in the iron–carbon (carbide) system. C. L. Shapiro and J. Strauss (*Amer. Inst. Min. Met. Eng.*, 1943, *Tech. Publ.*, 1646, 19 pp.; *Met. Tech.*, **10**, No. 8).—Elements which form definite carbides with Fe increase the [C] of the ternary eutectoid. These comprise Al, Be, Nb, Ta, Ti, V, and Zr and are termed class I elements. Class II elements, Co, Cu, and Si, form no carbides, enter into solid solution with Fe, and shift the eutectoid to a lower [C]. Mo, which first forms solid solutions with Fe and then, in higher concns., forms carbides which undergo peritecto-eutectoid reactions, first decreases and then increases the [C] of the eutectoid. It is suggested that Cr, W, Mn, and Ni, which in lower concns. decrease the [C] of the eutectoid, may behave in the same general manner and, with Mo, comprise class III elements. The conception of peritecto-eutectoid reactions, which result in the formation of three phases (α-Fe, Fe_3C, and compound) and may take place over a range of temp., is discussed. J. C. C.

Passivity in copper–nickel and molybdenum–nickel–iron alloys. H. H. Uhlig (*Trans. Electrochem. Soc.*, 1944, **85**, *Preprint* 20, 207—218).—The author's theory, that passivity in an Fe or Ni alloy appears at a crit. composition related to the tendency of the α band of electronic energy to fill with electrons (cf. B., 1939, 1046), is tested

by existing data on the passivity of Cu–Ni and Mo–Ni–Fe alloys. It is known that for Cu–Ni alloys the α band is filled at 60 at.-% Cu, and corrosion data confirm that passivity occurs at the same composition. Conditions of electron transfer or sharing described for binary alloys are essentially retained in the Mo–Ni–Fe system. Data for corrosion of the 28, 35, and 60% Ni series in H_2SO_4 confirm the prediction from the theory that passivity will occur at the at. ratio Mo : Fe = 1 : 5. The theory is similarly confirmed in connexion with the addition of Mo to austenitic stainless steel, and the [Mo] required to passivate the alloy Hastelloy A. C. E. H.

Solubility of ferrous oxide in pure solid iron.—See B., 1944, I, 272.

Organometallic lead and tin compounds. K. A. Jensen and N. Clauson-Kaas (*Z. anorg. Chem.*, 1943, **250**, 277—286).—The solubility of hexa*cyclo*hexyldiplumbane, $Pb_2(C_6H_{11})_6$, is 1·4% in C_6H_6 and 1·6% in $CHCl_3$ at 30°. Measurement of χ indicates that the solutions are not appreciably dissociated into paramagnetic radicals. $SnPh_2$ is diamagnetic and has an appreciable dipole moment. F. J. G.

Solubilities of symmetrical normal aliphatic secondary amines of high mol. wt.—See A., 1944, II, 248.

Influence of an adsorbed layer on cohesion and coalescence in liquids and in solids. C. Benedicks, and P. Sederholm (*Arkiv Mat. Ast. Fys.*, 1944, **30, A**, 34 pp.).—Various experiments are described relating to the phenomenon of the floating drop, the stability of which is characterised by its time of existence (durability). This is ~10 sec. for EtOH. The phenomenon is largely due to absorption of moisture in the surface layers. It is shown by H_2SO_4 when this has an appreciable H_2O content. In a solution of saponin (which shows strong adsorption) the durability, and hence the adsorption, possesses a max. at a concn. of ~1%. In malt beverages (possessing strong foaming and hence adsorption) the phenomenon is very prominent (durability 20—25 sec.). The presence of CO_2 in the liquid is necessary. When artificial adsorption layers are produced by thin oil films on H_2O the durability is very great. Fluid foams (containing only liquid matter) are studied, one of these being made from saponin solution and oil. Floating drops occur in molten paraffin, and there is a marked adsorption on solid paraffin. The cohesion between two plane surfaces was determined; this is high for freshly cut surfaces (adsorption excluded) but very low for cut surfaces after exposure to air. Similar results were obtained for solid Pb and Sn. L. S. G.

Cross-sectional areas of molecules adsorbed on solid surfaces. H. K. Livingston (*J. Amer. Chem. Soc.*, 1944, **66**, 569—573).—Measurements have been made on the adsorption of N_2, using the low-temp. method of Brunauer and Emmett (A., 1937, I, 510), and of H_2O, Pr^nOH and n-C_7H_{16}, by the sorption balance method, on graphite, quartz, anatase, and $BaSO_4$. Cross-sectional areas, calc. by the equations of Brunauer *et al.* (A., 1938, I, 190), are H_2O = 10·6, Pr^nOH = 20·0, C_7H_{16} = 55·0 sq. A. per mol., relative to N_2 = 15·4 sq. A., in agreement with vals. derived from density, *X*-ray and film-balance measurements. The val. for C_7H_{16} indicates that the mols. lie with long axes parallel to the solid surfaces. W. R. A.

Accommodation coefficient of helium on platinum. (Miss) P. Rolf (*Physical Rev.*, 1944, [ii], **64**, 185—189).—Vals. obtained for a clean Pt surface at 77°, 193°, 273°, and 373° K. are 0·090, 0·043, 0·071, and 0·072 (±0·004). respectively. For Pt in contact with He for 24 hr. or more, the respective vals. are 0·43, 0·071, 0·170, and 0·170. There is little absorption at 193° K., but strong van der Waals absorption appears at 77° K. and activated absorption at the higher temp. N. M. B.

Water sorption by starches.—See B., 1944, III, 132.

Simple, rapid method for determining maximal water-absorption of materials, especially applicable to small water-absorption values and very small samples. F. H. Müller (*Kolloid-Z.*, 1943, **105**, 16—20).—Apparatus and procedure are described for determining manometrically the max. amount of H_2O taken up, *e.g.*, by org. foils, on exposure to H_2O vapour. The method employs samples of 1—10 mg., is fairly rapid, and gives an accuracy of 10—15%, which is equally well attained for the lowest H_2O-absorption vals. R. H. F.

Photo-adsorption effects in the system pigment–fluid phase. J. A. Hedvall and S. Nord (*Arkiv Kemi, Min., Geol.*, 1943, **17, A**, No. 11, 11 pp.).—The adsorption by red and black HgS of phenolphthalein from aq. EtOH solution and by CdS of α-naphtholphthalein from similar solutions has been investigated under varying light conditions. Light has little effect on adsorption by black HgS but red HgS adsorbs six times as much phthalein in light as in darkness. This difference is ascribed to the different electronic structures of red and black HgS. Black HgS and irradiated red HgS are conductors whereas in darkness red HgS is an insulator. Irradiated CdS adsorbs phthalein ≫ in darkness. In each case adsorption in darkness is increased by presence of excess of S in the sulphide. A parallel is drawn between these photo-adsorption effects and the Becquerel or photo-voltaic effect. C. R. H.

Dependence of absorptive property on the concentration of hydrogen ions and of metallic cations. E. N. Gapon (*J. Gen. Chem. Russ.*, 1943, **13**, 382—390).—The equation derived by Gapon, viz., $S = S_0 + \beta \log (a_M^{1/z}/a_H)$ (1) (S = g.-equiv. of metal cations absorbed per g. of absorbent, a_M = activity of metal ions and a_H = activity of H ions, z = valency of cations, β = const.) on theoretical grounds is compared with Gortikov's empirical equation $S = \alpha + \beta pH - \gamma pM$ (2) (α, β, and γ being consts., pM = log [metal ions]$^{-1}$) and is tested on the data of Ivanov obtained for the action of buffered solutions on black earth (chernozem). Equations (1) and (2) hold for $Na^{\cdot}$ (α −2·2, β 6), $K^{\cdot}$ (α −3·3, β 6·4), $Mg^{\cdot\cdot}$ (α −6·6, β 7·6), and $Ba^{\cdot\cdot}$ (α −7·5, β 7·8) but not for $Ca^{\cdot\cdot}$, and an order of the standard absorbing capacity δ (g.-equiv. absorbed per 100 g. of absorbent at pH 7 and pM 0) is derived. For alkaline solutions an equation $S = \alpha_0 + \beta_0 \log a_\pm$, where $a_\pm$ is the mean activity of the alkali, holds in respect of Ivanov's data for Na (β_0 12·0), $K^{\cdot}$ (β_0 12·8), $Mg^{\cdot\cdot}$ (β_0 11·4), and $Ba^{\cdot\cdot}$ (β_0 11·7) (cf. Nikolski, B., 1935, 71). F. Hi.

Activation of a palladium surface by the glow discharge.—See A., 1944, I, 162.

Mechanism of chemical reactions between solids.—See A., 1944, I, 180.

Ionic interaction in the double electrolytic layer. O. Essin and V. Schichov (*J. Phys. Chem. Russ.*, 1943, **17**, 236—246).—The potential V of the electrocapillary max. is measured for Hg in 0·01—3N-KI, 0·01—10N-KCNS, 0·01—3N-NaBr, and 0·01—5N-NaCl. V increases with log C (C = concn. of the salt) more steeply than linearly, although Stern's theory predicts an expression $V \propto \log C$. To account for this discrepancy it is assumed that ions in the double layer are either distributed at random or form rigid ion pairs oriented towards the interface, but neither of these assumptions appears satisfactory. The interaction between parallel ion dipoles in the interface is calc. on the pattern of crystal lattice calculations. J. J. B.

Osmosis. L. Plantefol (*Compt. rend.*, 1943, **217**, 33—35).—A discussion of the phenomena of osmosis and osmotic pressure, as related to the characteristics of permeable and semipermeable membranes. The transfer of H_2O across a membrane depends, both as regards direction and magnitude, on the effect of the crystalloid on the membrane. The term osmosis should be applied to those cases where the controlling force is a process of hydration. P. G. M.

Causes of the dichroism of colloidal metals. P. A. Thiessen (*Z. anorg. Chem.*, 1943, **250**, 352—356).—The dichroism of colloidal metals in stretched gelatin is sometimes due to the orientation of rod- or leaf-shaped particles of metal, but in other instances to the orientation of non-metallic crystals in which spherical particles of metal are embedded. F. J. G.

Disperse structure of solid systems and its thermodynamic basis. XV. D. Balarew (*Kolloid-Z.*, 1943, **105**, 26—29).—The effect of the structure of the Ag cathode on the decomp. potential of Ag ions in $AgNO_3$ solution, and the effect of heating on the catalytic activity of powdered Ag, on the hardness of Au, and on the electrical conductivity and strength of Cr–Ni wires are considered in relation to the intermixing of surface components of the solid metals. R. H. F.

Thixotropy of montmorillonite. H. G. F. Winkler (*Kolloid-Z.*, 1943, **105**, 29—38).—The degree of thixotropy is expressed quantitatively by the "thixotropic limit," which is the vol. of liquid required per vol. of solid to give a system of setting time 1 min. under specified conditions. The increase in thixotropy with temp. follows the Arrhenius equation. Montmorillonite (I) differs fundamentally from other minerals, *e.g.*, kaolinite, in its thixotropic behaviour, as shown by the diminished thixotropy in presence of electrolytes and the lower thixotropy obtained with org. liquids as compared with H_2O. The differences are due to penetration by H_2O into the layers in the crystal aggregate, causing internal swelling. If the swelling-H_2O is replaced in the crystals by other liquids, *e.g.*, EtOH, the thixotropic behaviour is altered. There is also a pronounced difference between fully swollen and unswollen (I). Progressive reduction of particle size, by subjecting suspensions of (I) to ultrasonic waves, results in increased thixotropy. The energy necessary to liquefy systems of different concns. is examined. R. H. F.

Fibre structure in dispersions of soap in mineral oil. W. Gallay, I. E. Puddington, and J. S. Tapp (*Canad. J. Res.*, 1944, **22, B**, 66—75).—By microscopic examination of Et_2O-extracted greases (soaps dispersed in mineral oil) using polarised light, reliable determinations of the fibre length of metallic soap constituents can be made. Ca and Al soaps give fibres which are generally too small to be measured by this method and the resulting grease has a smooth texture. Na soaps give a wide range of fibre lengths which result in greases with characteristics ranging from very smooth to very ropy. The large fibres are made up of smaller units more or less parallelised. This orientation to larger units is easily brought about by applying a directional force, especially in presence of glycerol (I). In absence of (I) the soap is not wetted by the mineral oil, and on cooling a mixture of soap and oil very short fibres are obtained. In the recrystallisation

of soap in the commercial manufacture of grease, the growth of the crystallites first formed is aided by (I), which exerts a solvent action on the soap and enables the oil to wet the crystallites which, as a result of collisions, form larger crystallites or fine fibres. Formation of larger fibres then follows as a result of directional forces set up by agitation during cooling. C. R. H.

Recrystallisation of sodium soaps in mineral oils. W. Gallay and I. E. Puddington (*Canad. J. Res.*, 1944, **22, B**, 90—102).—The effect of various factors on the recrystallisation of Na soaps in mineral oils has been examined. In absence of any shearing stress, set up, *e.g.*, by agitation, slow cooling favours recrystallisation, and the presence of free acid causes the soap to recrystallise in the form of fibres. Large fibres are also formed in presence of polar substances such as H_2O or glycerol, or if the oil itself is of a polar nature. The application of shearing stresses favours fibre formation. Recrystallisation from a non-polar oil must be regarded as recrystallisation from a hot melt. The presence of polar substances causes the oil to exert a solvent action on the soap; recrystallisation is then partly of the hot melt and partly of the solvent type. In such cases shearing forces play a large part in orientation of the soap micelles. C. R. H.

Effect of high shearing stresses on recrystallisation of sodium soaps in mineral oils. W. Gallay and I. E. Puddington (*Canad. J. Res.*, 1944, **22, B**, 103—108).—High shearing stresses bring about recrystallisation of Na soaps at temp. < the plasticity point of the soap. The length of soap fibre increases with increase in the polarity of the oil, with decrease in the η of the oil, and with increase in the degree of unsaturation of the soap. Neither variation in free acidity or alkalinity nor addition of glycerol has any appreciable effect on the length of the fibres formed. Discussion of the action of shearing stresses leads to the view that long soap crystals are produced by a shearing of the double soap mols. on slip planes between melted hydrocarbon chains, recrystallisation being thus induced on molten portions of the soap. C. R. H.

Low-temperature saponification of anhydrous systems. W. Gallay and I. E. Puddington (*Canad. J. Res.*, 1944, **22, B**, 76—89).—At 50—60° finely divided NaOH and $Ca(OH)_2$ rapidly saponify fatty acids dissolved in mineral oil. The physical properties of the soap dispersions depend on the degree of unsaturation of the fatty acid. Dispersions of high η are obtained with saturated acids. As the result of an agglomeration effect which lowers dispersion, unsaturated acids give products of low η. The saponification of fats is more difficult, only mutton tallow being saponified rapidly. Al, Mg, Ba, Pb, Li, Ni, Co, and Mn soaps have been similarly prepared and the physical properties of some of them are described. C. R. H.

Peptisation of humic substances by alkaline solutions. A. Boutserin (*Compt. rend.*, 1943, **217**, 46—48).—Solutions of alkalis dissolve humic acids from lignite, and, on addition of acids, the humates are decomposed giving colloidal solutions of humic acids. Dil. NaOH is more effective than conc. in dissolving humic acids. The dissolution has been studied with NaOH and aq. NH_3 in the hot (in N_2) and in the cold. The most effective concn. of NaOH is 3%. If carried out in air, the more conc. NaOH dissolves more humic acid in the hot than dil. NaOH, but this is due to the effect of atm. O_2. In the cold, this effect is negligible. A. J. M.

Relationship between solution viscosity and mol. wt. in the amylose series. J. F. Foster and R. M. Hixon (*J. Amer. Chem. Soc.*, 1944, **66**, 557—560; cf. A., 1943, II, 221).—Osmotic pressure and $\eta_{sp.}$ of $CHCl_3$ solutions of maize- (I), tapioca- (II), and potato- ($\eta_{sp.}$ only) -amylose acetates have been determined. Mol. wts. of (I) and (II) are 42 and 75 × 10^3. The exponent, α, in the relation $\eta_{sp.} = KM^{\alpha}$ (M = mol. wt., K a const.) has a val. >1, as expected from the high rigidity of the Fischer–Hirschfelder models of amylose. The rigidity of amylose acetates in $CHCl_3$ is the same as that of amyloses in $(CH_2{\cdot}NH_2)_2$. W. R. A.

Theory of solutions of high-polymeric substances. A. Münster (*Kolloid-Z.*, 1943, **105**, 1—9).—The methods of statistical mechanics are used to explore the theoretical behaviour of solutions of high polymers. The laws of ideal solutions are not valid when solvent and solute mols. are of widely different sizes; the problem is treated by subdividing the high-polymer mol. into units comparable in size with solvent mols. A coherence condition is introduced because a certain group of units always forms one large mol. The significant factor is the no. of possible arrangements of the polymer mols., and a formula is derived for the thermodynamic potential of the dil. solution, introducing a "virtual molar fraction." This leads to modified formulæ for chemical potential, lowering of v.p., and osmotic pressure, which become identical at infinite dilution with the formulæ for ideal solutions. A consequence of solvation is that not all configurations have the same energy, and an additional term is required in the expression for the thermodynamic potential of the solution. R. H. F.

Mol. wt. and mol. wt. distribution in high polymers. General introduction. H. W. Melville (*Trans. Faraday Soc.*, 1944, **40**, 217—220).—A short survey of problems and methods of investigation. F. L. U.

Mol. wt. and shape of macromolecules in solution. H. Campbell and P. Johnson (*Trans. Faraday Soc.*, 1944, **40**, 221—233).—Measurements of viscosity, sedimentation rate, and diffusion const. for globular proteins (egg- and serum-albumins, ground-nut globulin) and cellulose nitrate (N 12·2%) (I) are reported and discussed from the point of view of mol. wt. and shape. Mol. wts. of (I) fractions are calc. by the use of various equations relating η to mol. shape. The validity of the equations remains in doubt until accurate vals. for the mol. wt. of (I) fractions have been established by independent methods. Experimental conditions needed for accurate work on sedimentation and diffusion are discussed, and the importance of using solutions of suitably high dilution is emphasised. Data so far obtained indicate that (I) mols. in $COMe_2$ are fully extended but slightly flexible, with a diameter increased by solvation to ~17·6 A. F. L. U.

Osmotic pressure of high polymer solutions and mol. wt. E. A. W. Hoff (*Trans. Faraday Soc.*, 1944, **40**, 233—236).—Osmotic pressures of $CHCl_3$ solutions of cellulose acetate (I) and polymethyl methacrylate have been measured with an osmometer as described by Carter and Record (A., 1939, I, 318). The Cellophane membranes used became less permeable after prolonged contact with the solutions, and this behaviour led to difficulties when working with solutes having a wide range of particle size. Plots of Π/c against c (Π = osmotic pressure, c = concn.) were never rectilinear, those of Π/c against Π only for some specimens of (I). Where both plots are curved it is advantageous to draw them on the same diagram and extrapolate both to meet at $c = 0$. F. L. U.

Mol. wt. of rubber and related materials. V. Interpretation of mol. wt. measurements on high polymers. G. Gee (*Trans. Faraday Soc.*, 1944, **40**, 261—266).—Osmotic and viscosimetric methods of ascertaining the mol. wt. of polymers are discussed. F. L. U.

Theory of viscosity of solutions of macromolecular substances. I. General considerations. P. H. Hermans, J. J. Hermans, and D. Vermaas (*Kolloid-Z.*, 1943, **105**, 199—204).—General views on the η of solutions of macromol. substances are put forward. The theories of η of very dil. solutions are discussed. These theories have assumed the presence of either rigid anisodiametric particles or rigid knots of mols. It is, however, very probable that such knots will be deformed and broken down into their original state by the process of streaming. The investigation of the deformation forces and the relaxation time of the deformation gives quant. agreement with experiment. Amongst the interactions between the solute mols. the association linkings between the chains must play an important part. These associations take place at local points of attraction and are of limited life. They influence η considerably. The above general considerations apply also to the formation and structure of gels. A. J. M.

Structure mechanics of viscous elastic continua. IX. Hysteresis in rheonomic systems. H. Umstätter (*Kolloid-Z.*, 1943, **105**, 182—190).—In medium ranges of tangential pressure flow curve measurements are less reproducible than in the higher or lower ranges. This is due to a hysteresis effect. Space diagrams for the Maxwell equation are drawn for various conditions of force and velocity. The hysteresis is thus shown to be characterised by thixotropy (analogous to retentivity) and elasticity of flow (analogous to coercivity), but complete analogy with the magnetic case can be obtained only for solids. The structure-mechanical properties of substances can be expressed in terms of three fundamental consts.—shear elasticity, relaxation time, and the limiting val. of the film thickness. A. J. M.

Cataphoresis of purified fractionated kaolinite particles.—See B., 1944, I, 267.

Boundary anomalies and electrophoretic analysis of colloidal mixtures. H. Svensson (*Arkiv Kemi, Min., Geol.*, 1943, **17, A**, No. 14, 15 pp.).—A mathematical theory of boundary anomalies in colloidal mixtures has been developed and tested qualitatively by means of a series of electrophoresis experiments with hog serum, in which a successive decrease of boundary anomalies was obtained by using phosphate buffers containing increasing concns. of NaCl. The apparent albumin content decreases with increasing [NaCl], and high [NaCl] is necessary to obtain vals. approaching the limiting val. The albumin content of hog serum approaches 42% at infinite [NaCl]. The necessity of eliminating boundary anomalies when determining albumin concns. in serum is emphasised. C. R. H.

VI.—KINETIC THEORY. THERMODYNAMICS.

Dissociation constants and pH titration curves at constant ionic strength from electrometric titrations in cells without liquid junction. Titrations of formic acid and acetic acid. R. G. Bates, G. L. Siegel, and S. F. Acres (*J. Res. Nat. Bur. Stand.*, 1943, **30**, 347—359).—pH titration curves for HCO_2H and AcOH in the cell $Pt|H_2|H^+$, $Cl^-|AgCl|Ag$ at const. [Cl^-] and const. μ are recorded. The pK vals. are: HCO_2H, 3·742; AcOH, 4·754. F. J. G.

Second ionisation constant of deuterocarbonic acid. J. Curry and Z. Z. Hugus, jun. (*J. Amer. Chem. Soc.*, 1944, **66**, 653—655).—The

e.m.f. of the cells $H_2|KHCO_3, K_2CO_3|KCl|AgCl, Ag$ in H_2O and $D_2|KDCO_3, K_2CO_3|KCl|AgCl, Ag$ in 98·9% D_2O has been measured. Using MacInnes and Belcher's val. of $5·61 \times 10^{-11}$ (A., 1933, 904) for the ionisation const. of HCO_3', the ionisation const. of DCO_3' has been calc. as $1·42 \times 10^{-11}$. W. R. A.

Hydration of ions. J. Swyngedauw (*J. Phys. Radium*, 1942, [viii], **3**, 117—120).—The action of $CO(NH_2)_2$, glucose, and sucrose is similar to that of gelatin in solutions of a salt; they undergo hydration, and thereby reduce the hydration of the ions of the salt. N. M. B.

Ionic strength valency of ferrohæmoglobin. R. D. Bernard (*J. Biol. Chem.*, 1944, **153**, 91—111).—When solutions of ferrohæmoglobin (I) containing NaCl or NaBr are titrated with NaOH the change from (I) to globin ferrohæmochromogen takes place at a slightly lower pH than in salt-free solutions. Each salt exerts an effect on both the acid- and base-combining powers of (I) everywhere on the titration curve except at the isoelectric point, thus increasing the buffer power of (I). The ionic strength valency of (I) rises from 0 (at the isoelectric point) to a max. of ~3 on the basic side of the titration curve. Substitution of $Ca(OH)_2$ for NaOH does not change the shapes of the titration curves, but more Ca than Na equivs. are bound by (I) at pH vals. > the isoelectric point. Measurement of the effect of (I) on the distributed capacity of the inductive component of an antiresonant electrical circuit suggests that (I) is without effect on the dielectric const. of NaCl solutions for frequencies 12—45 megacycles per sec. Theoretical considerations support this. The magnitude of the difference between $Na^{\cdot}$ and $Ca^{\cdot\cdot}$ is > can be explained by the Debye–Hückel theory. Possible causes for this are a sp. ion effect or a smaller degree of dissociation for Ca than for Na ferrohæmoglobinate. C. R. H.

System bromine–boron bromide. J. Cueilleron (*Compt. rend.*, 1943, **217**, 112—113).—The system has been examined by the cryoscopic method. BBr_3 is the only compound of B and Br existing under the temp. conditions used (−8·8° to −60°). Br and BBr_3 form a eutectic containing 80% of BBr_3, m.p. −60·4°. A. J. M.

Azeotrope in the system *n*-butane–methyl bromide. J. D. Holdman (*J. Amer. Chem. Soc.*, 1944, **66**, 661).—An azeotrope, b.p. −4·4°, containing 58·1±0·5 mol.-% of n-C_4H_{10}, has been observed in the n-C_4H_{10}–MeBr system. W. R. A.

Equilibria in reduction of chromic oxide by carbon.—See B., 1944, I, 275.

System $CaO–Al_2O_3–H_2O$ at 21° and 90°. L. S. Wells, W. F. Clarke, and H. F. McMurdie (*J. Res. Nat. Bur. Stand.*, 1943, **30**, 367—409).—Equilibrium studies on the system $CaO–Al_2O_3–H_2O$ at 21° and 90° are recorded. The so-called hexagonal Ca_3 aluminate hydrate consists of $2CaO,Al_2O_3,8H_2O$ (I) and $4CaO,Al_2O_3,13H_2O$ (II) intercryst. in equimol. proportions. On keeping in contact with solution, (I) affords (II) and $Al(OH)_3$. Both (I) and (II) are metastable with respect to the isometric $3CaO,Al_2O_3,6H_2O$ (III). Diagrams are given showing the solubility relationships of (I), (II), and (III). The only stable solid phases are (III), $Ca(OH)_2$, and gibbsite, $Al_2O_3,3H_2O$. F. J. G.

Heats of formation of beryllium, magnesium, and calcium sulphides. H. von Wartenberg (*Z. anorg. Chem.*, 1943, **252**, 136—143).—By comparison of the heats of dissolution of the metals and the sulphides the heats of formation of BeS, MgS and CaS have been determined as 56·1±1, 83·9±0·5, and 114·3±0·5 kg.-cal. per g.-mol. F. J. G.

VII.—ELECTROCHEMISTRY.

Oxidation–reduction potentials: their significance and applications. H. I. Stonehill (*J. Soc. Dyers and Col.*, 1944, **60**, 176—183).—A review. C. S. W.

Electrode polarisation in electrodeposition of silver from complex electrolytes. A. Levin (*J. Phys. Chem. Russ.*, 1943, **17**, 247—257).—Potential–c.d. curves are determined for Ag and dropping Hg cathodes in some $[Ag(NH_3)_2]_2SO_4$, three $K_3[Ag(CNS)_4]$, and three $K_3[AgI_4]$ solutions. The polarisation E is reduced by stirring, and E = const. + 0·058 log $(1 - D/D_0)$ for both stirred and resting solutions; D is the c.d. corresponding to E, and D_0 is the limiting c.d. for the given intensity of stirring; D_0 is defined by the condition that at $D > D_0$, E increases with D very rapidly. The validity of the equation and the influence of stirring show that the polarisation is a pure concn. polarisation. The behaviour of the anodic polarisation on Ag anodes is similar. J. J. B.

VIII.—REACTIONS.

Kinetics of complex homogeneous reactions. I. General theory of complex reactions. N. N. Semenov (*J. Phys. Chem. Russ.*, 1943, **17**, 187—214).—The types of homogeneous reactions taking place in several steps are systematically reviewed, the main types being linear sequence of reactions, unbranched chain reaction, and branched chain reaction. General rules for branched chain reactions are given, and Bodenstein's method of stationary concns. of intermediate compounds is extended for non-stationary reactions. J. J. B.

Polymeric phosphates. IV. Rate of hydrolysis of pyrophosphate, tripolyphosphate, and hexametaphosphate. R. Watzel (*Chemie*, 1942, **55**, 356—359).—The hydrolysis of $Na_4P_2O_7$ (I), $Na_5P_3O_{10}$ (II), and $(NaPO_3)_6$ (III) has been studied in 1% solution at 60° and 100° and pH (controlled) 0·6—13·0; results were confirmed by examination of the Ca-sequestering power of the hydrolysates. The rate of hydrolysis of (I), (II), and (III) is high at low pH, and falls rapidly with increasing pH; at pH 7 (II) and (III) are only slowly, but (I) is still quite rapidly, hydrolysed. Above pH 7, the rate of hydrolysis of (I) falls rapidly until pH 10, when it is stable indefinitely, of (II) falls slowly with increase of pH to 13, and of (III) falls to a min. at pH 8—9 and then rises again slowly (all at 100°). The rate of hydrolysis is in all cases greatly reduced at 60° and the compounds can be treated as stable indefinitely above pH 7. In the range 0·1—1·0% the rate of hydrolysis of the compounds increases with increasing concn. at pH 7—10, and, with (III) only, with decreasing concn. at pH 3 and 13, but the effect is small compared with those of pH and temp. M. H. M. A.

Non-stoicheiometric equations. (A) O. F. Steinbach. (B) W. T. Hall. (C) A. Lehrman (*J. Chem. Educ.*, 1944, **21**, 66—69, 201—202, 202—203).—Crit. discussions. L. S. T.

Flame spectrum of carbon monoxide. III. The cool flame.—See A., 1944, I, 190.

Homogeneous thermal decomposition of *cyclo*pentane. L. Küchler (*Z. physikal. Chem.*, 1943, **B**, **53**, 307—319).—The decomp. velocity was measured at 500—600° by a static method, and the products were separated by desorption. The decomp. is about half a dehydrogenation to *cyclo*pentadiene and half a ring cleavage in which C_3H_6 and C_2H_4 are formed. Small quantities of CH_4 are also produced. The dehydrogenation occurs in two stages via *cyclo*pentene; the first stage is rate-determining; it is of the first order and has an activation energy of ~75 kg.-cal. per g.-mol. The ring cleavage is autocatalytic, the acceleration being caused by the C_3H_6 and C_2H_4 produced. It is improbable that chain reactions play any part in the process. J. F. H.

Thermal decomposition of acetaldehyde. J. C. Morris (*J. Amer. Chem. Soc.*, 1944, **66**, 584—589).—The products of the thermal decomp. of MeCHO (I) and $CD_3·CDO$ (II) and their mixtures at 500° have been studied by means of their infra-red absorption spectra. Abs. reaction rates have been determined. CH_4, CD_4, MeD, and CHD_3 are the only methane-species produced in any quantity, indicating that decomp. is truly unimol., and that chain reactions play but a minor part, being probably induced by impurities. Abs. reaction rates only half as large as previous determinations support this view. The rate of decomp. of (I) is 1·3—1·4 times that of (II). W. R. A.

β-Lactones and β-lactonic acids. IV. Rate of fission of the β-lactone ring. M. M. Schemjakin and N. S. Vulfson (*J. Gen. Chem. Russ.*, 1943, **13**, 448—456).—β-Lactones of *iso*propylidene- (I) and benzylidene-malonic acid (II) were treated with 0·1N. aq. NaOH at various temp. The unimol. reaction coeffs. were, (I): $6·4091 \times 10^{-3}$/75°, $7·5275 \times 10^{-3}$ (temp. ?), and $7·105 \times 10^{-3}$ (temp. ?); $1·6196 \times 10^{-2}$ and $1·6949 \times 10^{-2}$/85·5°; $6·0977 \times 10^{-2}$, $6·5235 \times 10^{-2}$, $6·25473 \times 10^{-3}$/104°; (II): $8·5548 \times 10^{-3}$, $7·9102 \times 10^{-3}$, $8·0789 \times 10^{-3}$/75°; $2·127 \times 10^{-2}$, $2·282 \times 10^{-2}$/85°, $1·018 \times 10^{-1}$, $9·9 \times 10^{-2}$/103°, whence the calc. heat of activation of scission of the ring of (I) is 19,323 g.-cal., and of the ring of (II) is 22,832 g.-cal. F. Hi.

Interpretations of reactions in the carbohydrate field in terms of consecutive electron displacement.—See A., 1944, II, 250.

[Slow] oxidation of ketones and aromatics in the gaseous phase.—See B., 1944, II, 193.

Autoxidation of β-elæostearic acid. Application of the spectrophotometer to the study of the course and the kinetics of the reaction. R. W. Brauer and L. T. Steadman (*J. Amer. Chem. Soc.*, 1944, **66**, 563—569).—The oxidation of n-C_5H_{11}·OAc solutions of β-elæostearic acid (I) by mol. O_2 has been studied at 64·5° by the simultaneous determination of O_2 uptake and absorption spectra. Plots of O_2 uptake rates against initial concn., at various stages in the reaction, are linear above 0·05 g. per c.c., but deviate from linearity below this concn. During the oxidation, the intensity of the absorption band of (I) at 2685 A. decreases, and that of a new band at <2500 A. first increases and finally decreases. The rate of decomp. of the triene group of (I) has been calc. from the O_2 uptake curves and from the relation between absorbed O_2 and residual triene groups. Initially, decomp. of (I) needs ~½ mol. of O_2, suggesting that the initial reaction results in a dimerisation of (I) involving C–C bonds, and that the peroxides formed during the reaction induce a parasitic polymerisation. Dimerides have been isolated from the reaction mixture. O_2 uptake can be approx. calc. for the early stages from the absorption spectra, if it be assumed that two mols. of (I) react with one mol. of O_2 to give a dimeric diene, which further reacts with one mol. of O_2 giving spectrographically inert products capable of

absorbing two mols. of O_2 per mol. of (I) originally present. The rate of O_2 absorption becomes small after the absorption of two mols. per mol. of (I). The two mols. of O_2 may be recovered as a dibasic acid, probably a polymeride of (I), which loses $\frac{3}{4}$ of the absorbed O_2 on boiling with 2% aq. KOH. W. R. A.

Catalytic studies on alloys. XI. Copper–palladium and copper–platinum alloys as catalysts for the hydrogenation of ethylene. G. Rienäcker, E. Müller, and R. Burmann (*Z. anorg. Chem.*, 1943, **251**, 55—70).—The behaviour of Cu–Pd and Cu–Pt mixed crystals as catalysts for the hydrogenation of C_2H_4 has been studied. Alloys with $\not<$47 at.-% Pd and $\not<$16 at.-% Pt are comparable in efficiency with pure Pd and Pt, although the activation energies decrease steadily from pure Cu to pure Pd or Pt. Alloys with ordered structure show activation energies < those for the corresponding alloys with disordered structure. F. J. G.

Generalised acid–base catalysis. I. Condensation of *o*-benzoylbenzoic acid in sulphuric acid. W. F. Luder and S. Zuffanti (*J. Amer. Chem. Soc.*, 1944, **66**, 524—526).—The condensation of o-$C_6H_4Bz{\cdot}CO_2H$ to anthraquione (I), catalysed by oleum, is discussed with respect to the generalised theory of acid–base catalysis. The postulate of a cyclic ion does not impair the applicability of the latter. Inhibition of the reaction by (I), $AlCl_3$, HCl, $CuCl_2$, and HF is ascribed to a reduction in the acid strength of the oleum. W. R. A.

Promoting effect of some metal oxides on iron–copper contacts used in synthesis of gasoline from water-gas.—See B., 1944, I, 258.

Sodium peroxide bleaching of mechanical pulps. Control of metal catalysts in the bleaching operation.—See B., 1944, II, 228.

Mechanism of electrolysis. R. Audubert (*J. Phys. Radium*, 1942, [viii], **3**, 81—89).—By taking into account the activation energy of the ions and the ionisation of the discharge products, a relation is obtained representing the intensity variation as a function of potential. Results are verified by tabulated and graphical experimental data. From the theory developed, activation energies of different processes and the mechanism of discharge are deduced. N. M. B.

Plating magnesium [with nickel and silver].—See B., 1944, I, 281.

Recent developments in zinc plating.—See B., 1944, I, 281.

Cadmium plating.—See B., 1944, I, 281.

Impurities in cobalt electrowinning.—See B., 1944, I, 281.

Electrochemical mechanism of corrosion. G. Masing (*Z. anorg. Chem.*, 1943, **252**, 164—169).—Contrary to the observations of Todt (A., 1929, 145, 270) the corrosion of both Cd and Fe when in contact with Cu or Pt in an AcOH buffer with the H_2O-line covered $\propto$ the sum of the surfaces of the two metals. F. J. G.

Electrolytic reduction of acetophenone in alkaline solution.—See A., 1944, II, 218.

Photo-reduction of ferric chloride in presence of aqueous acetone and anhydrous ether. M. Prasad and P. R. Bavdekar (*Proc. Indian Acad. Sci.*, 1943, **18**, **A**, 373—382).—The photo-reduction of $FeCl_3$, by radiation of mean λλ 4725, 5975, and 6625 A. in aq. $COMe_2$ and anhyd. Et_2O has been investigated. The reductions are unimol., with velocity coeffs. markedly affected by changes of temp. and λ, and rates $\propto$ incident intensity. Quantum yields increase with decreasing $[FeCl_3]$, and with increasing temp. and ν of the exciting radiation, and are ~0·5 for aq. $COMe_2$ and ~1·0 for anhyd. Et_2O. W. R. A.

Reactions shown by spectra of electron affinity of chromous and ferrous ions. B. J. Dain, B. F. Kutzaja, and E. A. Liberzon (*J. Phys. Chem. Russ.*, 1943, **17**, 226—235).—The absorption in ultra-violet of $CrSO_4$ solutions was determined between 0·02 and 0·55M.; the Lambert–Beer law was valid at <0·09 mol. per l. The long-wave frontier was at ~3500 A., *i.e.*, at 3·5 e.v., in agreement with the work of removing an electron from aq. $Cr^{\cdot\cdot}$. Solutions of $FeSO_4$ and $CrSO_4$ evolve H_2 when illuminated with λ <3000 A.; the rate (v_1 for $Fe^{\cdot\cdot}$ and v_2 for $Cr^{\cdot\cdot}$) of evolution is independent of temp. (17—50°). H_2SO_4 accelerates the rate: v_1 is raised 4·4 times when $[H_2SO_4]$ increases 120 times, and v_2 rises 1·8 times when $[H_2SO_4]$ increases 40 times; this acceleration is so small that OH′ cannot be formed in the primary reaction, which is more likely to result in formation of an intermediate compound of $Fe^{\cdot\cdot\cdot}$ (or $Cr^{\cdot\cdot\cdot}$) with negatively charged H_2O. v_1 is lowered by $Fe^{\cdot\cdot\cdot}$ and becomes immeasurably small when $[Fe^{\cdot\cdot}] : [Fe^{\cdot\cdot\cdot}] = 20 : 1$. v_2 is not affected by $Cr^{\cdot\cdot\cdot}$, which obviously is not reduced by at. H. The quantum yield for $Fe^{\cdot\cdot}$ is 0·1—0·2, and that for $Cr^{\cdot\cdot}$ is ~0·4, of that for $CH_2Cl{\cdot}CO_2H$. J. J. B.

Photochemical after-effect: decomposition of hydrogen peroxide by potassium ferricyanide. B. B. Lal and C. P. Singhal (*Current Sci.*, 1944, **13**, 78—79).—A large after-effect was observed in decomp. by pre-insolated $K_3Fe(CN)_6$, especially when some unilluminated $K_4Fe(CN)_6$ is also present in the reaction mixtures. The irradiated salt solution shows a much enhanced reactivity towards H_2O_2 in the dark, and this enhanced effect which shows itself as a photochemical after-effect is retained for a long time, but diminishes gradually on keeping in the dark. Tabulated data are reported, the mechanism of reaction is discussed, and evidence of the formation of $K_2Fe(CN)_5,H_2O$ by irradiation of $K_3Fe(CN)_6$ is given. N. M. B.

Reactions of hydrocarbons with sulphuryl chloride and with sulphur dioxide–chlorine mixtures. H. J. Schumacher and J. Stauff (*Chemie*, 1942, **55**, 341—345).—Chlorination of hydrocarbons by SO_2Cl_2 (I) in light or in presence of Bz_2O_2 (II) always gives some $R{\cdot}SO_2Cl$, the yield falling as the temp. rises owing to decomp. of $R{\cdot}SO_2Cl$ and increase in the rate of chlorination [*cyclo*hexane in light at 30° gives 70% of $C_6H_{11}{\cdot}SO_2Cl$ (III) at 70° 20%], but $R{\cdot}SO_2Cl$ must be determined by hydrolysis of the reaction product and not by distillation, when decomp. occurs, catalysed by (II) [the rate of decomp. of (III) at 100° is increased 10-fold by 2% of (II)]; hence Kharasch's failure to detect $R{\cdot}SO_2Cl$ (A., 1939, II, 497; 1940, II, 3, 72, 172, 202, 363). Chlorination by (I) in presence of (II) occurs, as in light, via Cl_2, the dissociation of (I) being amply fast, and the mechanism put forward by Kharasch (*loc. cit.*) is unnecessary. The photochemical chlorination is catalysed by active C owing to its catalysis of the dissociation of (I), but the reaction in presence of (II) is inhibited, as it also catalyses the decomp. of (II). The slow chlorination of, *e.g.*, $CHCl_3$ or $(CHCl_2)_2$ in presence of (II) is due to their reaction with (II), causing chain-breaking. C_5H_5N has no catalytic effect on the production of $R{\cdot}SO_2Cl$ from RH and SO_2Cl_2, acting only by removing SO_2 stoicheiometrically and thus causing a high initial $[Cl_2]$ which shortens any induction period due to the presence of chain-breakers (usually dissolved O_2); with pure reagents there is no induction period and C_5H_5N has no effect. Illumination is preferred to the presence of (II), as the decomp. of (II) is very slow at the temp. (30—50°) necessary to minimise decomp. of $R{\cdot}SO_2Cl$, but replacement of (II) by a less stable peroxide gives satisfactorily rapid reaction. In the photochemical reaction: $SO_2 + Cl_2 \rightarrow$ (I), $k \propto I \times [SO_2]^{0\cdot5-1\cdot0}$, and is independent of $[Cl_2]$, $[O_2]$, and p; the quantum yield is <1. There is no evidence of $\cdot SO_2Cl$ formation. The homogeneous thermal decomp. of (I) is immeasurably slow at 100°, but moderately rapid when sensitised by illuminated Cl_2. The kinetics of the photochemical reaction: n-C_7H_{16} (IV) + Cl_2 + SO_2 $\rightarrow n$-$C_7H_{15}{\cdot}SO_2Cl$ (V) + HCl, have been studied at 25° in CCl_4, using light of λ = 436 mμ., by photoelectric determination of $[Cl_2]$. $-d[Cl_2]/dt = 4\cdot9 \times 10^{-2} \times [(IV)] \times I^{0\cdot5}$, and is independent of $[SO_2]$ above a min. concn.; the apparent activation energy is ~6 kg.-cal., and the quantum yield $\sim 3\cdot5 \times 10^4$. The following mechanism is proposed: $Cl_2 + h\nu \rightarrow 2Cl$; (IV) + Cl $\rightarrow C_7H_{15}$ + HCl; $C_7H_{15}{\cdot}$ + $SO_2 \rightarrow C_7H_{15}{\cdot}SO_2{\cdot}$; $C_7H_{15}{\cdot}SO_2{\cdot} + Cl_2 \rightarrow$ (V) + Cl. The chain is broken by: $2Cl \rightarrow Cl_2$. The reaction is inhibited by O_2, the chain being broken by its reaction with $C_7H_{15}{\cdot}$; this reaction is $\not<10^4$ times as fast as the reaction of $C_7H_{15}{\cdot}$ with SO_2, which again is much faster than: $C_7H_{15}{\cdot} + Cl_2 \rightarrow C_7H_{15}Cl + Cl$. M. H. M. A.

IX.—PREPARATION OF INORGANIC SUBSTANCES.

Double compounds of sodium oxide and the bivalent oxides of the manganide elements. G. Woltersdorf (*Z. anorg. Chem.*, 1943, **252**, 126—135).—ZnO, CuO, NiO, and CoO react with Na_2O at ~450° affording the *compounds* Na_6ZnO_4; Na_2ZnO_2; Na_4CuO_3; Na_2CuO_2; Na_2NiO_2; Na_4CoO_3. F. J. G.

Production of sodium silicofluoride.—See B., 1944, I, 263.

Growth of crystals of potassium sodium tartrate. L. C. Baker (*New Zealand J. Sci. Tech.*, 1943, **25**, B, 62—64).—Details of a method for growing crystals weighing 150—200 g. by seeding solutions saturated between 30° and 40° and cooling the solutions by lowering the temp. of a small insulated room are given. The cooling of solutions saturated at temp. >40° yields a mixture of Na K tartrate and Na tartrate. Crystals were also grown between glass plates to restrict growth to the Y and Z axes. L. S. T.

Identification of the products of corrosion of lead by water in the presence of air, by means of their *X*-ray spectra. M. F. Taboury and E. Gray (*Compt. rend.*, 1943, **217**, 211—213).—Two phases are present in the deposit formed on Pb when exposed to the action of H_2O in presence of air. One is cerussite, $PbCO_3$ (I), the other is hydrocerussite, $2PbCO_3,PbO,H_2O$, identical with the product obtained by boiling a suspension of (I). The red powder occasionally formed on Pb near the surface of the H_2O has the spectrum of minium. A. J. M.

Chromammines. III. Preparation of diacidodiethylenediamino-salts by thermal decomposition of triethylenediamine luteo-salts. C. L. Rollinson and J. C. Bailar, jun. (*J. Amer. Chem. Soc.*, 1944, **66**, 641—644).—The thermal decomp. of $[Cr\,en_3]Cl_3,3{\cdot}5H_2O$ (I) at 160° and of $[Cr\,en_3](CNS)_3,H_2O$ (II) at 130° has been investigated. NH_4Cl and NH_4CNS catalyse conversion of (I) into *cis*-$[Cr\,en_2Cl_2]Cl$ (III) and of (II) into *trans*-$[Cr\,en_2(CNS)_2]CNS$ (IV). The prep. of the monohydrates of (III) and (IV) by this method, giving 50 and 60% yields, are described. W. R. A.

***X*-Ray examination of patches of oxide formed on iron at high temperatures.** J. Bénard (*Compt. rend.*, 1943, **217**, 77—78).—If Fe is heated in air to 900° it becomes covered with a layer of oxide, chiefly FeO. If this patch is removed, and again heated to 900°,

it rapidly becomes Fe_2O_3. It is supposed that there is a diffusion of Fe towards the oxide during the process of oxidation. This has been verified by *X*-ray determinations, the parameters of FeO being found at various temp. Fe can dissolve in FeO, causing an increase in *a* from 4·282 A. to 4·300 A. at 900°. FeO nearer the Fe surface has a larger *a*, indicating that FeO in the neighbourhood of the metal surface is saturated with Fe. Similar results are obtained at lower temp., *a* being always ~4·300 A., but at the surface exposed to the atm. *a* is not as low as 4·282 A. A. J. M.

Reducibility of oxides and sulphides in metallurgical processes.—See B., 1944, I, 272.

X.—LECTURE EXPERIMENTS AND HISTORICAL.

Experiment in colorimetry and reaction kinetics for physical chemistry. R. Wistar and L. Nelson (*J. Chem. Educ.*, 1944, **21**, 94—95).—The coupling of diazotised sulphanilic acid with 1 : 4-$NH_2{\cdot}C_{10}H_6{\cdot}SO_3H$ acid to form an amber-coloured solution is followed colorimetrically to 77% completion in ~20 min. at 20°. Procedure is detailed. L. S. T.

[Laboratory] preparation of magnesium nitride. F. Fromm and P. J. Rivera (*J. Chem. Educ.*, 1944, **21**, 196).—Well-dried N_2 from NH_4NO_2 is passed for several hr. over Mg powder contained in a porcelain boat and heated between 300° and 700° in a hard-glass tube. Traces of H_2O produce MgO. L. S. T.

Removal of electrolytes from solutions by ion exchange. Lecture demonstration experiment. F. C. Nachod and S. Sussman (*J. Chem. Educ.*, 1944, **21**, 56—58).—Removal of salts from tap-H_2O, of sucrose from H_2O, and of $Cu^{\cdot\cdot}$ from H_2O by means of the cation exchanger, Zeo-Karb, and the anion exchanger, De-Acidite, is described. L. S. T.

Friedrich Wöhler and his American pupils. H. S. van Klooster (*J. Chem. Educ.*, 1944, **21**, 158—170). L. S. T.

Ernst von Meyer, 1847—1916. R. E. Oesper (*J. Chem. Educ.*, 1944, **21**, 107—108). L. S. T.

Don José Celestino Mutis, 1732—1808. M. E. Weeks (*J. Chem. Educ.*, 1944, **21**, 55). L. S. T.

XI.—GEOCHEMISTRY.

Waters from the Frio formation, Texas Gulf Coast. F. W. Jessen and F. W. Rolshausen (*Amer. Inst. Min. Met. Eng.*, 1944, *Tech. Publ.* 1729, 16 pp.; *Petroleum Tech.*, 1944, **7**, No. 3).—Analyses of 116 brines from various depths in a no. of oilfields in the area surveyed indicate variation in salinity with depth, with a possible max. concn. in the top 300 ft. of the Frio formation. D. D.

Metals in the stars. (Sir) H. S. Jones (*J. Inst. Metals*, 1944, **70**, 175—196).—A lecture discussing our present knowledge of the composition of the sun, the stars, and interstellar space based on spectroscopic observations. A. R. P.

Temperature of the upper atmosphere. (Mme.) A. Vassy and E. Vassy (*J. Phys. Radium*, 1942, [viii], **3**, 8—16).—The calculation of the temp. of the upper atm. from observations of ρ and composition, and of the polar auroræ, and from radioelectrical measurements, and the applicability of the formulæ of Laplace and of Chapman (A., 1931, 1350), relating pressure to altitude, are discussed. Temp. relations and the ionic composition of the ionised layers of the atm. are separately considered. Calculation of the temp. against altitude curves for temperate and polar latitudes indicates the importance of the direct absorption of light in the atm. thermal equilibrium. W. R. A.

Minerals new or rare to Britain. A. Russell (*Min. Mag.*, 1944, **27**, 1—10).—A gold nugget (501·2 grains with quartz) was found in 1940 at Leadhills, Lanarkshire. Specks of Au have been found on russellite (A., 1938, I, 376) from Castle-an-Dinus wolfram mine, Cornwall. Other minerals described are: orpiment in clay from Clevedon, Somerset; semseyite from Carnarvonshire; dundasite from Cornwall and Carnarvonshire; wulfenite from Westmorland. L. J. S.

Crystal structure of gümbelite. E. Aruja (*Min. Mag.*, 1944, **27**, 11—15).—Gümbelite forms fine flexible fibres (1 cm. long) perpendicular to the walls of fissures in slate on the shore of Lake Onega, Karelia. It is monoclinic with *a* 5·21, *b* 9·02, *c* 20·12 A., β 96°, ρ 2·77. A similar *X*-ray pattern is given by the original gümbelite from Nordhalben, Bavaria. The mineral is compared with muscovite and hydromuscovite. L. J. S.

Mineral composition of the tin ores of Renison Bell, Tasmania. F. L. Stillwell and A. B. Edwards (*Proc. Austral. Inst. Min. Met.*, 1943, No. 131—2, 173—186).—The chief minerals in the ore-bodies are cassiterite, arsenopyrite, pyrite, and pyrrhotite, with quartz as the chief gangue mineral, accompanied by smaller amounts of tourmaline and topaz. Small amounts of chalcopyrite and stannite (I) accompany or follow these chief pyritic sulphides. Much of the gangue mineral of the late stages of crystallisation is a Mn–Fe–Mg carbonate of varying composition (chemical analyses given). Minor and rare constituents of the lodes are wolfram, marcasite, magnetite, (I), tetrahedrite, jamesonite, canfieldite, pyrargyrite, franckeite, and native Bi and Au. All these minerals and their mode of occurrence are described. The sequence of mineralisation, and the manner and rate of oxidation of the ores, which vary considerably with locality and composition, are discussed. L. S. T.

Petrology of two clastic dykes from the Placerville District, Colorado. J. C. Haff (*Amer. J. Sci.*, 1944, **242**, 204—217). L. S. T.

Age of the Deccan traps of the Bombay and Salsette Islands. A. S. Kalapesi and R. N. Sukheswala (*J. Univ. Bombay*, 1944, **12, A**, Part 5, 36—43).—The U and Pb contents of 9 rocks from different localities in these islands are recorded and used to calculate the age of the rocks by the well-known Pb, U, Th formula. The Th content is nil. The Deccan Traps belong to the Tertiary era. L. S. T.

Decomposed granite, Baton, Nelson. B. L. Taylor (*New Zealand J. Sci. Tech.*, 1943, **25**, B, 78—86).—The geology of the decomposed granites and arkositic grits of the Baton district is outlined, and their prospecting and sampling described. Chemical analyses of the clay fractions and their behaviour on burning are recorded. Chemical analyses of granites and felspars are also given. L. S. T.

Zircon in sedimentary rocks of Otago. F. J. Turner (*New Zealand J. Sci. Tech.*, 1943, **25**, B, 89—90).—The distribution of zircon in the rocks of the Maniototo basin is discussed. The amount in Au-bearing deposits and the amount probably available from Au-mining operations are estimated. L. S. T.

Felspathic clay, Wyndham, Southland. R. W. Willett (*New Zealand J. Sci. Tech.*, 1943, **25**, B, 87—88).—A bed of indurated clay interstratified in the basement rocks of the Wyndham district has the composition and physical properties of a stoneware clay. L. S. T.

Formation of colloid from halloysite in dilute acid solutions. P. G. Nutting (*J. Washington Acad. Sci.*, 1944, **34**, 110—112).—Treatment of halloysite with dil. HCl at 96° forms a sol having the composition of allophane, $2Al_2O_3,SiO_2,7H_2O$, after drying at 160°. A quant. relationship between sol formed and the HCl, clay, and H_2O used is given for certain ranges of [HCl]. L. S. T.

Some properties of brookite in the detritic formations of the Parisian Basin. (Mlle.) S. Duplaix (*Compt. rend.*, 1943, **217**, 81—82).—The crystal form and optical properties of brookite found in the above formation are described. It is found only in small quantity, but is more stable than is usually supposed. A. J. M.

Regular inclusions of plagioclase in orthoclase (sanidine). A. Maucher (*Z. Krist.*, 1943, **105**, 82—90).—Orthoclase (I) from Keban (Turkey) contains numerous inclusions of plagioclase (II). One surface of (II) always lies parallel to a surface of (I), and one or more edges of (II) are parallel to an edge of (I). This is difficult to explain since (II) is older than (I). A. J. M.

Etch figures of basal sections of quartz: their use in the orientation of water-worn crystals. F. N. Hanlon (*J. Proc. Roy. Soc. New South Wales*, 1944, **77**, 40—51).—Results obtained by etching with HF sections of quartz cut perpendicular to the optic axis are recorded. L. S. T.

Measurement of densities [of minerals] by comparison with sand. A. Cailleux (*Compt. rend.*, 1943, **217**, 30—31).—A method of estimating the *d* of minerals, by finding whether they sink or float in sand, is outlined. A vessel is partly filled with sand (grain size ~0·3 mm.), a fragment (3—7 mm. long) of the mineral is placed on the surface, and the vessel is gently shaken horizontally. After a few sec. minerals with $d \not> $ that of quartz remain on the surface; those with $d >$ that of quartz are submerged. The error is 1—2%. For success the sand must be neither too damp nor too dry, the fragments of mineral must be $<$ 5 times as long as they are thick, and there is an optimum grain size for the sand. A. J. M.

Ilmenorutile from Sierra Leone. [L. C. Chadwick and T. Deans] (*Bull. Imp. Inst.*, **52**, 45—47).—Ilmenorutile (I) is the chief constituent of an alluvial concentrate obtained from a locality near Sakasakala on the Tonkolili river. (I) crystallised apparently in intimate association with quartz. (I), ρ 4·74, has approx. TiO_2 55·7, Nb_2O_5 22·6, Ta_2O_5 9·4, FeO 11·0, total 98·7%. L. S. T.

Crystal structure of daubréelite. D. Lundqvist (*Arkiv Kemi. Min., Geol.*, 1943, **17, B**, No. 12, 4 pp.).—*X*-Ray powder photographs show that daubréelite ($FeCr_2S_4$) has a spinel and not a pentlandite structure. C. R. H.

Discovery of nickel minerals in the argentiferous lead vein at Pontpéan (Ille et Vilaine). H. Vincienne (*Compt. rend.* 1943, **216**, 899—900).—Ni minerals are to be found in very fine fissures in the calcite of this vein. They consist of breithauptite (Ni antimonate) and rammelsbergite (Ni arsenate). A. J. M.

Radioactive substances. III. Analysis and age of a North Carolina monazite. A. D. Bliss (*Amer. J. Sci.*, 1944, **242**, 327—330).—A monazite, ρ 5·18, from Spruce Pine, North Carolina, has Th 4·83, U 0·02, and Pb 0·13%. The age, calc. by the usual formula, is ~6×10^8 years. L. S. T.

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