

JUNE, 1942.

I.—SUB-ATOMICS.

General physical constants. R. T. Birge (*Physical Soc. Rep. Progr. Physics*, 1941, 8, 90—134).—A progress report, to August, 1941, with details on the velocity of light only. W. J.

M.I.T. wave-length project. G. R. Harrison (*Physical Soc. Rep. Progr. Physics*, 1941, 8, 212—230).—A progress report. W. J.

Simple formula for wave-length measurement in ultra-violet spectra. P. Bary (*Compt. rend.*, 1941, 213, 165—166).—A formula, which gives good vals. for 13 lines of Hg, is proposed for the reduction of wave-lengths from measurements in quartz-prism spectrograms. W. R. A.

Precision method for the measurement of the wave-lengths of diffuse lines. W. W. A. Johnson and D. Norman (*J. Opt. Soc. Amer.*, 1941, 31, 177—178).—A method is described of determining in the micrometer trace of a diffuse, asymmetric, self-reversed line (e.g., Sn 3330, 3262, and 3175 Å.) the centre of intensity of the line, i.e., the vertical line which divides the spectral line into areas of equal intensity. This is the most significant measure of the position of a line. O. D. S.

Electrode concentrations and total intensity of spectral lines. H. Hemmendinger (*J. Opt. Soc. Amer.*, 1941, 31, 150—156).—The intensities of the Fe and Ti lines in a d.c. arc between Fe or Fe-Ti (Ti 30—99%) electrodes have been measured and compared with theoretical vals. For Fe electrodes the intensity ratios agree with theoretical at low c.d. At high c.d. the intensity of the strongest lines is below the theoretical, and lines of low excitation potential deviate > those of high excitation potential. A similar change with increasing concn. of either element in the mixed electrodes is observed at low c.d. As the concn. of Fe is increased the intensity of the strongest lines begins to fall below the theoretical. A similar effect is observed for Ti but does not show the same dependence of deviation on the excitation potential of the lines as was observed for Fe. This indicates that the weakening of the strongest Ti lines is due to self-absorption rather than self-reversal. The best criterion for the determination of concn. ratio from observed intensities is obtained by plotting the observed against theoretical intensities for a large no. of lines of both elements and measuring the ratio of intensity for that part of the curve which is a straight line. The dependence of this ratio on the abundance ratio from 0 to 100% of Fe in Fe-Ti mixtures is given. O. D. S.

Spectrochemical analysis by the stepped sector method.—See A., 1942, I, 181.

Spectrum-analytical determination of metals in microscopical preparations.—See A., 1942, I, 181.

Use of electrodeless annular discharge in a high-frequency magnetic field in spectrum-analytical detection of traces.—See A., 1942, I, 182.

He I lines in Balmer continuum. F. E. Roach and L. Blitzer (*Astrophys. J.*, 1940, 92, 50—58).—Equiv. widths of He I lines of diffuse series, measured for 22 stars of classes Oe 5 to B 5, show that higher members of the triplet diffuse series are abnormally weak. This weakening is interpreted in terms of an increase in the continuous absorption coeff. in the Balmer continuum. Comparison with theory suggests a high H content for these stars. E. R. R.

Zeeman effect and the nature of some new helium lines. P. Jacquinot (*Compt. rend.*, 1941, 213, 64—67).—The nature of He lines of the types $^3P-^3D$, $^1P-^3F$, $^1P-^1F$, $^3P-^3F$, 1F , and ^3P-G , has been investigated by studying the Zeeman effect. The lines are very weak, and are in the neighbourhood of much more intense lines, thus making the study of the Zeeman effect difficult. All the transitions studied start from the 3F level. The Zeeman splittings are those which would be given by quadrupole lines. Owing to the fact that the 3F level is the superposition of three levels 3F_2 , 3F_3 , and 3F_4 , these three levels suffer a complete Paschen-Back effect. By combining the rules for this effect for dipole lines, and those of the Zeeman effect for quadrupole lines, it is shown that the complete Paschen-Back effect for the lines of the multiplet is the same as the Zeeman effect of the singlet lines, for a quadrupole line. The lines due to the transitions $^3P_1-^3F$ and $^1P-^3F$ are considered to be of this type. A. J. M.

Remarkable [auroral] green-line source. J. Kaplan (*Nature*, 1942, 149, 273).—A tube previously used (A., 1940, I, 275) when cleaned and filled with N₂ at 100 mm. quickly developed a strong afterglow rich in the green auroral line. Another tube at 50 mm. also showed strong forbidden O and N line excitations. Apparently the catalytic effect of the walls for the destruction of active N had been removed. A. A. E.

Kinetic temperature of the solar reversing layer. P. J. Rubenstein (*Astrophys. J.*, 1940, 92, 114—117).—Redetermination of the curve of growth for the sun gives $5400^\circ \pm 1300^\circ$ as the temp. of the solar reversing layer for Fe atoms, and $1.7 \times 10^6 \pm 0.40 \times 10^6$ as the damping const. E. R. R.

Emission spectra of the rare-earth elements. W. F. Meggers (*J. Opt. Soc. Amer.*, 1941, 31, 157—159).—A review of present knowledge of the analysis of the emission spectra of the rare-earth elements. 5000 Tm lines have been measured between 2200 and 9000 Å., and a partial analysis of the spectrum is reported but not described in detail. O. D. S.

Transition probabilities of forbidden lines. S. Pasternack (*Astrophys. J.*, 1940, 92, 129—155).—The calculation of transition probabilities of forbidden lines for atoms in p^2 , p^3 , p^4 , d^2 , and d^3 configurations is discussed. Results for many elements in p^k configurations, for the d^2 configuration of Fe VII, and for the d^3 configuration of C VI, Mn V, and Fe VI are given. E. R. R.

DO Aquilae 1925—an unusual nova of Nova Pictoris 1925 type. B. Vorontsov-Velyaminov (*Astrophys. J.*, 1940, 92, 283—288).—In its decline the nova showed strong lines of [Fe II]. Its light curve is similar to that of Nova Pictoris, and the comparison leads to reconstruction of unobserved parts of both curves. E. R. R.

Spectrum of NGC 6543 and its nucleus. P. Swings (*Astrophys. J.*, 1940, 92, 289—294).—Bowen's fluorescence mechanism is absent; the recombination process is especially efficient in the nebula, giving strong lines of C II, C III, and N III. The nucleus is a Wolf-Rayet star showing lines of N IV and C IV of similar intensities, and is thus intermediate between WN and WC sequences. E. R. R.

Nebular spectra of two slow novæ DQ Herculis and RT Serpentis. P. Swings and O. Struve (*Astrophys. J.*, 1940, 92, 295—302).—In Nova Herculis many new lines are identified in the region 3200—6700 Å. The spectrum has not changed much since 1935—6 but the increased separation of the two visible components now makes it possible to observe their spectra separately. They exhibit similar ionisations but some differences of line structure. In Nova Serpentis lines of [Ne III], [Ne V], [Fe VI], H, He I, He II, and [O III] are strong, but those of [Fe III] are very weak; the spectrum has thus changed markedly since 1931. E. R. R.

Physical processes in gaseous nebulae. X. Collisional excitation of nebulum. M. H. Hebb and D. H. Menzel (*Astrophys. J.*, 1940, 92, 408—423).—Calc. target areas for collisional excitation of O III by electron impact are large, especially for excitation between the levels of 3P . In nebulae the levels of 3P_2 and atoms in the ground level attain a high population, which is consistent with resonance absorption of He II λ 303 by the coincident line $^3P_2-^3P_2$ of O III as proposed by Bowen. E. R. R.

γ-Cassiopeiae. R. B. Baldwin (*Astrophys. J.*, 1940, 92, 82—113).—Equiv. widths of sharp absorption lines of He and H are measured, and the distance from the photosphere to the stratum in which the lines are produced is derived. Results are consistent with the radii determined from broad absorption and emission lines. The sharp absorption lines are produced in the outermost layers. Variations in the emission intensity ratios of the two components of the lines of ten elements are established and discussed. E. R. R.

Absorption spectrum of γ-Cassiopeiae in 1940. M. L. Tchong (*Compt. rend.*, 1941, 213, 162—164).—Absorption and emission (bright-line) spectra are compared. The presence of lines, due to H I, Ca II, Mg II, Fe II, C II, Fe III, He I, He II, N II, O II, and Al III, in the absorption spectrum is reported. W. R. A.

Alternations in stability of compounds of the elements of group V. J. H. Hildebrand (*J. Chem. Educ.*, 1941, 18, 291—292).—Cor-

relations between ionising potential and the stability of the chlorides and oxides of the fifth group of the periodic system are discussed.

L. S. T.
Discharge phenomena in gases. R. W. Lunt, A. von Engel, and J. M. Meek (*Physical Soc. Rep. Progr. Physics*, 1941, 8, 338—367).—A progress report. W. J.

High-frequency conductivity and effective dielectric constant of electronic medium in a high-vacuum thermionic valve. R. G. Basak (*Indian J. Physics*, 1941, 15, 343—358).—The high-frequency conductivity of the anode-screen-grid space in a thermionic valve is α the thermionic current, and increases with frequency and with the time of stay of electrons. The effective dielectric const. of the electronic medium decreases rapidly with increase in the transit time of electrons. W. R. A.

Relation between the magnitudes of the first and of the total electron affinity of atomic residues. B. V. Nekrassov (*J. Gen. Chem. Russ.*, 1941, 11, 669—670).—The energy E_1 of the reactions $F^+ \rightarrow F^+$, $Cl^+ \rightarrow Cl^+$, $O^+ \rightarrow O^+$, and $S^+ \rightarrow S^+$ and that, E_2 , of the reactions $F^+ \rightarrow F^-$, $Cl^+ \rightarrow Cl^-$, $O^+ \rightarrow O^-$, and $S^+ \rightarrow S^-$ are related by the expression $E_2 = (0.507 \pm 0.002)zE_1$, z being 7 for F and Cl and 6 for O and S. This equation appears to have a theoretical significance. J. J. B.

Gram electron. L. F. Audrieth and M. J. Copley (*J. Chem. Educ.*, 1941, 18, 373—374).—The use of the concept of the gram electron, mass $9 \times 10^{-28} \times N$ g., is advocated. L. S. T.

Separation and use of stable isotopes. H. C. Urey (*J. Appl. Physics*, 1941, 12, 270—277).—The Hertz diffusion, the Clusius and Dickel thermal diffusion, and the distillation and chemical exchange methods of separating stable isotopes are described. The production, cost, time required to establish equilibrium, and probable ease of enlargement of the apparatus to greater capacity are compared for these methods. The use of stable isotopes of H, C, O, and N in the investigation of chemical and biological problems is discussed and it is suggested that these may prove at least as useful as radioactive indicators. O. D. S.

γ -Radiation of radio-thorium. J. Surugue and S. T. Tsien (*Compt. rend.*, 1941, 213, 172—174).—The radiation accompanying the emission of α -particles from radiothorium is γ -radiation and not, as suggested by Meitner (*Z. Physik*, 1928, 52, 637), X-radiation. The energies of the two γ -radiations emitted are 86.8 and 83.3 ke.v. W. R. A.

Scattering of neutrons in deuterium. C. K. Sundaracher and J. F. Streib (*Nature*, 1942, 149, 51).—Using neutrons released in the Be-D nuclear reaction, the scattering of medium-fast neutrons in D_2 has been investigated. The curve relating no. of tracks with energy of recoil deuteron shows max. at 1.2 Me.v. (which may correspond with the peak energy of the low-energy group of neutrons) and, more prominently, at 0.7 Me.v. The latter is presumably due to an anomaly in the neutron-deuteron interaction; it may be associated with the Ramsauer effect and with Bethe's $\lambda_{cr} = 5.4 \times 10^{-13}$ cm. There is a wide spread of energy in the neutron beam which is scattered in the gas contained in the ionisation chamber. A. A. E.

Cloud-chamber analysis of barytron secondaries. J. I. Hopkins, W. M. Nielsen, and L. W. Nordheim (*Physical Rev.*, 1939, [ii], 55, 233).—Secondaries produced by barytrons (filtered through 274 g. per sq. cm. of Fe) in a 0.82-cm. Pb plate or three spaced 0.31-cm. Pb plates have been studied in a counter-controlled cloud-chamber. The no. of single secondaries is not significantly greater in a 0.82-cm. than in a 0.31-cm. Pb plate. Nearly all the observed secondaries can be explained by assuming that they are produced by direct collisions between barytrons and at. electrons. A. J. E. W.

Significance of sidereal time variations of cosmic rays. A. H. Compton and P. S. Gill (*Physical Rev.*, 1939, [ii], 55, 233).—Analysis of all available data by Fourier and harmonic-dial methods indicates an amplitude of the sidereal time variation which is \ll that predicted by Compton and Getting's galactic rotation theory. Application of a new harmonic-dial method to data from Mexico and the Pacific shows the probable insignificance of the first harmonic present in the Fourier series, and the existence of a real second harmonic corresponding with a 12-hr. sidereal period. The results indicate that the earth is not moving appreciably with respect to the cosmic-ray source, and hence that the rays do not come directly from outside our galaxy. A. J. E. W.

Direct demonstration of spontaneous meson disintegration. P. Auger, R. Maze, and R. Chaminade (*Compt. rend.*, 1941, 213, 381—383).—A beam of penetrating cosmic rays traverses a system of two parallel superposed horizontal counters separated by a 10-cm. Pb filter. Coincidences denote the passage of each meson. Below the second counter is a layer of several cm. of Pb in which $\sim 1\%$ of the mesons is retarded and undergoes disintegration, emitting a neutrino and an electron. These electrons emerge from the Pb and a fraction of them are recorded by a third counter at a time subsequent to the original coincidence (cf. Rasetti, A., 1941, I, 316). N. M. B.

Photographic method of estimating the mass of the mesotron. D. M. Bose and (Miss) B. Choudhuri (*Nature*, 1942, 149, 302).—After applying to the results previously obtained (A., 1941, I, 396) corrections relating, respectively, to the val. of Z and to the grouping of the lengths of the ionisation tracks, the mesotron mass is recalcd. as $217 \pm 30 m_0$. Curvatures of the pair tracks lead to the val. $186.0 m_0$. A. A. E.

Applied nuclear physics. R. D. Evans (*J. Appl. Physics*, 1941, 12, 260—269).—A review of the applications of methods derived from nuclear physics in chemistry, metallurgy, radiology, geology, physiology, and medicine. The uses of "tracer" atoms in chemistry, metallurgy, and physiology are described. O. D. S.

Symmetry properties of nuclear levels. E. P. Wigner and E. Feenberg (*Physical Soc. Rep. Progr. Physics*, 1941, 8, 274—317).—A progress report. W. J.

Lorentz invariance in quantum theory. (Sir) A. Eddington (*Proc. Camb. Phil. Soc.*, 1939, 35, 186—194).—Attention is drawn to the frequent disregard in quantum theory investigations of the proviso that the co-ordinates to which the formal conditions of Lorentz invariance apply form a 4-vector, and special attention is directed to the misapplication of Lorentz invariance in Dirac's theory of the H atom and in the calculation of degeneracy energy of ionised material. W. J.

Lorentz invariance in the quantum theory. (A) P. A. M. Dirac, R. Peierls, and M. H. L. Pryce. (B) (Sir) A. Eddington (*Proc. Camb. Phil. Soc.*, 1942, 38, 193—200, 201—209).—(A) A reply to criticism by Eddington (see preceding abstract). (B) Further criticism. L. J. J.

Lorentz invariance of the Dirac theory of the positron. H. Hönl (*Physikal. Z.*, 1941, 42, 294—295).—Further points in elaboration of previous work are discussed (see A., 1942, I, 163). A. J. M.

Opacity of gas mixtures in stellar systems. P. M. Morse (*Astrophys. J.*, 1940, 92, 27—49).—Opacities of mixtures of H_2 , He, O_2 , Na, Mg, Si, K, Ca, and Fe are computed, for any proportions of H_2 and He and for 4 mixtures of the heavier elements, for temp. 4×10^4 to 10^6 , and for densities from 10^{-2} to 10^4 g. per c.c. The dependence of the opacity on the chemical constitution of the mixture and the bearing of these results on the computation of [H] in stars are discussed. E. R. R.

Nuclear reactions in the carbon cycle. H. A. Bethe (*Astrophys. J.*, 1940, 92, 118—121).—The life-times of ^{12}C and ^{14}N previously assumed to be in the ratio of $\sim 1:20$ are approx. equal, viz., 2.5×10^6 and 4×10^6 years respectively. In main-sequence stars the abundances of ^{12}C and ^{14}N should be approx. equal and the combined abundance of C and N should be $\sim 1\%$ by wt., a result in closer agreement between observations and the requirements of the C cycle. E. R. R.

Internal temperature of white dwarf stars. R. E. Marshak (*Astrophys. J.*, 1940, 92, 321—353).—The state of matter, temp. distribution, and electron density in the interior of a white dwarf are investigated. The central temp. and radii of Sirius B ($\theta_c = 1.5 \times 10^{10}$ c.) and 40 Eridani B ($\theta_c = 3 \times 10^{10}$ c.) are difficult to reconcile with the thermonuclear reactions of the C cycle. At such temp. and the prevailing high densities reactions between protons and other nuclei would be very rapid. It is concluded that no H is present, and that the energy production is due to gravitational contraction rather than thermonuclear reactions. E. R. R.

II.—MOLECULAR STRUCTURE.

Applications of spectroscopy to combustion. A. G. Gaydon (*Physical Soc. Rep. Progr. Physics*, 1941, 8, 50—70).—A progress report. W. J.

Molecular electronic spectra, dispersion, and polarisation. Theoretical interpretation and computation of oscillator strengths and intensities. R. S. Mulliken and (Mrs.) C. A. Rieke (*Physical Soc. Rep. Progr. Physics*, 1941, 8, 231—273).—A progress report. W. J.

Chemistry of high-current carbon arc. W. Finkelnburg (*Z. physikal. Chem.*, 1941, B, 49, 297—302).—The characteristics of the high-current C arc are described, and problems awaiting solution, especially those connected with the spectrum of the arc, are pointed out. A. J. M.

Temperatures in spectroscopic sources used in analytical work. O. S. Duffendack and J. M. La Rue (*J. Opt. Soc. Amer.*, 1941, 31, 146—149).—The temp. parameters T of the d.c. and a.c. arcs between graphite electrodes and in the a.c. arc between graphite electrodes coated with NaOH have been determined from measurements of the distribution of intensity among the rotational lines of the CN band at 4216 \AA . T is equal to the temp. of the source only when thermal equilibrium is attained; for other sources it is an equiv. temp. and, by substitution in the Boltzmann formula, determines the populations of at. levels of different excitation. T is found to be independent of the arc current and the length of the gap and is

not correlated with the temp. of the electrodes observed visually. Average vals. of T for the high-voltage a.c. arc and the d.c. arc between graphite electrodes are respectively 8616° and 7136° K. The presence of NaOH on the electrodes does not reduce T of the high-voltage a.c. arc. O. D. S.

Spectra of comet heads. V. Dufay (*Compt. rend.*, 1941, 213, 160—162).—A no. of band-lines in the spectra of comet heads, particularly in the region 3930—4140 Å., are attributed to NaH. W. R. A.

Possible existence of formaldehyde in the atmosphere of Venus. R. Wildt (*Astrophys. J.*, 1940, 92, 247—255).—No absorption bands of CH_2O are detected in ultra-violet spectrograms of Venus. Their absence does not preclude photochemical formation of CH_2O in the planet's atm. in the past. Solid polyoxymethylene hydrates may constitute the clouds observed in the atm. E. R. R.

Vibrational spectra of hydrocarbon molecules. IV. General method of forming equations for computation of the vibrations of complicated molecules. M. A. Eliashevitch (*J. Phys. Chem. Russ.*, 1940, 14, 1381—1395; cf. A., 1941, I, 192).—If different vibrations in a mol. are mutually independent their equations can be found as soon as the symmetry of the mol. is known. Examples are worked out for a non-linear mol. XY_2 , a tetrahedral mol. XY_4 , and a plane symmetrical mol. X_2Y_4 . J. J. B.

Identification of homologous organic compounds or isomerides by their near infra-red absorption spectra. (Mme.) M. Freymann and R. Freymann (*Compt. rend.*, 1941, 213, 174—177).—Aliphatic hydrocarbons absorb near 1μ . The band, $4\nu(\text{CH}) + \delta(\text{CH})$, has two max. at ~ 1.02 and 1.04μ . The difference in intensity, Δh , of these varies with the no. of C in the hydrocarbons in a regular manner, the component at 1.02μ becoming more intense as the no. of C increases. The greater is the branching in isomerides the lower is the intensity of the 1.02μ component. Ketones give similar results. W. R. A.

Infra-red absorption spectra of ethylene and tetrafluoroethylene under high resolution. W. S. Galloway and E. F. Barker (*J. Chem. Physics*, 1942, 10, 88—97).—Several infra-red bands of C_2H_4 and C_2F_4 have been resolved, and from the rotational const. vals. of moments of inertia, and mol. dimensions have been calc.: C—C 1.353 , C—H 1.071 Å., angle H—C—H $119^\circ 55'$. Fundamental frequencies consistent with observed data have been assigned. W. R. A.

Systematics in the vibrational spectra of the halogen derivatives of methane. T. Y. Wu (*J. Chem. Physics*, 1942, 10, 116—124).—From considerations of mol. symmetry and the approx. nature of the vibrations, observed infra-red and Raman frequencies of halogen derivatives of CH_4 have been classified, and transitions in passing along the series CH_4 , MeX , CH_2XY , CH_2X_2 , CHX_2Y , CHX_3 , CX_4 (X and Y = halogen) are indicated. A valency-force treatment of CH_2X_2 mols. is given. The potential function contains six const., and ν equations have been derived. W. R. A.

Low-frequency fundamental band of ethane at 12μ . R. G. Owens and E. F. Barker (*J. Chem. Physics*, 1942, 10, 146).—Re-examination of the 12μ band of C_2H_6 indicates that (i) the spin effect is operative and accentuates slightly every third line, (ii) the band centre lies at 820.82 cm^{-1} and the high-frequency side is the more intense, (iii) approx. midway between the major peaks a series of minor absorption max. are observed, arising probably from the change $1 \rightarrow 2$ in the same vibrational quantum no. for which the transition $0 \rightarrow 1$ yields the principal band. W. R. A.

Molecular vibrations and infra-red spectrum of acetaldehyde. H. W. Thompson and G. P. Harris (*Trans. Faraday Soc.*, 1942, 38, 37—46).—The infra-red spectrum of MeCHO vapour has been measured in the range $1\text{--}20 \mu$, and 14 fundamental frequencies are assigned on the basis of these results and of Raman data; that corresponding with the torsional oscillation about the C—C bond is missing. The difference ($2\text{--}3 \text{ g. cal.}$) between the observed sp. heat and that calc. from the 14 fundamentals suggests a considerable barrier to internal torsion. F. L. U.

Absorption of polysubstituted benzene derivatives. A. L. Sklar (*J. Chem. Physics*, 1942, 10, 135—144).—The intensification of the forbidden ${}^1A_{1g} \rightarrow {}^1B_{2u}$ transition in C_6H_6 by non-chromophoric substituents is due to the unsymmetrical distortion of the ring by the normal vibrations and to the transition moment produced at the equilibrium position by the migration of charge from the substituent into the ring, or vice versa. These effects are discussed mathematically and predicted ratios of intensification agree well with experimental data. W. R. A.

OH band in the infra-red absorption spectra of organic molecules. (Mlle.) A. M. Vergnoux and (Mlle.) R. Dadillon (*Compt. rend.*, 1941, 213, 166—169).—The spectra of C_6H_6 , PhOH , $o\text{-OH}\cdot\text{C}_6\text{H}_4\cdot\text{CHO}$ (I), EtCHO , PhCHO , and $o\text{-C}_2\text{H}_4\text{Cl}\cdot\text{OH}$ (II) have been examined from 2.6 to 3.2μ . The C_6H_6 nucleus gives bands at 3439 , 3390 , and 3312 cm^{-1} ; PhOH gives a narrow OH band at 3638 cm^{-1} in dil. solution in CCl_4 and a broad OH band at 3390 cm^{-1} in conc. solution. (I) gives a band at 3358 cm^{-1} in dil. solution which fuses into a much wider band in conc. solution. Dil. solutions of (II) give two bands at

3600 and 3530 cm^{-1} . For equimol. concn. general absorption near 3500 cm^{-1} is in the following order: (I) > (II) > PhOH > PhCHO > C_6H_6 . The significance of the positions of bands and of differences in intensities is discussed. W. R. A.

Light absorption and constitution of organic compounds. I. Analysis of the extinction curves of aromatic Schiff's bases. A. von Kiss and G. Auer (*Z. physikal. Chem.*, 1941, A, 189, 344—363).—The extinction curves of several aromatic aldehydes and amines and of the Schiff's bases derived from them have been measured over the ν range $20,000\text{--}46,000 \text{ cm}^{-1}$. In the absorption spectra of Schiff's bases the characteristic bands of the parent aldehyde and amine are usually absent. With increasing no. of conjugated double linkings the energy of excitation is decreased, so the C_6H_6 bands are shifted towards longer λ and the intensity of the bands is increased. The formation of H bonds and quinonoid structures causes the appearance of a new band near the limit of the visible region. The mechanism of the absorption is discussed. J. W. S.

Light absorption of cobalt thiosulphate solutions. A. von Kiss and E. Major (*Z. physikal. Chem.*, 1941, A, 189, 364—372).—The extinction curves of various conc. solutions of CoSO_4 and CoS_2O_8 and of CoSO_4 in various conc. solutions of $\text{Na}_2\text{S}_2\text{O}_8$, H_2SO_4 , and $\text{Na}_2\text{S}_2\text{O}_8$ have been measured at room temp. and over the λ range $2000\text{--}7000 \text{ Å.}$, in comparison with the extinction curve of $\text{Co}(\text{ClO}_4)_2$, attributable to the $\text{Co}(\text{H}_2\text{O})_6^{2+}$ ion. Evidence is obtained that in the presence of excess of Co^{2+} and $\text{S}_2\text{O}_8^{2-}$ ions, CoS_2O_8 and the coordination complex $\text{Co}(\text{S}_2\text{O}_8)_2^{2-}$ are formed. In conc. H_2SO_4 a complex $\text{Co}(\text{SO}_4)_2^{2-}$ is formed. Owing to the low solubility of $\text{Na}_2\text{S}_2\text{O}_8$ the formation of $\text{Co}(\text{S}_2\text{O}_8)_2^{2-}$ could not be established. The mechanism of the absorption is discussed. J. W. S.

Structure and absorption of hydroxylic dyes derived from triphenylmethane. Tautomerism of the benzaurins and phthaleins. (Mme.) P. Ramart-Lucas (*Compt. rend.*, 1941, 213, 67—69).—The absorption spectra of benzaurin, tetrabromobenzaurin, and the ester of tetrabromophenolphthalein have been investigated, where possible, in Et_2O , EtOH , C_6H_6 , and dioxan, and in acid, neutral, and alkaline solution. Compounds of these types can exist in three forms with different absorptions in the visible, each convertible into the other reversibly. The equilibria between these three forms varies with the solvent, the concn., the $p\text{H}$ of the solution, and the nature and no. of the atoms or radicals attached to the nucleus. The introduction of Br into benzaurin does not affect the general form of the absorption spectrum of this compound, but simply exerts a bathochromic effect. A. J. M.

Coloured tautomeric forms in the benzaurin, phenolphthalein, and phenolsulphonophthalein series. (Mme.) P. Ramart-Lucas (*Compt. rend.*, 1941, 213, 244—246; cf. A., 1940, I, 145).—Examination of the absorption spectra of benzaurin and phenolsulphonophthalein and their Br_4 -derivatives, o -cresolsulphonophthalein and its Br_2 -derivative, and allied compounds indicates that one of the three coloured tautomeric forms exists mainly in CHCl_3 , C_6H_6 , or H_2O (and to some extent in EtOH or $\text{EtOH}\text{-AcOH}$), a second form exists mainly in aq. Na_2CO_3 (and to some extent in neutral medium or in AcOH), whilst the third form appears mainly in acid medium, e.g., $\text{HCl}\text{-EtOH}$ (and also in EtOH , $\text{EtOH}\text{-AcOH}$). Theoretical aspects of the relation between the three forms are discussed. A. T. P.

Spectrophotometric study of glutathione. (Miss) G. A. Anslow and (Miss) E. R. Lyman (*J. Opt. Soc. Amer.*, 1941, 31, 114—117).—The visible and ultra-violet absorption spectrum of glutathione (I) in aq., EtOH , and NaOH solution has been measured. Bands with centres at 500 , 325 , 280 , and $252 \text{ m}\mu$. are observed and are ascribed to the $\alpha\text{-}\beta$ C link in the glutamic acid radical, the SH group of the cysteal radical, the peptide linking, and the S—S linking of oxidised (I), respectively. The peptide band at $280 \text{ m}\mu$. consists of two components; their position, shape, and relative intensities depend on the solvent. F.p. measurements of the mol. wt. of the (I) mol. and of its constituent NH_2 -acids before and after irradiation with light of various λ confirm the conclusions that dissociation of (I) at the peptide link is caused by $\lambda 280 \text{ m}\mu$., oxidation at the SH group with the formation of S—S linkages by $\lambda 325 \text{ m}\mu$., and reduction of previously oxidised mols. by $\lambda 252 \text{ m}\mu$.. O. D. S.

Absorption of ultra-violet energy by the peptide linkage. (Miss) G. A. Anslow and (Miss) S. C. Nassar (*J. Opt. Soc. Amer.*, 1941, 31, 118—123).—The absorption spectra of ovalbumin, lactalbumin, and gelatin in aq., NaOH , or EtOH solution have been measured and compared with those of phenylalanine, tryptophan, tyrosine, NHPhAc , stearanilide, and glutathione (cf. preceding abstract). A region of selective absorption characteristic of the peptide group was observed at $\sim 280 \text{ m}\mu$., overlapping with that characteristic of tyrosine and tryptophan. The band consists of two components separated in the proteins and NH_2 -acid peptides by $\sim 1200 \text{ cm}^{-1}$ and in the anilides by $\sim 850 \text{ cm}^{-1}$. Denaturation by radiation is due to breaking of the peptide link. The energy of the absorbed quantum is $\sim 4.4 \text{ e.v.}$ and varies with the solvent. O. D. S.

Spectra of lipid fractions from human non-cancerous and cancerous tissue. H. S. Penn (*J. Chem. Physics*, 1942, 10, 145—146).—

Under identical experimental conditions Hg-excited fluorescence in non-cancerous lipid fractions was < in cancerous. With increasing deproteinisation the fluorescence of the cancerous fraction approaches that of methylcholanthrene. W. R. A.

Excitation of the green fluorescence of mercury by near ultra-violet radiations. R. Lennuier (*Compt. rend.*, 1941, 213, 169—171).—The green fluorescence is excited by radiations >3000 Å. The triplet $^3S \rightarrow ^3P_{0,1,2}$ is not emitted although, in the spectrum of the incident light, the line 4047 Å. is only partly reversed. The visible fluorescence is completely depolarised. The intensity of the visible band varies as a function of the v.d. The mechanism of the excitation process is discussed. W. R. A.

Effect of size of particle on intensity of fluorescence of a phosphor. H. S. Oldham and W. Kunerth (*J. Opt. Soc. Amer.*, 1941, 31, 102—104).—The intensity of the fluorescence excited by Hg 2537 Å. in opaque layers of particles of artificial ZnBeSiO₃ phosphors decreases with increasing diameter of the particles (diameters up to $\frac{1}{8}$ in.) according to a straight-line relationship. It is supposed that fluorescence is confined to the surface layers of the particles. O. D. S.

Fluorescence of methylcholanthrene. I. Hieger (*Nature*, 1942, 149, 300—301; cf. Penn, A., 1942, I, 194).—No differences in fluorescence between fatty extracts of cancer tissues and those of non-cancer tissues have been observed. The fluorescence spectrum of methylcholanthrene exhibits 3 massive bands, the interval between the first and second bands being near Hg 4047 Å. The hydrocarbon fluoresces very powerfully in the most sensitive region (violet) of the photo-sensitivity curve of an ordinary plate. A. A. E.

Fluorescence, absorption, and scattering of light in ruby. (Miss) A. Mani (*Proc. Indian Acad. Sci.*, 1942, 15, A, 52—64).—The first-order lattice spectrum of Al₂O₃ has 18 normal modes of vibration. Two Raman displacements of 376 and 412 cm.⁻¹ have been obtained using a single crystal of Al₂O₃. The fluorescence and absorption spectra of ruby have been investigated and the polarisation characteristics of the bands in relation to the directions of the optic axis of the crystal and polarisation of the incident beam. Emission bands fall into two groups: (i) electronic bands caused by transitions of the shielded electrons of the Cr⁺⁺⁺ ions, and (ii) vibrational bands arising from a modulation of the electronic transitions by the crystal lattice vibrations. Shifts in ν of 8 of the vibrational bands from the principal doublets agree with observed Raman and infra-red ν of Al₂O₃. Bands on the Stokes and anti-Stokes sides show similar polarisation characters. W. R. A.

Raman effect in deuteritric acid. G. B. Banerji and B. Mishra (*Indian J. Physics*, 1941, 15, 359—363).—The Raman spectrum of DNO₃, prepared by the action of D₂O on N₂O₅, consists of 12 displacements. By comparing with HNO₃ isotopic shifts have been calculated, and ν assigned. W. R. A.

Raman spectra of compounds in the gaseous and liquid states. J. R. Nielsen and N. E. Ward (*J. Chem. Physics*, 1942, 10, 81—87).—An apparatus for exciting the Raman spectra of gases and liquids at temp. up to 300° has been constructed. Spectra of PCl₃, MeCl, MeBr, MeOH, C₂H₂Cl₂, C₂H₂Br₂, CHCl₃, and CCl₄ in the vapour and liquid states have been photographed at the same temp. in juxtaposition. Raman spectra of gaseous n-C₅H₁₂, n-C₆H₁₄, and D₂O, excited by 2537 Å., are recorded. The change in Raman frequencies with the state of aggregation is different for different vibrations and varies markedly from compound to compound. Perpendicular bands of symmetrical top mols. are much less diffuse in the liquid than in the gas, indicating that intermol. forces quench rotation of the mols. in the liquid. Other bands have approx. the same sharpness in both states. W. R. A.

Dielectric loss of solid high polymerides. W. Holzmüller (*Physikal. Z.*, 1941, 42, 281—293).—In the case of vitreous high polymerides (chiefly polyvinyl compounds) there is a displacement of the max. loss angle to higher temp. with increase of frequency. This is in agreement with theory. There is also anomalous dispersion of the dielectric const. The increase in dielectric loss at high temp. and low frequency is attributed to ionic conductivity. A. J. M.

Physical properties of alicyclic hydrocarbons. I. Molal volumes of monoalicyclic hydrocarbons at 20°. G. Egloff and R. C. Kuder (*J. Physical Chem.*, 1942, 46, 281—295).—The mol. vols. (*V*) at 20° of 515 alicyclic hydrocarbons not containing fused rings have been studied from the viewpoint of isomerism and homology. In a homologous series *V* can be represented by equations of the form $V = a + bn$, where *n* is the no. of C atoms and *a* and *b* are consts. Comparison with paraffins shows the effect of ring-closure. The data are in complete agreement with Ruzicka's theory of the structure of alicyclic compounds. C. R. H.

Molal volumes of aliphatic hydrocarbons at their m.p. G. Egloff and R. C. Kuder (*J. Physical Chem.*, 1942, 46, 296—304).—The mol. vol. (*V*) of liquid aliphatic hydrocarbons at their m.p. can be expressed by $V = a + bn$ (*a* and *b* are consts., *n* = no. of C atoms) provided each homologous series is divided into two sub-series of even and odd C. The equations for any two sub-series may inter-

sect at high vals. of *n*; to obviate this they can be replaced by one equation of the type $V = a' + b'n \pm c/n$, the + and - signs being used for even and odd members respectively. C. R. H.

Optical properties of thin chromium films. M. Perrot (*Compt. rend.*, 1941, 213, 238—240).—Transmission and reflexion coeffs., air-metal *R*, and metal-glass *R'*, for four different λ of transmitted and normally incident Hg arc radiation in the range 3660—5780 Å. are obtained for films of thickness 0—100 μ , deposited on glass. Full tabulated data show sharp max. and min. for *R* and *R'* in contrast to available data for Ag, Au, and Pt which, in general, show a uniform increase of *R* and *R'* with film thickness, and a general decrease in transmission tending towards almost total absorption, in contrast to ~79% transmission found for Cr. N. M. B.

Dispersion in the far infra-red. L. Kellner (*Physical. Soc. Rep. Progr. Physics*, 1941, 8, 200—211).—A progress report. W. J.

Synthetic optical crystals.—See A., 1942, I, 180.

Structure of vitreous silica. H. P. Rooksby and L. A. Thomas (*Nature*, 1942, 149, 273—274).—Experimental support for the view that the bands at 8.18 and 5.80 Å. reported by Lu and Chang (A., 1941, I, 193) are spurious is presented, and their conclusion that there is variation of structure between neighbouring regions of a slab of vitreous SiO₂ and in powdering is rejected. Warren's random network theory (A., 1938, I, 67) is satisfactory. A. A. E.

Effect on reflecting power in the near infra-red of liquids absorbed by solids. M. Dérivé (*Compt. rend.*, 1941, 213, 379—380).—Measurements of % reflexion of finely powdered ZnO, kaolin, pptd. SiO₂, sand, Prussian-blue, and graphite containing 0—9% H₂O show a rapid initial decrease followed by a slow decrease tending to an asymptotic val. corresponding with the val. for a liquid paste. The variation of the effect with the nature of the liquid is shown by data for pptd. Al₂O₃ containing 0—5% of various liquids. N. M. B.

Polarisation of atmospheric haze (air-light). G. M. Byram (*Science*, 1941, 94, 192—193).—The fraction of light *F* _{θ} polarised in a direction making an angle θ with the direction of the sun is related to the fraction, *F*_{max}, polarised in a direction perpendicular to the sun, by $F_{\theta} = F_{\text{max}} \sin^2 \theta / (1 + \cos^2 \theta)$, θ being near to 90°. The use of polarising screens in visual work and in photography is discussed. E. R. R.

Absorption of light and heat radiation by small spherical particles. II. Scattering of light by small carbon spheres. R. Ruedy (*Canad. J. Res.*, 1942, 20, A, 25—32; cf. A., 1942, I, 9).—Theoretical. C spheres for which the ratio of diameter (*2a*) to incident λ is $< \sim 1/10$ scatter light in all directions; intensity scattered at any angle $\propto V^2 \lambda^{-4}$, where *V* = vol. of particle. As the ratio $2a/\lambda$ increases from $\frac{1}{2}$ to $\frac{1}{4}$ and greater vals. the diffused light collects into a beam of decreasing width which appears as a continuation of the incident ray. Blue light is predominant in the scattered radiation. The size of the particles can be found approx. from the intensity, distribution, and polarisation of the scattered light. W. J.

Dispersion and absorption in dielectrics. II. Direct current characteristics. K. S. Cole and R. H. Cole (*J. Chem. Physics*, 1942, 10, 98—105; cf. A., 1941, I, 242).—Mathematical. For times, *t*, $\ll \tau_0$, the generalised relaxation time, the transient current $\propto (t/\tau_0)^{-\alpha}$ ($\alpha = \text{const.}, 0 < \alpha < 1$), whilst for $t \gg \tau_0$ it is $\propto (t/\tau_0)^{-(2-\alpha)}$. The transition occurs when $t \approx \tau_0$. Mica, glass, and amber are considered. W. R. A.

Theory of the specific heat of solids. M. Blackman (*Physical Soc. Rep. Progr. Physics*, 1941, 8, 11—30).—A progress report. W. J.

Valency angle of the carbon atom. G. L. Gombert (*J. Chem. Educ.*, 1941, 18, 336—337).—A tetrahedral model with specially-opening sides is described, and a method of calculating the angle, 109° 28', between the C linkings is given. L. S. T.

Modern valency formulæ and the elementary student. G. N. Copley (*Chem. and Ind.*, 1942, 196—197).—It is contended that the modern theory of valency can be introduced to elementary students by always using structural formulæ, made up by using the following rules: (1) each bond between two atoms represents a valency from each atom, (2) a + sign on an atom indicates that one additional valency must be given to this atom, (3) a - sign on an atom shows that a valency must be taken away from the atom. The rules apply to all mols. containing ionic, ordinary covalent, co-ordinate, and mixed co-ordinate-ionic bonds. A. J. M.

Hydrogen bonds involving the sulphur atom. T. G. Heafield, G. Hopkins, and L. Hunter (*Nature*, 1942, 149, 218).—Cryoscopic measurement of mol. wt. of many thioamides in C₁₀H₈ solution shows that those which possess an unsubstituted imino-H (R-CS-NH₂, R-CS-NHR') exhibit marked mol. association, whilst R-CS-NRR' are invariably unimol. Hence the association is attributable to S-H-N bonds. Further, the considerable mol. association of NHPH-CSMe is completely checked by the substitution of suitable

o-substituents capable of chelating with the anilido-H. Also thioacids are associated, whereas their esters, $R\cdot CO\cdot SR'$, are not.

A. A. E.

Two-centre integrals occurring in the theory of molecular structure. C. A. Coulson (*Proc. Camb. Phil. Soc.*, 1942, **38**, 210—223).—A no. of results are given for "one-electron" integrals involving two centres of force.

L. J. J.

Polyiodides of caesium. IV. Molecular formula of caesium tetraiodide. S. S. Hubbard (*J. Physical Chem.*, 1942, **46**, 227—229).—The diamagnetic nature of the compound and the val. of the magnetic susceptibility (-220.5×10^{-6} c.g.s. units per mol.) support the view that its formula is Cs_4I_8 , the most probable arrangement in the polyiodide group being the sharing of an I_2 mol. between two CsI_2 groups, *i.e.*, $Cs^+[-I_2-I_2-]Cs^+$.

C. R. H.

Steric hindrance in organic solids. B. S. Biggs (*J. Chem. Educ.*, 1941, **18**, 224—226; cf. A., 1940, I, 98).—Limiting deviations from perfect symmetry that will still permit compounds of the substituted C_6H_6 class to rotate in the solid state are discussed. In penta-substituted benzenes, *e.g.*, C_6HMeCl_4 and trichloro-*o*- and -*m*-xylenes, one indentation of the periphery equiv. in size to the space occupied by one substituent does not prevent rotation of the mol. in the temp. range immediately below the m.p. In C_6Me_5CN , the deviation from perfect symmetry, *viz.*, protrusion in the plane of the ring, is slightly < the max. that still permits rotation. Of hexa-substituted C_6H_6 mols. with protrusions out of the plane of the ring only *o*- $C_6Me_4(NO_2)_2$ rotates, and this only above 154° . It is suggested that the protrusions outside the plane of the ring in the other mols. must block each other enough to stop rotation.

L. S. T.

Aromatic problem. II. Density distribution and zero-point energy of the B-electrons of aromatic compounds. O. Schmidt (*Physikal. Z.*, 1941, **42**, 307—319; cf. A., 1942, I, 163).—The density and the zero-point energy of conductivity electrons for aromatic compounds are only slightly < for the conductivity electrons of graphite. The "effective no." of "free" electrons, *i.e.*, the proportion of free electrons to the total no. of B electrons, increases continuously in passing from C_6H_6 , through hydrocarbons with a higher % of C, to graphite. The "metallic" character of the aromatic linking is due to the high % of free B electrons. The calculation of diamagnetic anisotropy from the density distribution of B electrons is considered. 2-, 6-, and 10-groups of B electrons are the smallest completely closed systems, and the density and zero-point energy of the B electrons in each group are different. The density in $C_{10}H_8$ is > in C_6H_6 . It is increased by substitution, which thus causes a decrease in the excitation and activation energies. Carcinogenic hydrocarbons and other aromatic compounds of this class have two groups of B electrons. The density of B electrons increases in passing from anthracene to phenanthrene. Carcinogenic hydrocarbons are characterised by relatively low excitation energy, the lowest being ~ 3.2 e.v. It is assumed that this energy will be still further lowered by adsorption on the body-substance. Since, in the excited state, uncoupled valency electrons are present, possessing electron affinity, the carcinogenic properties of these compounds depends on the electron affinity of their comparatively easily produced excited state, which lowers the quantum jump in neighbouring mols., *e.g.*, protein mols. The wave-mechanics treatment of the aromatic problem is discussed.

A. J. M.

Determination of intermolecular energies by inductive analysis. W. J. C. Orr (*Proc. Camb. Phil. Soc.*, 1942, **38**, 224—230).—Mathematical.

L. J. J.

Centres of van der Waals attraction. F. London (*J. Physical Chem.*, 1942, **46**, 305—316).—Mathematical. The theory of intermol. attraction is extended to anisotropic force centres and to mols. containing extended electronic oscillators. The rôle possibly played by van der Waals forces in the case of rubber is discussed.

C. R. H.

Mean "tarrying" path (Verweilweg). K. Bennewitz (*Z. physikal. Chem.*, 1941, **B**, **49**, 293—296).—Theoretical. The path of a mol. which accidentally enters a defined area between the time of entering and that of leaving is called the "tarrying" path (Verweilweg). An expression for this is deduced.

A. J. M.

III.—CRYSTAL STRUCTURE.

Reflexion and scattering of X-rays with change of frequency. I. Theoretical. II. Experimental. (Sir) C. V. Raman (*Proc. Roy. Soc.*, 1942, **A**, **179**, 289—301, 302—314).—I. The theory is given of two new phenomena, the quantum reflexion and the quantum scattering of X-rays. Quantum or modified scattering is due to the excitation of elastic low-frequency vibrations of the lattice by the X-ray photon; it has but small intensity and is distributed over a wide range of solid angles. The view that ascribes extra spots on Laue diagrams to elastic vibrations is held to be erroneous. Quantum or modified reflexion is due to excitation of infra-red or characteristic high-frequency vibrations of the crystal lattice by the X-rays. These reflexions are more intense, and the directions

in which they appear are discussed. The frequency change is a consequence of both classical and quantum points of view, but the law of temp.-dependence of intensity is different in classical and quantum formulations.

II. Experimental confirmation of the theory is given. The specular character and the geometric law of quantum reflexion are demonstrated. Differences between diamond and other crystals are discussed, and the changes of intensity at high and low temp. investigated.

G. D. P.

Extra reflexions from the two types of diamond. (Mrs.) K. Lonsdale (*Proc. Roy. Soc.*, 1942, **A**, **179**, 315—320).—Two kinds of extra reflexions are identified on well exposed photographs of diamonds. All diamonds show primary diffuse reflexions which are temp.-sensitive and correspond to the diffuse reflexions observed in all other crystals. Type-I diamonds alone show the secondary reflexions which are not temp.-sensitive but are strongly structure-sensitive. There is as yet no adequate explanation of the significance of these reflexions.

G. D. P.

Diffuse scattering of X-rays by crystals. The Faxén-Waller theory and the surfaces of isodiffusion for cubic crystals. H. A. Jahn (*Proc. Roy. Soc.*, 1942, **A**, **179**, 320—340).—The Faxén-Waller theory of scattering of X-rays by thermally excited lattice vibrations is given, and the shape of the surfaces of isodiffusion surrounding the points of reciprocal space for cubic crystals is investigated. In substances with high elastic anisotropy these surfaces differ markedly from spheres and differ for different crystal planes. The theory is applied to the case of Na.

G. D. P.

X-Ray study of the elastic constants of metals. (Mrs.) K. Lonsdale and H. Smith (*Nature*, 1942, **149**, 21—22).—Data for Na illustrate the fact that the diffuse X-ray reflexions from single crystals of alkali metals are related to the elastic consts. in accordance with Jahn's interpretation of Waller's theory. For Pb the reflecting regions in reciprocal space are similar to those for Na. For W the prediction of small, elliptical diffuse spots which should disappear at a very small angular distance from the Bragg position is verified by experiment. It is considered proved that the relation of diffuse to normal (Bragg) reflecting power for any set of planes is governed by the actual vals. of the elastic consts. and not primarily by the crystal structure.

A. A. E.

Crystallisation in an inflated rubber balloon. A. Schallamach (*Nature*, 1942, **149**, 112).—X-Ray reflexions from an inflated rubber balloon indicated a unit cell having a 8.5, b 8.2, c 12.6 Å., monoclinic structure and $\beta = 83^\circ 20'$ being assumed. The dilatation of the rubber skin appears to produce an oriented crystallisation, the crystallites tending to arrange themselves with the b - c plane in the plane of the skin.

A. A. E.

New structure of carbon. H. Lipson and A. R. Stokes (*Nature*, 1942, **149**, 328).—"Extra" lines in X-ray photographs of graphite (A., 1940, I, 348) are attributed to the presence of $\sim 10\%$ of another structure closely related to graphite. The new structure, which is rhombohedral although it may be referred to hexagonal axes, belongs to the space-group $R\bar{3}m$ ($a = 3.635$ Å., $a = 39.49^\circ$) and has atoms at $\pm(\frac{1}{3}, \frac{1}{3}, \frac{1}{3})$.

A. A. E.

X-Ray diffraction of allotropes of selenium. K. D. Gupta, S. R. Das, and B. B. Ray (*Indian J. Physics*, 1941, **15**, 389—399).—Monoclinic Se is transformed monotropically into hexagonal Se in 1 hr. at 120° and in >17 days at 65° . The transformation has been followed by X-ray diffraction measurements. Amorphous varieties soften at 38° but exhibit three bands coinciding in position and intensity with three distinct groups of lines of the cryst. varieties. Vitreous Se devitrifies even at 28° and the devitrified mass is cryst. A sample of vitreous Se kept for 7 years at $<27^\circ$ had a cryst. surface but the interior gave diffuse bands. At low temp. devitrified Se is monoclinic and at high temp. hexagonal. Band spacing is \propto period of heating and size of crystallite, in agreement with the theory of Lennard-Jones (*Z. Krist.*, 1930, **75**, 250) that the lattice const. is a function of particle size. The band spacing of amorphous Se coagulated from colloidal Se is 3.8 Å.; that of vitreous Se heated for 60 hr. at 38° is 3.4 Å.

W. R. A.

Weakening of intensity of X-rays by a lithium beryllium borate glass. S. D. Gertsriken and M. A. Revutskaja (*J. Tech. Phys. U.S.S.R.*, 1936, **6**, 1144—1152).—A glass prepared from $BeCO_3$, 1.00, Li_2CO_3 , 1.07, and H_3BO_3 , 7.17 parts is sufficiently transparent to X-rays to be used instead of Lindemann glass. Its effective μ no. is 7.02, and that of a Li_2Be tetraborate is 7.08 (theoretical vals. 7.03 and 7.10, respectively).

CH. ABS. (w)

X-Ray diffraction and physical properties of potassium borate glasses. R. L. Green (*J. Amer. Ceram. Soc.*, 1942, **25**, 83—89).—The co-ordination of the B atoms changes from 3 to 4 as the K_2O content increases to 22%; beyond this point the effect diminishes again. The strengthening of the loose BO_2 structure by the BO_4 structure is accompanied by a decrease in the thermal expansion and a rise in the transformation and softening temp. and isothermal η , the respective min. and max. vals. occurring at a composition of

22% of K_2O . The d and n also increase over the range 0—22% of K_2O . J. A. S.

"Notable points" occurring simultaneously on cube and spherical surfaces. R. Reinicke (*Z. Krist.*, 1941, 103, 355—358; cf. *ibid.*, 1937, 98, 89—106).—An arithmetical development of a speculative structural theory based on tetrahedra, cubes, and spheres.

A. J. E. W.

A. C. Gill's development of the concept of unique diameters in crystallography. J. D. Burfoot, jun. (*Amer. Min.*, 1941, 26, 617—626).—Criteria, distribution, definitions of the six crystal systems in terms of unique diameters, selection of axes of reference, and applications of the concept are discussed. The concept of a unique diameter provides a basis for the definition and treatment of systems founded on inherent, independent properties, and not on hypothetical axes of reference, or on groupings of classes. L. S. T.

Atomic arrangement in the sulphur unit cell. W. Brown (*J. Chem. Educ.*, 1941, 18, 182—184).—Details for the construction of a model, using $CH_2 \cdot CMe \cdot CO_2Me$, are given. L. S. T.

Structure analogies of uranium and thorium phosphides. (Frl.) M. Zumbusch (*Z. anorg. Chem.*, 1941, 245, 402—408).—Structure analogies as revealed by X-ray diagrams of U and Th phosphides are discussed. U_3P_4 and UP are isomorphous with Th_3P_4 and the "ThP" phase respectively. C. R. H.

Diffraction of cathode rays by vivianite. T. Yamaguchi (*Proc. Phys.-Math. Soc. Japan*, 1936, 18, 372—379).—X-Ray and electron-diffraction data show that $Fe_3(PO_4)_2 \cdot 8H_2O$ has a base-centred monoclinic unit cell with a 9.997, b 13.37, c 4.696 Å. ($a:b:c = 0.749:1:0.354$), β 104° 16'. Electron reflexions from a (010) cleavage face give a mean internal potential of 10.0 v.; the apparent n falls rapidly from higher to lower orders. CH. ABS. (w)

X-Ray diffraction studies on heavy-metal iron cyanides. H. B. Weiser, W. O. Milligan, and J. B. Bates (*J. Physical Chem.*, 1942, 46, 99—111).—X-Ray diffraction studies show that Ti_3X_4 , TiX , InX , Prussian-blue, Turnbull's blue, Al_4X_3 , Sc_4X_3 , In_4X_3 , Zn_2X_2 , Cd_3X_2 , Cu_3X_2 , and Cu_2X , where $X = Fe(CN)_6$, form an isomorphous series with face-centred cubic symmetry. La_4X_3 , LaX , and Nd_4X_3 have more complicated structures. The compositions of Prussian-blue and Turnbull's blue are discussed. Diffraction data, density vals., and oxidation-reduction potentials for the reaction $Fe^{3+} + e \rightarrow Fe^{2+}$ and $X^{3+} + e \rightarrow X^{2+}$ indicate that the two compounds may be identical, the formula being either Fe_4X_3 or Fe_2X_2 . C. R. H.

Variation of the magnetic properties of antimony with electron concentration.—See A., 1942, I, 169.

Transition state theory of diffusion in crystals. R. M. Barrer (*Trans. Faraday Soc.*, 1942, 38, 78—85; cf. A., 1942, I, 90).—Equations of the transition state theory are developed for the Schottky, Frenkel, and zeolitic mechanisms of diffusion. The simplest val. of D_0 in $D = D_0 e^{-E/RT}$ is $\sim 3 \times 10^{-3}$ cm² sec⁻¹, and deviations from this val. imposed by the different mechanisms cover most of the observed range. The effect of high pressures on diffusion and conductivity consts. is discussed quantitatively. F. L. U.

Friction between solid bodies. R. Schnurmann (*Physical Soc. Rep. Progr. Physics*, 1941, 8, 71—89).—A progress report. W. J.

Crystal growth. V. Rosický (*Z. Krist.*, 1941, 103, 328—352).—A detailed study is made, by Fedorov's method and with a Goldschmidt two-circle goniometer, of the orientation of growth faces in freely-growing crystals of $CuSO_4 \cdot 5H_2O$ and $KAl(SO_4)_2 \cdot 12H_2O$, and of the disposition of individual needle crystals in parallel and radial aggregates (andalusite, amphibole, and gypsum, and sucrose, respectively). The effects of the habit and symmetry of the crystals are discussed. A. J. E. W.

Projection sphere; an aid in the study of crystals. V. Rosický (*Z. Krist.*, 1941, 103, 353—354).—The device described consists of a sphere 40 cm. in diameter on which the angles of a crystal can be plotted during goniometric measurements, without the use of projections. It facilitates the correct orientation of damaged or imperfect crystals. A. J. E. W.

Connexion between light absorption and space arrangement of molecular aggregates. G. Scheibe, R. Müller, and R. Schiffmann (*Z. physikal. Chem.*, 1941, B, 49, 324—333).—The arrangement of mols. of ψ -isocyanine in aggregates is discussed. The distance between the two N atoms of the mol. agrees almost exactly with the separation of the K^+ in a mica crystal. Two arrangements are possible, either a staircase, or a ladder type. The latter is favoured. A. J. M.

IV.—PHYSICAL PROPERTIES OF PURE SUBSTANCES.

Electromagnetic investigation of the mechanism of electrical conductivity in platinum and rhodium. Connexion between conductivity and texture. R. Schulze (*Physikal. Z.*, 1941, 42, 297—307).—According to the theory of free isotropic electron gas, the max. effect exerted on the resistance of a metal by a magnetic field

perpendicular to the direction of the current is $\sim 0.01\%$. In practice this val. is exceeded even for moderate fields; in the case of polycryst. Pt and Rh in a transverse magnetic field of 40,000 gauss, at the temp. of boiling He, an increase of resistance of $\sim 200\%$ was found. The type of conductivity is dependent on the no. of valency electrons. For Rh the increase in resistance is considerable even for small magnetic fields, and seems to reach a saturation val. at $\sim 30,000$ gauss. With Pt the increase in resistance is more rapid with increasing field strength, and saturation is not reached in the fields investigated ($\sim 40,000$ gauss). This agrees with results for other metals, where it is found that elements with an even at. no. show an unlimited increase in resistance with increasing magnetic field strength, whilst those with an odd at. no. reach saturation. The results can be shown on a Kohler diagram. Deviation from the smooth curve may be produced by a difference in texture, caused, for example, by drawing the metal into wire. The resistance of Pt and Rh at low temp., in the absence of a magnetic field, does not follow a single exponential law, but varies with T^2 at He temp. and with higher powers of T at H temp. A. J. M.

Effect of isotopic constitution on electrical resistance and superconductivity of lead. E. Justi (*Physikal. Z.*, 1941, 42, 325—327).—Isotopic constitution gives rise to very little difference in the resistance of ordinary Pb and U-Pb at various temp. U-Pb is a superconductor, and has a transition temp. identical with that of ordinary Pb. A. J. M.

Paramagnetism of aqueous solutions of copper nitrate.—See A., 1942, I, 201.

Diamagnetism of the halogens. S. R. Rao and S. R. Govindarajan (*Proc. Indian Acad. Sci.*, 1941, 15, A, 35—51).—Vals. of χ for Br and I are -0.346 and -0.364×10^{-6} . Vals. of χ for solutions (solvents in brackets) are given for Cl_2 [$AcOH$, $CHCl_3$, cyclohexane (I)], Br [CCl_4 , $CHCl_3$, $AcOH$, and (I)], and I [CS_2 , C_6H_6 , $EtOH$, and (I)] and vals. for the halogens are calc. For Cl_2 the vals. range $CHCl_3 \approx AcOH > (I) \approx$ element; for Br $AcOH > CHCl_3 \approx CCl_4 > (I) \approx$ element; for I $C_6H_6 > EtOH > CS_2 > (I) \approx$ element. Tentative explanations of ionisation and formation of loose mol. compounds between solute and solvent are given and correlation with optical properties is attempted. W. R. A.

Fundamental laws and definitions in physics. I. Ohm's law. II. Specific heat and Newton's law of cooling. III. Mass. C. W. Hansel (*Proc. Physical Soc.*, 1942, 54, 151—159, 159—164, 164—204).—I. With a view to arriving at the best elementary treatment of Ohm's law a survey is given of the nature of Ohm's work, different statements of the law in textbooks, standardisation of notation, and a simple illustrative experiment. Conclusions are tabulated.

II. Definitions of thermal capacity and sp. heat are examined, Newton's law of cooling and the cooling calorimeter are discussed, and recommendations are proposed.

III. A detailed discussion is given of dynamical quantities and their definition, the present chaotic systems of units, their treatment in various textbooks, remarks on mass and wt. by engineers, mathematicians, and physicists, and reports of committees on teaching. Recommendations on simplification are suggested. N. M. B.

Effects of heat capacity lag in gas dynamics. A. Kantrowitz (*J. Chem. Physics*, 1942, 10, 145).—Measurements of the velocity and absorption of sound have shown that gases absorb their vibrational heat content exponentially with a measurable relaxation time. The significance of this in gas dynamics is indicated, and an apparatus is briefly described by which energy dissipations in the flow of gases, and hence of relaxation times, can be measured. W. R. A.

Heat capacity of some pure liquids and azeotropic mixtures. A. K. Shdanov (*J. Gen. Chem. Russ.*, 1941, 11, 471—482).— C_p of CCl_4 is 0.2013, 0.2053, and 0.2095 at 5.5°, 24.8°, and 46.1°; of Pr^oOH : 0.5431, 0.5623, 0.5781, 0.5951, and 0.6480 at 6.5°, 17.6°, 24.4°, 30.9°, and 45.6°; of Bu^oOH : 0.5322, 0.5916, and 0.6600 at 5.1°, 23.1°, and 45.8°; of C_6H_6 : 0.4044, 0.4141, and 0.4316 at 8.2°, 22.4°, and 45.6°; of $PhMe$: 0.3871, 0.4077, and 0.4312 at 5.3°, 23.6°, and 47.2°. The ratio MC_p/T_0 for each homologous series (Kolosovskii, A., 1934, 1300), M being the mol. wt. and T_0 °K. the b.p., is a const.; C_p is that for T_0 . The C_p of the azeotropic mixtures of C_6H_6 with Pr^oOH or $COMeEt$, of $PhMe$ with Pr^oOH , Bu^oOH , and $iso-C_8H_{11}OH$, and of CCl_4 with Pr^oOH , Pr^oOH , and Bu^oOH is determined at several temp. and extrapolated to the b.p. C_p vals. are usually $>$ the sums of the C_p of the components for positive azeotropic mixtures, and $<$ the sums for negative ones. J. J. B.

Vapour pressures of the phosphorus dichloronitrides and the existence of an equilibrium between "mineral rubber" and its vapour. H. Moureu and A. M. de Fiquelmont (*Compt. rend.*, 1941, 213, 306—308).—By means of a closed Pyrex apparatus fitted with a glass manometer the v.p. of $(PNCl_2)_3$, $(PNCl_2)_4$, and their polymerisation product $(PNCl_2)_n$ ("mineral rubber") have been measured at 114—257°, 123.5—275°, and 350—450°, respectively. The mean heats of vaporisation are 13, 15.5, and 15.5 kg.-cal. per g.-mol., respectively. The b.p. of $(PNCl_2)_4$, determined by extrapolation,

is 325.5°. The analogy between the PN and CN groups is pointed out. J. W. S.

Temperature-dependence of viscosity, dielectric relaxation, and place interchange processes in amorphous solids. W. Holzmüller (*Physikal. Z.*, 1941, **42**, 273—281).—The variation with temp. of η and dielectric relaxation in liquids and amorphous solids may be explained by considering the place interchange phenomena in which the elementary units of these substances take part. In the case of liquids, the potential waves to be exceeded are small and uniform in size, so that there is only one relaxation time, but in amorphous solids the potential waves are of various sizes and give rise to a no. of relaxation times. The variation of these with temp. can be obtained from the Boltzmann principle, the results agreeing with the exponential formula for the variation of the η with temp. when one relaxation time is considered. At high temp. the spectrum of the relaxation time crowds together, thus explaining the increase in the max. loss angle. It is impossible to express the variation of η of a substance with temp. through all the stages from the liquid state to the highly viscous melt by a single exponential function. A. J. M.

V.—SOLUTIONS AND MIXTURES (INCLUDING COLLOIDS).

Influence of diffusion on the propagation of shock waves. T. G. Cowling (*Phil. Mag.*, 1942, [vii], **33**, 61—67).—Mathematical. It is shown that in the propagation of shock waves through a mixture of gases there is a variation of composition in the track of the wave which becomes large when the densities are sufficiently different. F. J. G.

Scattering of light in binary liquid mixtures. D. V. Rao (*Proc. Indian Acad. Sci.*, 1942, **15**, A, 24—34).—The isothermal variation of the depolarisation components, ρ_{μ} , ρ_{ν} , and ρ_{λ} , with variation in concn. of CS₂-MeOH mixtures indicates mol. clustering in the crit. composition mixtures at room temp. Existing theories have been tested. ρ_{λ} depends on the shape rather than on the size of the container. W. R. A.

Propagation of supersonic waves in liquid mixtures and intermolecular forces. I. Alcohols in water. R. Parshad (*Indian J. Physics*, 1941, **15**, 323—336).—Supersonic velocities in aq. MeOH, EtOH, and PrⁿOH increase with concn. of alcohol and pass through a max. Compressibilities exhibit min. with increasing concn. of alcohol. A theory of mol. force fields has been developed and is used to explain the results. On mixing, the alcohol and H₂O de-associate each other and random mol. motion and distribution result. W. R. A.

Paramagnetism of aqueous solutions of copper nitrate. J. Amiel (*Compt. rend.*, 1941, **213**, 240—242).—In view of discordant available data, susceptibility measurements at 20° for 0.1—4.0M. solutions are reported. Mol. magnetic susceptibilities and at. susceptibilities of Cu are calc.; the latter vals. decrease slightly with increasing dilution and the average val. in the concn. range is 1665×10^{-6} . Corresponding data for CuSO₄ and CuCl₂ are plotted for comparison. N. M. B.

Derivation of the f.p. equation. H. M. Teeter (*J. Chem. Educ.*, 1941, **18**, 393).—A simplified derivation of this equation is presented. L. S. T.

Anomalous mixed crystals. IV. Anomalous miscibility of organic substances. A. Neuhaus (*Z. Krist.*, 1941, **103**, 297—327; cf. A., 1930, 682; 1938, I, 68, 347).—From rotation and Schiebold-Sauter X-radiograms, Me-red (I) has *a* 8.45, *b* 11.6, *c* 9.30 Å. [*a*:*b*:*c* (crystallographic) 0.732:1:0.800]; α 115° 20', β 125° 40', γ 66°; *V* 668 cu. Å.; 2 mols. per unit cell; $\rho_{\text{obs.}}$ 1.31, $\rho_{\text{calc.}}$ 1.334; morphological data are given, and twinning characteristics are described. *o*-C₆H₄(CO₂H)₂ (II) has *a* 5.04, *b* 14.25, *c* 9.52 Å., β 86° 30'; *V* 681 cu. Å.; 4 mols. per unit cell. A comparison of the X-ray data indicates that the {110} planes of (I) and (II) are closely similar in geometrical pattern and linking type; such planes are termed "affinitive" planes. Since the distances between these planes and the unit cell vols. are also simply related there is a "pseudo-three-dimensional" analogy between the structures, which explains their anomalous miscibility. A structure for (II), involving double mols., is derived. Anomalous miscibility in the systems (II)—methylene blue (III), and Ba(NO₃)₂— and Pb(NO₃)₂—(III), is similarly explained. The mode of growth of the mixed crystals is discussed. Systems showing anomalous miscibility form three classes having the following structural features: (i) linking forces similar, point-lattices partly isomorphous [e.g., (I)—(II), (II)—(III)]; (ii) linking forces dissimilar, point-lattices strictly isomorphous (e.g., ZnS—FeS, Al₂O₃—Fe₂O₃); (iii) linking forces dissimilar, point-lattices partly isomorphous [e.g., Pb(NO₃)₂— and Ba(NO₃)₂—(III)]. A. J. E. W.

Miscibility gaps. II. System methyl acetate-carbon disulphide. K. Clusius and H. Ulmke (*Z. physikal. Chem.*, 1941, **A**, **189**, 331—334; cf. A., 1942, I, 19).—The system MeOAc—CS₂ shows a region of incomplete miscibility at low temp.; the upper crit. solution

temp., the lowest yet recorded, is -52.6° and the crit. composition 61 mol.-% of CS₂. J. W. S.

Solubility diagrams for the systems ethylidene diacetate-acetic acid-water and vinyl acetate-acetone-water. J. C. Smith (*J. Physical Chem.*, 1942, **46**, 229—232).—Solubility data for the two systems are recorded in tabular and triangular diagrammatic form. C. R. H.

Solubility generalisations. C. J. Heimerzheim (*J. Chem. Educ.*, 1941, **18**, 377).—Solubilities of common salts are classified. L. S. T.

Solubility of basic lead carbonate and of lead sulphate in dilute solutions.—See B., 1942, III, 118.

Mixed solvents for soaps. S. R. Palit (*Current Sci.*, 1941, **10**, 436—437).—Mixtures of mono- and poly-hydric alcohols of optimum composition will give solutions containing >10% of an alkali metal soap at room temp.; at temp. >40° solutions sufficiently conc. to give transparent gels can be prepared. The solvent action is considerably increased by addition of a hydrocarbon, which permits gel formation at room temp. The component solvents used, in decreasing order of efficiency, are as follows: BuⁿOH, *iso*-C₈H₁₇OH, PrⁿOH, EtOH, MeOH; (CH₂OH)₂, OH-CH₂-CHMe-OH, (OH-[CH₂]₂)₂O, glycerol, OH-[CH₂]₃-OH ("latent solvents"); C₆H₆, turpentine, cyclohexane, C₇H₁₆, C₈H₁₈ ("couplers"). Preliminary electrical conductivity and ultrafiltration experiments indicate that the solutions are of a truly mol. type. A. J. E. W.

Complex formation associated with the distribution of ferric chloride between water and ether. B. V. Nekrassov and V. V. Ovsiankina (*J. Gen. Chem. Russ.*, 1941, **11**, 573—576).—When an aq. solution of FeCl₃ and HCl is extracted with Et₂O, the ratio Cl:Fe in the Et₂O is near 4 (3.85—4.10) when HCl is 2—6N, and FeCl₃ 1—4N. When [HCl] is <1N, the ratio is less (e.g., 3.4—3.7 for pure FeCl₃), and for 9N- or 10N-HCl it rises to 5 or 5.4. The solubility of Et₂O in the aq. phase is raised by HCl, especially at concns. >5N, whereas FeCl₃ increases the solubility of H₂O in Et₂O. It is concluded that Et₂O extracts from FeCl₃-HCl solutions H[FeCl₄(H₂O)₂]; when [HCl] is low, Et₂O contains H[FeCl₄(OH)(H₂O)₂], and when [HCl] is very high, H₂[FeCl₄(H₂O)] and H₂[FeCl₄] are transferred to Et₂O. Vals. are given for the distribution of HCl between H₂O and Et₂O. J. J. B.

Thermodynamic derivation of Fowler's adsorption isotherm. G. S. Rushbrooke (*Proc. Camb. Phil. Soc.*, 1942, **38**, 236—239).—Rushbrooke and Coulson's derivation of Langmuir's isotherm (A., 1940, I, 291) is extended to cases in which the adsorption energy is dependent on the no. of adsorbed atoms or mols. If the relation is linear, Fowler's isotherms for crit. adsorption are obtained. L. J. J.

Autosorption at the liquid-vapour boundary. G. L. Starobinets and A. V. Pamfilov (*J. Gen. Chem. Russ.*, 1941, **11**, 493—500).—It is assumed that the liquid-vapour boundary of chemically homogeneous substances has a higher density than either of the bulk phases, and for this accumulation an equation is derived involving mainly the heat of evaporation *L* and the temp. coeff. of the surface tension *d* γ /*d* θ . For various substances (ranging from A to H₂O) the accumulation is $\sim 10^{-10}$ mol. per sq. cm. The existence of the autosorption accounts for the deviations from Stefan's law connecting *L* with γ and *d* γ /*d* θ . J. J. B.

Adsorption of bromine in the crystal lattice of graphite. Bromographite. W. Rüdorff (*Z. anorg. Chem.*, 1941, **245**, 383—390).—Several types of graphite adsorbed $\sim 84\%$ of Br when exposed to its vapour at room temp. The adsorbed gas was easily removed in a current of air. X-Ray analysis shows that bromographite is a solution of Br in the graphite lattice and is not a compound analogous to fluorographite. The layers of C in bromographite are unequally spaced, a distance of 3.35 Å. alternating with a distance of 7.05 Å., and it is between the wider spaced layers that the Br atoms or mols. form a layer. C. R. H.

Adsorption of alcohols at the salicylaldehyde-water interface. G. C. H. Ehrensward and D. F. Cheesman (*Science*, 1941, **94**, 23—25).—E.m.f. of the cell Hg|Hg₂Cl₂|0.0001N-KCl|(1) salicylaldehyde (I)|saturated KCl|(2) (I) + alcohol|0.0001N-KCl|Hg₂Cl₂|Hg, where alcohols are titrated into (2), are measured. With alcohols containing odd nos. of C atoms, especially *n*-heptyl and *n*-nonyl, large initial decreases in e.m.f. are observed. In the cell Hg|Hg₂Cl₂|saturated KCl|(1)|(2)|saturated KCl|Hg₂Cl₂|Hg, when (1) and (2) are separated by a long diffusion path, the effect is very small; the principal phase boundary effect is thus at the (2)|0.0001N-KCl interface. The relation of the observed effect to sp. adsorption of alcohols at the (I)/H₂O interface is discussed. E. R. R.

Sorption of water by Cellophane.—See B., 1942, II, 189.

Surface activity of alcohols in bromobenzene. A. V. Pamfilov and G. L. Starobinets (*J. Gen. Chem. Russ.*, 1941, **11**, 501—506).—Using the max. bubble pressure the γ of some solutions of MeOH, EtOH, PrⁿOH, and BuⁿOH in PhBr is measured at 20°, 30°, and 40°. The curves for γ against concn. (mol. per c.c.) are almost linear for MeOH and EtOH and agree with Schischkovski's equation

for the other alcohols. The energy change associated with the transfer of a CH_2 group into the surface is for H_2O ~ 3 times as large as for PhBr. Traube's rule holds for PhBr but the coeff. is 1.5 instead of 3 as in H_2O . J. J. B.

Behaviour of the static surface tension of solutions of sodium oleate as a function of concentration. M. Herquet (*Compt. rend.*, 1941, 213, 302—304).—Using a completely automatic tensimeter which permits the determination of the surface tensions (γ) of a series of solutions in an atm. of N_2 , the vessels containing the solutions having a surface: vol. ratio of 12.035, it has been confirmed that Na oleate solutions show a series of min. in their γ -concn. curves (cf. du Nouy, A., 1925, ii, 109). The mean val. of the Avogadro no., deduced on the assumption that each min. corresponds with the completion of a perfect unimol. film of the surface layer, is 6.01×10^{23} . J. W. S.

Behaviour of solutions of various sodium soaps at the interface between vaseline oil and water. R. Cavier (*Compt. rend.*, 1941, 213, 70—71).—The no. of drops of solutions of various Na soaps, isotonic with blood serum, and buffered at p_{H} 9, given from a tube in air and in vaseline oil has been compared. Like surface tension, the interfacial tension between vaseline oil and H_2O is lowered by soaps. In general the no. of drops formed by the various soap solutions is in the same order in air and in oil. For the soaps of unsaturated fatty acids, the lowering of the interfacial tension is the greater, the larger is the no. of double linkings. In the case of soaps from chaulmoogra oil, and particularly Na hydnocarpate, the effect on interfacial tension is considerably $>$ that on surface tension. A. J. M.

Expansion of unimolecular layers of mixed saturated fatty acids. F. Kane (*Proc. Roy. Irish Acad.*, 1942, 47, B, 265—273).—At const. pressure unimol. films containing a mixture of myristic, palmitic, and stearic acids expand irregularly with rising temp. The irregularities correspond with the expansion characteristics of the components and it is inferred that no mol. association or complex formation can occur and that attempts to predict the behaviour of fatty acid films from the known behaviour of the constituents (A., 1940, III, 56) are justified. J. W. S.

Permeability of Cellophane [to ions].—See A., 1942, I, 206.

Electrical method for converting an aerosol into an organosol. M. Pauthenier and E. Brun (*Compt. rend.*, 1941, 213, 313—314).—The electrical method of transferring fog droplets into a suspension in oil (*ibid.*, 212, 1081) has been applied to the production of suspensions of soot, charcoal, talc, and colouring matters in oils. J. W. S.

Stability properties of hydrophobic colloidal solutions. S. Levine and G. P. Dube (*J. Physical Chem.*, 1942, 46, 239—280).—Theoretical. A no. of applications of the mutual energy of two colloidal particles are given. An expression for the interaction of two particles is derived in which the energy max. determines the stability properties of a sol fairly satisfactorily if coagulation is slow. This energy max. depends on particle charge, ζ -potential, electrolyte concn., valency of the ions, and particle radius (r). The concept of the pptg. ion is shown to be of limited validity. In the phenomena of charge reversal by polyvalent ions, theory predicts that the crit. ζ -potential in the second region of stability is $>$ that in the first. The van der Waals const. calc. from the crit. ζ -potential, electrolyte concn., and r has approx. the same val. for different electrolytes in the same sol, in agreement with theory. If ζ -potential is independent of r the energy max. in the coagulation zone increases with r if r is small, but reaches a max. and then decreases if r is large. This is consistent with secondary particles being formed from smaller primary particles and with the phenomenon of step-wise coagulation. C. R. H.

Hydration of colloidal sulphur. T. R. Bolam and A. K. M. Trivedi (*Trans. Faraday Soc.*, 1942, 38, 140—147).—The hydration of S in Odén sols is calc. from the distribution of a reference substance (NaCl, free Na polythionate, raffinose, sucrose) between the sol and its intermicellar liquid or between two sols of unequal S content, on the assumption that none of the reference substance is present in the micelles or coagulum. The results indicate that the micelles in Odén sols are hydrated. Reversible coagulation (Li^+ or Na^+) is accompanied by partial dehydration, and irreversible coagulation (K^+ or Ba^{++}) by complete dehydration. No appreciable amount of Cl^- is adsorbed by the micelles in undialysed sols. F. L. U.

Effect of potassium salts on aluminium oxychloride hydrosol. M. W. Kelly and K. S. Rostler (*J. Physical Chem.*, 1942, 46, 317—325).—The sols show no change in p_{H} when aged at room temp. but become more acid when aged at 80—85°. If the heated sol is allowed to age at room temp. a partial reversal of the p_{H} change is observed. The relative effectiveness of K salts in raising p_{H} is oxalate $>$ citrate $>$ malonate \geq maleate $>$ succinate = malate \geq KOAc $>$ lactate = glycollate \geq tartrate $>$ K_2SO_4 $>$ KCl. The results are explainable on the Thomas theory. The pptg. power of these salts is not directly related to the valency of the pptg. ion, the order of decreasing pptg. power being K_2SO_4 $>$ citrate $>$

tartrate = succinate = oxalate = malonate = malate $>$ maleate $>$ glycollate $>$ lactate $>$ KOAc $>$ KCl. C. R. H.

Structural precipitates: silicate garden type. T. H. Hazlehurst (*J. Chem. Educ.*, 1941, 18, 286—289).—Ppts. of this type can be produced in solutions of alkali phosphates, borates, zincates, aluminates, plumbites, and polysulphides in addition to those already known. Four types of growth are distinguished and discussed. L. S. T.

Colloidal structure of bitumens.—See B., 1942, I, 210.

Mixed solvents for soaps.—See A., 1942, I, 202.

Electrochemical properties of mineral membranes. III. Estimation of ammonium ion activities. IV. Measurement of ammonium ion activities in colloidal clays. C. E. Marshall and W. E. Bergman (*J. Physical Chem.*, 1942, 46, 325—327, 327—334).—III. Using electro-dialysed bentonite membranes dried at 490° the potentiometric determination of NH_4^+ activities has been carried out. Above p_{H} 4 agreement between observed and calc. vals. is good. The effect of Ca^{++} is more marked than with K^+ - Ca^{++} mixtures.

IV. Titration curves with aq. NH_3 have been obtained for the same four clays as were investigated in connexion with K^+ (cf. A., 1942, I, 172). NH_4^+ salts of weak acids or of high initial p_{H} lose NH_4^+ to the clay in much the same way as does NH_3 . C. R. H.

Statistical thermodynamics of rubber. F. T. Wall (*J. Chem. Physics*, 1942, 10, 132—134).—The change in entropy for the stretching of rubber has been calc. by statistical methods, neglecting intermol. attractions and deformation of bonds and bond angles, and an equation of state relating tension, length, and temp. of a rubber band has been derived. W. R. A.

Interaction between rubber and liquids. I. Thermodynamical study of system rubber-benzene. G. Gee and L. R. G. Treloar (*Trans. Faraday Soc.*, 1942, 38, 147—165).—Equations relating thermodynamic properties of a rubber-liquid system to its v.p. are developed. V.p. of rubber- C_6H_6 mixtures at 25° have been measured, the use of four different methods (osmotic pressure, equilibration against triolein, direct manometric, and McLeod gauge) enabling the range 2×10^{-6} —0.997 wt. fraction to be covered. Temp. coeffs. of the v.p. are given for a no. of concns. From the data the Gibbs free energies, heats, and entropies of dilution and of dissolution are calc. The entropy of dilution ΔS_0 is approx. twice the heat of dilution over a wide range of concn. and is independent of the mol. wt. of the rubber fraction except in dil. (<5%) solutions. ΔS_0 is \geq the ideal val. and can be represented approx. by Flory's equation (cf. A., 1942, I, 58) at concns. $> 5\%$. The miscibility of rubber and C_6H_6 can be explained only by the abnormally high entropy of dissolution. F. L. U.

Micellar or macromolecular mode of reaction of cellulose xanthate.—See B., 1942, II, 151.

VI.—KINETIC THEORY. THERMODYNAMICS.

Mechanism of aromatic side-chain reactions with special reference to the polar effects of substituents. XI. The aldehyde-cyanohydrin reaction: evidence for the mesomeric effects of alkyl groups. J. W. Baker and M. L. Hemming (*J.C.S.*, 1942, 191—198; cf. A., 1940, I, 295).—The equilibrium consts. at 20° and 35° and the velocity consts. at 20° for the reaction $p\text{-C}_6\text{H}_4\text{R}\cdot\text{CHO} + \text{HCN} \rightleftharpoons p\text{-C}_6\text{H}_4\text{R}\cdot\text{CH}(\text{OH})\cdot\text{CN}$ have been determined where $\text{R} = \text{H}, \text{Me}, \text{Et}, \text{Pr}^{\beta}, \text{or Bu}^{\beta}$. These indicate that the stability of the free aldehyde relative to the cyanohydrin and hence the relative total electron-release effect increases in the order $\text{H} < \text{Bu}^{\beta} < \text{Pr}^{\beta} < \text{Et} < \text{Me}$. Since this is known to be the order of inductive electron-release (cf. A., 1940, I, 391) the new results indicate the same sequence for the mesomeric electron-release effect in agreement with Baker and Nathan's hypothesis (cf. A., 1936, 195). W. C. J. R.

Complex formation associated with distribution of ferric chloride between water and ether.—See A., 1942, I, 202.

Spectroscopic investigation of the association of normal primary alcohols. J. Kreuzer and R. Mecke (*Z. physikal. Chem.*, 1941, B, 49, 309—323).—A new photo-electric spectrophotometer is described. The absorption of the sharp band (λ 9680) of MeOH , EtOH , $\text{Pr}^{\alpha}\text{OH}$, and $\text{Bu}^{\alpha}\text{OH}$ in CCl_4 has been investigated up to concns. of 0.01 g.-mol. per l. The law governing the association of PhOH , $K = ac/(1 - \sqrt{a})$, holds also for the alcohols, although the latter, apparently on account of their polar association, show systematic deviations. The form of the absorption curve for low concns. is discussed. The binary complex appears to be absent at low concns. A. J. M.

Quantitative investigation of amino-acids and peptides. VII. Equilibria between amino-acids and formaldehyde. E. H. Frieden, M. S. Dunn, and C. D. Coryell (*J. Physical Chem.*, 1942, 46, 215—221).—The polarimetric titration method used for determining the consts. of the l -proline- CH_2O equilibria is based on the principle that the optical rotations of any complexes which may be formed

will differ from each other and from that of *l*-proline. The only complex observed has a val. 105 ± 5 for its association const.

C. R. H.

Light absorption of nickel thiocyanate solutions. A. von Kiss and P. Csokán (*Z. anorg. Chem.*, 1941, 245, 355—364).—Extinction curves of $\text{Ni}(\text{CNS})_2$ solutions containing KCNS and other salts show the existence of the complex ions $[\text{Ni}(\text{H}_2\text{O})_4(\text{CNS})]'$ and $[\text{Ni}(\text{CNS})_4]''$ in solutions containing a large excess of Ni^{2+} and CNS' respectively. Conc. solutions of $\text{Ni}(\text{CNS})_2$ contain the undissociated salt. Solutions of NiCl_2 in conc. HCl and of NiSO_4 in conc. H_2SO_4 contain the complex ions $[\text{NiCl}_4]''$ and $[\text{Ni}(\text{SO}_4)_2]''''$, respectively.

C. R. H.

Diffusibility and hydrolysis of yttrium and cerous salts in aqueous solutions of different hydrogen-ion concentration. G. Jander and H. Möhr (*Z. physikal. Chem.*, 1941, A, 189, 335—343).—The diffusion coeff. (*D*) of Y^{3+} and Ce^{3+} in 0.04M- $\text{Y}(\text{NO}_3)_3$ and - $\text{Ce}(\text{ClO}_4)_3$ remains const. whether the solution is made m. in the respective acids or in the respective Na salts. *D* for Y^{3+} also remains unchanged when the solution containing NaNO_3 is made 0.04 or 0.08M. in NaOH, whilst *D* for Ce^{3+} in the presence of NaClO_4 is unaltered when the solution is made 0.04M. in NaOH. The results are interpreted as indicating that, unlike Al^{3+} , Fe^{3+} , and Cr^{3+} salts, there is no tendency to form O-bridged basic ions, but a proportional amount of the Y^{3+} or Ce^{3+} is pptd. as hydroxide.

J. W. S.

Resumé of the proton transfer concept of acids and bases. H. N. Alyea (*J. Chem. Educ.*, 1941, 18, 206—209).

L. S. T.

Effect of substituents on the acid strength of benzoic acid. V. In *n*-propyl alcohol. J. H. Elliott (*J. Physical Chem.*, 1942, 46, 221—227).—The acid strengths (*K*) of 23 monosubstituted benzoic acids in Pr^nOH have been potentiometrically determined. Log *K* varies linearly with $1/\epsilon$ (ϵ = dielectric const.) for the substituents *o*-Br, -Cl, -OMe, *m*- and *p*-Me as was observed in Bu^nOH (cf. A., 1941, I, 210). In the other cases disagreement is pronounced. The cases where agreement is observed are considered exceptional. Where ϵ for the solvent is < 24.2 the relation is generally not linear.

C. R. H.

Relative acidity and basicity of sulphanilamide and *p*-aminobenzoic acid. A. Albert and R. Goldacre (*Nature*, 1942, 149, 245).—*K* (base) and *K* (acid), respectively, have been determined as follows: sulphanilamide (I), 1.6×10^{-12} , 6.3×10^{-11} ; *p*- $\text{NH}_2\text{C}_6\text{H}_4\text{CO}_2\text{H}$ (II), 3.1×10^{-12} , 1.5×10^{-5} ; *p*- $\text{NH}_2\text{C}_6\text{H}_4\text{CH}_2\text{CO}_2\text{H}$ (III), 3.1×10^{-11} , 6.3×10^{-6} . The fact that (I) and (II) are bases of approx. the same strength, together with a certain steric similarity between (I) and (II), support Fildes' hypothesis that (I) acts biologically by competing against the essential metabolite, (II), for the possession of particular groups (receptors) in enzyme systems. The feeble basicity may be connected with the formation of $\text{NH}\cdot\text{OH}$ -compounds. (III), a much stronger base, possesses no anti-(I) activity.

A. A. E.

Statistical mechanics of binary systems. K. Fuchs (*Proc. Roy. Soc.*, 1942, A, 179, 340—361).—The partition function of a binary solid solution is derived as an expansion in powers of the at. fractional concn. Singularities in the expansion correspond to a phase transition. The case of a binary solid solution with a two-phase field is treated in full; limits of solid solubility and the sp. heat are obtained. The latter is discontinuous at the phase boundary.

G. D. P.

Compounds of magnesium with elements of the IVb group. W. Klemm and H. Westlinning (*Z. anorg. Chem.*, 1941, 245, 365—380).—The phase diagram of the system Mg-Ge has two eutectics, at 635° (1.2—1.3 at.-% of Ge) and at 690° (~60 at.-% of Ge), and a peak at $1115 \pm 5^\circ$, the m.p. of Mg_2Ge . The lattice constns. of Mg_2Ge , Mg_2Si , Mg_2Sn , and Mg_2Pb have been redetermined, viz., 6.380, 6.338, 6.762, and 6.799 ± 0.002 Å, respectively. Comparison between the phase diagrams of these four Mg-metal systems, especially in the Mg-rich region, has been made. The solubility of Si and Ge in solid Mg is < 0.1 at.-% at 600° .

C. R. H.

Transformations of H_2Se -HDSe- D_2Se mixed crystals. A. Kruis (*Z. physikal. Chem.*, 1941, B, 48, 321—335).—Calorimetric studies of the mixed crystals of the ternary system H_2Se -HDSe- D_2Se have shown that the displacement of the transformation temp. and melting temp. in the transition of H_2Se to D_2Se is \propto the D content of the mixed crystals and that the sharpness of the transformation and m.p. is approx. the same as in the pure components H_2Se and D_2Se . Transformation temp. for HDSe have been interpolated.

W. R. A.

Geometric interpretation of the method of intercepts. H. S. van Klooster (*J. Chem. Educ.*, 1941, 18, 283—284).

L. S. T.

Heats of combustion of aliphatic and polymethylenic hydrocarbons in relation to their structure. V. P. Golmov (*J. Gen. Chem. Russ.*, 1941, 11, 405—410).—Correlation of the heat of combustion of the simpler aliphatic hydrocarbons with their structure shows that the H atoms contained therein are not thermochemically equiv.; the heat of combustion of H bound to C rises in the series $\text{CH}_4 < \text{CH}_3 < \text{CH}_2 < \text{CH}$, thus explaining the higher reactivity of H attached to a *tert.* C. From the heats of combustion of cyclic polymethylenic

hydrocarbons, it is shown that the energy stored in the ring structure is greatest for the 3- and 4-membered rings.

N. G.

Heats of reaction of acid and alkaline phenol-formaldehyde mixtures.—See B., 1942, II, 164.

Second law of thermodynamics. R. H. Wright (*J. Chem. Educ.*, 1941, 18, 263—269).—A semi-historical exposition.

L. S. T.

Space model of the Carnot cycle. E. W. Kanning and R. J. Hartman (*J. Chem. Educ.*, 1941, 18, 180—181).—A model, made in plaster of Paris set on a wooden base, is used to illustrate the four steps of a Carnot cycle.

L. S. T.

Entropy increase accompanying the formation of azeotropic mixtures. A. K. Shdanov (*J. Gen. Chem. Russ.*, 1941, 11, 483—492).—From the vals. of thermal expansion, heat of evaporation, and heat capacity of the azeotropic mixtures of Pr^nOH with C_6H_6 and PhMe and of Bu^nOH with CCl_4 and PhMe the change of entropy taking place in the formation of the mixture is calc. This change consists of a term common to all mixtures and another connected with the interaction of the components of the mixture. The second term is the greater the smaller is the difference between the b.p. of the azeotrope and that of an ideal mixture.

J. J. B.

Statistical thermodynamics of rubber.—See A., 1942, I, 204.

Thermodynamical study of system rubber-benzene.—See A., 1942, I, 204.

VII.—ELECTROCHEMISTRY.

Conductance and ionic mobilities for aqueous solutions of potassium and sodium chloride at temperatures from 15° to 45° . H. E. Gunning and A. R. Gordon (*J. Chem. Physics*, 1942, 10, 126—131).—Vals. of Λ for aq. NaCl and KCl (0.0005—0.01N.) at 10° intervals between 15° and 45° have been measured by a modified d.c. method and agree with a.c. vals. for 15° and 25° . Vals. can be represented at all temp. by the Onsager-Shedlovsky equation. Ionic mobilities and their temp. coeffs. are tabulated.

W. R. A.

Chemistry of free thiocyanogen. Electric conductivity of the system thiocyanogen-organic solvent. J. A. Fialkov and K. E. Kleiner (*J. Gen. Chem. Russ.*, 1941, 11, 671—682).—Solutions of $(\text{CNS})_2$ in CS_2 , CCl_4 , CHCl_3 , CHBr_3 , EtBr , and Et_2O do not conduct electricity. If to a solution of $(\text{CNS})_2$ in EtBr > 0.2 mol. of COMe_2 per 1 mol. of EtBr is added, the conductivity κ of the solution gradually increases and reaches a const. val. within 30 min.; a few hr. later κ decreases slightly. When κ has its max. val., the concn. of $(\text{CNS})_2$ is ~10% of the initial concn., and it drops to $< 4\%$ within a few hr. The increase of κ is probably due to the reaction $(\text{CNS})_2 + \text{COMe}_2 = \text{MeCO}\cdot\text{CH}_2\cdot\text{CNS} + \text{HCNS}$ as the solution contains CNS' . The subsequent lowering of κ is probably due to polymerisation of $(\text{CNS})_2$.

J. J. B.

Variation of the transference numbers of sodium chloride in aqueous solution with temperature. II. R. W. Allgood and A. R. Gordon (*J. Chem. Physics*, 1942, 10, 124—126; cf. A., 1940, I, 324).—The transference nos. of aq. NaCl (0.015—0.1N.) have been measured at 10° intervals from 15° to 45° by the moving boundary method. The Longworth function t_+^0 is linear at low concn. for all temp. and the val. at infinite dilution has been extrapolated. At higher concn. t_+^0 deviates from linearity. Ionic mobilities for the various temp. have been evaluated.

W. R. A.

Mobility of quinine ions. Permeability of Cellophane. E. B. R. Prideaux (*Trans. Faraday Soc.*, 1942, 38, 121—128).—Comparison of collodion and Cellophane (I) membranes shows that whilst the former exerts a selective retardation on anions, even in salts of alkaloids, the membrane potentials of HCl and KCl obtained with (I) are nearly the same as the free diffusion potentials. This is also true of the potentials between solutions of quinine hydrochloride having concn. ratios 1/50, 1/20, and 1/10, the max. concn. being 0.1M. The transport no. of the anion is calc. to be 0.76, and the average mobility of the mixed uni- and bi-valent quinine cations is 21.5. At the concns. used the bivalent ion does not move with twice the speed of the univalent. The mobility of the univalent cation calc. for limiting dilution from conductivity data is 19 at 25° .

F. L. U.

Accidental increase in the equivalent capacity of the conducting area between a Beilby layer and an electrolyte with solutions of alkali-metal iodides. F. J. Taboury (*Compt. rend.*, 1941, 213, 62—64; cf. A., 1938, I, 461; 1939, I, 267).—The capacity of polished metal electrodes immersed in solutions of iodides of alkali metals is considerably $>$ when they are immersed in solutions of chlorides, bromides, or oxy-salts. The Beilby layer remains unaltered, and with Pt, simple washing with H_2O sufficed to restore the electrode to normal when immersed in a chloride solution, after having given the abnormal results in an iodide. The origin of the phenomenon appears to be the presence of complex ions in the solution.

A. J. M.

VIII.—REACTIONS.

Effect of concentration on reaction rate and equilibrium. A. A. Frost (*J. Chem. Educ.*, 1941, 18, 272—274).—The validity of the law of mass action is discussed, and general derivation of the condition for equilibrium presented. L. S. T.

Kinetics of the interaction between dry sulphur dioxide and nitrogen dioxide. G. K. Borekov and V. V. Illarionov (*J. Phys. Chem. Russ.*, 1940, 14, 1428—1446).—The gas pressure of SO_2 - NO_2 mixtures was measured at room temp. (p_1) before the reaction started, at high temp. after the equilibrium was reached (p_2), and after cooling the equilibrium mixture to the room temp. (p_3). The difference $p_2 - p_3$ corr. for the temp. difference gave the v.p. of the reaction product at the reaction temp.; it was 21 mm. Hg at 208° and 46 mm. at 231.5°. The difference $p_1 - p_3$ gave the composition of the reaction product as $(\text{SO}_2)_2\text{N}_2\text{O}_3$; direct analysis confirmed this. The decrease of pressure p at const. temp. $dp/dt \propto [\text{SO}_2][\text{NO}_2]$, but the kinetics above 208° are complicated by the dissociation of NO_2 . The energy of activation between 160° and 230° is 24,500 g.-cal. and much less below 150°. At 208° the reaction is accelerated by glass wool if some H_2O is present. Probably the low activation energy below 150° is due to the heterogeneous reaction at the walls of the vessel (glass). Earlier results (cf. Zeiberlich, B., 1937, 131, and Kuzminich, A., 1937, I, 521) gave reaction coeffs. which were 10^3 times as high as the new ones. J. J. B.

Regions of inflammation of hydrocarbons. G. Reutenauer (*Compt. rend.*, 1941, 213, 72—74).—The variations in the lower and upper temp. limits for the primary ignition of hexadecene, dipentene, and decalhydronaphthalene have been investigated. The variation in ignition temp. with concn. has been determined. It varies considerably with the hydrocarbon, and this is probably due to the different intermediate compounds formed. A. J. M.

Aërated burner flames.—See B., 1942, I, 218.

Chain length and chain-ending processes in acetaldehyde decomposition. M. Burton, H. A. Taylor, and T. W. Davis (*J. Chem. Physics*, 1942, 10, 146).—Erratum (A., 1940, I, 120). W. R. A.

Thermal decomposition of *n*-butylamine. H. C. Beachell and H. A. Taylor (*J. Chem. Physics*, 1942, 10, 106—110).— NH_2Bu^n decomposes similarly to lower aliphatic amines and does not split up into NH_3 and C_2H_4 (cf. A., 1938, II, 425). Initially H atoms and a NHBu radical (I) are formed; (I) yields NH_3 through prior formation of an imine. Rates of pressure change yield an energy of activation of 89 kg.-cal. W. R. A.

Kinetics of reaction between manganous and permanganate ions. F. C. Tompkins (*Trans. Faraday Soc.*, 1942, 38, 131—139).—The course of the reaction $3\text{Mn}^{++} + 2\text{MnO}_4^- + 2\text{H}_2\text{O} = 5\text{MnO}_2 + 4\text{H}^+$ has been followed with the photo-electric turbidimeter (A., 1942, I, 214). The reaction is accelerated by increase in $[\text{Mn}^{++}]$ or $[\text{MnO}_4^-]$ and retarded by increase in $[\text{H}^+]$. The presence of complex-forming anions (SO_4^{--} , F^-) retards the formation of MnO_2 . The initial presence of MnO_2 in the form of a sol leads to an increased rate of production of MnO_2 , and is considered to catalyse the surface reaction $\text{Mn}^{+++} + 4\text{OH}^- \rightarrow \text{MnO}_2 + 2\text{H}_2\text{O}$; this effect is much reduced if the MnO_2 is in a granular or coagulated condition, as well as in the presence of a protective such as gum arabic. The kinetics of the reaction are discussed and a mechanism is proposed. F. L. U.

Kinetics of the reaction between ethylene chlorohydrin and sodium hydroxide. D. Porret (*Helv. Chim. Acta*, 1941, 24, 80—85E).—In accord with previous observations the reaction between $\text{Cl}[\text{CH}_2]_2\text{OH}$ and NaOH is approx. of second order and NaCl has only a very slight influence on its velocity. The energy of activation between 0° and 30° is 22,600 g.-cal. per g.-mol. The observed velocity of reaction is ~ 1000 times that predicted by the kinetic theory. J. W. S.

Reaction between glucose and iodine in alkaline medium. Effect of neutral salts. K. D. Jain and B. L. Vaish (*J. Indian Chem. Soc.*, 1941, 18, 503—504).— KCl , KBr , KNO_3 , NaCl , NaBr , NaNO_3 , NH_4Cl , NH_4Br , and NH_4NO_3 retard the velocity of oxidation of glucose by I and the velocity coeff. of the reaction decreases with increasing concn. of the salts; k is not independent of the salt used. F. R. G.

Formation of chymotrypsin from chymotrypsinogen.—See A., 1942, III, 342.

Effect of moisture on chemical reactions. G. Chamlin (*J. Chem. Educ.*, 1941, 18, 386—388).—A review. L. S. T.

Kinetics of ammonia synthesis on promoted iron catalysts. M. Temkin and V. Pishev (*Acta Physicochim. U.R.S.S.*, 1940, 12, 327—356).—Observed results for the kinetics of NH_3 synthesis may be accounted for if equations taking account of non-uniformity of surface and of interaction between adsorbed mols. are used to represent adsorption equilibria. The determining rate is that of activated adsorption of N_2 ; the apparent activation energy of the

synthesis is $\sim 14,000$ g.-cal., and that of the dissociation $\sim 40,000$ g.-cal. F. J. G.

Catalytic properties of rhenium. VIII. Dehydrogenation of iso-amyl alcohol. IX. Dehydrogenation of alcohols by rhenium disulphide. M. S. Platonov (*J. Gen. Chem. Russ.*, 1941, 11, 590—591, 683—685).—VIII. When $\text{iso-C}_5\text{H}_{11}\cdot\text{OH}$ is passed over Re at 250—500°, aldehydes, H_2 , CO, and saturated and unsaturated hydrocarbons are formed; the yield of aldehydes and H_2 is max. at 400°, and the yield of other products is the higher the higher is the temp.

IX. ReS_2 is a powerful catalyst, giving with MeOH , EtOH , and Pr^nOH H_2 and CH_2O , MeCHO , and COMe_2 , respectively, whilst the formation of CO and hydrocarbons is negligible within the temp. range investigated (200—550°). *cyclo*Hexanol at 200—250° is transformed into roughly equal amounts of *cyclo*hexanone (I) and *PhOH*, but the yield of *PhOH* increases and that of (I) decreases at higher temp. (400—550°). J. J. B.

Peculiarities in the behaviour of the lead accumulator. Overvoltage and production of ozone at the positive electrode at the end of the charge at low temperature. E. Briner and A. Yalda (*Helv. Chim. Acta*, 1941, 24, 109—118E).—For an accumulator containing H_2SO_4 of d 1.29 the p.d. across the terminals at the end of the period of charge, while gassing is in progress, increases from 2.36 v. at 19° to 2.82 v. at -43°, whereas the normal e.m.f. of the accumulator decreases with decreasing temp. At low temp. and high c.d. the O_2 produced at the anode contains O_3 . The presence of O_3 in O_2 circulated around a Pb electrode in H_2SO_4 increases its potential considerably, particularly at low temp., but it has no effect on the potential of a PbO_2 electrode around which the O_2 is circulated. This behaviour is correlated with the fact that the potential of the $\text{Pt}_2\text{O}_3|\text{H}_2\text{SO}_4$ electrode is < that of the $\text{PbO}_2|\text{H}_2\text{SO}_4$ electrode, and the higher potential observed during the evolution of gas is attributed to the production of O atoms. J. W. S.

Electrolysis of diethylacetic acid in mixture with its alkali metal salts and with the addition of nitrates. F. Fichter and M. Rudin (*Helv. Chim. Acta*, 1941, 24, 398—405E).—Electrolysis of $\text{CHET}_2\cdot\text{CO}_2\text{H}$ (I) (5 mols. per l.) to which KOH (2 mols. per l.) has been added yields principally CHET_2OH , CHMePr^nOH , and the esters formed by their interaction with (I), together with $\text{CHMe}:\text{CHET}$, COEt_2 , and COMePr^n . Only very low yields of $(\text{CHET}_2)_2$ are obtained. The esters are very stable and can be hydrolysed in aq. solution only with difficulty. The electrolysis of (I) in the presence of alkyl nitrates or $(\text{CH}_3)_2\text{O}\cdot\text{NO}_2$ yields, in addition to the above, also $\text{CHET}_2\cdot\text{O}\cdot\text{NO}_2$, $\text{CHMePr}^n\cdot\text{O}\cdot\text{NO}_2$, and the various esters formed by $\text{OH}\cdot\text{CHMe}:\text{CHET}:\text{OH}$ with (I) and HNO_3 . J. W. S.

Relation of electromotive force to the concentration of deuterium oxide in saturated standard [cadmium] cells.—See A., 1942, I, 175.

Cathodic protection of steel in corrosive solutions.—See B., 1942, I, 240.

Electrolytic polishing [of metals].—See B., 1942, I, 242.

Mechanism of chemical reactions in the glow discharge. A. Schechter (*Acta Physicochim. U.R.S.S.*, 1940, 12, 357—370).—Current theories of the mechanism of chemical reactions in the glow discharge are discussed. Reasons are given for the belief that the active centres are not ions or excited mols., but atoms, and that combination occurs in an adsorbed layer on the walls. F. J. G.

Inhibition of photochemical and dark reactions by inorganic compounds. S. S. Greenfield (*Science*, 1941, 93, 550—551).— ZnSO_4 , NiSO_4 , KCl , and solutions of high osmotic pressure retard the dark reaction. CuSO_4 , H_3BO_3 , KI , CoSO_4 , and $(\text{NH}_4)_2\text{SO}_4$ retard both dark and photochemical reactions. E. R. R.

Chlorknallgas. II. Rôle of the reaction $\text{H} + \text{HCl} = \text{H}_2 + \text{Cl}$. M. Bodenstein [with L. von Müffling, A. Sommer, and S. Khodschaijan]. **III. Chain breaking in oxygen-containing gases.** M. Bodenstein and H. F. Launer (*Z. physikal. Chem.*, 1941, B, 48, 239—267, 268—288).—II. The explanations advanced by Ritchie and Norrish (A., 1933, 576) are erroneous. The reaction involving the breaking up of HCl is insignificant and the velocity \propto light intensity. The velocity of the reaction $\text{H} + \text{HCl} = \text{H}_2 + \text{Cl}$ has been compared with that of the reaction $\text{H} + \text{Cl}_2 = \text{HCl} + \text{H}$ using $p\text{-H}_2$ and the ratios are 1:249 at 30°, 1:114 at 110°, and 1:57 at 198°.

III. Kinetics of explosions in mixtures containing various amounts of H_2 , Cl_2 , HCl , with addition of O_2 , have been investigated. Chain breaking occurs through $\text{H} + \text{O}_2 + \text{M} = \text{HO}_2 + \text{M}$, Cl and the wall, and $\text{Cl} + \text{O}_2 + \text{HCl} = \text{H}_2\text{O} + \text{Cl}_2$. The HO_2 reacts with H_2 and with HCl to give H_2O_2 and with Cl_2 to give ClO_2 , and these are converted into stable end products by Cl and H . Existing data are discussed. W. R. A.

Photo-oxidation of iodide ion sensitised by eosin. Effect of oxygen concentration and of light intensity. R. Livingston (*J. Physical Chem.*, 1942, 46, 233—238).—At relatively low light intensities (I) the quantum yield (ϕ) can be represented by $\phi = A[\text{O}_2]^{0.5}I^{0.5}$ ($A = \text{const.}$). Yields as high as 2.8 have been observed but this

may not be the max. attainable. The data are compared with earlier data (cf. A., 1941, I, 275).
C. R. H.

Photolysis of azomethane in the presence of hydrogen. H. A. Taylor and R. G. Flowers (*J. Chem. Physics*, 1942, 10, 110—115).—Between 20° and 200° the C_2H_6 produced in the photolysis of azomethane in presence of H_2 is independent of H_2 and at low temp. the amount of CH_4 produced is decreased. The rate increases more rapidly with temp. if H_2 is present. A mechanism, involving CH_3 radicals is proposed; CH_3 is produced by the reaction $CH_3 + CH_3 = 2CH_4$. This is preferred to $CH_3 + H_2 = CH_4 + H$ because no H atoms could be detected. A similar mechanism has been advanced to account for the decomp. of $HgMe_2$.
W. R. A.

p_H changes in water when irradiated with X-rays. P. Günther and L. Holzapfel (*Z. physikal. Chem.*, 1941, B, 49, 303—308).—The observation of Risse (A., 1930, 1261) that there is a decrease in the p_H of H_2O when irradiated with X-rays has been shown to be due to the presence of an impurity, probably H_2CO_3 . This probably gives rise to a stronger acid (possibly $H_2C_2O_4$) when irradiated with X-rays. The effect is not observed with ordinary impure H_2O on account of its buffering action.
A. J. M.

Mechanism of oxidation effect of ultrasonic vibrations. S. Bresler (*Acta Physicochim. U.R.S.S.*, 1940, 12, 323—326).—With the aid of "luminol" (3-aminophthalhydrazide) as an indicator of the presence of oxidising radicals, it has been shown that the formation of H_2O_2 by ultrasonic vibrations in H_2O depends on activation of dissolved O_2 , and that this is connected with cavitation.
F. J. G.

IX.—METHODS OF PREPARATION.

Sodium monothio-orthophosphate. E. Zintl and A. Bertram (*Z. anorg. Chem.*, 1940, 245, 16—19).—Anhyd. Na monothio-orthophosphate, Na_3PO_3S , is obtained when the calc. quantities of $NaPO_3$ and Na_2S are heated at 450—750°. It exists in two modifications with a transition temp. at $\sim 550^\circ$. On crystallisation from H_2O it affords the dodecahydrate, which is identical with that obtained by hydrolysis of $PSCl_3$.
F. J. G.

Existence of anhydrous sodium silicophosphates. E. Zintl and W. Morawietz (*Z. anorg. Chem.*, 1940, 245, 12—15).—The products resulting from the ignition of Na phosphates at $>1100^\circ$ with Na_2SiO_3 or SiO_2 have been studied. No evidence for the existence of $Na_3[Si(PO_3)_4]$ (A., 1929, 39) was obtained. SiO_2 does not displace P_2O_5 from Na phosphates but $NaPO_3$ and Na_2SiO_3 afford Na_3PO_4 and SiO_2 . A high-temp. modification of Na_3PO_4 exists. The transition temp. is $\sim 700^\circ$.
F. J. G.

Action of ozone on sputtered metals. H. Schützu and I. Schützu (*Z. anorg. Chem.*, 1940, 245, 59—66).—When Au is sputtered by high-frequency sparking in an O_2-O_3 mixture, the product contains 40% of Au_2O_3 , and when heated evolves $\sim 2\%$ of O_3 . With Pb the product consists mainly of PbO_2 and evolves $\sim 4\%$ of O_3 when heated. The O_3 may be adsorbed, or may originate in the decomp. of a higher oxide. Pure Au_2O_3 and PbO_2 do not evolve O_3 when heated; earlier observations suggesting that they do so are due to the liberation of N oxides from specimens contaminated with NO_3^- from the method of prep.
F. J. G.

Structure of tricalcium aluminate.—See A., 1942, I, 166.

Tensimetric determination of higher ammoniates of complex salts. II. G. Spacu and P. Voichescu (*Z. anorg. Chem.*, 1941, 245, 341—351).—The composition of complex metal ammoniates of the general type $[XY]Cl_2 \cdot nNH_3$, where $X = Cd, Zn, Co$, and Ni , $Y =$ benzidine (I), *o*-tolidine (II), and *o*-dianisidine (III), and n is a whole no. has been determined. For the same central metal the heat of formation (Q) decreases with increase in n , and for a given val. of n , Q increases as the at. vol. of the central metal decreases. Cd and Zn compounds with $n = 5$ are not formed and Zn compounds with (I) and (III) are the only compounds with $n = 7$. Unlike (II) which forms complexes with $n > 10$, (I) and (III) form complexes with $n = 12$. The prep. and properties of the (III) complexes, here reported for the first time, are described.
C. R. H.

Transformation of black mercuric sulphide into red by heating. J. Krustinsons (*Z. anorg. Chem.*, 1941, 245, 352—354).—The rate of conversion of black HgS into red increases with temp., attaining a max. at $\sim 290^\circ$. Above this temp. there is a decrease in conversion with decomp. of HgS into Hg and S . The change is apparently catalysed by $Hg_2Cl_2S_2$ or Hg_2Cl_2 formed together with HgS when H_2S is passed through a solution of $HgCl_2$.
C. R. H.

Boron monoxide. E. Zintl, W. Morawietz, and E. Gasting (*Z. anorg. Chem.*, 1940, 245, 8—11).— BO is obtained as a light brown sublimate when B is heated with ZrO_2 at 1800° in vac.
F. J. G.

Double oxides having the rock-salt structure. E. Zintl and W. Morawietz (*Z. anorg. Chem.*, 1940, 245, 26—31).— Na_2PrO_2 , in which Pr is quadrivalent, is obtained by heating Pr_2O_3 with Na_2O at 470° in O_2 . It has the rock-salt structure with $a = 4.84 \text{ \AA}$, and $\rho = 4.60$. The

Na and Pr^{IV} cations are distributed statistically over equiv. positions. Na_2CeO_3 has an analogous structure, with $a = 4.82 \text{ \AA}$. When La_2O_3 and Na_2O are heated in O_2 at 500° the product is $NaLaO_2$.
F. J. G.

Formation and stability of halogen and cyanogen derivatives of the carbonyls and carboxycyanides. I. B. Ormont (*Acta Physicochim. U.R.S.S.*, 1940, 12, 411—432).—The possibility of the existence of various types of CN-carbonyl compounds of the transitional metals is discussed. Theoretical considerations indicate that in $Fe(CO)_4Cl_2$ the Cl atoms are covalently, not ionically, bound and that $Fe(CO)_4(CN)_2$ should be very stable.
F. J. G.

Silicon monoxide. E. Zintl [with W. Bräuning, H. L. Grube, W. Krings, and W. Morawietz] (*Z. anorg. Chem.*, 1940, 245, 1—7).— SiO is quantitatively volatilised as SiO when silicates are heated with the calc. quantity of Si at $\sim 1500^\circ$ in vac. The sublimate may be solid SiO or may be a mixture of Si and SiO_2 . It is readily oxidised to SiO_2 , by air at room temp., by H_2O or CO_2 at 500° , and by SO_2 at 800° . Cl_2 at 800° affords $SiCl_4$ and SiO_2 . When it is heated in vac. at 1350° with CaO and MgO or ZnO , Mg or Zn volatilises and Ca_2SiO_4 remains.
F. J. G.

Thiohalides of metalloids. Preparation and properties of phosphorus thiofluoride. S. A. Voznenski and L. M. Dubnikov (*J. Gen. Chem. Russ.*, 1941, 11, 507—517).— PSF_3 was prepared from P_2S_5 and $3PF_5$ and purified by pumping off at -85° . It has m.p. -121° , b.p. $-57.5^\circ/740$, v.p. 0.2 atm./ -100° and 5.0 atm./ -12.2° ; mol. wt. 118—121. The hydrolysis by H_2O vapour at 21° is very slow (weeks). Na (and K) at 200° produce ignition and give NaF , Na_2S , S, and P_2O_5 . Fe reacts similarly. Hot $KMnO_4$ gives PF_3 . NH_4Et_3 gives $PSF(NEt_2)_2$, m.p. 54.4° , $\rho = 1.08$, and $PSF_2 \cdot NEt_2$ crystals (from C_6H_6).
J. J. B.

Sodium bismuthate. E. Zintl and K. Scheiner (*Z. anorg. Chem.*, 1940, 245, 32—34).—When Bi_2O_3 is heated at 650° in O_2 with Na_2O or Na_2O_2 , in proportions Na:Bi = 3—4, the product contains 100% of BiV and is free from Na_2O_2 . This suggests the existence of Na_2BiO_4 and also of a bismuthate richer in alkali. With Na:Bi < 3, the product contains Bi^{III} and Na_2O_2 , and with Na:Bi > 4 Na_2O_2 is formed in addition to bismuthate.
F. J. G.

Action of hydrogen sulphide on sulphites. III. Influence of hydrogen-ion concentration on the direction of the reaction. J. I. Zilberman and V. M. Fridman (*J. Gen. Chem. Russ.*, 1941, 11, 363—370; cf. A., 1941, I, 19, 344).—The variation of the yields of $Na_2S_2O_4$ and Na polythionates formed by interaction of H_2S with Na sulphite-bisulphite solutions is shown graphically for p_H vals. 5.06—7.26. At 80° , the yield of $S_2O_4^{2-}$ is greatest at p_H 6.2, and falls rapidly in more acid or more alkaline media because of side reactions, during which polythionates are produced. At 20° , the yield of $S_2O_4^{2-}$ is greater, and varies much more slowly with p_H , being greatest at p_H 6.28—6.31. A glass electrode was used for p_H measurement.
N. G.

Affinity. XCV. Uranium phosphides. M. Heimbrecht, M. Zumbusch, and W. Biltz (*Z. anorg. Chem.*, 1941, 245, 391—401).—An investigation of the system U—P has shown the existence of UP_2 , U_3P_4 , and UP . The mol. vol. and structure of these compounds as revealed by d and X-ray data are discussed with reference to similar properties of U sulphides and Th phosphides, and the ionic vols. of P^{III} and S^{IV} in these compounds have been calc.
C. R. H.

Sodium orthoperiodate. E. Zintl and W. Morawietz (*Z. anorg. Chem.*, 1940, 245, 20—25).— NaI may be oxidised directly to Na_4IO_6 by heating in air at $400-700^\circ$ with Na_2O , Na_2O_2 , or $NaOH$, or by heating in absence of air with $NaOH$ and $NaNO_3$.
F. J. G.

Metallic carbonyls. XXXII. Iron carbonyl halides. W. Hieber and A. Wirsching (*Z. anorg. Chem.*, 1940, 245, 35—58).—The reactions of a no. of halogen compounds with $Fe(CO)_5$ (I) or $Fe(CO)_4I_2$ (II) have been investigated. With (I), IBr and ICl afford $Fe(CO)_4IBr$ (III) and $Fe(CO)_4ICl$, and $SbCl_3$ and $SnCl_4$ afford $Fe(CO)_4SbCl_3$ (IV) and $Fe(CO)_4SnCl_4$ (V). (IV) and (V) contain Fe^{II} and Sb^{III} or Sn^{II} and are non-electrolytes. $SOCl_2$ reacts violently with (I), liberating CO and affording a product which contains Fe, CO, Cl, and S. $SOCl_2$ with (II) affords $Fe(CO)_2Cl_2$ (VI) ($\rho_2^0 = 2.233$) liberating CO, I_2 , and SO_2 . Comparative data on the rates of thermal decomp. of these substances and of the other Fe carbonyl halides are given. (IV), (V), and (VI) are intermediate in stability between $Fe(CO)_4Cl_2$ and $Fe(CO)_4Br_2$, and (III) between $Fe(CO)_4Br_2$ and (II).
F. J. G.

Nickel hydrides. A. A. Balandin, B. V. Erofeev, K. A. Petscherskaja, and M. S. Stachanova (*J. Gen. Chem. Russ.*, 1941, 11, 577—589).—When $NiCl_2$ (distilled in HCl) reacts with $MgPhBr$ in Et_2O , C_6H_6 , or $PhMe$ in a H_2 atm., 2—18 mols. of H_2 are absorbed for 1 mol. of $NiCl_2$. The low absorption is due to formation of NiH_2 , and the high absorption to dissolution of H_2 in the Ni hydride suspension and, to a larger extent, to hydrogenation of the aromatic solvent or of the decomp. products of $MgPhBr$. The hydrogenated products have been isolated but not identified. When $NiCl_2$ reacts with Mg hexyl bromide in Et_2O or Bu_2O , the amount of H_2 absorbed is 3.7—4.7 mols. Thermal decomp. of Ni hydride from these solutions shows it to be NiH_4 ; earlier investigators found NiH_2 .

since they decomposed it by acids and induced hydrogenation of C_6H_6 by NiH_4 . The rate v of absorption of H_2 by $NiCl_2$ - $MgPhBr$ solutions is poorly reproducible but usually shows a min. after 2-6 mols. of H_2 , and a max. after 3-3.5 mols., have been absorbed. In some cases v had a min. at the absorption of 1 H indicating a hydride NiH . The composition of the stable hydride (NiH_4) is independent of temp. (18-50°) but v is lower at higher temp. If v is high, the total amount of H_2 absorbed is also high. As formation of NiH_4 can take place without hydrogenation but no hydrogenation occurs without formation of NiH_4 , the hydrogenation appears to be more sensitive to poisons than is the synthesis of hydride. Thiophen stops the absorption of H_2 altogether. The NiH_4 formed in Et_2O remains in colloidal solution when $[MgPhBr]$ is >0.5 mol. and ppts. when $[MgPhBr]$ is <0.3 mol.; the excess of $MgPhBr$ functions as a protective colloid. J. J. B.

Reactions in the solid state at high temperatures. XXV. Intermediate states arising in the formation of nickel aluminate from nickel oxide and aluminium oxide in the solid state. W. Jander and K. Grob (*Z. anorg. Chem.*, 1940, 245, 67-84).—The properties of equimol. mixtures of NiO and $\alpha-Al_2O_3$ after ignition at various temp. (500-1000°) have been studied. The rate of dissolution of Al_2O_3 remains const. for mixtures heated at $>690^\circ$, then rises to a sharp max. for those heated at 750° , and then slowly falls. In powder photographs the first appearance of the lines of $NiAl_2O_4$ is in preps. heated at 1000° . When the preps. are used as catalysts for the decomp. of $MeOH$, H_2 and CO are the main products, and the yields of these are a max. for preps. ignited at 715° , with a lower max. at 850° . The yields of various minor products depend markedly and specifically on the ignition temp. F. J. G.

X.—ANALYSIS.

Qualitative spectrochemical analysis in agriculture and geochemistry. S. S. Ballard (*J. Appl. Physics*, 1940, 11, 750-758).—The technique of the qual. or semi-quant. spectrographic analysis of soil, fertiliser, plant, and geological samples for trace elements is described. O. D. S.

Spectrochemical analysis for trace elements.—See A., 1942, I, 215.

Polarographic analysis. III. Fundamentals of quantitative analysis. IV. Fundamentals of qualitative analysis. V. Applications. O. H. Müller (*J. Chem. Educ.*, 1941, 18, 172-177, 227-234, 320-329). L. S. T.

Absorption analysis. A. Tiselius (*Science*, 1941, 94, 145-146).—The Tswett method is modified and its application to the analysis of colourless substances discussed. E. R. R.

Optimum volume for a wash portion. L. Waldbauer and W. P. Cortelyou (*J. Chem. Educ.*, 1941, 18, 341-342).—The best conditions for washing a ppt. are discussed mathematically. The general rule of washing with 10-c.c. portions of wash liquid is not sound; a better rule is to wash with vols. 2-4 times that of liquid retained by the pores of the ppt. and between the ppt. and the walls of the vessel. L. S. T.

Application of organic reagents to inorganic analysis. J. A. Southern (*J. Chem. Educ.*, 1941, 18, 238-240).—General principles are discussed and illustrated. L. S. T.

Determination of total and inorganic bromide in foods fumigated with methyl bromide.—See B., 1942, III, 138.

Magnesium acetate as an ashing agent in fluorine analysis.—See A., 1942, III, 504.

Indirect polarographic determination of phosphorus in biological material.—See A., 1942, III, 504.

Determination of boron in soils.—See B., 1942, III, 126.

Micro-determination of calcium by precipitation as picrolonate and determination of the precipitated carbon by manometric combustion. D. D. Van Slyke and F. J. Kreysa (*J. Biol. Chem.*, 1942, 142, 765-776).—The Ca is pptd. as picrolonate, the C of which after centrifuging and draining is determined by the manometric wet combustion method (A., 1941, II, 24). The method is accurate for <0.2 mg. Ca. A. L.

Spectrographic analysis of magnesium alloys.—See B., 1942, I, 241.

Potentiometric measurements for the determination of complex ions in cadmium salt solutions.—See A., 1942, I, 174.

Absorption by metals of the iron group in analysis. G. J. Austin (*Analyst*, 1942, 67, 132-135).—Results of tests showing the effect of p_H on the co-pptn. of Ni, Fe, Zn, Cr, and Mn with Al are tabulated. In the determination of Al by Lundell and Knowles' method (A., 1923, ii, 341) in presence of Ni, much more Ni is co-pptd. than was anticipated. S. B.

Rapid detection of nickel in alloy steel.—See B., 1942, I, 239.

Photo-colorimetric determination of vanadium in iron.—See B., 1942, I, 237.

Determination and localisation of metallic minerals by the contact print method. G. Gutzeit (*Amer. Inst. Min. Met. Eng.*, 1942, 6, *Tech. Publ.* 1457, 13 pp.).—Gelatin-coated paper is impregnated with a selective attacking reagent, such as a mineral acid, H_2SO_4 , org. acids, NH_3 , KCN, and NaOH, and then placed on a polished surface of the mineral or ore, and pressed in contact with it. The contact print is developed by treatment with a reagent, of the type used in drop reactions, which locates by colour the constituent sought. Photomicrographs are taken of the polished surface and print, and are superimposed to obtain accurate localisation. The method permits the determination and localisation of the different elements forming an opaque mineral without destruction of the surface, the estimation of relative amounts of an element, and the solution of mineralogical problems, such as the identification of the members of closely-related groups, and of metallurgical problems concerned with suitable concn. processes to be applied to an ore. Reagents suitable for detecting Sb, As, Bi, Cd, Cr, Co, Cu, Au, Fe, Pb, Mn, Hg, Mo, Ni, Pd, Ag, S, Sn, Ti, W, U, V, and Zn are enumerated, and coloured photomicrographs obtained with Cu-Pb, W, and Mn ores are reproduced. L. S. T.

XI.—APPARATUS ETC.

Resistor furnace, with some preliminary results [on the behaviour of refractory materials] up to 2000°. R. F. Geller (*J. Res. Nat. Bur. Stand.*, 1941, 27, 555-566).—The laboratory furnace described utilises heating elements of fused ThO_2 (85) with Y_2O_3 (15) moulded around Pt-Rh wires utilised for the preliminary heating of the oxides to the temp. at which they become freely conductive. Contact is made to the conductors through a mixture of ZrO_2 (85) with Y_2O_3 (15). An oxidising atm. can be maintained in such a furnace. Various linings have been used. It has been shown that shapes of the following pairs of oxides can be heated in contact to the temp. indicated without harmful effect: $MgO-ThO_2$, $BeO-ThO_2$, and ZrO_2-ThO_2 , 2000°; $Al_2O_3-ThO_2$, 1850°; $Al_2O_3-ZrO_2$, 1900°; $BeO-ZrO_2$, 1925°; $MgO-BeO$, 1800°; Al_2O_3-BeO , 1825°. The product of heating an intimate mixture of $ZrO_2 + ThO_2$ at $\sim 2000^\circ$ has anomalous thermal expansion, showing a large reversal between 500° and 1000°. This cannot be explained by compound formation since X-ray and petrographic examination shows only the presence of the original oxides. Spinel and chrysoberyl (m.p. 1855-1880°) are the principal products of heating $MgO + Al_2O_3$ and $BeO + Al_2O_3$ mixtures, respectively. J. W. S.

Physical tools in chemistry. D. H. Killeffer (*Rev. Sci. Instr.*, 1942, 13, 49-53).—A brief review, including a diagram of a recording infra-red spectrometer and electron micrographs of MgO and $CaCO_3$. A. A. E.

Recording echelette grating spectrometer for the near infra-red. L. G. Smith (*Rev. Sci. Instr.*, 1942, 13, 54-62).—The prism-grating spectrometer employs replica echelette gratings and is capable of resolving lines from 0.3 cm^{-1} to 1.0 cm^{-1} apart in the region $1-25\ \mu$. Galvanometer deflexions can be directly recorded and atm. absorption has been almost entirely eliminated. A. A. E.

New source for infra-red spectrometers. L. G. Smith (*Rev. Sci. Instr.*, 1942, 13, 63-64).—A C rod heated electrically in vac. provides a source of brightness comparable with that of a Nernst glower but more robust and of greater width. A. A. E.

Infra-red absorption cell for gases at high and low temperatures. L. G. Smith (*Rev. Sci. Instr.*, 1942, 13, 65-67).—The cell, of Monel metal and sealed with rock-salt windows, may be used at temp. from -100° to 200° . A. A. E.

Anti-reflexion films on glass surfaces. A. F. Turner (*J. Appl. Physics*, 1941, 12, 351-352).—A criticism of French (A., 1941, I, 91). In order to obtain max. transmission of visual white light the thickness of anti-reflexion cryolite films on glass should be adjusted to $\pm 10\%$ of the theoretical thickness for max. transmission in the green. O. D. S.

Improved source for the Lyman continuum in the vacuum ultraviolet. R. E. Worley (*Rev. Sci. Instr.*, 1942, 13, 67-71).—Mechanical difficulties are largely avoided by use of a replaceable SiO_2 capillary held in permanent alignment by a metal clip, and a fin-type electrode that prevents clogging of the spectrograph slit. A. A. E.

Demonstrating ultramicroscope. H. J. Abrahams and W. Blitstein (*J. Chem. Educ.*, 1941, 18, 378-379).—Apparatus for demonstrating Brownian movement is described and illustrated. L. S. T.

New cassette for X-ray diffraction patterns. S. T. Gross (*Rev. Sci. Instr.*, 1942, 13, 81-82).—The cassette, which is constructed in one piece and may be of Al, is designed to prevent bulging of the film which is inserted through a slot. A. A. E.

New method in X-ray crystallography. E. Orowan (*Nature*, 1942, 149, 355-356).—The method described gives directly both spacings and positions of the reflecting planes for all diffraction spots in a rotation or oscillation photograph on flat film. A fine grid of thin

parallel wires is placed in front of the film and rotated in its own plane during the exposure, the rotation being linked with that of the crystal. The position of the reflecting planes in the crystal is given by the inclination of the lines, and their spacing by the position of the diffraction spots. A. A. E.

Compact calomel electrode. E. H. Shaw, jun. (*J. Chem. Educ.*, 1941, 18, 330).—The electrode described is suitable for electrometric titrations with the quinhydrone electrode, especially with titrations at small vol. It is more rugged than conventional types. L. S. T.

Applications of the polarograph in soil investigations.—See B., 1942, III, 123.

Symmetrical cells. P. Renaud (*Compt. rend.*, 1941, 213, 377—379).—Experiments on electrodes (Cu, Fe, Pt, Ta) under repeated dipping in solutions of their respective salts in air and in vac. were made with a micro-ammeter of high sensitivity. Readings indicate the deposition of a unimol. layer on the electrode. There is evidence of two phenomena: a p.d. on dipping and removing the electrode is due to capillary effects or to the formation of a concn. cell by the production at the electrode surface of a thin liquid film having a concn. different from that of the solution; on continued dipping there is chemical action between the solution and the electrode. N. M. B.

Reversible discharge tube. R. K. Asundi, N. L. Singh, and J. D. Singh (*Nature*, 1942, 149, 22).—A discharge tube which could be made to show either the arc spectrum or the H_2 spectrum is described. A. A. E.

Reversible discharge tube. A. G. Gaydon (*Nature*, 1942, 149, 112).—The behaviour of the discharge tube described by Asundi *et al.* (preceding abstract) is attributed to a leak. A. A. E.

Arc employing high streaming velocity for spectrochemistry. M. F. Hasler (*J. Opt. Soc. Amer.*, 1941, 31, 140—145).—An arc source is described in which a high streaming velocity through the arc is obtained by packing a space around the lower electrode with a substance (NH_4Cl or sugar C) gas from which carries the sample for analysis mechanically into the arc. For the analysis of powders the sample is mixed with the vaporising material. For the analysis of metals the electrode is formed from the metal sample and the vapour carries with it portions of the metal which are melted by the arc. The arc is more stable than the usual d.c. arc, more sensitive than the spark, and possesses a greater working range than the a.c. arc. The analysis of Zn containing Sn, Cd, and P 0.001—0.01%, Mg and Fe 0.01—0.1%, Cu 0.1—3%, and Al 3.5—4.5%, and of oxide prepared from the same metal is described. O. D. S.

Clean-up of mercury vapour in discharges through hydrogen, helium, and nitrogen. O. S. Duffendack, R. A. Wolfe, and F. Lederer (*J. Opt. Soc. Amer.*, 1941, 31, 174—176).—When a glow discharge is passed through H_2 saturated with Hg vapour the Hg emission spectrum disappears rapidly. A large amount of Hg may be "cleaned up" in this way. The effect is due to the formation of Hg hydride. This is decomposed at 150°. Hg may be liberated by heating the walls of the discharge tube. The clean-up is inhibited by saturation of the walls with He or by covering them with a layer of sputtered metal. A much smaller clean-up in He and N_2 is due to adsorption of Hg on the electrodes and tube walls. O. D. S.

Modification of the Barnes Geiger-Müller counter. J. C. Wang, J. F. Marvin, and K. W. Stenstrom (*Rev. Sci. Instr.*, 1942, 13, 81).—The central element of 0.1-mm. W wire has its lower end fixed in glass, and a glass shield increases the insulating distance between the electrodes. The upper end has a Ni sleeve connecting with a 1-mm. W lead-in. A Pt or Al film is deposited by evaporation on the sensitive portion of the tube. A. A. E.

Precision method of measuring Geiger counter resolving times. Y. Beers (*Rev. Sci. Instr.*, 1942, 13, 72—76).—By means of formulæ which are derived the resolving time and errors involved can be calc. from the difference between the counting rates due to two separate const. β -ray sources and to the two sources combined. A. A. E.

Electron microscope. H. N. Alyea (*J. Chem. Educ.*, 1941, 18, 236—237).—An illustrated description. L. S. T.

Capillary pipettes. H. A. Frediani and L. Gamble (*J. Chem. Educ.*, 1941, 18, 270—271).—A capillary pipette sealed into a protecting, graduated outer tube and operated by means of a rubber policeman is described. L. S. T.

Two simple micro-burettes and an accurate wash-out pipette. I. H. Hadfield (*J.S.C.I.*, 1942, 61, 45—50).—A description is given of a simple burette made from a glass tube with a jet at one end and a piece of rubber tubing at the other. A rod passing through the rubber tubing expels a vol. of liquid equal to the vol. of the rod which passes into the tube. The distance of travel is read on a scale behind the burette. The capacity is ~ 3 ml. and vols. can be read to 0.001 ml. In a more accurate model of capacity 0.5 ml. the rubber is dispensed with and the rod is ground to fit the tube with only a small clearance. The head of liquid is reduced by

bending the burette tube at right angles to the jet. The rod is impelled by a micrometer and the vols. may be read to 0.0001 ml. A simple wash-out pipette is described in which a plunger is used both to fill and to empty the pipette, and also acts as a reservoir for the H_2O for washing the pipette.

Paper for platinum in flame tests. C. C. Kiplinger (*J. Chem. Educ.*, 1941, 18, 297).—Paper soaked repeatedly in $NaNH_2HPO_4$ is used in place of Pt wire. Fused $Na_2B_4O_7$ cannot be used in this method. L. S. T.

Making fused porcelain-Pyrex filters. F. E. Holmes (*J. Chem. Educ.*, 1941, 18, 311—312).—The construction of various types of filter from unglazed porous porcelain discs fused into Pyrex glass is described and illustrated. L. S. T.

Apparatus for autofiltration. G. E. Lewis (*Pharm. J.*, 1942, 148, 151).—Sterile injections are prepared by filtration through a candle, capillary tubing, and a hypodermic needle directly into a previously sterilised, evacuated, rubber-capped bottle. The apparatus used, which is fully described and figured, entirely precludes contamination. A. A. E.

Pressure filter. A. Wexler (*J. Chem. Educ.*, 1941, 18, 167—168).—The filter consists of a test-tube drawn out at one end, and fitted with glass chips and a layer of asbestos or filter-paper pulp to act as the filter. The filter is useful for micro-work, for vac. drying, or for heating a ppt. in a current of gas. A high-pressure modification is also described. L. S. T.

Breaking of Pyrex flasks. H. A. Wooster (*J. Chem. Educ.*, 1941, 18, 196).—300-ml. Pyrex Florence flasks, filled with H_2O , cracked when they were placed on a wire gauze and heated over a blast lamp. When heated in the inner cone of the same flame without the interposition of the gauze, the H_2O boiled without fracture of the flask. Cracking is also avoided by suspending the flasks ~ 2 cm. above the gauze. It is attributed to local overheating by the hot wire. Wire gauze reaches the temp. given when heated in the flame of a blast lamp, 1300°, Fisher burner, 1080°, Meeker burner, 1080°, and Bunsen burner 970°. L. S. T.

Laboratory steam trap. S. H. Tucker (*Chem. and Ind.*, 1942, 194).—The trap contains a glass float so shaped that it can effectively seal the rubbered end of the H_2O -exit tube even when the apparatus or float is not vertical. A. A. E.

Hydrometer-type float method for measuring surface and interfacial tensions. B. Vonnegut (*Rev. Sci. Instr.*, 1942, 13, 82—83).—A float for measurement of γ has a very thin stem and has as small a mass or displacement as is consistent with maintenance of the perpendicular position. Such floats are described and the necessary measurements and formula for calculating γ are given. A. A. E.

Large crystals. R. P. Seward (*J. Chem. Educ.*, 1941, 18, 346).—Large crystals that require no protective coating can be grown in solutions containing approx. equal wts. of Cr alum and K alum. L. S. T.

Apparatus for producing liquids of low b.p. E. B. Wilson (*J. Chem. Educ.*, 1941, 18, 394—395). L. S. T.

Photo-electric turbidimeter for use in solution kinetics. F. C. Tompkins (*Trans. Faraday Soc.*, 1942, 38, 128—131).—Construction and use are described. The instrument is designed to follow the course of pptn. reactions and can be arranged to give direct readings or used as a null-point instrument. F. L. U.

Improved dilatometer. A. Furst (*J. Chem. Educ.*, 1941, 18, 335).—A dilatometer for studying rates of reaction is described. L. S. T.

Non-recording densitometer. W. S. Baird (*J. Opt. Soc. Amer.*, 1941, 31, 179—180).—Apparatus is described. O. D. S.

Ether-insoluble stopcock lubricant. B. L. Herrington and M. P. Starr (*Ind. Eng. Chem. [Anal.]*, 1942, 14, 62).—Starch-glycerol gel, prepared by heating a suspension of 9 g. of sol. starch in 22 g. of glycerol to 140°, decanting, and keeping overnight, furnishes a lubricant insol. in Et_2O and light petroleum. It is sol. slowly in H_2O . L. S. T.

Anchor-type laboratory stirrer for viscous or foamy materials. R. E. Forrest (*Ind. Eng. Chem. [Anal.]*, 1942, 14, 56).—An anchor-shaped stirrer cut from sheet metal is fitted into the flask, suppresses foaming, and prevents pptd. solid material from adhering to the sides of the flask. L. S. T.

Electrical precipitator for research and demonstration purposes. J. H. Billman and R. V. Cash (*J. Chem. Educ.*, 1941, 18, 261—262).—The modified Cottrell precipitator described and illustrated coagulates effectively AcOH mist and tobacco smoke. L. S. T.

Dry polishing of mineralogical specimens. H. J. Fraser and R. von Huene (*Econ. Geol.*, 1939, 34, 467).—Details of the method, which is particularly suitable for hard minerals, are given. L. S. T.

Molecular refraction nomograph.—See A., 1942, I, 165.

XII.—LECTURE EXPERIMENTS AND HISTORICAL.

Lecture demonstrations in chemistry. S. B. Arenson (*J. Chem. Educ.*, 1941, 18, 168—169; cf. A., 1941, I, 133).—Demonstrations for the following are described: decomp. of KClO_3 catalysed by MnO_2 , Gay Lussac's law of vols., the re-dissolution of carbonates in excess of CO_2 , the motion of mols. in gases, explosion range of gases, reaction velocity, cold P flame, and the prep. of blueprints. L. S. T.

Lecture experiments using rubber balloons. E. T. Mitchell (*J. Chem. Educ.*, 1941, 18, 269).—The law of mass action is demonstrated by the different rates at which equal-sized balloons are filled by H_2 from the action of m - to $6m$ - HCl on Zn . Common ion effect is shown similarly by the action of AcOH and $\text{AcOH} + \text{NaOAc}$ on CaCO_3 , and catalysis by the action of Zn and $\text{Zn} + \text{Cu}$ on dil. H_2SO_4 . L. S. T.

Ammonium chloride "chimney." H. L. Davis and J. W. Neckers (*J. Chem. Educ.*, 1941, 18, 292).—The deposition of a solid ring, ~18 mm. high, of NH_4Cl at the mouth of a test-tube is described and illustrated. L. S. T.

Demonstration of electrolytic extraction of aluminium. J. F. Castka (*J. Chem. Educ.*, 1941, 18, 193—194).—Details for a lecture demonstration are given. L. S. T.

Simple method of building close-packed molecular and crystal models. E. A. Hauser (*J. Chem. Educ.*, 1941, 18, 164—166).—Balls of wood, glass, metal, plastics, rubber, or, preferably, pressed cork are coated with unvulcanised rubber, which sticks only to itself. Details of the method and illustrations (AgBr , Si , Na silicate, and montmorillonite) are given. L. S. T.

Equipment for studying electrolysis and conductivity. G. B. Heisig and H. P. Klug (*J. Chem. Educ.*, 1941, 18, 314). L. S. T.

Demonstration involving air pressure. G. M. Lisk (*J. Chem. Educ.*, 1941, 18, 346).—Apparatus for demonstrating the absorption of NH_3 or HCl by H_2O is described. L. S. T.

Demonstrations of gas explosions. W. E. Thrun and J. M. Lien (*J. Chem. Educ.*, 1941, 18, 375—377).—Demonstrations showing differences in violence of explosive mixtures in bubbles, balloons, and glass containers are described. L. S. T.

Chart for qualitative analysis. L. P. Biefeld (*J. Chem. Educ.*, 1941, 18, 374).—A diagram showing the increasing solubility of the sulphides of the commoner cations is given. L. S. T.

Lecture and laboratory notebooks of three early Irish-American refugee chemists, W. J. Macneven, J. P. Emmet, and T. Antisell. C. A. Browne (*J. Chem. Educ.*, 1941, 18, 153—158).—Historical. L. S. T.

XIII.—GEOCHEMISTRY.

Geochemical study of Saratoga mineral waters by a spectrochemical analysis of their trace elements. L. W. Strock and S. Drexler (*J. Opt. Soc. Amer.*, 1941, 31, 167—173; cf. A., 1942, I, 120).—The analytical methods used in the previously reported investigation are described in detail. Erratic results obtained in the spectrochemical determination of Zr co-pptd. with $\text{Fe}(\text{OH})_3$ were due to the formation of ZrO_2 , probably by decomp. of Fe^{II} zirconate, during a short, but not accurately controlled, preheating period ~10 sec. during striking of the arc. O. D. S.

Theory of ground-water motion. (A) H. Krutter. (B) M. K. Hubbert (*J. Geol.*, 1941, 49, 324—326, 327—330).—A criticism (cf. A., 1941, I, 433) and a reply. L. S. T.

Hydrothermal deposits in the Specimen Mountain volcanics, Rocky Mountain National Park, Colorado. E. E. Wahlstrom (*Amer. Min.*, 1941, 26, 551—561).—Hydrothermal solutions, rising from depth, have deposited jasper (I) and opal which have replaced pitchstone flows adjacent to thrust faults. Locally, the (I) forms geodes, partly or completely filled with agate, onyx, opal, calcite, and minor amounts of allophane and chloropale. L. S. T.

Geological occurrence and practical relations of water, gas, and oil encountered in driving the Claremont tunnel through the Beverley Hills. G. D. Louderback (*Econ. Geol.*, 1939, 34, 469—470).—No H_2O -bearing strata were found in the Jurassic, Cretaceous, or Miocene formations. The main H_2O flows came from Pleistocene stream beds and the Pliocene volcanics. Hydrocarbon gas was found in the Cretaceous, and light oil seepages in the freshwater Pliocene. L. S. T.

Formation of sedimentary deposits of calcium phosphate. A. Rivière (*Compt. rend.*, 1941, 213, 74—77).—The concn. of phosphates in sea- H_2O is always < the solubility of these compounds under the conditions of p_{H} pertaining. Where there is a considerable deposit of phosphates it has been due to the presence of org. matter. A. J. M.

Mineral deposition at Steamboat Springs, Nevada. V. P. Gianella (*Econ. Geol.*, 1939, 34, 471—472).—Minerals are now being deposited from the hot (up to 95°) waters, which have high $[\text{NaCl}]$ and $[\text{SiO}_2]$, but are low in Ca. The large deposit of sinter is mainly SiO_2 , but a small carbonate content occurs in some areas. Sulphide minerals occur in the sinter, and some cinnabar has been mined. A deposit that quickly chokes the casings of borings is practically pure CaCO_3 , and not SiO_2 . Metastibnite in quantity, stibnite, and pyrite have been ejected. L. S. T.

Sub-river solution cavities in the Tennessee Valley. B. C. Money-maker (*J. Geol.*, 1941, 49, 74—86).—Deep drill holes and deep open-cut excavations at numerous widely-separated localities in an extensive area of variable geological character disclose the presence of solution cavities at depths considerably below the beds of the master streams. The development of solution channels in limestone, dolomite, marble, and other carbonate rocks within the zone of saturation appears to be a normal geological process. L. S. T.

Meteorites and the age of the solar system. W. J. Arrol, R. B. Jacobi, and F. A. Paneth (*Nature*, 1942, 149, 235—238).—The accuracy of radioactivity measurements has been improved by modifications in procedure which are summarised. Age vals. are determined by the He, Th, and U + actino-U contents. Six Fe meteorites of widely differing He content were re-examined; the calc. ages vary from 60 to 7600×10^6 years. The applicability of the He method is discussed. Among 44 other Fe meteorites which have been studied, none contains more He than that affording the highest val. above, and moreover a He content of twice the highest val. would raise the age val. to only 8500×10^6 years. Ages of the other 44 meteorites are calc. on the assumption that the average activity found for the six Fe meteorites is valid for the others also. It is concluded that the age of the solar system cannot be $< 7 \times 10^9$ years. A. A. E.

Origin of underground carbon dioxide. F. E. E. Germann and H. W. Ayres (*J. Physical Chem.*, 1942, 46, 61—68).—The increase in pressure which occurs when finely powdered natural CaCO_3 is heated at 98° in presence of H_2O vapour is > in absence of H_2O vapour. The max. pressure depends on the amount of sample, indicating that the reaction is not the simple hydrolytic decomp. of CaCO_3 , a more reasonable explanation being that impurities in the sample, e.g., SiO_2 , Al_2O_3 , react with CaCO_3 . The data do not support the view that the high underground pressure of CO_2 cannot be due to the thermal decomp. of CaCO_3 , merely because it is assumed that the temp. prevailing in the neighbourhood of igneous intrusions are too low to produce such pressure. Such assumptions are based on calculations using the dissociation pressure of pure CaCO_3 , whereas natural CaCO_3 contains impurities. C. R. H.

Distribution of helium and radioactivity in rocks. III. Radioactivity and petrology of some Californian intrusives. E. S. Larsen and N. B. Keevil (*Amer. J. Sci.*, 1942, 240, 204—215; cf. A., 1942, I, 122).—Data for minerals separated from the Lakeview tonalite and two other granitic rocks from the batholith of S. California are recorded and discussed. The distribution of radioactivity is non-uniform, the bulk of the radioactive elements having separated with the early minor constituents zircon (I), apatite, and sphene (II). The He retentivities of the constituent minerals in decreasing order are hornblende, biotite, quartz, apatite, felspar, (II), and (I). Field data and corr. He ages indicate a Jurassic rather than a Cretaceous age for the earliest intrusives in the batholithic complex of S. California. L. S. T.

Identification of minerals by means of X-rays. M. A. Peacock (*Trans. Roy. Soc. Canada*, 1941, [iii], 35, IV, 105—112).—Principles of the method are outlined, and its possibilities, particularly the identification of minerals described originally as distinct species, are discussed and illustrated. L. S. T.

Ep-Archean and Ep-Algonkian erosion surfaces, Grand Canyon, Arizona. R. P. Sharp (*Bull. Geol. Soc. Amer.*, 1940, 51, 1235—1270).—Chemical weathering, the ultimate product of which consists of quartz, muscovite, clay, and hydrated Fe oxides, is described and discussed. L. S. T.

Granite drift near Brittas, on the border between Co. Dublin and Co. Wicklow. A. Farrington (*Proc. Roy. Irish Acad.*, 1942, 47, B, 279—291).—Sands and gravels of granitic origin are described, and mineral analyses recorded and discussed. L. S. T.

Microchemical investigations on spotted muscovite mica. J. Dasgupta (*J. Indian Chem. Soc.*, 1941, 18, 381—382).—The black material present as minute specks in some specimens of muscovite mica has been analysed by micro-methods, and found to be magnetite. F. J. G.

Differentiation of the Palisade diabase, New Jersey. F. Walker (*Bull. Geol. Soc. Amer.*, 1940, 51, 1059—1106).—The 15 new chemical analyses [F. A. Gonyer] recorded and the micrometric measurements of 150 rock sections show that crystal fractionation accounts satisfactorily for most of the differentiation phenomena displayed by the sill. The main differentiation was effected by the settling of early-formed olivine crystals followed later by pyroxene. L. S. T.

Rock series in diabase sills at Duluth, Minnesota. G. M. Schwartz and A. E. Sandberg (*Bull. Geol. Soc. Amer.*, 1940, **51**, 1135—1172).—Petrography is described and chemical analyses and variation diagrams are given for the rocks of the Endion, Northland, and Lester River sills. Possible origins of the rocks in the sills are discussed. L. S. T.

Origin of the muck-silt deposits at Fairbanks, Alaska. R. Tuck (*Bull. Geol. Soc. Amer.*, 1940, **51**, 1295—1310).—The silt of the overburden that blankets these Au-bearing gravel deposits is eolian in origin, whilst the inorg. material of the muck consists mainly of wind-blown particles. L. S. T.

Concentric patterns in the granites of the Llano-Burnet region, Texas. D. Keppel (*Bull. Geol. Soc. Amer.*, 1940, **51**, 971—999).—The larger bodies of pre-Cambrian granites of this region show a concentric arrangement of three textural varieties; these, in order of solidification, are an outer coarse-grained granite, an intermediate zone of porphyritic coarse-grained granite, and a core of medium-grained granite. Petrographic and chemical (recorded) analyses show that the three textural varieties are similar. L. S. T.

Audubon-Albion stock, Boulder Co., Colorado. E. E. Wahlstrom (*Bull. Geol. Soc. Amer.*, 1940, **51**, 1789—1820).—This stock is a composite intrusive consisting mainly of monzonite, and injected into and cross-cutting pre-Cambrian granite, gneiss, and schist. Syenogabbro, the oldest rock in the stock, is probably a chilled phase of the parent magma from which the other types of rock were derived. Chemical analyses of this rock show relatively high K_2O , and are similar to those of basalt flows interbedded with the sediments of the Denver formation near Golden, Colorado. L. S. T.

Archean metaconcretions of Thunder Lake, Ontario. F. J. Pettijohn (*Bull. Geol. Soc. Amer.*, 1940, **51**, 1841—1850).—Silicified calcareous concretions occur in paragneisses and mica schists of Archean age near Thunder Lake in N.W. Ontario. Anorthitic plagioclase, quartz, and hornblende are the chief constituents. Chemical analyses [R. B. Ellestad] are recorded. L. S. T.

Igneous rocks of the Terlingua-Solitario region, Texas. J. T. Lonsdale (*Bull. Geol. Soc. Amer.*, 1940, **51**, 1539—1626).—Geology and petrography are described. The igneous rocks include an analcite-bearing series and intermediate, trachytic, and rhyolitic types, most of which are soda-rich. Chemical analyses [R. B. Ellestad] and variation diagrams are given. L. S. T.

Measuring grain boundaries in crystalline rocks. G. W. Bain (*J. Geol.*, 1941, **49**, 199—206).—Technique for measuring grain perimeters and surfaces in cryst. rocks is outlined. Vals. for the range of cryst. limestones illustrate the method. Application of the results to the determination of width of intergranular space and adsorptive capacity is indicated. L. S. T.

Structural control of ore deposition: effects of mineral sequence. C. D. Hulin (*Econ. Geol.*, 1939, **34**, 471).—The depositional sequence of minerals of hydrothermal ores is also a sequence of introduction of elements. Common metals are introduced in the order Fe, Zn, Pb, Cu, Ag, and Au. The relative time of appearance of these elements is essentially fixed for all ores, but the time of persistence and concn. of each metal in the solutions vary markedly. This obtains also with the elements (sequence, O, S, As, and Sb) combining with these metals. Minerals of Sn, W, Mo, and Bi are erratic in their time relation to the more common metals, but are coincident in time with the main period of quartz deposition. During mineralisation the SiO_2 , W, Sn, Mo, and Bi group is independent of the Fe, Zn, etc., and associated acids group. L. S. T.

Types of colouring in minerals. T. G. Kennard and D. H. Howell (*Amer. Min.*, 1941, **26**, 405—421).—Data relating to the various types of colouring that can occur in minerals are collected and correlated. The types are classified according to the means or mechanism of the colour production. A fundamental distinction is made between colouring due to characteristic absorption or reflexion that is determined by the chemical composition of the substance, and colouring caused by structural characteristics. Both body colour and surface colour are significant in the first type, whilst interference and scattering are the important factors in the second. The effect of particle size on colour is also discussed. Practical criteria for recognising and identifying the types of colouring shown in any particular specimen are suggested. L. S. T.

Retrograde metamorphism. G. M. Schwartz and J. H. Todd (*J. Geol.*, 1941, **49**, 177—189).—Retrograde metamorphism is defined as any change, not caused by weathering, by which a metamorphic mineral or rock alters to a mineral or rock of lower grade, i.e., to minerals and rocks more stable at lower temp. and pressures, and containing more H_2O . Retrogression is due mainly to the attack of hydrothermal solutions on so-called high-grade metamorphic minerals. Large amounts of H_2O , as in the change pyroxene \rightarrow amphibole \rightarrow biotite \rightarrow chlorite, are required. The theory of retrograde metamorphism outlined by Becke and elaborated by Harker is probably not adequate to explain the changes cited repeatedly as retrograde. L. S. T.

Optical properties of cordierite in relation to alkalis in the cordierite-beryl structure. R. E. Folinsbee (*Amer. Min.*, 1941, **26**, 485—500).—A chemical analysis of optically positive, gem-quality cordierite (I) from a new occurrence, north of Great Slave Lake, is recorded; it shows that pure (I) is low in H_2O + (0.67%). The analogy between the structure of (I) and beryl (II), indicated by X-ray data (A., 1929, 1223), is confirmed by similarities in the chemical, crystallographic, optical, and physical properties of the two minerals. The nature of the isomorphous substitution accompanying the introduction of alkalis into the (II) structure is established for an alkali-rich (II), and confirmed by examination of the relation of the structural formulae of alkali (II) and (I). The anomaly of the existence of optically-positive (I) is explained by variations in the alkali content of (I), an increase in which increases n_x , decreases the birefringence, and lowers the optic angle (cf. A., 1938, I, 163). Optically positive cordierites are, in general, low in alkalis and high in CaO. The importance of complete chemical analyses for the elucidation of the problems of mineralogy is emphasised. L. S. T.

Manganese deposits of Costa Rica, Central America. B. N. Webber (*Amer. Inst. Min. Met. Eng.*, 1942, **6**, *Tech. Publ.* 1445, 7 pp.).—History, production, and general geology are described. The Mn deposits are of two types, (i) hydrothermal deposits of hypogene origin, associated with abundant jasperoidal SiO_2 , and (ii) concns. and superficial replacement deposits of supergene origin. The chief Mn oxides identified are pyrolusite, manganite, and psilomelane. The deposits are described. L. S. T.

Manganese deposits in the Olympic Peninsula, Washington. C. F. Park, jun. (*Econ. Geol.*, 1939, **34**, 944—945).—Chocolate-red limestone (I), containing as much as 10% of finely-divided hæmatite, forms the host rock for the Mn. The limestones are associated with lavas, particularly pillow basalts. The Mn is of low-temp., hydrothermal origin, and occurs in irregular lenses and bodies that have replaced red (I) or red limy argillite. The Mn bodies are generally small, and contain up to a few hundred tons of ore. At Crescent mine, ~25,000 tons of high-grade hausmannite (II) have been mined. The mineral composition of the ores is unique in that the ore consists of (II), and a fine-grained mixture of Mn silicates called "bementite." Small amounts of cinnabar and native Cu are distributed widely throughout the deposits. The (II) deposits are low in SiO_2 . L. S. T.

Tungsten-bearing manganese deposit at Golconda, Nevada. P. F. Kerr (*Bull. Geol. Soc. Amer.*, 1940, **51**, 1359—1389).—W-bearing manganese and ochreous deposits underlie calcareous tufa. The W ore blankets an erosion surface, and beneath the blanket deposits are veins of similar mineralisation, which probably provided the source of the overlying ores. The ore minerals are colloidal in origin, $WO_3 \cdot nH_2O$ having been adsorbed in psilomelane (I) and limonite (II) while both were gels. The ore-bearing layers and the tufa are considered to be chiefly of hot spring origin. The ores consist of (II) containing adsorbed $WO_3 \cdot nH_2O$, W-bearing (I), for which the name *tungomelane* is suggested, and W-bearing hollandite (III). (III) has formed along gel cracks in (I) as a later part of the Mn mineralisation. An older jarosite vein containing small amounts of W appears to represent a level of mineralisation even lower than the veins immediately below the blanket deposits. Mineralisation started probably with chertification and silification, but resulted ultimately in pptn. of W, Fe, Mn, and tufa. The W-bearing (II) (chemical analysis given) contains 2.64% of WO_3 , and the deposits contain enough W for economic development. L. S. T.

Studies of the Lake Superior Pre-Cambrian by accessory-mineral methods. S. A. Tyler, R. W. Marsden, F. F. Grout, and G. A. Thiel (*Bull. Geol. Soc. Amer.*, 1940, **51**, 1429—1538).—Heavy mineral analyses of numerous rocks from the States bordering Lake Superior are recorded and discussed. The average relative % of accessory minerals is different for rocks of different composition even if the rocks are of the same age, and appear to be related genetically. The type of dominant zircon in Keeweenawan rocks is remarkably const. regardless of rock composition, and almost regardless of texture and cooling history of the rock. The striking changes in heavy accessory minerals in weathering and sedimentation are described for four districts. The data do not agree wholly with previous views as to which minerals are most rapidly or the least attacked by such processes. L. S. T.

Geology of Buxa Duars. A. Lahiri (*Quart. J. Geol. Soc. India*, 1941, **13**, 1—62).—The geology, petrology, and petrography, stratigraphy and structure of the rocks are described. The most important deposit economically is dolomite (I), which is abundant and of good quality, with nests of calcite. Chalcopyrite with Fe pyrite and pyrrhotite, and some azurite, has been found. Argentiferous galena with cerussite, sphalerite, and limonite occurs with the (I). Fe ores, coal, and good quality lignite also occur. Talc schists from the Jainti Hills are used for refractories and mosquito spray. Quartzite is used as building material. L. S. T.

Atomic arrangement of sylvanite. G. Tunell (*Amer. Min.*, 1941, **26**, 457—477).—Weissenberg and powder diffraction data are

recorded for sylvanite (I) from Cripple Creek, Colorado, from Săcărâmbu, Transilvania, and from the Buena Mine, Colorado. a_0 is 8.94, b_0 4.48, c_0 14.59 Å. (all ± 0.02 Å), and β $145^\circ 26' \pm 20'$, $\rho_{\text{calc.}}$ 8.17, $\rho_{\text{obs.}}$ 8.16; space-group C_{2h}^2-P2/c . The unit cell contains 2AuAgTe , with a small part of the Ag replaced by Au. At. positions are given; they have been confirmed by Fourier projection. Each Au and each Ag is surrounded octahedrally by 6Te, and each Te is surrounded octahedrally by 3Te, 2Au, and 1Ag, or by 3Te, 2Ag, and 1Au. A model showing the arrangement of atoms in (I) is reproduced. Interat. distances are Au—Te, 2.67, 2.76, and 3.26 Å, Ag—Te 2.69, 2.94, and 3.19 Å., and Te—Te, 2.88, 3.56, 3.64, and 3.64 Å. L. S. T.

Vermiculite and hydrobiotite. R. F. Ruthruff (*Amer. Min.*, 1941, 26, 478—484).—Chemical analysis supports the findings of Gruner (A., 1935, 841) that hydrobiotite (I) consists of interstratified layers of vermiculite (II) and biotite, probably in the ratio 1:1 or 3:2. Heating with dil. H_2SO_4 removes oxides from (II), leaving SiO_2 in the form of white plates. Complete removal of all oxides other than SiO_2 from (I) is more difficult. (I) saturated with conc. H_2SO_4 and exposed to air for < 24 hr., or steamed for a shorter time, exfoliates considerably. (II) soaked in conc. H_2SO_4 and exposed to air effervesces with the elimination of salts, but shows no further change. L. S. T.

Intrusive rocks of the Okanogan valley, and the problem of their correlation. K. B. Krauskopf (*J. Geol.*, 1941, 49, 1—53).—Eight plutonic masses, which include granodiorites, quartz-diorite, meta-gabbro, and malnigite, are described. Chemical analyses are recorded. L. S. T.

Grossularoid group (hibschite, plazolite). D. S. Beliankin and V. P. Petrov (*Amer. Min.*, 1941, 26, 450—453; A., 1940, I, 45).—Chemical analyses of hibschite (I) from Nikortzmindia, Georgia, and plazolite (II) from Crestmore, California, are recorded. (I) is grossularite with one mol. of SiO_2 replaced by $2\text{H}_2\text{O}$. A comparison of the occurrence, paragenesis, and properties of Bohemian and Caucasian (I) with those of (II) shows that (I) and (II) are both members of the same mineral group for which the name grossularoid group is suggested. Chemically, (II) differs from (I) by a small and variable content of CO_2 . (I) and (II) are less rare than is supposed. The heating curve of (I) shows an endothermal effect at 650 — 690° , and two exothermal effects at 870° and 940° . L. S. T.

X-Ray crystallography of seamanite. D. McConnell and W. L. Pondrom, jun. (*Amer. Min.*, 1941, 26, 446—447).—Seamanite from Chicagon mine, Michigan, has a_0 7.83, b_0 15.14, c_0 6.71 Å. (all ± 0.02 Å), $\rho_{\text{calc.}}$ 3.09, $\rho_{\text{obs.}}$ 3.08; the space-group is probably $Pbnm-V_6^h$. L. S. T.

Relation of Philippine mining districts to the structural history of the archipelago. E. Wisser (*Econ. Geol.*, 1939, 34, 468—469).—The rock formations, the structure, and the geologic history of the Philippine Archipelago are discussed with special reference to the Miocene Revolution, which culminated in the Au-quartz veins, the present source of Philippine Au production. L. S. T.

Columbomicrolite from Eshowe, Natal. J. E. de Villiers (*Amer. Min.*, 1941, 26, 501—506).—Columbomicrolite, a new member of the pyrochlore group occurring as small grains in albittite, has Nb_2O_5 71.2%, Ta_2O_5 none, TiO_2 1.8, Fe_2O_3 trace, Ce_2O_3 none, CaO 15.2, Na_2O 10.0, H_2O 1.8, total 100.0% (recalc. to 100.0%), ρ 4.16, n 2.152. The essential chemical characters of each member of the pyrochlore group are summarised. L. S. T.

Origin of the magnetic iron ores in the Lyon Mountain region, N.Y. W. J. Miller (*Econ. Geol.*, 1939, 34, 947).—A discussion. L. S. T.

Galena-sphalerite deposit in northeast Alabama. T. G. Andrews (*Econ. Geol.*, 1939, 34, 945).—Galena and sphalerite occur in Ordovician limestone near Angel Station, Calhoun Co., Alabama. L. S. T.

Spinel group. A. N. Winchell (*Amer. Min.*, 1941, 26, 422—428).—Members of this group are represented on a diagram, which also shows the variations in ρ that result from variations in composition. L. S. T.

Crystallographic notes. Cahnite, stolzite, zincite, ultrabasite. C. Palache (*Amer. Min.*, 1941, 26, 429—436).—Crystals of cahnite from Franklin, N.J., belong to the tetragonal disphenoidal class, 4. Crystallographic data for stolzite (I) from Primos Mine and Reef Mine, Arizona, and for (I) from Nigeria are recorded. (I) from Nigeria has ρ 8.34 ± 0.004 . Data for zincite from Franklin, N.Y., are also given. Ultrabasite is identical with diaphorite. L. S. T.

Volcanic rocks of the Western San Augustin plains district, New Mexico. W. E. Powers (*J. Geol.*, 1941, 49, 207—217).—Mountains surrounding these plains are composed of an unusual variety of volcanic rock types, including rhyolite, andesite, basalt, silicic and basic tuff, and agglomerate. L. S. T.

Idocrase and scapolite from Manchester, New Hampshire. G. W. Stewart (*Amer. Min.*, 1941, 26, 509—511).—Idocrase (I) occurs in

calcareous seams in the bedrock of biotite schist; occasionally, a crystal of (I) occurs embedded in calcite. Scapolite (chemical analysis given) is found usually replacing quartz. L. S. T.

Skeletonised apophyllite from Crestmore and Riverside, California. E. H. Bailey (*Amer. Min.*, 1941, 26, 565—567).—Occurrences of skeletonised apophyllite (SiO_2 88.54, H_2O 7.21, MgO $\sim 4\%$, with small amounts of Fe, Mn, and traces of Al, Cu, Ag, Ti, and Ni) are described. Retention of some of the optical and physical properties of the parent mineral indicates that the original apophyllite has undergone a selective leaching process in which Ca, F, and K have been removed without destroying the SiO_2 framework of the crystals. L. S. T.

Occurrence of martite in micaceous hæmatite near Esmont, Virginia. A. A. Pegau and W. C. Overstreet (*Amer. Min.*, 1941, 26, 512).—The martite occurs as octahedra disseminated through a dark steel-gray hæmatite. L. S. T.

Formation of jarosite on pyrite ornaments. F. H. Pough (*Amer. Min.*, 1941, 26, 562—564).—The formation of jarosite from beads of pyrite buried in earth 600 years ago is described. Turquoise pendants buried at the same time are unaltered. L. S. T.

Igneous rocks of the Stanner-Hanter district, Radnorshire, N. Holgate and K. A. K. Hallowes (*Geol. Mag.*, 1941, 78, 241—267).—The igneous rocks of the district are divided into (i) fine dolerites, (ii) gabbros, (iii) acid types, and (iv) later dolerites. Their distribution and petrology are described and discussed. L. S. T.

Chilean hexahedrites, and the composition of all hexahedrites. E. P. Henderson (*Amer. Min.*, 1941, 26, 546—550).—New chemical analyses recorded for Chilean hexahedrites show no significant variations in composition, and since the meteorites have been found over a restricted area, it is probable that they are related to a single fall. In composition these hexahedrites are similar to those from other localities; the Ni content lies between 5.5 and 5.6%. The composition agrees with the equilibrium data for the system Fe—Ni. Hexahedrites are similar in structure to kamacite, the chief alloy in octahedrites. L. S. T.

Stibnite deposits of Cruosom in Upper Hungary.—See B., 1942, I, 240.

Composition and properties of some New Zealand glauconites. C. O. Hutton and F. T. Seelye (*Amer. Min.*, 1941, 26, 595—604).—Chemical analyses and optical data for seven pure glauconites from sediments of Upper Cretaceous and Tertiary age are recorded and discussed. Data showing the amounts of oxides removed by treatment with HCl of different concns. are also recorded. Curves showing the relation between refractive indices and Fe_2O_3 content are given. Gruner's formula for glauconite (A., 1936, 49) is supported. L. S. T.

Diabolite from Mammoth mine, Tiger, Arizona. C. Palache (*Amer. Min.*, 1941, 26, 605—612).—Crystallographic data for diabolite (I), ditetragonal-pyramidal, hardness $2\frac{1}{2}$, ρ 5.42 ± 0.01 , are recorded. (I) is uniaxial negative, with ω 1.98 ± 0.01 and ϵ 1.85 ± 0.01 [H. Berman], a_0 5.83 ± 0.02 , c_0 5.46 ± 0.02 , V_0 185.58 Å^3 [C. W. Wolfe]; space-group $P4mm$. (I) has PbO 72.01, CuO 12.68, Cl 11.42, H_2O 6.03, insol. 0.19, total 102.33, loss for Cl 2.57 , 99.76% [F. A. Gonyer], and the unit cell is $\text{Pb}_3\text{CuCl}_2(\text{OH})_4$. (I) is distributed widely in the Collins Vein of the Mammoth mine, and occurs with linarite. L. S. T.

Qualitative colour test for montmorillonite type of clay minerals.—See B., 1942, III, 65.

Coal palaeobotany. R. Thiessen and G. C. Sprunk (*U.S. Bur. Mines*, 1941, *Tech. Paper* 631, 56 pp.).—The identity of the plants and of the plant remains from which the majority of coals have been derived are discussed. In the Palaeozoic coals plants of three types are easily recognised: coniferous-like, cycadophyte, and lycopod. No other types have been identified with certainty. These plants are not mixed promiscuously throughout the coal, but one type predominates in a given coal bed or a particular layer thereof. The coniferous-like plants, the cordaitales, are represented in coal by the xylem, bark, and leaves and by resinous inclusions thereof. The most easily recognised lycopod tissues are from the periderm or outer bark, which was a very thick-walled, highly lignified tissue which resisted the peat- and coal-forming processes more than other tissues and hence remained in larger proportions. Cycadophytes were abundant contributors to the Palaeozoic coals, some of which are composed predominantly of cycadophytes, e.g., the Pittsburgh bed. These plants are represented in coals by the xylem, periderm, leaves, petioles, pollens, and resinous contents and, particularly, by the mucilaginous contents of the so-called gum ducts. Numerous coal sections showing the nature and type of the various plant remains are illustrated. H. C. M.

Bristol and Somerset coalfields.—See B., 1942, I, 215.

Correlation of marginal beds of Upper Silesian coal formation.—See B., 1942, I, 215.

INDEX OF AUTHORS' NAMES, A., I.

JUNE, 1942.

- ABRAHAMS, H. J., 212.
 Albert, A., 205.
 Allgood, R. W., 206.
 Alyea, H. N., 205, 213.
 Amiel, J., 201.
 Andrews, T. G., 219.
 Anslow, (Miss) G. A., 194.
 Aronson, S. B., 215.
 Arrol, W. J., 216.
 Asundi, P. K., 213.
 Audieth, L. F., 191.
 Auer, G., 194.
 Auger, P., 191.
 Austin, G. J., 211.
 Ayres, H. W., 216.
- BAILEY, E. H., 220.
 Bain, G. W., 217.
 Baird, W. S., 214.
 Baker, J. W., 204.
 Balandin, A. A., 210.
 Baldwin, R. B., 190.
 Ballard, S. S., 211.
 Banerji, G. B., 195.
 Barker, E. F., 193.
 Barrer, R. M., 199.
 Bary, P., 189.
 Basak, R. G., 191.
 Bates, J. B., 199.
 Beachell, H. C., 207.
 Beers, Y., 213.
 Beliankin, D. S., 219.
 Bennewitz, K., 197.
 Bergman, W. E., 204.
 Bertram, A., 209.
 Bethe, H. A., 192.
 Biefeld, L. P., 215.
 Biggs, B. S., 197.
 Billmann, J. H., 214.
 Biltz, W., 210.
 Birge, R. T., 189.
 Blackman, M., 196.
 Blitzer, L., 189.
 Blitzstein, W., 212.
 Bodenstein, M., 208.
 Bolam, T. R., 203.
 Boreskov, G. K., 207.
 Bose, D. M., 192.
 Bräuning, W., 210.
 Bresler, S., 209.
 Briner, E., 208.
 Brown, W., 199.
 Browne, C. A., 215.
 Brun, E., 203.
 Burfoot, J. D., jun., 199.
 Burton, M., 207.
 Byram, G. M., 196.
- CASH, R. V., 214.
 Casokán, P., 205.
 Castka, J. F., 215.
 Cavier, R., 203.
 Chaminade, R., 191.
 Chamlin, G., 207.
 Cheesman, D. F., 202.
 Choudhuri, (Miss) B., 192.
 Clustius, K., 201.
 Cole, K. S., 196.
 Cole, R. H., 196.
 Compton, A. H., 191.
 Copley, G. N., 196.
 Copley, M. J., 191.
 Cortelyou, W. P., 211.
 Coryell, C. D., 204.
 Coulson, C. A., 197.
 Cowling, T. G., 201.
- DADILLON, (Mlle.) R., 193.
 Das, S. R., 198.
 Das Gupta, J., 216.
 Davis, H. L., 215.
 Davis, T. W., 207.
 De Fiquelmont, A. M., 200.
 Déribéré, M., 196.
 De Villiers, J. E., 219.
 Dirac, P. A. M., 192.
- Drexler, S., 215.
 Dube, G. P., 203.
 Dubnikov, L. M., 210.
 Dufay, V., 193.
 Duffendack, O. S., 192, 213.
 Dunn, M. S., 204.
- EDDINGTON, (Sir) A., 192.
 Eglolf, G., 195.
 Ehrenscheidt, G. C. H., 202.
 Eliaschewitsch, M. A., 193.
 Elliott, J. H., 205.
 Engel, A., 191.
 Erofeev, B. V., 210.
 Evans, R. D., 192.
- FARRINGTON, A., 216.
 Feenberg, E., 192.
 Fialkov, J. A., 206.
 Fichter, F., 208.
 Finkelnburg, W., 192.
 Flowers, R. G., 209.
 Folinsbee, R. E., 218.
 Forrest, R. E., 214.
 Fraser, H. J., 214.
 Frediani, H. A., 213.
 Freymann, (Mme.) M., 193.
 Freymann, R., 193.
 Fridman, V. M., 210.
 Frieden, E. H., 204.
 Frost, A. A., 207.
 Fuchs, K., 205.
 Furst, A., 214.
- GALLAWAY, W. S., 193.
 Gamble, L., 213.
 Gastinger, E., 209.
 Gaydon, A. G., 192, 213.
 Gee, G., 204.
 Geller, R. F., 212.
 Germann, F. E. E., 216.
 Gertsriken, S. D., 198.
 Gianella, V. P., 215.
 Gill, P. S., 191.
 Goldacre, R., 205.
 Golmov, V. P., 205.
 Gombert, G. L., 196.
 Gordon, A. R., 206.
 Govindarajan, S. R., 200.
 Green, R. L., 198.
 Greenfield, S. S., 208.
 Grob, K., 211.
 Gross, S. T., 212.
 Grout, F. F., 218.
 Grube, H. L., 210.
 Günther, P., 209.
 Gunning, H. E., 206.
 Gupta, K. D., 198.
 Gutzeit, G., 212.
- HADFIELD, I. H., 213.
 Hallowes, K. A. K., 220.
 Hansel, C. W., 200.
 Harris, G. P., 193.
 Harrison, G. R., 189.
 Hartman, R. J., 206.
 Hasler, M. F., 213.
 Hauser, E. A., 215.
 Hazlehurst, T. H., 204.
 Heatfield, T. G., 196.
 Hebb, M. H., 190.
 Heimbrecht, M., 210.
 Heimerheim, C. J., 202.
 Heisig, G. B., 215.
 Hemmendinger, H., 189.
 Henning, M. L., 204.
 Henderson, E. P., 220.
 Herquet, M., 203.
 Herrington, B. L., 214.
 Hieber, W., 210.
 Hieger, I., 195.
 Hildebrand, J. H., 190.
 Hönl, H., 192.
 Holgate, N., 220.
 Holmes, F. E., 214.
 Holzapfel, L., 209.
- Holz Müller, W., 195, 201.
 Hopkins, G., 196.
 Hopkins, J. I., 191.
 Howell, D. H., 217.
 Hubbard, S. S., 197.
 Hubbert, M. K., 215.
 Huene, R., v., 214.
 Hulin, C. D., 217.
 Hunter, L., 196.
 Hutton, C. O., 220.
- ILLARIOV, V. V., 207.
- JACOBI, R. B., 216.
 Jacquinet, P., 189.
 Jahn, H. A., 198.
 Jain, K. D., 207.
 Jander, G., 205.
 Jander, W., 211.
 Johnson, W. W. A., 189.
 Justi, E., 200.
- KANE, F., 203.
 Kanning, E. W., 206.
 Kantowitz, A., 200.
 Kaplan, J., 190.
 Keovil, N. B., 216.
 Kellner, L., 196.
 Kelly, M. W., 203.
 Kennard, T. G., 217.
 Keppel, D., 217.
 Kerr, P. F., 218.
 Khodschaian, S., 208.
 Killeffer, D. H., 212.
 Kiplinger, C. C., 214.
 Kiss, A., 194, 205.
 Kleiner, K. E., 206.
 Klemm, W., 205.
 Klug, H. P., 215.
 Krauskopf, K. B., 219.
 Kreuzer, J., 204.
 Kreysa, F. J., 211.
 Krings, W., 210.
 Kruis, A., 205.
 Krustinsons, J., 209.
 Krutter, H., 215.
 Kuder, R. C., 195.
 Kunerth, W., 195.
- LAHRTI, A., 218.
 Larsen, E. S., 216.
 LaRue, J. M., 192.
 Lederer, F., 213.
 Lennuier, R., 195.
 Levine, S., 203.
 Lewis, G. E., 214.
 Lien, J. M., 215.
 Lipson, H., 198.
 Lisk, H. M., 215.
 Livingston, R., 208.
 London, F., 197.
 Lonsdale, J. T., 217.
 Lonsdale, (Mrs.) K., 198.
 Louderback, G. D., 215.
 Lunt, R. W., 191.
 Lyman, (Miss) E. R., 194.
- MCCONNELL, D., 219.
 Major, E., 194.
 Mani, (Miss) A., 195.
 Marsden, R. W., 218.
 Marshak, R. E., 192.
 Marshall, C. E., 204.
 Marvin, J. F., 213.
 Maze, R., 191.
 Mecke, R., 204.
 Meek, J. M., 191.
 Meggers, W. F., 190.
 Menzel, D. H., 190.
 Miller, W. J., 219.
 Milligan, W. O., 199.
 Mitchell, E. T., 215.
 Mishra, B., 195.
 Mohr, H., 205.
 Moneymaker, B. C., 216.
 Morawietz, W., 209, 210.
- Morse, P. M., 192.
 Moureau, H., 200.
 Müffling, L., 208.
 Müller, O. H., 211.
 Müller, R., 199.
 Mulliken, R. S., 192.
- NASSAR, (Miss) S. C., 194.
 Neckers, J. W., 215.
 Nekrassov, B. V., 191, 202.
 Neuhaus, A., 201.
 Nielsen, J. B., 195.
 Nielsen, W. M., 191.
 Nordheim, W., 191.
 Norman, D., 189.
- OLDHAM, H. S., 195.
 Ormont, B., 210.
 Orowan, E., 212.
 Orr, W. J. C., 197.
 Overstreet, W. C., 220.
 Ovsiankina, V. V., 202.
 Owens, R. J., 193.
- PALACHE, C., 219, 220.
 Palit, S. R., 202.
 Pamfilov, A. V., 202.
 Paneth, F. A., 216.
 Park, C. F., jun., 218.
 Parshad, R., 201.
 Pasternack, S., 190.
 Pauthenier, M., 203.
 Peacock, M. A., 216.
 Pegau, A. A., 220.
 Peierls, R., 192.
 Penn, H. S., 194.
 Perrot, M., 196.
 Petrov, V. P., 219.
 Pettijohn, F. J., 217.
 Petscherskaja, K. A., 210.
 Pishew, V., 207.
 Platonov, M. S., 208.
 Prings, W. L., jun., 219.
 Porret, D., 207.
 Pough, F. H., 210.
 Powers, W. E., 219.
 Prideaux, E. B. R., 206.
 Pryce, M. H. L., 192.
- RAMAN, (Sir) C. V., 197.
 Ramart-Lucas, (Mme.) P., 194.
 Rao, D. V., 201.
 Rao, S. R., 200.
 Ray, B. B., 198.
 Reinicke, R., 199.
 Renaud, P., 213.
 Reutenauer, G., 207.
 Riecke, (Mrs.) C. A., 192.
 Rivière, A., 215.
 Roach, F. E., 189.
 Rooksby, H. P., 196.
 Rosický, V., 199.
 Rostler, K. S., 203.
 Rubenstein, P. J., 190.
 Rudin, M., 208.
 Rudórf, W., 202.
 Ruedy, R., 196.
 Rushbrooke, G. S., 202.
 Ruthruff, R. F., 219.
- SANDBERG, A. E., 217.
 Schallamach, A., 198.
 Schechter, A., 208.
 Scheibe, G., 199.
 Scheiner, K., 210.
 Schiffmann, R., 199.
 Schmidt, O., 197.
 Schnürmann, R., 199.
 Schütza, H., 209.
 Schütza, I., 209.
 Schulze, R., 199.
 Schwartz, G. M., 217.
 Seelye, F. T., 220.
 Seward, R. P., 214.
 Sharp, R. P., 216.
- SHAW, E. H., jun., 213.
 Shdanov, A. K., 200, 206.
 Smith, H., 198.
 Smith, J. C., 202.
 Smith, L. G., 212.
 Singh, J. D., 213.
 Singh, N. L., 213.
 Sklar, A. L., 193.
 Sommer, A., 208.
 Southern, J. A., 211.
 Spacu, G., 209.
 Sprung, G. C., 220.
 Stachanova, M. S., 210.
 Starobinetz, G. L., 202.
 Starr, M. P., 214.
 Stenstrom, K. W., 213.
 Stewart, G. W., 219.
 Stokes, A. R., 198.
 Streib, J. F., 191.
 Strock, L. W., 215.
 Struve, O., 190.
 Sundarachar, C. K., 191.
 Surugue, J., 191.
 Swings, P., 190.
- TABOURY, F. J., 206.
 Taylor, H. A., 207, 209.
 Tcheng, M. L., 190.
 Temkin, M., 207.
 Tester, H. M., 201.
 Thiel, G. A., 218.
 Thiessen, R., 220.
 Thomas, L. A., 196.
 Thompson, H. W., 193.
 Thrun, W. E., 215.
 Tiselius, A., 211.
 Todd, J. H., 217.
 Tompkins, F. C., 207, 214.
 Treloar, L. R. G., 204.
 Trivedi, A. K. M., 203.
 Tsien, S. T., 191.
 Tuck, R., 217.
 Tucker, S. H., 214.
 Tunell, G., 218.
 Turner, A. F., 212.
 Tyler, S. A., 218.
- ULMKE, H., 201.
 Uray, H. C., 191.
- VAISH, B. L., 207.
 Van Klooster, H. S., 205.
 Van Slyke, D. D., 211.
 Vergnoux, (Mlle.) A. M., 193.
 Voichescu, P., 209.
 Vonnegut, B., 214.
 Vorontsov-Velyaminov, B., 190.
 Voznessenski, S. A., 210.
- WAHLSTROM, E. E., 215, 217.
 Waldbauer, L., 211.
 Walker, F., 216.
 Wall, F. T., 204.
 Wang, J. C., 213.
 Ward, N. E., 195.
 Webster, B. N., 218.
 Weber, H. B., 199.
 Westlinning, H., 205.
 Wexler, A., 214.
 Wigner, E. P., 192.
 Wildt, R., 193.
 Wilson, E. B., 214.
 Winchell, A. N., 219.
 Wirsching, A., 210.
 Wisser, E., 219.
 Wolfe, R. A., 213.
 Wooster, H. A., 214.
 Worley, R. E., 212.
 Wright, R. H., 206.
 Wu, T. Y., 193.
- YALDA, A., 208.
 Yamaguchi, T., 199.
- ZILBERMAN, J. I., 210.
 Zintl, E., 209, 210.
 Zumbusch, M., 199, 210.

ERRATA.

Abstracts A., I, 1941.

Page	Line	
40	46	For "R. H. Jones" read "R. N. Jones."
44	19	" "3-29 μ ." read "3-28 μ ."
54	29	" "or" read "and."
59	30	" "1165" read "1176."
74	19*	" "position" read "portion."

* From bottom.

JUDACTAN

ANALYTICAL REAGENTS WITH ACTUAL BATCH ANALYSIS

ACTUAL
BATCH
ANALYSIS



Each Batch
subjected
to
INDEPENDENT
ANALYSIS
before
label is printed

You are invited to compare the above actual batch analysis with the purities

guaranteed by the specifications of any competing maker in this Country or abroad

THE GENERAL CHEMICAL & PHARMACEUTICAL CO. LTD.

Chemical Manufacturers, Judex Works, Sudbury, Middlesex