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A., I.—GENERAL, PHYSICAL, AND INORGANIC CHEMISTRY

CONTENTS

I.—SUB-ATOMICS.

Theory of complex spectra. III. G. Racah (*Physical Rev.*, 1943, [ii], **63**, 367—382; cf. A., 1943, I, 77).—Consideration of the phases of the fractional-origin coeffs. allows the extension of matrix methods to configurations with >2 equiv. electrons. Origins of p^n and d^n terms are tabulated. Applications are made to the spin–orbit interaction of the d^n terms and to the electrostatic interaction between the configurations d^n, $d^{n-1}s$, and $d^{n-2}s^2$. N. M. B.

Measurements on X-ray production and absorption in the range 0·7—2·5 Mv. A. A. Petrauskas, L. C. Van Atta, and F. E. Myers (*Physical Rev.*, 1943, [ii], **63**, 389—399).—The intensity and total mass absorption coeff. of the heterogeneous radiation produced in a thick Au target were measured as a function of tube voltage, angle with the electron beam, and thickness and material of the filter. Absorption coeff.–voltage curves are given for Pb, Sn, Cu, Al, C, and H_2O absorbers. A method is described for calculating the absorption coeff. at a given tube voltage with given filtration. Measured and calc. coeffs. are in good agreement. Intensity–angle curves are in qual. agreement with approx. theory. Absorption coeff.–angle and forward intensity–voltage curves are given. A method of calculating the efficiency of X-ray production from these data gives agreement with theory in the range 0·90—2·35 Mv. N. M. B.

Lead equivalence of thallium with respect to X-rays. R. Jaeger (*Physikal. Z.*, 1940, **41**, 398—399).—The thicknesses of Pb and Tl which produce the same reduction in intensity of X-rays were determined. For the softest X-rays the protective action of Tl with respect to Pb increases with greater homogenisation. This effect is not so marked with harder rays. It depends on the position of the K-absorption edges for Tl and Pb. A. J. M.

Stark effect and its connexion with thermodynamics and magnetic behaviour of chrome alum at low temperatures. Z. W. Ku (*Physikal. Z.*, 1940, **41**, 291—296).—The wave-mechanical method of Slater is used to examine the thermodynamic properties of Cr^{+++}. At sufficiently low temp. an increase of susceptibility with decreasing temp. is expected. Van Vleck's theory of dipole–dipole coupling is used to obtain formulæ for entropy and sp. heat in the case where there is no external field. A. J. M.

Polarisability of the hydrogen atom. H. Scheffers (*Physikal. Z.*, 1940, **41**, 399—401).—Various experiments with at. H rays in an electric field indicate that the atoms have a velocity corresponding to a temp. of 600° K. instead of room temp. This leads to a val. for the polarisability of the H atom of $(6\pm2) \times 10^{-25}$ c.c., which agrees with wave mechanics but not with the Bohr theory. A. J. M.

Fundamental equation of quantum mechanics. H. T. Flint (*Phil. Mag.*, 1943, [vii], **34**, 496—502).—Mathematical. A method for modifying Schroedinger's equation for a particle of charge e and mass m in an electromagnetic field by taking account of the magnetic moment of the particle is given. W. R. A.

Recombination law for weak ionisation. P. J. Nolan (*Proc. Roy. Irish Acad.*, 1943, **49**, A, 67—90).—The recombination equation, $q = dn/dt = -an^2$, has been investigated in the case of weak ionisation, the ionic concn. being determined by applying a high field. The law holds over the range of ionisation considered (1500—12,000 ions per c.c.) if q is determined from rate of growth. Vals. of q determined from saturation currents are > those from rate of growth. The results are applied to atm. ionisation. The normal val. of a is $1·41 \times 10^{-6}$ c.c. per sec.; it is independent of concn. and of time after the initial period of non-random distribution has elapsed. A. J. M.

Low-velocity scattering of H^+ and H_3^+ in hydrogen. J. H. Simons, C. M. Fontana, E. E. Muschlitz, jun., and S. R. Jackson (*J. Chem. Physics*, 1943, **11**, 307—312).—The analytical determination of potential laws from low-velocity scattering measurements is discussed. Scattering measurements are recorded for H^+ and H_3^+ in H_2 at 2—135 v. The potential law changes with ion velocity; e.g., for H^+ in H_2, $V = -20·37 \times 10^{-32}/r^4$ at 2—24 v. and $-8·68 \times 10^{-14}/r^{1·74}$ at 24—135 v. (distance of closest approach, r_a >1·74 and 1·74—1·5 A., respectively). This gives interaction energy 3·0 e.v.

For H_3^+ in H_2 the average val. of V is $1·145 \times 10^{-36}/r^{4·60}$ at 5·4—130 v. and $-5·98 \times 10^{-32}/r^4$ at 10·5—28 v. (r_a 2·12—1·07 and 1·85—1·48 A.). In the case of H_3^+, but not of H^+, the potential law found agrees with a law calc. assuming that the only interaction is with the induced dipole of H_2. L. J. J.

Low-velocity scattering of H_2^+ in hydrogen. Determination of neutralisation. J. H. Simons, C. M. Fontana, H. T. Francis, and L. G. Unger (*J. Chem. Physics*, 1943, **11**, 312—316).—Neutralisation cross-sections for H_2^+ in H_2 have been determined at 4—30 v. The potential law is $V = 10·0 \times 10^{-32}/r^4$ at 10—25 v. and $6·96 \times 10^{-24}/r^3$ at >25 v. (r_a 2·14—1·70 A. and <1·70 A., respectively); the const. is $\gg$ that in interaction due to polarisability of H_2. L. J. J.

Scattering of low-velocity hydrogen ions in water vapour. J. H. Simons, H. T. Francis, E. E. Muschlitz, jun., and G. C. Fryburg (*J. Chem. Physics*, 1943, **11**, 316—321).—The elastic scattering of H^+, H_2^+, and H_3^+ in H_2O vapour has been measured at 2—130 v. For H^+ the potential law is $V = -6·33 \times 10^{-32}/r^4$ at 3—15 v. (r_a 2·74—1·77 A.), giving 6·5 e.v. for the H^+ affinity of H_2O at equilibrium distance 1·013 A. At >15 v. the r exponent increases to ~20. For H_2^+, $V = -193 \times 10^{-56}/r^7$ at 3—20 v. (r_a 3·14—2·33 A.), the r exponent increasing to ~13 at >20 v. For H_3^+, $V = -8·7 \times 10^{-16}/r^2$ at 5—20 v. (r_a 4·27—2·33 A.), in agreement with dipole–charge interaction. The exponent of r increases to ~8 at 30—60 v. Neutralisation is found with H^+ and H_2^+, but not with H_3^+. A Knudsen gauge is described. L. J. J.

Scattering of low-velocity hydrogen ions in helium. J. H. Simons, E. E. Muschlitz, jun., and L. G. Unger (*J. Chem. Physics*, 1943, **11**, 322—328).—No neutralisation of H^+, H_2^+, or H_3^+ is found in He. For H^+ at 3—130 v. (r_a 2·66—0·55 A.), $V = 1·36 \times 10^{-18}/r^{2·27}$; for H_2^+ at 4—50 v. (r_a 1·67—0·87 A.) and 50—120 v. (r_a 0·87—0·66 A.) $V = -1·47 \times 10^{-32}/r^4$ and $-1·31 \times 10^{-32}/r^4$, respectively, while for H_3^+ in the ranges 1·5—14, 14—65, and 65—130 v. (r_a 2·22—1·59, 1·59—1·12, 1·12—0·89 A.) $V = -3·9 \times 10^{-53}/r^{6·68}$, $-1·06 \times 10^{-24}/r^{4·46}$, and $-4·83 \times 10^{-24}/r^{3·01}$, respectively. The interaction energy of H^- with He to form HeH^+ is 3·27 e.v. for equilibrium distance 0·8 A. The interaction of H_2^+ with He agrees with mol. polarisation by an ionic charge. An exact analytical treatment of scattering is given. L. J. J.

Sparking in hydrogen. W. Fucks and F. Kettel (*Z. Physik*, 1940, **116**, 657—692).—The square-root rule for the variation of relative decrease in spark potential with density of foreign current has been verified in the case of H_2. A. J. M.

Retardation and neutralisation of argon ions in helium. W. J. Hamm (*Physical Rev.*, 1943, [ii], **63**, 433—438).—An apparatus is described for making direct measurements of the loss of forward velocity of A ions in single encounters with He atoms. Results are given as collision cross-sections for given % retardations, for ion energies 1000—200 e.v. The cross-sections are zero for energy losses >33·1% and increase with decreasing % loss and with decreasing beam speed. A correction to the necessary readings is itself the cross-section for charge exchange between the A ions and He atoms. Approx. vals. are $3·5—4·5 \times 10^{-16}$ sq. cm. per mol. in the energy range studied, compared with 28×10^{-16} for A^+ in A and 63×10^{-16} for N_2^+ in N_2. N. M. B.

At. wt. of ytterbium. C. Honigschmid and F. Hirschbold-Wittner (*Z. anorg. Chem.*, 1941, **248**, 72—76).—From the ratios $YbCl_3 : 3Ag : 3AgCl$, $Yb = 173·10$. F. J. G.

Antisymmetrical interaction in β-decay theory. C. L. Critchfield (*Physical Rev.*, 1943, [ii], **63**, 417—425).—Mathematical. N. M. B.

Scattering of neutrons by protons. L. Hulthén (*Physical Rev.*, 1943, [ii], **63**, 383).—Mathematical. Results of Amaldi *et al.* (A., 1943, I, 112) for the angular distribution of fast neutrons scattered by protons favour a neutral meson theory of nuclear forces, and disagree with the theory of Møller and Rosenfeld (*Kgl. Danske Vidensk. Selsk. Math.-fys. Medd.*, 1940, **17**, No. 8). N. M. B.

Calculation of absorption in highly concentrated radium preparations. H. Franz and C. Weiss (*Physikal. Z.*, 1940, **41**, 345—348).—The absorption of γ-rays in highly conc. Ra preps. cannot be determined directly, but must be calc. The absorption functions

of a cylindrical specimen, and of a cylindrical section cut parallel to the axis, are calc. The absorption coeff. must be known. The determination of true Ra content is discussed.   A. J. M.

Putting tagged atoms to work. J. A. Timm (*J. Chem. Educ.*, 1943, **20**, 54—59).—A review of transmutation, and applications of the products of transmutation.   L. S. T.

Disintegration scheme of ^{24}Na. L. G. Elliott, M. Deutsch, and A. Roberts (*Physical Rev.*, 1943, [ii], **63**, 386—387; cf. Mandeville, A., 1943, I, 47).—A repetition of experiments with improved accuracy confirms the presence of only two γ-rays, of energies $1 \cdot 38 \pm 0 \cdot 03$ and $2 \cdot 76 \pm 0 \cdot 06$ Me.v., and intensity ratio $0 \cdot 9 : 1$ ($\pm \sim 15\%$).   N. M. B.

γ-Rays from ^{24}Na and ^{140}La. C. E. Mandeville (*Physical Rev.*, 1943, [ii], **63**, 387—388).—Anomalies in previous data are discussed. NaF was irradiated with slow neutrons from a cyclotron. The momentum distribution of the Compton recoils of γ-rays from ^{24}Na shows that the spectrum consists of two electron groups with energies $1 \cdot 38 \pm 0 \cdot 03$ and $2 \cdot 94 \pm 0 \cdot 06$ Me.v., and intensity ratio $0 \cdot 84$, confirming the results of Elliott *et al.* (cf. preceding abstract). The momentum distribution of the Compton recoils of the γ-rays from ^{140}La shows marked symmetry. The γ-rays appear to be mono-chromatic, with energy $2 \cdot 04 \pm 0 \cdot 04$ Me.v., as found by Weimer (cf. A., 1943, I, 174). The similarity of the ^{24}Na $2 \cdot 9$-Me.v. γ-ray peak to the Th-$C + C''$ $2 \cdot 62$-Me.v. γ-ray peak is noted. The theoretical status of ^{24}Na is critically reviewed.   N. M. B.

New determinations of the atmospheric pressure and temperature effects with cosmic rays. F. Göttlicher and W. W. Dittrich (*Physikal. Z.*, 1940, **41**, 402—406).—The variation in atm. pressure and temp. effects with cosmic rays has been investigated by means of a special arrangement of counters. The temp. effect is very small and varies in sign, although it is usually negative. This agrees with the fact that the total intensity at sea level is largely made up of mesons. The pressure effect is negative.   A. J. M.

Intensity of cosmic rays at low altitude and the origin of the soft component. K. Greisen (*Physical Rev.*, 1943, [ii], **63**, 323—333).—The separate intensities of fast mesotrons, slow mesotrons, and electrons are deduced from the differences between the absorption curves of cosmic rays at low altitude with C, Fe, and Pb absorbers. Results indicate considerable production of low-energy mesotrons at low altitudes, and that < half the energy of the mesotrons goes to the electron component.   N. M. B.

Mesotron mass and heavy tracks on Mt. Evans. C. E. Nielsen and W. M. Powell (*Physical Rev.*, 1943, [ii], **63**, 384—385).—Preliminary mass data (giving 145—240e for the mass of a slow mesotron) are reported from an analysis of 4 of the 6 tracks of heavily-ionising mesotrons identified in ~7000 Wilson cloud-chamber photographs.   N. M. B.

Direct measurement of the mean life of the meson at rest. R. Maze and R. Chaminade (*Compt. rend.*, 1942, **214**, 266—268).—A coincidence method, depending on the selection of a group of elec-trons arising from the disintegration of the meson in Pb or Al, is described (cf. A., 1942, I, 191). The val. found is $\tau_0 = 10^{-6}$ sec. ($\pm 30\%$).   N. M. B.

Production of bursts by the meson and its dependence on the meson spin. S. K. Chakrabarty (*Indian J. Physics*, 1942, **16**, 377—392).—An analytical expression for the calculation of the frequency of bursts containing $\not< N$ particles produced by a meson has been derived and tested against experimental data, vals. of 0, $\frac{1}{2}$, and 1 being used for the meson spin. For a meson, spin 0 or $\frac{1}{2}$ is not possible, but spin 1 is probable provided that certain conditions are satisfied. For large bursts the radiation process predominates and the contribution of the knock-on process is insignificant.   W. R. A.

Theory of a mixed pseudoscalar and a vector meson field. W. Pauli and S. Kusaka (*Physical Rev.*, 1943, [ii], **63**, 400—416; cf. A., 1943, I, 384).—Mathematical.   N. M. B.

Meson theory of the magnetic moment of proton and neutron. J. M. Jauch (*Physical Rev.*, 1943, [ii], **63**, 334—342).—Mathematical. The magnetic moment is found by a second-order perturbation method, a new limiting process securing the convergence of the integration in momentum space. The results for pseudoscalar and vector mesons are the same, and lead to a positive magnetic moment for the neutron if the magnetic moment of the vector meson is assumed to be one meson magneton. The theory disagrees with known vals. of magnetic moments of heavy particles.   N. M. B.

II.—MOLECULAR STRUCTURE.

Spin doubling in the doublet Σ states of CO$^+$. L. H. Woods (*Physical Rev.*, 1943, [ii], **63**, 431—432).—From available photographs of the CO$_2$ spectrum, showing the first negative bands and the comet-tail bands of CO$^+$, in which the $^2\Sigma$ spin splittings were resolved, measurements were made and signs determined for the abs. vals. of the spin doubling coeffs.   N. M. B.

Silicon oxide bands. L. H. Woods (*Physical Rev.*, 1943, [ii], **63**, 426—430).—Bands described by Pankhurst (cf. A., 1940, I, 429) have been excited by a high-voltage uncondensed discharge through a constriction in a quartz tube, but in He instead of H$_2$. Data and analyses for bands photographed by a grating spectrograph are tabulated. A band near λ 3840 A. was resolved in the first and second orders and found to be a (0, 0) transition overlapped by a weak (1, 1) transition of the type $^2\Sigma \rightarrow {}^2\Sigma$. Consts. and coeffs. of spin doubling for the two states are evaluated; the results prove that the emitter is SiO$^+$. Other bands at λ 4270 A. have been resolved with weak intensity and provisionally ascribed to SiO$_2$.   N. M. B.

Structure of the electronic bands of the OD molecule. VI. Iso-topic shift. M. G. Sastry (*Indian J. Physics*, 1942, **16**, 343—346; cf. A., 1943, I, 4).—The vibrational and rotational isotopic shifts in the OH and OD band heads have been calc. from the consts. for OH; derived vals. of the total shift are in poor agreement with experimental data. If an electronic shift exists, it is <1 cm.$^{-1}$ W. R. A.

Band spectrum of SnSe in emission. R. F. Barrow and E. E. Vago (*Proc. Physical Soc.*, 1943, **55**, 326—328).—The spectrum was excited by a heavy-current uncondensed discharge through the vapour of Sn and Se, and a well-developed system of red-degraded bands in the region 3420—4040 A. was photographed and identified with the C absorption system (cf. Walker *et al.*, A., 1938, I, 116). Measurements for ~20 new bands of this system are tabulated and an equation for the band-heads is derived. Fainter bands on the short-λ side of the system were measured; these may form a fourth system of SnSe involving the same lower state.   N. M. B.

Molecular bands in the violet and near ultra-violet spectra of Mira Ceti. H. Grouiller (*Compt. rend.*, 1942, **214**, 256—258).—Data for bands of TiO and CN are tabulated. Comparison of known CH lines in the solar spectrum with lines of Mira Ceti gives no conclusive evidence of the presence of CH in the star.   N. M. B.

Production of emission spectra of organic molecules by electron collision in the glow discharge. H. Schüler, H. Gollnow, and A. Woeldike (*Physikal. Z.*, 1940, **41**, 381—386).—A d.c. glow-discharge tube, in which it is possible to excite the emission spectra of org. mols. by electron collision, is described. The spectra of C$_6$H$_6$, PhCl, C$_{10}$H$_8$, and COMe$_2$ have been investigated. The states excited by the glow discharge are not the same as those excited by light. Decomp. may occur, in which case characteristic spectra due to the products are observed. Previously undescribed bands of CO were detected at 3150—4050 A.   A. J. M.

Visible absorption bands of mercury halides, HgCl, HgBr, and HgI. A. L. S. Rao (*Indian J. Physics*, 1942, **16**, 393—397).—By heating the substances in an open steel tube to 1100° the absorption bands have been obtained. The band systems of HgCl and HgBr have been measured; a vibrational analysis is suggested, and from the vals. of the consts. the heats of dissociation of these mols. in the upper and lower electronic states are determined. With HgI intense red absorption bands of I have been obtained.   W. R. A.

Dimeric and other forms of methylene-blue. Absorption and fluorescence of the pure monomer. G. N. Lewis, O. Goldschmid, T. T. Magel, and J. Bigeleisen (*J. Amer. Chem. Soc.*, 1943, **65**, 1150—1154).—A dimeric methylene-blue (I) ion occurs in conc. 95% EtOH solutions at 110° κ. Absorption curves of the monomeric ion have been measured in EtOH at room temp. and, by extra-polation, at 110° κ. The latter curve is identical with that of leuco-(I), after illumination in a rigid solvent. Absorption of poly-merised (I) mols., in solvents of low ϵ, has been measured. In H$_2$O and M-KCl and -KNO$_3$ solutions much of the dye is in a colourless form, produced by addition of OH$'$ to the central N and H$^{\cdot}$ to amino-N. Comparison of fluorescence and absorption spectra shows that subsidiary absorption bands are due to vibrational resolution of one electronic band.   W. R. A.

Infra-red absorption of pyridine vapour. J. Turkevich and P. C. Stevenson (*J. Chem. Physics*, 1943, **11**, 328—329).—Measurements of 11 absorption max. between 662 and 3070 cm.$^{-1}$ are recorded.   L. J. J.

Fluorescence of monomethine-cyanine dyes, particularly reversibly polymeric monomethine-cyanines. II. F. Katheder (*Kolloid-Z.*, 1940, **93**, 28—50).—The quenching effect of H$^{\cdot}$ and OH$'$ on solutions of the diethochlorides of ψ-*iso*cyanine and mononaphtho-ψ-*iso*-cyanine shows min. at pH ~4 and ~10, and decreases with rise of temp. The quenching effect of pyrocatechol is slight, but with polymeric forms of the dyes it is considerable. The possibility of propagation of the excitation energy in the polymerised mols. is suggested as the reason for this difference. A kinetic theory of quenching is developed and applied to the calculation of the degree of polymerisation from quenching data. For the two dyes inves-tigated degrees of polymerisation of 10—10^5, depending on dye concn., have been calc.   C. R. H.

Chlorophyll fluorescence and energy transfer in the diatom *Nitzschia closterium.* H. J. Dutton, W. M. Manning, and B. M. Duggar (*J. Physical Chem.*, 1943, **47**, 308—313).—Fluorescence

measurements on *N. closterium*, using *Chlorella pyrenoidosa* as a control, show that the quantum yields of chlorophyll (I) fluorescence are fairly const. over the λ range 4358—6000 A. for the exciting light. Since absorbed yellow light appears as (I) fluorescence, it may be concluded that carotenoid-sensitised photosynthesis takes place through the transfer of absorbed energy from carotenoid mols. to (I) mols.; the subsequent reactions are the same as those which occur when (I) mols. are the primary absorbers. In $COMe_2$ extracts of *N. closterium* there is little or no energy transference.
                          C. R. H.

Fluorescing substances in dried egg powders.—See B., 1943, III, 215.

Energy distribution in the phosphorescence spectrum of oxygen. (Mme.) R. Herman and L. Herman (*Compt. rend.*, 1942, **214**, 261—263).—Energy distribution curves, compared with those of black-body emission at 2538° and 4730° K., indicate that the spectrum consists of a wide band having a max. at ~6200 A. and a narrower band with a max. at ~6700 A. The intensities depend on the excitation conditions. The intensity of the wide band decreases towards short λλ and tends to zero at ~3900 A., suggesting that the band is due to NO_2.   N. M. B.

Transformation of energy in crystalline phosphors. F. Möglich and R. Rompe (*Physikal. Z.*, 1940, **41**, 236—242).—Theoretical. The interaction of electrons with the phosphor lattice and with each other is considered. The electron energy in the upper band of a phosphor (*e.g.*, ZnS) is discussed.   A. J. M.

Raman spectra of four pairs of *meso*- and *dl*-disubstituted butanes. H. J. Taufen, M. J. Murray, and F. F. Cleveland (*J. Amer. Chem. Soc.*, 1943, **65**, 1130—1134).—Raman spectra of the *meso*- and *dl*-forms of (CHMe·OH)₂, (CHMe·OAc)₂, (CHMeBr)₂ and (CHMeCl)₂ have been investigated. The spectra of *meso*- and *dl*-forms show distinct differences. Multiplicity of some lines establishes the existence of rotational isomerides in the dihalogenated butanes, in agreement with dipole moment data.   W. R. A.

Raman spectra of hydrocarbons. III. Di*iso*butylene, *cyclo*hexene, and dipentene. F. F. Cleveland (*J. Chem. Physics*, 1943, **11**, 301—306; cf. A., 1943, I, 193).—Raman νν, relative intensities, and depolarisation factors have been determined for di*iso*butylene (I), *cyclo*hexene (II), and dipentene (III). Olefinic νν for (I) agree with those for β-methyl-Δᵅ-heptene, with ν 1376 cm.⁻¹ replacing that at 1414 cm.⁻¹ The νν 1653 and 3023 cm.⁻¹ of (II) appear at 1682 and 3012 cm.⁻¹ in the case of (III). Errors in the author's previous work (*loc. cit.*) are indicated.   L. J. J.

Raman spectra of *l*-ascorbic acid, tetronic acid, and related compounds. J. T. Edsall and E. L. Sagall (*J. Amer. Chem. Soc.*, 1943, **65**, 1312—1316).—Raman spectra of aq. solutions of *l*-ascorbic (I), *d*-glucoascorbic, *iso*ascorbic, tetronic (II), and α-nitrotetronic (III) acids and their Na salts, of PhOH and NaOPh in H_2O, of (I) and (III) in MeOH, and of (I) in D_2O have been determined. A very strong line at 1700 cm.⁻¹ is shifted to 1595 cm.⁻¹ when the ascorbic acids ionise. (II) shows a much smaller shift, whilst (III) and NaOPh exhibit no appreciable changes on ionisation. W. R. A.

Photo-electric investigations with luminous substances. L. Bergmann and F. Ronge (*Physikal. Z.*, 1940, **41**, 349—355).—A no. of technical fluorescent substances which show little or no after-glow have a definite photo-electric effect, of which the max. occurs at λλ for which excitation of fluorescence is max. The connexion of the photo-electric effect with the mechanism of fluorescence and phosphorescence is discussed. The extinction of luminescence brought about by infra-red rays is a photo-electric phenomenon.   A. J. M.

Dependence of secondary electron emission from insulators on the angle of incidence [of the primary electrons]. H. Salow (*Physikal. Z.*, 1940, **41**, 434—442).—Mica, glass, and ZnS were examined. A formula for the dependence of the secondary emission on the voltage and angle of incidence (α) of the primary electrons is deduced on the basis of the Widdington–Thomson law for energy consumption of the primary electrons, the absorption of secondary electrons being assumed ∝ path. A sudden change of the secondary emission with α, found by Wehnelt, could not be confirmed. A. J. M.

Dielectric properties of animal fibres.—See B., 1943, II, 280.

Dipole moments of palmitic acid, aleuritic acid, and alkyl esters of aleuritic acid. G. N. Bhattacharya (*Indian J. Physics*, 1942, **16**, 369—376).—The dipole moments in dioxan at 25° for palmitic acid and Me and Et aleuritates are 1·75, 4·27, and 4·31 D., respectively. Aleuritic acid (I) in dioxan at 40° gives 4·28 D. The cause of the anomalous solubility of (I) and its esters in polar solvents is discussed with respect to solvation and dissolution of the highly polar mols.   W. R. A.

Molar refraction and structure of hydroxymethylene ketones. —See A., 1943, II, 252.

Magneto-optic rotation. IV. Acetic and chloroacetic acids in polar and non-polar solvents. V. Selenium oxychloride in aqueous solutions. C. E. Waring, S. Steingiser and H. H. Hyman (*J. Amer. Chem. Soc.*, 1943, **65**, 1066—1068, 1068—1070).—IV. ρ, *n*, and κ2 (A. I.)

magneto-optic rotation of aq. AcOH, $CH_2Cl \cdot CO_2H$, $CHCl_2 \cdot CO_2H$, and $CCl_3 \cdot CO_2H$ solutions have been determined; vals. for AcOH in CCl_4 and CS_2 have been recalc. from previous data. Verdet consts., mol. Verdet consts., and mol. refractivities of the solutions have been calc. Mol. Verdet consts. are ∝ concn., suggesting that association has no effect on the intramol. electronic configuration.
V. Vals. of ρ and magneto-optic rotation of aq. $SeOCl_2$ have been determined. Verdet and mol. Verdet consts. of the solutions have been calc. The plot of the mol. Verdet consts. against concn. shows a break at 33·3 mol.-% of $SeOCl_2$, due to the formation of $SeOCl_2,2H_2O$, which causes an alteration in the internal electronic configuration. The structure of $SeOCl_2,2H_2O$ is discussed.
                          W. R. A.

Electro-negativity scale of elements. T. H. Liu (*J. Chinese Chem. Soc.*, 1942, **9**, 119—124).—The electro-negative character of an element can be quantitatively represented as a function $(n + 2·6)/3·2r^{2/3}$ of the no. of valency electrons (*n*) and the at. radius (*r*) in A. The derived electronegativity scale systematises the typical properties of oxides, hydrides, and halides.   L. J. J.

Forces between hydrogen molecules. H. Margenau (*Physical Rev.*, 1943, [ii], **63**, 385—386).—An outline of the calculation of intermol. forces having regard to exchange forces.   N. M. B.

Molecular volume and structure. V, VI. T. W. Gibling (*J.C.S.*, 1943, 146—148, 149—153).—V. From a consideration of parachors of org. compounds the following are the chief standard group vals. (S.V.) which have been calc. : (C)·CH_2·(N), 39·6; (C)·NO_2 76·8; (C)·O·N=O, 75·3; (C)·N=N·(C), 51·8; (C)=N=N, 53·2; (C)·N=N, 79·9; (C)·CN, 66·6; (C)·NC, 66·8. Structural peculiarities are discussed, and interference corrections are assessed. Corrections in alkyl chains are : CN ; β, −1·3 ; γ, −0·8 ; δ, −2·6 ; ε, −1·1 (total, −5·8).
VI. The following S.V. are also calc. : (C)·NH_2, 47·9 ; (C)(C)>NH, 32·0 (ideal S.V., 35·1) ; (C)(C)N·(C), 13·0 (ideal S.V., 22·3) ; (C)·OH, 39·2 ; (C)·O·(C), 21·5 (ideal S.V., 26·7) ; (C)·CH_2·(O), 39·4 ; (O)·CH_2·(O), 38·3 ; (O)(O)>CH·(C), 19·9 ; (O)(O)>CH·(O), 17·7 ; (C)·CH_2Cl, 96·1 ; (C)·CH_2Br, 110·3 ; (C)·CH_2I, 131·6 ; C<(C)(N), −2·4 ; N<(C)(C), −3·1 ; C<(C)(O), −2·6 ; C<(O)(O), −3·7 ; O<(C)(C), −5·2. Corrections in alkyl chains for Br and I are : γ, −0·7 ; δ, −1·5 ; ε, −0·6 (total, −2·8).   C. R. H.

Molecular surface energy of sulphur dioxide addition compounds. II. J. R. Bright and J. J. Jasper (*J. Amer. Chem. Soc.*, 1943, **65**, 1262—1263).—ρ, γ, and η of NEt_3,SO_2 at 0—30° have been measured, and the influence of temp. on the mol. surface energy determined. The val. of 386·0 for the parachor agrees with that calc. on the basis of N–O–S linking.   W. R. A.

III.—CRYSTAL STRUCTURE.

Derivation of the 32 point-groups. J. D. H. Donnay (*Amer. Min.*, 1942, **27**, 220).—Symmetry is re-defined. Symmetry operations are of two kinds only, rotation and rotatory inversion. General theorems on symmetry are re-cast in the form of eight propositions conforming to the concept of inversion axes instead of reflexion axes or planes of alternating symmetry. A simplified derivation of the 32 point-groups is based on these eight theorems. Advantages of this derivation are pointed out.   L. S. T.

Morphological expression of tetragonal space-groups. J. D. H. Donnay (*Amer. Min.*, 1942, **27**, 220).—The 68 tetragonal space-groups are distributed among 31 morphological aspects, 23 in the P–C lattice and 8 in the I–F lattice.   L. S. T.

Wide-angle diagram with X-ray or electron beams as a reciprocal lattice diagram of the atomic texture of crystals. H. Seemann (*Physikal. Z.*, 1940, **41**, 365—380).   A. J. M.

X-Ray line broadening by cold-working α-brass. M. Petersen and C. W. Tucker (*Physical Rev.*, 1943, [ii], **63**, 385).—Experiments reported do not confirm that the X-ray diffraction line broadening is enhanced by speed of working, as found by Niemann and Stephenson (cf. A., 1943, I, 53).   N. M. B.

Composition of X-rays scattered by a crystal subjected to thermal agitation. J. Laval (*Compt. rend.*, 1942, **214**, 274—276).—Mathematical.   N. M. B.

Structure of liquid xenon. J. A. Campbell and J. H. Hildebrand (*J. Chem. Physics*, 1943, **11**, 334—337).—The diffraction of Ag $K_α$ radiation by liquid Xe at −110° and 1 atm. (sp. vol. 0·324 c.c. per g.), and at −90° and 2·5 and 130 atm. (sp. vol. 0·339, 0·324 c.c. per g. respectively), has been examined. The no. of nearest neighbours is 9—10 at 4·43—4·50 A. The sp. vol. has a greater effect than the temp. on the structure.   L. J. J.

Structure of liquid mercury. J. A. Campbell and J. H. Hildebrand (*J. Chem. Physics*, 1943, **11**, 330—333).—The diffraction of

Mo $K\alpha$ radiation by liquid Hg at six temp. between $-38°$ and $200°$ has been examined. The first peak is at $3\cdot00$ A. at all temp., with $5\cdot3$—$6\cdot0$ atoms in the first co-ordination layer. L. J. J.

Crystal structure of minium. S. T. Gross (*J. Amer. Chem. Soc.*, 1943, **65**, 1107—1110).—The crystal structure of Pb_3O_4 has been determined by X-ray analysis. $Pb^{\cdots\cdots}$ ions, as in PbO_2, are co-ordinated with chains of O octahedra, which share opposite edges. Each $Pb^{\cdots}$ ion is co-ordinated with 3 O atoms of the parallel $Pb^{\cdots\cdots}$ chains. The structure is thus built up of alternate red PbO and PbO_2 units. The space-group is $P\bar{4}b2$. W. R. A.

Laminar disperse hydroxides and basic salts of bivalent metals. W. Feitknecht (*Kolloid-Z.*, 1940, **92**, 257—276; **93**, 66—86).—The general equilibrium conditions for basic salts and hydroxides of bivalent metals are given, and the val. of X-ray spectrographic measurements in helping to explain the " secondary structure of primary particles " is discussed. The salt/hydroxide ratio of basic salts depends on the conditions of formation, but the ratio is often a simple one. The stable hydroxides of Mg, Cd, Ni, and Co crystallise in the C6 lattice and possess a " simple-layer lattice," whereas the unstable or α-hydroxides possess a " double-layer lattice " in which layers of hydroxide are separated by unimol. layers of amorphous hydroxide. The α-form is thus intermediate between the cryst. and amorphous forms. The structure of double hydroxides is similarly discussed, and lattice dimensions of these and of α-hydroxides are tabulated. During the crystallisation of basic salts or hydroxides between the lattice layers, one or several of the following can occur : high dispersion; laminar formation; lattice " roughening "; displacement of lattice layers or layer bundles (Arnfelt structure); changes in lattice dimensions and layer distances. Published data on the hydroxides and basic salts of the metals mentioned and of Zn are summarised, and discussed with reference to the views expressed. C. R. H.

X-Ray crystallography of burkeite, $2Na_2SO_4,Na_2CO_3$.—See A., 1943, I, 268.

Unit cell and space-group of kaliophilite.—See A., 1943, I, 268.

Structural relations between high- and low-chalcocite.—See A., 1943, I, 268.

X-Ray examination of crystalline forms of anhydrous sodium stearate at room temperature. A. de Bretteville, jun. (*Amer. Min.*, 1942, **27**, 215—216).—The monoclinic B form is the most stable, and is due to a shortening of the c axis by $2\cdot4$ A. owing to a re-arrangement of the dipolar CO_2Na group. There is a shift of alternate mols. of $180°$ around the c-axis. The tilt of the C chain for the monoclinic B form is probably equal to that of the A form, viz., $62\cdot9°$. L. S. T.

Orientation in stretched films of amylose triacetate. R. L. Whistler and N. C. Schieltz (*J. Amer. Chem. Soc.*, 1943, **65**, 1436—1437).—X-Ray diffraction studies on stretched films of amylose triacetate, with and without plasticiser, reveal that they are highly cryst., with a periodicity of $18\cdot3$ A. along the fibre (b) axis. W. R. A.

Reactivity of cotton fibre and type of X-ray diffraction pattern.—See B., 1943, II, 280.

Intermolecular forces and chain configuration in linear polymerides. Effect of N-methylation on the X-ray structure and properties of linear polyamides. W. O. Baker and C. S. Fuller (*J. Amer. Chem. Soc.*, 1943, **65**, 1120—1130).—Young's modulus (E), sorption of H_2O, and solubilities in $EtOH$-$CHCl_3$ of 9 N-methylated polydecamethylene sebacamides, with 0—55% substitution, have been measured. E and hardness decrease, sorption of H_2O and solubility increase, with N-methylation, owing to the disappearance of H-bonds and polar forces. X-Ray investigation reveals inter-chain spacings essentially unchanged by the substitution, but the distance between dipole layers and the fibre identity period are shortened, with retraction of the chain. W. R. A.

M.p. and unit cell dimensions of symmetrical halogenobenzenes. T. Beacall (*Trans. Faraday Soc.*, 1943, **39**, 214—216).—Substitution of Br for Cl in the symmetrical compounds increases the m.p. in the same ratio as it increases the linear dimensions of the unit cell. F. L. U.

X-Ray crystallographic studies of ætioporphyrin-1. C. L. Christ and D. Harker (*Amer. Min.*, 1942, **27**, 219).—Goniometric and X-ray measurements show that the point-group is $2/m$. Oscillation photographs of single crystals show that the structure is monoclinic with a_0 $10\cdot3\pm0\cdot1$, b_0 $19\cdot5\pm0\cdot1$, c_0 $6\cdot75\pm0\cdot05$ A., β $98°\pm1°$; space-group $P2_{1/c}$, with 2 mols. per unit cell. The probable structure of the porphin mol. is discussed, and a model for the ætioporphyrin-1 mol. proposed. L. S. T.

Structure of methylene*cyclo*butane and hexamethylethane. L. H. Bauer and J. Y. Beach (*Amer. Min.*, 1942, **27**, 214—215).—Electron diffraction shows that in methylene*cyclo*butane the C atoms are co-planar, four of them being situated at the corners of a square of side $1\cdot56\pm0\cdot03$ A., and the fifth on an extension of one of the diagonals, $1\cdot34\pm0\cdot02$ A. from the C in the ring. The radial distribution curve for C_2Me_6 indicates that the central C—C bond distance is

stretched ($1\cdot58\pm0\cdot02$ A.); other distances are C—C $1\cdot54\pm0\cdot02$ A. and C—H $1\cdot09$ A. (assumed), and the C valency angles are $110°\pm2°$. L. S. T.

Polymorphism of bismuth trioxide. W. C. Schumb and E. S. Rittner (*J. Amer. Chem. Soc.*, 1943, **65**, 1055—1060).—Tetragonal (β), monoclinic (α), and body-centred cubic (γ) forms of Bi_2O_3 have been prepared. α is stable below $710°$, at which the β-form becomes the stable modification. No region of stability has been found for the γ-phase, which has a_0 $10\cdot245$ A. Previously reported body-centred and simple cubic forms of Bi_2O_3 are shown to have contained impurities, probably SiO_2. Solubility of Bi_2O_3 in NaOH, up to $2\cdot46$M., is $\propto$ [NaOH], the mol. species in solution being $NaBiO_2$. W. R. A.

IV.—PHYSICAL PROPERTIES OF SUBSTANCES.

Galvanomagnetic investigation of the mechanism of electrical conductivity of barium. E. Justi and J. Kramer (*Physikal. Z.*, 1940, **41**, 197—202).—The effect of temp. and magnetic field strength on the resistance of Ba of various degrees of purity has been determined at $1\cdot85$—$273°$ K. and with a transverse field (H) of $\not>35,000$ Gauss. Without the external field the resistance decreases more slowly than a T^4 law, and deviations from the Nernst–Matthiessen rule occur, probably owing to the bivalency of Ba. The increase of resistance (Δr) with H is approx. $\propto$ H^2. The reduced Kohler diagram shows that the observed Δr vals. approach a quadratic function of H/r, where $r = r_T/r_\theta$ ($\theta = 116°$), which is independent of variations in temp., H, and residual resistance. For the same vals. of H/r, Δr is $>$ that for any other cubic metal. A. J. M.

Galvanomagnetic experiments on the mechanism of the electrical conductivity of single crystals of cadmium. E. Justi, J. Kramer, and R. Schulze (*Physikal. Z.*, 1940, **41**, 308—325).—The resistance (r) of single crystals of Cd was determined at 273—$4\cdot2°$ K., in a transverse magnetic field (H) of 37,000 Gauss. The normal r for $H = 0$ decreases approx. according to a $T^{2\cdot5}$ law. The effect of the magnetic field was determined with the field parallel to, and also perpendicular to, the principal hexagonal axis, [0001]. Δr parallel to the [0001] axis was approx. isotropic, but that perpendicular to this axis was strongly anisotropic. The anisotropy factor is $1\cdot77$ at room temp., decreasing to a min. at $20\cdot4°$ K., below which it rises again. The variation of Δr with field strength and temp. for a given orientation obeys Kohler's law to a first approximation. A. J. M.

Electrical conduction and recrystallisation in thin lead films deposited at low temperatures. E. L. Armi (*Physical Rev.*, 1943, [ii], **63**, 451—454; cf. Foster, A., 1940, I, 103).—Resistance–time measurements were made for Pb films deposited by evaporation in high vac. on glass plates cooled by liquid H_2. Conduction began in films of thickness ~7 A. Ageing of these films at various temp. showed the existence of an equilibrium temp., above or below which ageing was accompanied by an increase or a decrease of resistance, respectively. Possible explanations are given. N. M. B.

Correlation of fringes near the K X-ray absorption discontinuity and electrical conductivity in hæmatite, magnetite, and pyrites. C. Kurylenko (*Compt. rend.*, 1942, **214**, 271—274).—Numerical data for these minerals, based on the application of Kronig's theory of the fringes, indicate that the high conductivity of the minerals is due to the high energy of the valency electrons. N. M. B.

Magnetocheimstry. S. Sugden (*J.C.S.*, 1943, 328—333).—Ninth Liversidge lecture. The determination of mass susceptibility, the connexion between diamagnetism and at. and mol. structure, and the effect of temp. on diamagnetism are discussed. The relation between the stereochemistry of complex compounds and their magnetic properties, and the general magnetic behaviour of complex compounds, are reviewed. A. J. M.

Comparison of the magnetic properties of solid and powdered magnetites, with observations on coercive force. E. F. Herroun (*Proc. Physical Soc.*, 1943, **55**, 338—343, 432).—Data are tabulated for several specimens, from different localities, of magnetites in the form of bars cut from the solid mineral and bars formed from the powdered mineral bound with gelatin and compressed. Results indicate that permeability (μ) is much reduced by powdering, the reduction being greater for magnetites of higher initial μ; max. μ is reached at higher forces with powders than with the solids; coercivity is increased for magnetites of low initial coercivity, but decreased for those of high coercivity, while for some of intermediate val. there is very little change. The persistence of magnetic structure is discussed. N. M. B.

Ferromagnetic impurities. II. F. W. Constant, R. E. Faires, and H. E. Lenander (*Physical Rev.*, 1943, [ii], **63**, 441—445; cf. A., 1939, I, 555).—Attempts to render traces of impurities (probably Fe) non-magnetic by heat-treatment showed that heating Cu at $900°$ and brass at $750°$ in H_2 for $\not<2$ hr., followed by quenching, would eliminate the ferromagnetism. This method was not successful with Ag. Results are interpreted in terms of the crystal structure of the metals and of Fe. Reheating Cu to $900°$ in an atm. containing

O_2 restored strong ferromagnetism; this is attributed to the diffusion of O_2 into the Cu at high temp. The effect of heat-treatment at other intermediate temp. on the magnetic hardness and hysteresis of the impurity was also investigated.   N. M. B.

Magnetochemical investigations. I. Introduction and experimental technique. II. Diamagnetic susceptibility of the CH_2 group. III. Diamagnetic susceptibility of isomerides. W. R. Angus and W. K. Hill (*Trans. Faraday Soc.*, 1943, **39**, 185—190, 190—197, 197—201).—I. A modified Gouy method is described.

II. Measurements of the susceptibility (χ) of 39 highly purified liquids, members of homologous series of hydrocarbons, alcohols, acids, and esters, are recorded. Analysis of the data by Pascal's method gives $\chi_{CH_2} = -11.68 \pm 0.02$, and by the method of Farquharson and Sastri (A., 1938, I, 20), which is considered the more accurate, -11.69 ± 0.003. Conversion of an acid into its Me ester gives -10.66. An iso-compound is more diamagnetic than its n-isomeride.

III. Branching of a hydrocarbon chain increases χ, the order among isomeric compounds being tert.- slightly > sec.- > iso- > n-. For n- and iso-isomerides the more diamagnetic compound has the lower b.p., d, and n. An iso-compound is more diamagnetic than the corresponding n-compound, and a monocarboxylic acid than isomeric esters, by ~1 unit.   F. L. U.

Absorption of ultrasonic waves in gases. H. H. Keller (*Physikal. Z.*, 1940, **41**, 386—393).—The optical method of investigating the absorption of ultrasonic waves in gases (cf. Petersen, A., 1940, I, 235) has been developed. The apparatus was calibrated using A, and the absorption in N_2, NH_3, CO_2, and a mixture of CO_2 and 8% H_2 was investigated at various pressures. The absorption in A, N_2, and NH_3 agrees approx. with the formula $\alpha = kv^2$ (α = energy absorption coeff.) required by classical theory, although there was some deviation with N_2 and NH_3 due to relaxation of the rotational energy. In the case of CO_2 and $CO_2 + H_2$, the relaxation was more marked, and agreed qualitatively with theory.   A. J. M.

Specific heats of nickel, bismuth, and phosphorus. O. Kubaschewski and G. Schrag (*Z. Elektrochem.*, 1940, **46**, 675—680).—The mean sp. heats of Ni (22° to 396—1040°), Bi (23° to 112—483°), and red P (22° to 300—480°) have been measured. The results are shown graphically, and probable errors of the measurements are calc. For Ni at 650—1050°, $c_p = 0.1047 + 2.78 \times 10^{-5}\theta$. The latent heat of fusion of Bi is 2.63 kg.-cal. per g.-atom.   R. KE.

Specific heats at low temperatures of anhydrous chlorides of calcium, iron, magnesium, and manganese. K. K. Kelley and G. E. Moore (*J. Amer. Chem. Soc.*, 1943, **65**, 1264—1267).—Vals. of C_p at 51—298° K. for anhyd. $CaCl_2$, $FeCl_2$, $MgCl_2$, and $MnCl_2$ have been determined. Vals. of $S_{298.16°}$ are 27.2 ± 0.4, 28.7 ± 0.8, 21.4 ± 0.2, and 28.0 ± 0.8 g.-cal. per degree per g.-mol., respectively. Vals. of $\Delta G^\circ_{298.16°}$ of formation are -179.8, -72.6, -141.5, and -102.9 kg.-cal. per g.-mol.   W. R. A.

Heat content of manganese dioxide and carbonate at high temperatures. G. E. Moore (*J. Amer. Chem. Soc.*, 1943, **65**, 1398—1399).—Vals. of H for $MnCO_3$ (420—660° K.) and MnO_2 (340—780° K.) have been determined. Equations are given for $H_T - H_{298.16°}$, $S_T - S_{298.16°}$, and C_p.   W. R. A.

Thermal data. XVI. Heat capacity and entropy of iso-pentane. Absence of a reported anomaly. G. B. Guthrie, jun., and H. M. Huffman (*J. Amer. Chem. Soc.*, 1943, **65**, 1139—1143).—C_p of $Pr^\beta Et$ has been measured calorimetrically at 13—300° K. The m.p. is $113.37 \pm 0.05°$ K., and ΔH of fusion 1232.2 ± 1.0 g.-cal. per g.-mol. The val. of $S_{298.16°}$ from C_p data is 62.24 ± 0.10 g.-cal. per degree per g.-mol. Anomalous behaviour of C_p in the range of 180—240° K., reported by Aston et al. (A., 1942, I, 292), was not encountered.   W. R. A.

Heat capacity and entropy, heats of transition, fusion, and vaporisation, and vapour pressure of cyclohexane. Vibrational frequencies of alicyclic ring systems. J. G. Aston, G. J. Szasz, and H. L. Fink (*J. Amer. Chem. Soc.*, 1943, **65**, 1135—1139).—Vals. of C_p of solid and liquid cyclohexane have been determined calorimetrically at 12.6—293.8° K. The transition point is $186.09 \pm 0.05°$ and m.p. $279.84 \pm 0.05°$ K. ΔH of transition, fusion, and vaporisation are 1598.3 ± 1.5, 627.8 ± 1.8, and 7967 ± 8 g.-cal. per g.-mol. The v.p. of liquid cyclohexane has been measured at 280—294° K. Vibration νν have been assigned by comparing entropy vals. from calorimetric and spectroscopic data, a chair configuration being assumed for the mol.   W. R. A.

Thermodynamics of styrene, including equilibrium of formation from ethylbenzene. L. Guttman, E. F. Westrum, jun., and K. S. Pitzer (*J. Amer. Chem. Soc.*, 1943, **65**, 1246—1247).—C_p of $CHPh:CH_2$ at 15—300° K. has been measured. ΔH of fusion is 2617 g.-cal. per g.-mol. The v.p. (p mm.) at 0—60° is represented by $\log_{10} p = -2604.67 T^{-1} - 2.57692 \log_{10} T + 15.90485$. $S_{298.16°}$ of $CHPh:CH_2$ as ideal gas at 1 atm. is 82.07 g.-cal. per degree per g.-mol. Equilibrium consts. at 381—1000° K., of the dehydrogenation of PhEt to $CHPh:CH_2$ have been calc.   W. R. A.

Molecular state of acetic acid vapour. Experiment in gaseous equilibrium. R. H. Wright (*J. Chem. Educ.*, 1943, **20**, 179—182).—Apparatus and procedure for investigating pressure–vol. relationships of AcOH vapour at different temp. are described.   L. S. T.

Effect of high electrostatic fields on (A) the vaporisation of molybdenum, (B) the vaporisation and resistance of molybdenum filaments. (A) G. B. Estabrook. (B) W. P. Reid (*Physical Rev.*, 1943, [ii], **63**, 352—358, 359—366).—(A) For wires of varying diameters, field strengths (X) > ~0.52×10^6 v. per cm. at the wire surface caused no change in rate of change of resistance with time, and hence in the rate of vaporisation (v) on application of the field; as X was increased above ~0.52×10^6 v. per cm., v decreased, first slowly, then more rapidly, and finally asymptotically towards 0 at X >1.8×10^6 v. per cm.; with increasing temp. the same X applied at the surface of a wire produced progressively smaller decreases in v; when there was an effect on v, the resistance increased suddenly when the field was applied and decreased suddenly when it was removed.

(B) Equations are obtained to fit the above variation of v with X on the assumption that the vaporisation decrease is due to the formation of an adsorbed gas layer on the filament. Time-lags in relation to the formation and removal of gas layers are discussed, and certain postulates are proposed.   N. M. B.

Cloud formation by withdrawal of heat by thermal conduction. F. Trey (*Physikal. Z.*, 1940, **41**, 415—418).—It is shown theoretically that it should be possible to produce a cloud by cooling a closed vessel containing air and saturated H_2O vapour. By cooling a cylindrical vessel by means of a coil through which passed cold CO_2, cloud formation was observed, as well as condensation on the walls.   A. J. M.

Properties of fluids. S. C. Bradford. (*Phil. Mag.*, 1943, [vii], **34**, 433—471; cf. A., 1938, I, 123).—Mathematical. The following properties have been calc., without introduction of arbitrary consts., by Newton's dynamics from Maxwell's kinetic theory and Edser's inverse eighth power law of mol. attraction: mean paths of mols.; potential energy; latent heat; association, cohesion, and surface tension of associated liquids; v.p. of an associated liquid; thermal conductivity and viscosity of gases; viscosity of liquids. Vals. accurate to 2 significant figures are obtained in good agreement with experimental data.   W. R. A.

Simple derivation of the existence of a critical temperature. F. L. Hahn (*J. Chem. Educ.*, 1943, **20**, 233—234).   L. S. T.

Accommodation coefficients of helium, neon, argon, hydrogen, deuterium, oxygen, carbon dioxide, and mercury on platinum as a function of temperature. L. B. Thomas and F. Olmer (*J. Amer. Chem. Soc.*, 1943, **65**, 1036—1043).—The accommodation coeffs. have been calc. from the theoretical heat conductivity and the measured power losses from an electrically heated Pt filament in a vac. and in gas at pressures up to 0.05 mm. The theoretical distribution of temp. along the filament has been calc., the results indicating the importance of having a uniform filament temp. An apparatus has been designed to fulfil this condition. Plots of measured and existing vals. of accommodation coeffs. against temp., for use with the Pirani gauge, are given.   W. R. A.

Viscosity of ethylene glycol. E. Estel (*Physikal. Z.*, 1940, **41**, 413—415).—Vals. of η are given at close temp. intervals from 22.84° to 75.57°. The log η–temp. curve is shown.   A. J. M.

Energies for self-diffusion in zinc. H. B. Huntington (*Physical Rev.*, 1943, [ii], **63**, 383—384; cf. A., 1943, I, 262).—Diffusion is more rapid along the hexagonal axis than in the basal plane (cf. Miller and Banks, A., 1942, I, 322). Explanations from energy considerations are examined.   N. M. B.

V.—SOLUTIONS, DISPERSIONS, AND MIXTURES.

Aliphatic hydrocarbon densities. Correlation in the critical region. T. G. Stevenin and J. G. Allen (*Ind. Eng. Chem.*, 1943, **35**, 788—789).—Curves correlating density with reduced pressure at reduced temp. 0.70—2.40 and reduced pressure up to 5.0 are given. The curves are applicable to paraffins with 2—5% deviation, and applicable to some extent to olefines.   L. J. J.

Viscosity of methane–propane system. L. B. Bicher, jun., and D. L. Katz (*Ind. Eng. Chem.*, 1943, **35**, 754—761).—Data for η of CH_4, C_3H_8, and mixtures with 20, 40, 60, and 80 mol.-% CH_4 are recorded for temp. 77—437° F. and 400—5000 lb. per sq. in. pressure. Correlation by mol. wt., pseudo-reduced temp., and pseudo-reduced pressure gives a relation valid for any light paraffin or hydrocarbon mixture with ~3.5% average error.   L. J. J.

Calculation of relative volatility. (A) R. Edgeworth-Johnstone. (B) J. Griswold. (*Ind. Eng. Chem.*, 1943, **35**, 826).—A new formula for relative volatility (α_P) for non-polar liquids $A + B$, $\log \alpha = [1 - (T_A/T)] \log T_A + [(T_B/T) - 1] \log T_B + [(T_B/T) - (T_A/T)] \log R$, where P represents v.p. at temp. T, $T_{A,B}$ represents b.p./1 atm., is given.   L. J. J.

Anomalous osmotic effects in chain molecules. III. Summary of previous results. F. Klages (*Kolloid-Z.*, 1940, **93**, 19—28).—Published data, mainly for sugars and allied compounds, are reviewed. C. R. H.

Long-chain molecules in aqueous urea solution. R. E. D. Clark (*Nature*, 1943, **151**, 642).—2% aq. $CO(NH_2)_2$ (I) shows continuous friction, but 20% aq. (I) exhibits friction of a new type characterised by periodic movement sensitive to pH changes. The effect is attributed to formation of fibrils from chain-like mols., and this view is supported by other evidence. In such a chain intermediate dipoles would cause lateral attraction between chains, and the end charges would serve to attach chains to interfaces. A. A. E.

Viscosity of mixed solutions containing three and four ionic species. A. S. Chakravarti (*J. Indian Chem. Soc.*, 1943, **20**, 41—44).—Data on η for mixed salt solutions are recorded. They are represented by $\eta/\eta_0 = 1 + A\sqrt{c} + Bc$ in which A and B are linear functions of composition. F. J. G.

Configurative relationship between optical active methyl- and thiolsuccinic acid.—See A., 1943, II, 251.

Magnetic properties of solid solutions. III. Paramagnetic alloys of copper and nickel. A. R. Kaufmann and C. Starr (*Physical Rev.*, 1943, [ii], **63**, 445—450; cf. A., 1941, I, 405).—Susceptibility measurements as a function of temp. (14—1273° K.) and applied field are tabulated and plotted. A Curie–Weiss equation cannot represent the results, but an equation of the form $\chi = aT + b + (c/T)$ is satisfactory. Alloys in the range 30—38% Ni show considerable field-dependence of the susceptibility at low temp. N. M. B.

Thermal diagram of the system iron–tin. W. F. Ehret and D. H. Gurinsky (*J. Amer. Chem. Soc.*, 1943, **65**, 1226—1230).—A phase diagram of the system Fe–Sn is described. Lattice consts. of the intermediate phases Fe_2Sn, Fe_3Sn_2, γ (~62% Sn), FeSn, and $FeSn_2$, all possessing hexagonal symmetry, are described. The high-temp. γ phase has the NiAs structure. W. R. A.

Diffusion rates of carbon in iron–molybdenum and iron–tungsten alloys. R. Smoluchowski (*Physical Rev.*, 1943, [ii], **63**, 438—440; cf. A., 1942, I, 122).—Measurements show that W and Mo in face-centred Fe at 1000° slow down the diffusion of C, the influence of W being > twice that of Mo. There appears to be no connexion between the variation in Fe lattice parameter and the variation in C diffusion rate. N. M. B.

Solubility of hydrogen at low pressures in iron, nickel, and steels. M. H. Armbruster (*J. Amer. Chem. Soc.*, 1943, **65**, 1043—1054).—The solubilities of H_2 at 400°, 500°, and 600° and pressures between 0·001 and 1·5 mm., in α-Fe, Ni, and 13 steels, and in α-Fe at 600° and pressures up to 350 mm. have been determined, and are $\propto p^{\frac{1}{2}}$. Heats of dissolution have been calc. Solubility in ferritic mild steels is similar to that in α-Fe; vals. for austenitic and high-alloy content steels approximate to the solubility in Ni. W. R. A.

Solubility of ammonium bromide in alcoholic solvents. M. E. Bedwell (*Trans. Faraday Soc.*, 1943, **39**, 205—206).—The solubilities of NH_4Br in MeOH, EtOH, and $Pr^{\alpha}OH$ have been determined at 10° intervals from 0° to near the b.p. of the saturated solutions. The solubility–temp. curve for each solvent shows a break between 30° and 40°, which is attributed to a change in the degree of solvation. The mean ionic radius of the dissolved salt, calc. by Bjerrum's theoretical formula, is in a const. ratio of 1·21 to the experimental cryst. val. ($a/2$). F. L. U.

Complex compounds. II. Solubility of silver bromide in aqueous hydrobromic acid. III. Solubility of silver iodide in aqueous hydriodic acid. W. Erber (*Z. anorg. Chem.*, 1941, **248**, 32—35, 36—44).—II. Solubility data for AgBr in aq. HBr at 0° and 25° are given. They accord with the formation of a complex $[Ag_2Br_6]^{4-}$ having a stability const. = $3·3 \times 10^{10}$ and a heat of formation = 19·5 kg.-cal. per g.-mol. of AgBr.

III. Solubility data for AgI in aq. HI at 0° and 25° are given. They accord with the formation of a complex $[Ag_2I_6]^{4-}$ having a stability const. = $1·0 \times 10^{15}$ and a heat of formation = 26·5 kg.-cal. per g.-mol. of AgI. F. J. G.

Sorption of water vapour by soap curd. J. W. McBain and W. W. Lee (*Ind. Eng. Chem.*, 1943, **35**, 784—787).—Anhyd. soap takes up 1—2% of H_2O by physical sorption before forming a hemihydrate at 40—70% R.H. H_2O is then taken up more rapidly up to 10—12% by a sorption law with $1/n > 1$, indicating the presence of capillary H_2O in interstices. Finally a new phase forms. Na oleate forms no hemihydrate. Higher hydrates readily revert to hemihydrate when the R.H. falls by $>15\%$. L. J. J.

Adsorption of riboflavin by lactose.—See B., 1943, III, 212.

Equilibrium between lens and unilayer in the system hydrocarbon oil–oleic acid–water, in relation to the interfacial film. E. Heymann and A. Yoffe (*Trans. Faraday Soc.*, 1943, **39**, 217—219).—It is suggested that the negative sign of the final spreading coeff. of paraffin oil, containing oleic acid as spreader, on H_2O (cf. A., 1942, I, 360) is related to the fact that the lateral adhesion between the spreader mols. is smaller in the interface than in the surface. Mea-surements of the surface and interfacial pressures when a lens of oil containing oleic acid is in equilibrium with a surface film of the latter are recorded and the relation between them is discussed. F. L. U.

Veratrine alkaloids. XVIII. Surface film studies. A. Rothen and L. C. Craig (*J. Amer. Chem. Soc.*, 1943, **65**, 1102—1106).—Films of the veratrine alkaloids (I) and solanidine (II) have been investigated. Mol. measurements of (I), from these films, show that six hydroaromatic rings are so arranged that max. length (18 A.) and min. cross-sectional area (47 sq. A.) are obtained. The vals. agree well with the dimensions of a proposed linear formula. (II) gives films very similar to those of (I) and has approx. equal mol. dimensions. W. R. A.

Nature of the electrical double layer. D. C. Grahame (*J. Chem. Educ.*, 1943, **20**, 154).—The electrical double layer is regarded as being composed of a compact layer of specifically adsorbed ions and a diffuse layer of non-adsorbed ions. L. S. T.

Burton's rule for positive hydrosols. II. Coagulation measurements. H. Kauffmann (*Kolloid-Z.*, 1940, **93**, 86—103).—Coagulation measurements on various metal oxide and hydroxide sols under varying conditions show that the Burton rule is valid for the electrogenic CuO and Al_2O_3 sols and partly valid for the chemogenic $Fe(OH)_3$ and $Cr(OH)_3$ sols. C. R. H.

Charge and stability of colloids. III. Potentiometric titrations of ferric hydroxide sol. IV. Potentiometric titrations of aluminium hydroxide sol. B. P. Yadava (*J. Indian Chem. Soc.*, 1943, **20**, 115—119, 123—126).—III. Potentiometric titrations of Cl' displaced on addition of a no. of electrolytes at varying concn. to $Fe(OH)_3$ sols, made by dialysis of $FeCl_3$, show that with progressive dialysis the amount of Cl' released for a given addition of electrolyte diminishes, being > that equiv. to the added electrolyte for the more impure, and < this val. for the purer, sols.

IV. $Al(OH)_3$ sols give results corresponding with those found with $Fe(OH)_3$, except for KNO_3, which releases Cl' < equiv. to the KNO_3 at all degrees of purity of the sol. L. J. J.

Effect of H-ion concentration on viscosity changes in thorium phosphate gel-forming mixtures during setting. (Miss) A. Nathan (*J. Indian Chem. Soc.*, 1943, **20**, 56—61).—Variation of η with time during the setting of Th phosphate gels at different pH is recorded. In general the rate of change of η with time increases when the pH is reduced to a certain val.; further reduction of pH causes a decrease. F. J. G.

Opacity changes in gel-forming mixtures during setting. I. Thorium molybdate, stannic arsenate, and silicic acid gels. M. Prasad and V. S. Gogate (*Proc. Indian Acad. Sci.*, 1943, **A, 17**, 161—170).—An improved apparatus for measuring opacity changes during gelation is described. The effects of adding HCl and salts have been investigated. Changes in opacity appear to be related to changes in the no., size, distribution, anisotropy, and arrangement of micelles of the gel. W. R. A.

Sedimentation and diffusion behaviour of nucleic acid preparations. See A., 1943, II, 245.

VI.—KINETIC THEORY. THERMODYNAMICS.

Vapour-phase esterification over zirconium oxide. W. J. Knox, jun., and T. N. Burbridge (*J. Amer. Chem. Soc.*, 1943, **65**, 999—1001).—The equilibrium EtOH + AcOH ⇌ EtOAc + H_2O, over ZrO_2 at 200°, 150°, and 125°, has been investigated. Vals. of equilibrium consts. and $\Delta G°$ have been calc. W. R. A.

Reactions of organic silicic acid compounds. I. Association in systems of silicic esters and alcohols. (Frl.) L. Holzapfel (*Z. Elektrochem.*, 1941, **47**, 327—329).—ρ, n, and η of Et, Me, and *iso*amyl silicates have been determined. Electrical conductivities of mixtures of EtOH with C_6H_{14}, Et and Me silicates, of MeOH with Me silicate, and of *iso*-C_5H_{11}·OH with *iso*amyl silicate (I), and η of Me and Et silicate–EtOH, and (I)–*iso*-C_5H_{11}·OH mixtures have been determined. The effect of association on the variation of η and electrical conductivity of these mixtures with concn., and on the prevention of polymerisation of $Si(OH)_4$ by org. OH-compounds, is discussed. W. R. A.

Revision of the constants of the Debye–Hückel theory. P. van Rysselberghe (*J. Amer. Chem. Soc.*, 1943, **65**, 1249).—Consts. h and g of the Debye–Hückel expression for log γ of a z_1z_2-valent electrolyte in aq. solution at 25° have been recalc. from the revised consts. of Birge (*Rev. Mod. Phys.*, 1941, **13**, 233). W. R. A.

Constants of the Debye–Hückel theory. G. Scatchard (*J. Amer. Chem. Soc.*, 1943, **65**, 1249—1250).—The equations of Scatchard and Epstein (*Chem. Rev.*, 1942, **30**, 211) for the Debye–Hückel limiting law expressions are revised, using the vals. of fundamental consts. given by Birge (*Rev. Mod. Phys.*, 1941, **13**, 233). W. R. A.

Complex ions. IV. Monoammine silver ion. W. C. Vosburgh and R. S. McLure (*J. Amer. Chem. Soc.*, 1943, **65**, 1060—1063).—Determination of the solubilities of Ag_2SO_4, $AgBrO_3$, and $AgIO_3$ in dil.

aq. NH_3 solutions have confirmed the existence of $Ag[NH_3]^{\cdot}$ ions. The instability const. of $Ag[NH_3]^{\cdot}$ is $4\cdot3 \times 10^{-4}$, in agreement with the existing val. $4\cdot8 \times 10^{-4}$. The dissociation const. of $Ag[NH_3]_2^{\cdot}$ to $Ag^{\cdot}$ and NH_3, recalc. from existing data, is $6\cdot2 \times 10^{-8}$.
W. R. A.

Basic ionisation constant of glycine in dioxan–water solutions. H. S. Harned and C. M. Birdsall (*J. Amer. Chem. Soc.*, 1943, 65, 1117—1119).—Basic ionisation consts. of glycine in dioxan–H_2O (20, 45, and 70% of dioxan) have been calc. from vals. of the e.m.f. of cells of the type $H_2|Z(m_1)$, $NaZOH(m_2)$, $NaCl(m_3)|AgCl$-Ag ($Z = {}^{\cdot}NH_3{\cdot}CH_2{\cdot}CO_2{}'$ and NaZOH is hydrated $NH_2{\cdot}CH_2{\cdot}CO_2Na$), measured at 5° intervals from 0° to 50°. ΔG°, ΔH°, ΔC°, and ΔS° for the ionisation reaction at 25° have been calc.
W. R. A.

Modern theories of acids and bases. H. I. Stonehill (*J. Soc. Dyers and Col.*, 1943, 59, 171—176).—A review.
C. S. W.

Acids and bases. Critical re-evaluation. R. Ginell (*J. Chem. Educ.*, 1943, 20, 250—252).—A discussion in which it is concluded that neutralisation is the union of solvo-positive ions with solvo-negative ions, and that an acidic solution is one that contains a solvo-positive ion as one of the predominant species present, and a basic solution one that contains a solvo-negative ion as one of the predominant species. Acidity and basicity are thus properties of solutions and not of pure substances.
L. S. T.

Acid–base relationships at higher temperatures. L. F. Andrieth and T. Moeller (*J. Chem. Educ.*, 1943, 20, 219—222).—The Brønsted and Lewis definitions are extended qualitatively to certain acid–base reactions at higher temp. regardless of the presence or absence of a liquid phase.
L. S. T.

Effect of dielectrics and solvent on the regeneration in acid solution of alkali-faded bromophenol-blue. E. S. Amis and J. B. Price (*J. Physical Chem.*, 1943, 47, 338—348).—The regeneration of alkali-faded bromophenol-blue in aq., aq. MeOH, and aq. EtOH solutions of HCl at 25°, 35°, and 45° has been investigated. The data indicate a change in the mol. dispersion of the faded dye with changing acidity. In alcoholic solutions there is a lack of conformity to the predictions of the electrostatic and collision theories which is attributed to the formation of $ROH_2^{\cdot}$ ions.
C. R. H.

Methylene-blue and other indicators in general acids. The acidity function. G. N. Lewis and J. Bigeleisen (*J. Amer. Chem. Soc.*, 1943, 65, 1144—1150).—Addition of $H^{\cdot}$ to aq. methylene-blue (I) occurs at the central N. The absorption spectrum of the new compound has a peak at a lower ν than that of (I). Capri-blue (II) adds $H^{\cdot}$ to the amino-N, resulting in a band of higher ν, but a small amount of the isomeride with centrally added $H^{\cdot}$ is also formed. A second $H^{\cdot}$ adds in >70% H_2SO_4, forming three isomerides with (I) and two with (II). Change in relative concn. of the former isomerides in the range 78% to fuming H_2SO_4 has been determined. Changes in the spectra of (I), (II), and Bindschedler's green are very similar on the addition of $H^{\cdot}$ in H_2O or of BCl_3 or $SnCl_4$ in $COMe_2$, MeCN, or PhCN. Phenolphthalein, eosin, and dinitrodibromoeosin (III) are indicators in 95% to fuming H_2SO_4, SO_3 here acting as an acid. (III) has been used to extend the vals. of the acidity function of Hammett and Deyrup (A., 1932, 921) to concns. >50 mol.-% of SO_3.
W. R. A.

Phase equilibria in hydrocarbon systems. Composition of dew-point gas in ethane–water system. H. H. Reamer, R. H. Olds, B. H. Sage, and W. N. Lacey (*Ind. Eng. Chem.*, 1943, 35, 790—793).—The composition of the dew-point gas phase in C_2H_6–H_2O systems at 100—460° F. and up to 10,000 lb. per sq. in. has been determined from samples from a static system. The general behaviour resembles that of N_2–H_2O and CH_4–H_2O systems. The mol. fraction of H_2O is ~5 times that predicted from simple v.p. considerations at the higher pressures and lower temp.
L. J. J.

High-pressure vapour–liquid equilibria. Vapour–liquid equilibrium of benzene–toluene.—See B., 1943, I, 349.

Relative weights of phases present in a heterogeneous system at equilibrium. W. M. Spicer and J. S. Metcalf (*J. Chem. Educ.*, 1943, 20, 199).
L. S. T.

Ternary system dioxan–ethyl alcohol–water. C. H. Schneider and C. C. Lynch (*J. Amer. Chem. Soc.*, 1943, 65, 1063—1066).—Vapour-liquid equilibria for the system dioxan–H_2O at 1 atm. have been determined. The min. azeotrope contains $48\cdot5$ mol.-% of dioxan and boils at $87\cdot59°$. Measurements of n and ρ for the analysis of dioxan–EtOH–H_2O mixtures are given, and an analysis diagram is drawn. Sufficient vapour–liquid equilibrium data at 1 atm. to estimate the ternary min. azeotrope of this system ($4\cdot2$ mol.-% dioxan, $85\cdot3$ mol.-% EtOH, b.p. $78\cdot08°$) have been determined.
W. R. A.

VII.—ELECTROCHEMISTRY.

Variation of specific conductivity with concentration of electrolytes in aqueous solution. R. Gopal (*J. Indian Chem. Soc.*, 1943, 20, 62—68).—κ for NH_4 and alkali (except Li) salts of mineral acids in

aq. solution increases steadily with concn. For most other sol. electrolytes, κ shows a max. at 20—30%.
F. J. G.

Limiting equivalent conductance of electrolytes. P. van Rysselberghe (*J. Chem. Educ.*, 1943, 20, 131).
L. S. T.

Conductivity of sulphuric acid in methyl alcohol at 25°. E. W. Kanning, E. G. Bobalek, and J. B. Byrne (*J. Amer. Chem. Soc.*, 1943, 65, 1111—1116).—Conductivity of $0\cdot02107$ to $6\cdot006 \times 10^{-5}$M. solutions of H_2SO_4 in MeOH has been determined. At <$0\cdot002$M. mol. conductance is $\propto$ (concn.)$^{\frac{1}{2}}$. H_2SO_4 in MeOH acts as a partly dissociated univalent electrolyte, with a dissociation const. of ~$0\cdot029$ at 25°.
W. R. A.

Electrical conduction of textiles. S. Baxter (*Trans. Faraday Soc.*, 1943, 39, 207—214).—Measurements of the electrical resistance of wool, collagen, silk, and cotton fibres at various temp. from 30° to 60° are described and recorded. Polarisation is marked in dry wool fibres (regain <5%), but disappears at higher regains, at which Ohm's law is obeyed. Since the activation energy associated with the wool–H_2O system is larger, and is independent of pH over the range 2—8, and since the wool–MeOH system behaves similarly, it is inferred that the conduction is not ionic. The assumption that wool-H_2O behaves as an electronic semi-conductor leads to a simple relation between the resistance R and the regain m, viz., $\log R = a + b/\sqrt[3]{m}$ (a and b const.), in agreement with the experimental results of Marsh and Earp (B., 1933, 298).
F. L. U.

Reversible oxygen electrode. W. G. Berl (*Trans. Electrochem. Soc.*, 1943, 83, Preprint 19, 231—248).—A half-cell was constructed, using a C electrode, in which gaseous mol. O_2 was in equilibrium with one of its ions. It behaved in accordance with the thermodynamic predictions concerning the effect of changes in the activities of reactants and reaction products on the e.m.f. The ion with which O_2 establishes a reversible equilibrium in alkaline solution is HO_2^-, and the measured e.m.f. was in agreement with the calc. val. for the half-cell reaction $OH' + HO'_2 \rightleftharpoons O_2 + H_2O + 2e$. This assumed reaction was verified by operating a cell containing the O_2 electrode so that the equilibrium of the above reaction could be displaced in either direction. This was done by connecting the O_2 electrode cathodically into either a galvanic or an electrolytic cell. Current efficiencies on the basis of the H_2O_2 yield in either instance were 100%.
C. E. H.

Electrolytically deposited metals. Influence of the gas above the electrolyte on the deposition potential. B. Kassube and H. Schmellenmeier (*Z. Elektrochem.*, 1941, 47, 309—313).—The potential of the cathode surface, within the electrolyte and at the electrolyte–gas interface, in the electro-deposition of Zn, Sn, and Fe at various c.d. has been measured. With O_2 above the electrolyte the potential at the interface was > that within the electrolyte; with H_2 they were approx. equal. Variation of the H_2 content of the deposited metal with c.d. influences the deposition potential and the structure of the deposit, and results in the non-superposability of the current/potential taken with increasing and decreasing current.
W. R. A.

E.m.f. measurements in liquid sulphur dioxide. K. Wickert (*Z. Elektrochem.*, 1941, 47, 330—333).—Polemical against Cruse (A., 1943, I, 229) on the definition of the terms "acid" and "base" in liquid SO_2 solutions.
W. R. A.

Two-stage reversible electro-reduction, with the formation of semi-quinones and their dimerides, at the dropping mercury electrode. R. Brdička (*Z. Elektrochem.*, 1941, 47, 314—326).—General equations have been derived for the current–potential curves in the polarographic reduction of reversible bivalent redox systems, including the separate and simultaneous formation of semi-quinones and their dimerides. By a mathematical analysis of the experimental curves the dismutation, dimerisation, and equilibrium consts. of the system may be evaluated. The effects, on the experimental results, of irreversibility and immobility of the equilibrium, of adsorption and insolubility of the components, and of internal resistance and pH, are qualitatively discussed.
W. R. A.

VIII.—REACTIONS.

Prediction of reaction rates. F. Daniels (*Ind. Eng. Chem.*, 1943, 35, 504—510).—A review of the published information on reaction rates in homogeneous systems. The only reliable and consistent figures are obtained from gas-phase reactions of low orders, and in these the Arrhenius equation ($k = ae^{-Q/RT}$) can be applied. Vals. of a range from 10^{12} to 10^{14}, and abnormal vals. are related to disturbing factors such as chain reactions. In view of the multiplicity of such factors in most cases, it is considered better to predict relative rates rather than abs. vals.
F. Rd.

Organic reactions. H. Eyring, H. M. Hulburt, and R. A. Harman (*Ind. Eng. Chem.*, 1943, 35, 511—521).—A short mathematical derivation of reaction rate from the sp. properties of an oscillating mol. system. The actual quantities involved can seldom be determined and show only the relative val. of factors such as change of vol. in the formation of suitably activated reacting complexes. Two types of complex are distinguished, in which the valency bonds

are respectively homopolar (shared electron) and polar, or ionic. The increase in reaction rate shown in many solvents may be due to formation of complex ions with part of the solvent mol. Such a mechanism may also be used to explain reactions at a solid surface, which behaves as an ionising solvent to adsorbed reactants. Metallic oxide catalysts can combine with both positive and negative ions and thus give two or more reactions.   F. Rᴅ.

Viscometric method for studying alcoholysis of esters. A. J. Rao (*J. Indian Chem. Soc.*, 1943, **20**, 69—75).—Measurement of η is a convenient method for studying alcoholysis. Data on the rate of alcoholysis of MeOAc by $C_5H_{11}\cdot OH$, $Bu^\beta OH$, and $Pr^\alpha OH$ at 25° and 30° in presence of HCl are recorded.   F. J. G.

Laws governing growth of films on metals. U. R. Evans (*Trans. Electrochem. Soc.*, 1943, **83**, Preprint 10, 8 pp.).—Derivations of three different types of growth laws are given and discussed. The linear law, $y = k_1 t_1$, is obtained where the film is porous and O_2 or other non-metals can penetrate to the metallic surface. The parabolic law, $y^2 = k_2 t + k_3$, is obtained when the film is non-porous and has ionic and electronic conductivity. Here the growth rate is governed by outward ionic migration, and is usually associated with vacant sites in the cationic lattice. The logarithmic law, $y = k_4 \log (k_5 t + k_6)$, occurs when the conditions for parabolic growth are absent. It is explained by the outward passage of interstitial matter through flaws of loose structure in the outer part of the film. The three types of growth occur with Ca, Cu, and Zn, respectively. In the case of highly protective films, *e.g.*, on Al, the rate of growth is largely governed by the formation of cracks in them.   C. E. H.

Disproportionation of diphenyl-*o*-tolylmethyl.—See A., 1943, II, 258.

Kinetics of amylase action.—See A., 1943, III, 683.

Concept of catalytic chemistry. A. V. Grosse (*Ind. Eng. Chem.*, 1943, **35**, 762—767).—A lecture.   L. J. J.

Autoxidation of ascorbic acid. R. W. Peterson and J. H. Walton (*J. Amer. Chem. Soc.*, 1943, **65**, 1212—1217).—The half- and 95%-life periods of the autoxidation of ascorbic acid, with the catalytic effect of $Cu^{..}$ and org. compounds, have been determined. At pH <8 the reaction is slow, but it accelerates rapidly in more alkaline solutions. In the presence of $Cu^{..}$ the rate is large in acid and alkaline media, with a max. between pH 8 and 10, and a min. at pH 6—8, and an autocatalytic effect, probably caused by the monoester of $H_2C_2O_4$ and *l*-threonic acids. Order of reaction depends on pH. The vol. of O_2 absorbed varies with pH and $[Cu^{..}]$. Concn. of H_2O_2 produced could not be correlated with the vol. of O_2 absorbed or the rate of reaction. The inhibiting effect of 10 org. substances has been determined.   W. R. A.

Stimulation of formation of additive compounds between bases and phenol derivatives by lipoid solvent. H. Bergstermann (*Biochem. Z.*, 1940, **304**, 223—237).—The stimulation of the phenol–base addition reaction in the lipoid phase applies not only to nitrophenols and antipyrine but also to the biologically important phenols and bases. Data are given for the partition coeffs. between C_6H_6 and H_2O for the *o*-, *m*-, and *p*-$NO_2\cdot C_6H_4\cdot OH$–antipyrine complexes.   P. G. M.

Photographic development as a catalysed heterogeneous reaction. T. H. James (*J. Chem. Physics*, 1943, **11**, 338—341).—Published data on kinetics of development of Ag halides by NH_2OH and quinol indicate that reduction proceeds along the solid Ag–Ag halide interface, by adsorbed developer ions. Ag filaments can be formed by migration of newly formed Ag along the Ag surface before incorporation in the lattice, with formation of secondary development centres.   L. J. J.

Solid catalysts and reaction rates. O. A. Hougen and K. M. Watson (*Ind. Eng. Chem.*, 1943, **35**, 529—541).—It is assumed that reaction at a solid surface is carried out by activated adsorption of reactants. Mathematical reasoning based on this derives a series of rate equations from the rates of adsorption and desorption. The effect of diffusion in the reactant streams is ignored, but allowance is made for changes of concn. in the actual body of the catalyst particle. Methods are suggested for the determination of the consts. in the rate equations.   F. Rᴅ.

Ignition of methane by hot wires. W. Davies (*Fuel*, 1943, **22**, 72—76).—A 10% CH_4–air mixture could not be ignited by direct transmission of heat from an electrically-heated Au or Pt wire of 0·127 mm. diameter. Ignition was brought about only by the arc formed when the wire fused. Ignition occurred more readily with the Au than with the Pt wire in spite of the higher m.p. of the latter. With Pt catalytic oxidation of the CH_4 begins at ~600° (in itself causing a rise of temp. of the wire) so that when fusion ultimately occurs the gas mixture in the neighbourhood of the wire may be non-inflammable. Au has no catalytic action on the oxidation of CH_4. Moreover a heavier current is required to fuse a Au wire than a Pt wire of the same diameter so that the arc produced when the former fuses is more powerful. Since the arc is the effective agent producing ignition the nature of the electric circuit employed will affect the results observed.   A. B. M.

Catalytic hydrogenation of benzene over metal catalysts. P. H. Emmett and N. Skau (*J. Amer. Chem. Soc.*, 1943, **65**, 1029—1035).—Catalytic activity, in the hydrogenation of C_6H_6 below 200°, and the adsorption of CO and CO_2 on Co, Fe–Co, Fe, Cu, Cu–Ni, Ni, Pd, Pd–Ag, and Ag catalysts has been determined. Body-centred cubic Fe catalysts, having a surface area equal to that of the very active Co and Fe–Co catalysts, are not active. Face-centred cubic Cu catalysts are also inactive but addition of small amounts of Ni induces slight activity at 200°. Pd is active, Ag inactive; the activity, per unit of Pd, of Pd–Ag alloys decreases considerably with decreasing Pd content. CO is instantly adsorbed (chemisorption) on reduced Cu and Ni catalysts at −195°; CO_2 at −78° is chemisorbed on Ni but not on Cu. Having crystal structure and lattice dimensions within the Balandin square of activity is a necessary but insufficient criterion for the activity of metal catalysts in the hydrogenation of C_6H_6 below 200°.   W. R. A.

Catalytic investigation on alloys. VIII. Properties of copper-nickel alloys in the catalysis of the decomposition of formic acid vapour. G. Rienäcker and H. Bade. **IX. Decomposition of formic acid vapour on copper–platinum mixed crystals in relation to composition and ordering of the alloys.** G. Rienäcker and H. Hildebrandt (*Z. anorg. Chem.*, 1941, **248**, 45—51, 52—64).—VIII. Ni has a high and Cu a low catalytic activity for the decomp. of HCO_2H vapour. Alloys with $\not> 70\%$ Ni resemble Cu, though there is a max. of activity at 18 at.-% Ni. The activation energy rises with increasing % of Ni up to 20 at.-%, remains const. up to 70 at.-%, and then increases again to the val. for pure Ni.

IX. The catalytic activity of Pt for the decomp. of HCO_2H vapour is $\geqslant$ that of Cu. That of the chilled alloys increases steadily with increasing % of Pt. The activation energy decreases with increasing % of Pt up to 44 at.-% and then remains const. The change from disordered to ordered structure in the Cu_3Pt region produces a marked increase in activity and decrease of activation energy.   F. J. G.

Catalysis in oxidation of lubricating oil.—See B., 1943, I, 358.

[Catalytic] synthesis of liquid fuels from carbon monoxide and hydrogen.—See B., 1943, I, 357.

[Laboratory] method for producing electrolytic gas. A. F. Williston (*J. Chem. Educ.*, 1943, **20**, 210).   L. S. T.

Action of light on acetaldehyde vapour. C. W. Woolgar and A. J. Allmand (*Trans. Faraday Soc.*, 1943, **39**, 219—225).—In the decomp. of MeCHO vapour by ultra-violet light large quantities of a liquid polymeride, probably paraldehyde, are formed, photolysis of which in the vapour phase at 25° and in Cl_2-filtered light is negligible. Pressure changes are recorded, and quantum efficiencies for the decomp. and for the polymerisation are given. Analysis of the gaseous products suggests that $COMe_2$ is probably formed simultaneously with the main reaction $MeCHO \rightarrow CH_4 + CO$.   F. L. U.

Physico-chemical basis of mitogenetic radiation. Y. I. Frenkel and A. G. Gurvich (*Trans. Faraday Soc.*, 1943, **39**, 201—204).—In the scission of peptides by peptidase, of $CO(NH_2)_2$ by urease, and of glucose by zymase, mitogenetic radiation occurs only in presence of O_2, and in the first two systems under the action of visible light. Assuming that the radiation is due to recombination of radicals, the wave-length of light required to promote it is calc. on the basis of available thermal data. The results [λ 5000 ᴀ. for glycylglycine, 4800 ᴀ. for $CO(NH_2)_2$] are confirmed by experiment. For radiation accompanying glucolysis no external source of energy should be needed, and this is in accord with the observation that the glucose–zymase system radiates in the dark.   F. L. U.

Effect of intense sonic waves on molten metals. III. Dissolution of iron in molten zinc. G. Schmid and A. Roll (*Z. Elektrochem.*, 1940, **46**, 653—657).—Zn was melted in Fe crucibles, and the rate at which the Fe dissolved was determined by chemical analysis and microscopical examination. $\not> 1\%$ of iron was taken up in a short time. The rate of dissolution of the Fe was greatly increased by the sonic waves; they also did not favour dendritic growth, and caused a reduction in grain size on solidification.   R. Kᴇ.

IX.—PREPARATION OF INORGANIC SUBSTANCES.

New type of complex silver compounds with tervalent silver. P. Rây (*Nature*, 1943, **151**, 643).—The *compounds* $[Ag^{III}(endigH)_2]X_3$ (endigH = ethylenediguanide; X = SO_4, NO_3, ClO_4, OH), red acicular prisms, stable at room temp., diamagnetic, have been prepared. The diamagnetic character accords with the supposition that the co-ordination bonds are of the hybrid d–s–p^2 type, as in planar Ni^{II} complexes.   A. A. E.

Pyridine complex of metallic perchlorates. I. P. C. Sinha and R. C. Ray (*J. Indian Chem. Soc.*, 1943, **20**, 32—36).—The following *complexes* are described (X = C_5H_5N) : $AgClO_4,4X$; $Cu(ClO_4)_2,4X$; $Mg(ClO_4)_2,6X$; $Ca(ClO_4)_2,6X$; $Sr(ClO_4)_2,6X$; $Ba(ClO_4)_2,6X$; $Zn(ClO_4)_2,4X$; $Cd(ClO_4)_2,6X$; $Hg(ClO_4)_2,6X$; $Mn(ClO_4)_2,8X$; $Ni(ClO_4)_2,6X$; $Co(ClO_4)_2,6X$.   J. H. Bᴀ.

Hydration of calcium aluminates. IV. Hydrothermal reactions of tricalcium aluminate and its hydrates. G. M. Harris, W. G. Schneider, and T. Thorvaldson (*Canad. J. Res.*, 1943, **21**, B, 51—72).—Homogeneous samples of $3CaO,Al_2O_3,6H_2O$ (I) can be obtained by heating $3CaO,Al_2O_3$ (II) or its hexagonal hydrate in saturated steam at $\not> 150°$. At $\not< 250°$ and under conditions favouring rapid hydrolysis, crystals of $Ca(OH)_2$ and a hydroaluminate (III) of $CaO : Al_2O_3$ ratio $<1·5 : 1$ are formed. (III) forms rectangular elongated prismatic plates of low birefringence and n 1·627. It is also produced by the action of $Ca(OH)_2$ on hydrated Al_2O_3 in saturated steam at 350°. Prolonged action of saturated steam on $Ca(OH)_2$ and (III) at $\not> 150°$ reconverts them into (I). When (II) or its hydrates are heated at $<250°$ under conditions favouring hydrolysis another hydroaluminate which is strongly birefringent, n 1·58, is formed. The production of these hydroaluminates may explain the effect of hydrothermal treatment at $>150°$ on the tensile and compressive strength of precast Portland cement concrete products.   J. W. S.

Volatile borates of polyhydric alcohols and the activation of boric acid.—See A., 1943, II, 290.

Alumina of graded adsorptive powers for chromatographic adsorption. H. Brockmann and H. Schodder (*Ber.*, 1941, **74**, [*B*], 73—78).—Five grades of alumina (Merck) are noted. Full activation is achieved by heating to red heat and cooling in a desiccator and partly deactivated aluminas are obtained when this product is kept, or shaken in moist air. The various grades possess graded adsorptive powers towards 6 dyes (*p*-methoxyazobenzene, azobenzene, Sudan-yellow, Sudan-red, *p*-amino- and -hydroxy-azobenzene), which are passed through columns under standardised conditions.   J. Wa.

Synthesis of triphosgene for war gas identification sets. F. C. Hickey and J. J. Hanley (*J. Chem. Educ.*, 1943, **20**, 229—230).—Prep. by chlorination of Me_2CO_3 in ultra-violet light is described.   L. S. T.

Demonstration of the oxidation of ammonia to nitric acid. S. S. Hauben and R. S. Siegel (*J. Chem. Educ.*, 1943, **20**, 166).   L. S. T.

Niobium oxides. G. Brauer (*Z. anorg. Chem.*, 1941, **248**, 1—31).—Nb_2O_5, NbO_2, and NbO are the only Nb oxides. Nb_2O_5 exists in three modifications, one of which is isomorphous with Ta_2O_5. Its m.p. is $1460°±5°$. The structure of NbO is closely related to that of rutile, with a 4·84, c 2·99 a., $c/a = 0.618$. NbO is cubic with a 4·202 a. At. positions and a diagram of the structure are given. $\rho_4^0 = 7·30$. The solubility of O_2 in Nb is $\not> 5$ at.-%.   F. J. G.

Basic bismuth permanganates. F. Hein and H. Holzapfel (*Z. anorg. Chem.*, 1941, **248**, 77—83).—*Basic Bi permanganates*, $[Bi_2O_2(OH)]MnO_4,1·5H_2O$ and $[Bi_3O_3(OH)_2]MnO_4$, are described.   F. J. G.

Mechanism of chemical reactions with heavy oxygen. A. E. Brodsky, N. I. Dedussenko, I. A. Makolkin, and G. P. Miklukhin (*J. Chem. Physics*, 1943, **11**, 342).—(i) In the Beckmann rearrangement of $CPh_2:N·OH$ in presence of PCl_5 and $H_2^{18}O$, the O of the oxime is entirely replaced by ^{18}O, indicating intermediary dehydration and hydration steps, but not direct intramol. transfer. (ii) $Et^{18}OH$ and $Ac_2^{18}O$ give $MeC^{18}O^{16}OEt$. (iii) $Na^{18}OH$ fusion of Na salts of $PhSO_3H$, $2\text{-}C_{10}H_7·SO_3H$, and anthraquinone-2-sulphonic acid gives $R^{18}ONa$, indicating elimination of SO_3Na and addition of ONa. (iv) In the xanthation of $EtOH$ and alkali cellulose with $Na^{18}OH$, the ^{18}O passes into the H_2O formed.   L. J. J.

Preparation of phosphomolybdic acid from phosphoric acid and pure molybdic acid. A. Linz (*Ind. Eng. Chem.* [*Anal.*], 1943, **15**, 459).—Details for the prep. of phosphomolybdic acid from MoO_3 and 85% H_3PO_4 are given. The method is applicable to the prep. of phosphotungstic acid by substituting WO_3 for MoO_3.   L. S. T.

Effect of heating γ-iron hydroxide, cadmium carbonate, and stoicheiometric mixtures thereof. I. W. Schröder (*Z. Elektrochem.*, 1940, **46**, 680—697).—The formation of Cd–Fe spinel was studied, the methods used being (1) loss of wt. on slow heating, (2) vol. and composition of evolved gases, (3) observation of colour changes, (4) *X*-ray examination of reaction products, and (5) measurement of the emanation after the reactants had been treated with radio-Th. $γ\text{-}FeO·OH$ begins to lose H_2O at 150°, and is converted into $γ\text{-}Fe_2O_3$ at 250°; above 350° $α\text{-}Fe_2O_3$ is formed, the change being complete at 450°. $CdCO_3$ when heated lost CO_2, the dissociation temp. ($p_{CO_2} = 1$ atm.) being 357°. Above 800° the CdO began to decompose, Cd vapour being evolved. When mixtures of the two substances were heated, they began to react at 500°, but no spinel lines were found in the *X*-ray examinations below 730°. At 800° spinel formation was complete, and above 900° decomp. commenced, Cd vapour being evolved.   R. Ke.

Reactions of organometallic compounds with iron pentacarbonyl and iron carbonyl hydride. F. Hein and H. Pobloth (*Z. anorg. Chem.*, 1941, **248**, 84—104).—$Fe(CO)_5$ and $H_2Fe(CO)_4$ react with organometallic compounds, probably forming mixed organometallic carbonyls, which then undergo further reactions. With organo-Hg compounds the final products are $HgFe(CO)_4$ and ketones. $H_2Fe(CO)_4$ and organo-metallic bases afford organo-metallic carbonyls. $Et_2PbFe(CO)_4$ is described.   F. J. G.

Complex compounds : their derivation and nomenclature. O. J. Stewart (*J. Chem. Educ.*, 1943, **20**, 230—231 ; cf. A., 1941, I, 277).—New names for $K_3Fe(CN)_6$, $K_4Fe(CN)_6$, $[Cr(H_2O)_6]Cl_3$, $Na_2S_2O_3$, $K_2Cr_2O_7$, KI_3, and $(NH_4)_3PO_4,12MoO_3$ are discussed.   L. S. T.

Demonstration of some properties of Prussian-blue. M. Kohn (*J. Chem. Educ.*, 1943, **20**, 198).—Reduction to $Fe_2Fe(CN)_6$ and reaction with aq. $K_2C_2O_4$ are described.   L. S. T.

Reversible chromatic thermosensitivity. E. W. Blank (*J. Chem. Educ.*, 1943, **20**, 171—174).—The changes in colour shown by numerous substances on heating are tabulated and discussed. Data for several ferri- and ferro-cyanides are recorded.   L. S. T.

Isomerism of ruthenium trichloride hydrates. G. Grube and G. Fromm (*Z. Elektrochem.*, 1940, **46**, 661—667).—$RuCl_3$; free from $RuCl_2$ and $RuCl_4$, was prepared. Dil. HCl was used as solvent throughout, to prevent hydrolysis of the $RuCl_3$. The isomerism was investigated by means of electrical conductivity measurements and potentiometric titrations with $AgNO_3$. A freshly prepared solution in 0·1N-HCl contained $\leqslant$ one Cl′ per Ru atom ; on keeping at 50° [Cl′] increased to one Cl′ per Ru atom, the colour changing from blue-green to emerald-green. Further keeping, or heating at 80°, produced little change, but the solution turned yellow-brown. Similar changes took place in 0·5N-HCl. The changes are said to be $[RuCl_4H_2O]$ (blue-green) $\rightarrow [RuCl_2(H_2O)_2]Cl$ *cis*-isomeride (emerald-green) $\rightarrow trans$-isomeride (yellow-brown).   R. Ke.

Complex compounds of diguanide with bivalent metals. IV. Palladium diguanidine and its salts. P. Ray and S. P. Ghose (*J. Indian Chem. Soc.*, 1943, **20**, 19—21).—*Palladium diguanide*, $Pd(C_2H_6N_5)_2$, forms *compounds* $[Pd(C_2H_7N_5)_2]X$, where X = $(OH)_2$, Cl_2 (2H_2O), Br_2 (H_2O), I_2 (2H_2O), SO_4 (3H_2O), S_2O_3 (3H_2O), $(NO_3)_2$, $(CNS)_2$ (H_2O), $Pd(CNS)_4$, $PtCl_6$ (5H_2O). The Pd complex is more stable than the corresponding Ni complex.   J. H. Ba.

X.—ANALYSIS.

Sensitivity of chemical reactions. I. A. Schleicher (*Z. anal. Chem.*, 1941, **121**, 86—90).—Current methods of expressing the sensitivity of a reaction are critically discussed. It is proposed to express the qual. sensitivity of a reaction as a detection sensitivity by means of the limiting dilution and not by a limiting concn.; sensitivity then becomes vol. in c.c. per μg.   L. S. T.

Correction of a computation formula in Bunsen's " Gasometric Methods." H. Koelsch (*Z. anal. Chem.*, 1941, **121**, 84—86).   L. S. T.

Semi-micro scheme of qualitative analysis for the anions. J. T. Dobbins and M. E. Kapp (*J. Chem. Educ.*, 1943, **20**, 118—120).—Details are given for separating anions into the following groups : (i) ions pptd. as Ca salts from alkaline solution, viz., CO_3'', F′, C_2O_4'', tartrate, SO_3'', AsO_4''', AsO_3''', and PO_4'''; (ii) ions pptd. as Ba salts from alkaline solution, viz., SO_4'' and CrO_4''; (iii) ions pptd. as Cd salts from alkaline solution, viz., S′′, $Fe(CN)_6''''$, BO_3''', and $Fe(CN)_6''''$; (iv) ions pptd. as Ag salts from a solution just acid with HNO_3, viz., CN′, CNS′, S_2O_3''', Cl′, Br′, and I′; (v) the ions OAc′, ClO_3', NO_3', and NO_2'. Additional separations in each group and identification of individual ions are described.   L. S. T.

Determination of hydrogen-ion concentration with tungsten and molybdenum electrodes. H. Brintzinger and B. Rost (*Z. anal. Chem.*, 1940, **120**, 161—165).—W and Mo electrodes are preferred to the Sb electrode. Comparative vals. for buffered solutions of known pH and for other solutions obtained with W, Mo, and H_2 electrodes or colorimetrically are given.   F. N.

Estimation of high chlorine residuals [in water].—See B., 1943, III, 228.

Volumetric determination of bromide in brines.—See B., 1943, I, 366.

Volumetric determination of fluorine by means of zirconium-alizarin lake. F. Nölke (*Z. anal. Chem.*, 1941, **121**, 81—84).—The test solution ($\not> 50$ c.c.) is neutralised with aq. NH_3, acidified with 10 c.c. of glacial AcOH, and diluted accurately to 100 c.c. 10 c.c. of Zr–alizarin solution (prep. described) and 5 c.c. of $C_6H_{11}·OH$ are diluted to 20 c.c. and titrated with the diluted test solution until, after thorough shaking of the whole solution, the $C_6H_{11}·OH$ layer just becomes yellow. A specially-prepared comparison solution facilitates the detection of the end-point. The method is accurate, and is suitable for both simple and complex fluorides.   L. S. T.

Determination of fluorine in aluminium oxide containing cryolite.—See B., 1943, I, 367.

Determination of dissolved oxygen in water by Winkler's method without using potassium iodide.—See B., 1943, III, 228.

Analysis of oxygen and carbon dioxide resuscitation mixtures.—See B., 1943, I, 367.

Dead-stop end-point as applied to the Karl Fischer method for determining moisture.—See B., 1943, II, 269.

New possibility of error in the determination of sulphur as barium sulphate. A. Schleicher (*Z. anal. Chem.*, 1941, **121**, 90—92).—

$BaCl_2$ is absorbed from the mother-liquor by the filter-paper, and is not completely removed even by abundant washing with hot H_2O. This error is avoided when the filter-paper is given a preliminary rinsing with moderately conc. HCl.   L. S. T.

Automatic apparatus for determination of small concentrations of sulphur dioxide in air. Application to hydrogen sulphide, mercaptan, and other sulphur and chlorine compounds.—See B., 1943, III, 226.

Titration with alkaline permanganate solution. IV. Volumetric determination of quadrivalent selenium with permanganate. H. Stamm and M. Goehring (*Z. anal. Chem.*, 1940, **120**, 230—232).—Se (40—120 mg.) as SeO_3'' is added to 50 c.c. of $0.1N$-$KMnO_4$ + 25 c.c. of 23—25% aq. NaOH; after 15 min. H_2O, H_2SO_4, $H_2C_2O_4$ (~0.25 M.), and $MnSO_4$ are added in that order. The solution is then titrated at 50° with $KMnO_4$, and a blank determination is performed in absence of Se. Vals. ± 0.2 mg. were obtained. HNO_3 does not interfere; HNO_2 or N oxides are removed with air.   F. N.

Determination of small amounts of tellurium in high-lead and tin-base alloys.—See B., 1943, I, 376.

Anhydrous copper sulphate in the Kjeldahl nitrogen determination. C. Beatty, 3rd (*Ind. Eng. Chem. [Anal.]*, 1943, **15**, 476).—The use of anhyd. $CuSO_4$ instead of $CuSO_4,5H_2O$ prevents bumping and permits a smoother and quicker digestion.   L. S. T.

Formaldehyde method of determining ammonia-nitrogen in fertilisers.—See B., 1943, III, 199.

Determination of nitrogen in slags produced during electro-melting [of metals].—See B., 1943, I, 378.

Determination of phosphorus by molybdenum-blue method. W. I. M. Holman (*Biochem. J.*, 1943, **37**, 256—259).—The method, which involves use of KI as reducing agent, is described. The blue colour produced is stable at 12—32° for 24 hr., and 1—100 μg. of P can be determined with $\pm 2\%$ error if a photoelectric absorptiometer is used. The blue colour closely obeys Beer's law, and a correction is applied for a faint colour in the control when a visual colorimeter is used. ≯ traces of Cu'' should be present. As and Si also produce blue colours, and the max. amounts which can be present without affecting the test are 1 μg. of As for Na_3AsO_4 and 10 μg. of SiO_2 for water-glass. The method is suitable for HCl extracts of residues formed by ashing or fusion with Na_2CO_3. It cannot be used to distinguish between org. and inorg. P, and several org. P compounds are hydrolysed under the conditions of the determination.   J. N. A.

Colorimetric determination of phosphorus.—See B., 1943, III, 199.

Photoelectric determination of phosphorus in plain carbon steels. See B., 1943, I, 376.

Volatility of potassium or sodium sulphate in the gravimetric determination of potassium or sodium as K_2SO_4 or Na_2SO_4. N. Kolarow (*Z. anal. Chem.*, 1941, **122**, 399—404).—The literature technique of treating the H sulphates or pyrosulphates with $(NH_4)_2CO_3$ and heating to only moderate temp. is unnecessary. Complete decomp. of $KHSO_4$ or $K_2S_2O_7$ to K_2SO_4 at 670° requires 7 hr.; pretreatment once with $(NH_4)_2CO_3$ (to const. wt. at 120°) reduces this to 6 hr., three times to 5 hr. Na_2SO_4, K_2SO_4, and mixtures thereof do not lose wt. in the gas flame, or in the electric oven below 1040°, whether the Pt crucible is covered or not. For determinations, heating at red heat for 5—7 min. suffices, but there is no danger of loss even in ½ hr.   S. A. M.

Determination of caustic alkali and carbonate in the zinc cyanide bath.—See B., 1943, I, 376.

Polarographic analysis of calc spar. M. Straumanis and A. Dravnieks (*Z. anal. Chem.*, 1940, **120**, 168—177).—Small amounts (≮0.001%) of Pb, Zn, and Mn can be determined with an accuracy of 5% by using the apparatus of Heyrovsky and Shikata (A., 1925, ii, 674).   F. N.

Electrolytic determination of zinc at brass electrodes. I. Separation of zinc from a solution buffered with sodium acetate. M. Karschulin and S. Ban. **II. Separation of zinc from copper from a buffered solution** M. Karschulin and M. Mirnik (*Z. anal. Chem.*, 1940, **120**, 244—247, 248—252).—I. At brass cathodes the deposition potential of Zn is −0.820 v. and is independent of pH; at Zn cathodes it increases with increasing pH. At pH 6 separation at brass cathodes is satisfactory; at pH <6 it is not quant. II. Cu is completely removed by electrolysis in dil. H_2SO_4 solution; the electrolyte is then conc., neutralised, brought to pH 6—6.5 with NaOAc, and electrolysed for Zn.   F. N.

Determination of zinc in aluminium and its alloys.—See B., 1943, I, 378.

Determination of zinc and cadmium in yellow glasses.—See B., 1943, I, 370.

Use of cadmium tetrapyridine thiocyanate in gravimetry. G. Vornweg (*Z. anal. Chem.*, 1940, **120**, 243).—When NH_4CNS is added to a neutral Cd solution and heated with a large excess of C_5H_5N a ppt. of $[Cd(C_5H_5N)_4(CNS)_2]$ is obtained (cf. Spacu and Dick, A., 1928, 499). After cooling the ppt. is collected and dried for 20 min. in a vac. desiccator. It is insol. in C_5H_5N and contains 20.63% Cd.   F. N.

Determination of lead by the chromate method. F. Grote (*Z. anal. Chem.*, 1941, **122**, 395—398).—2 equivs. of $0.5N$-$K_2Cr_2O_7$ in AcOH is added to boiling $Pb(OAc)_2$ in AcOH, boiled for 10 min., and filtered after 2 hr.; the ppt. is washed with hot distilled H_2O, and dried for 1 hr. at 105° and 2 hr. at 160°. CrO_4'' is held by the ppt. The empirical factor is 0.6378 (± 0.0005); agreement with the sulphate method is then obtained (to $\pm 0.05\%$).   S. A. M.

Analysis of lead [accumulator] paste.—See B., 1943, I, 350.

Quinaldinic acid as a reagent for the separation of copper and cadmium. A. K. Majumdar (*Analyst*, 1943, **68**, 242—244; cf. A., 1940, I, 81).—A reply to criticisms by Lindsay and Shennan (A, 1941, I, 57).   S. B.

Separation of copper and cadmium by means of quinaldinic acid. C. F. Pritchard and R. C. Chirnside (*Analyst*, 1943, **68**, 244).—The results given by Majumdar (preceding abstract) are confirmed. X-Ray and chemical examination indicate that no co-pptn. of Cd with Cu occurs.   S. B.

Substituted amides of dithiocarbonic acid as reagents for Cu'' ions. E. Geiger and H. G. Müller (*Helv. Chim. Acta*, 1943, **26**, 996—1003). —With $NRR'·CS_2H$ Cu'' forms coloured salts which give yellow-brown solutions. The salts are formed immediately and in true solutions which are stable. For the detection of Cu'' in aq. solutions an alcoholic solution of diethanolamine NN-di-β-hydroxyethyl-carbamate is used. Cu NN-di*iso*amyl- and NN-diethyl-dithio-carbamate can be removed from aq. solution by CCl_4. *Cu NN-di-β-hydroxyethyldithiocarbamate* decomposes at 169°.   H. W.

Copper content of sea-water. P. S. Galtsoff (*Ecology*, 1943, **24**, 263—265).—$NEt_2·CS_2Na$ is the most sensitive reagent for Cu but the [Cu] in sea-H_2O is < the concn. which permits an accurate determination. The use of a photometer does not greatly increase the accuracy because of the high corrections that have to be employed. In the localities studied the Cu content of sea-H_2O was rarely >0.02 mg. per l.   L. G. G. W.

Rapid photometric determination of copper in ferrous [alloy] materials.—See B., 1943, I, 376.

Rapid volumetric determination of copper in presence of much tin and of iron and tin.—See B., 1943, I, 376.

Determination of small amounts of aluminium in water by means of hæmatoxylin.—See B., 1943, III, 228.

Spectrochemical procedure in clay analysis.—See B., 1943, I, 370.

Identification of rust on iron and steel. R. O. Clark (*Ind. Eng. Chem. [Anal.]*, 1943, **15**, 464—465).—Gelatin paper (prep. from photographic paper described) moistened with H_2O will remove sufficient rust for identification purposes without affecting the metal. The paper is pressed against the specimen, removed, and the pattern of the rusted surface developed by immersion in 10% HCl containing 0.05% of $K_4Fe(CN)_6$. Sulphide films from Cu or Pb are not removed by this treatment.   L. S. T.

Microscopical identification of ferrous sulphate in mixtures. G. L. Keenan and W. V. Eisenberg (*J. Assoc. Off. Agric. Chem.*, 1943, **26**, 256—257).—Partly dried crystals are detected by the min. and max. n (1.525, 1.539) of fragments showing max. double refraction with crossed nicols. After recrystallisation from a drop of H_2O the $FeSO_4,7H_2O$ has n_α 1.471, n_β 1.478, n_γ 1.486.   A. A. E.

Use of perchloric acid in analysis of alloys of the iron group.—See B., 1943, I, 376.

Determination of nickel salts by means of the Zeiss dipping refractometer. P. Csokán (*Z. anal. Chem.*, 1941, **121**, 29—38).—Data relating refraction to concn. are tabulated for 0.1—1.2M. solutions of $NiCl_2,6H_2O$ and $Ni(NO_3)_2,6H_2O$ at 17.5°. Temp. corrections for the range 0—30° are also recorded.   L. S. T.

Determination of small amounts of molybdenum in tungsten and molybdenum ores.—See B., 1943, I, 378.

Analysis of tunsten carbide tips.—See B., 1943, I, 378.

Determination of quadrivalent tin. E. Eegriwe (*Z. anal. Chem.*, 1940, **120**, 81—84).—1 drop of 1 : 2 : 7-trihydroxyanthraquinone in MeOH (0.1 g. in 100 c.c.) is added to 1 drop of the Sn solution in HCl (yellow colour), then dropwise 7.5% aq. $(NH_4)_2CO_3$ until basic (red colour), followed by AcOH (33 vol.-%) until acid (orange to orange-red colour or ppt.). 0.2 μg. Sn in 1 drop of solution can be detected.   F. N.

α-Picoline methiodide as a reagent for bismuth. K. Whelan and F. J. Welcher (*J. Chem. Educ.*, 1943, **20**, 246—248).—Aq. α-picoline methiodide (prep. described) gives an orange colour or ppt. with Bi''' (limit of identification 0.002 mg. per ml., or 0.4 μg. per drop). Ag' and Hg_2'' must be removed by HCl; Cu'', Fe''', and other oxidising substances interfere by liberating I, and must be removed. Small amounts of Pb, Hg'', Ag, and Sn'' do not interfere, but large amounts must be removed by the usual group procedure.   L. S. T.

Detection of gold in plating.—See B., 1943, I, 377.

XI.—APPARATUS ETC.

Theory of the electric arc furnace. II. P. Drossbach (*Z. Elektrochem.*, 1940, **46**, 668—669; cf. A., 1943, I, 238).—The theory is extended to make allowance for superheating of the melt.   R. KE.

Vapour thermoregular [for accurate temperature control of small, insulated rooms]. J. Y. Yee (*Ind. Eng. Chem.* [*Anal.*], 1943, **15**, 462—463).   L. S. T.

Simple method of demonstrating the decrease of specific heat of a solid at low temperatures. F. H. Müller (*Physikal. Z.*, 1940, **41**, 296—297).—A Ni disc attached to a thermo-element is placed inside a Dewar flask and light from an arc lamp is focussed on it. Liquid air is then poured into the vessel, and the time for which the disc must be illuminated for the galvanometer to indicate the same swing as when the vessel was empty is determined.   A. J. M.

Actinic value of light sources. H. Korte and W. Meidinger (*Physikal. Z.*, 1940, **41**, 305—307).—Comparisons of the actinic val. of a DIN light source, a Nitra-lamp, and a Hg-vapour lamp have been made.   A. J. M.

Use of a rotation-dispersion stationary filter. F. Gabler (*Physikal. Z.*, 1940, **41**, 339—341).—The use of such a filter for investigating double refraction or optical and magnetic rotations is described.   A. J. M.

Refractive power of absorbing liquids. H. Littmann (*Physikal. Z.*, 1940, **41**, 442—447).—Methods of determining n for absorbing liquids are discussed.   A. J. M.

Fibre refractometer.—See B., 1943, II, 281.

Applications of near infra-red spectrophotometry.—See B., 1943, II, 302.

Measurement of anomalous dispersion in opaque dielectrics. A. W. Lawson (*Rev. Sci. Instr.*, 1943, **14**, 38—43).—A method for measuring n of opaque materials as a function of λ is based on the determination of Brewster's angle of reflexion of polarised light from a polished surface.   J. L. E.

Measurement of angular domains of reflexion in polycrystalline samples. A. Reis (*Amer. Min.*, 1942, **27**, 231).—An outline of the method used is given. Systematic study of imperfections in crystal structure can be made.   L. S. T.

Briquetting press and electrode loader for spectrochemical analysis. H. C. Harrison and C. C. Ralph (*Ind. Eng. Chem.* [*Anal.*], 1943, **15**, 466—467).   L. S. T.

Improved salt bridge for polarographic and potentiometric measurements. D. N. Hume and W. E. Harris (*Ind. Eng. Chem.* [*Anal.*], 1943, **15**, 465).—The calomel electrode is connected to the cell by ordinary rubber tubing filled with saturated KCl. The tubing ends with a short length of glass tubing filled wth 3% agar gel saturated with KCl.   L. S. T.

Electrometric apparatus for use with the Karl Fischer method for determination of water. C. D. McKinney, jun., and R. T. Hall (*Ind. Eng. Chem.* [*Anal.*], 1943, **15**, 460—462).   L. S. T.

Electrophoresis of colloids under war-time conditions. K. G. Stern (*Rev. Sci. Instr.*, 1943, **14**, 187).—A summary of simplified technique, the use of substitutes, and extended applications of the Tiselius type apparatus.   N. M. B.

Voltage stabiliser for electron diffraction power supply. S. H. Bauer, J. M. Hastings, and D. P. MacMillan (*Rev. Sci. Instr.*, 1943, **14**, 30—32).—The circuit and performance characteristics of a simple degenerative type high-voltage stabiliser in which the regulator is inserted in the positive side of the high-voltage line is described, the design being particularly applicable to electron diffraction power supplies.   J. L. E.

Measuring small electric charges. R. M. Showers (*Rev. Sci. Instr.*, 1943, **14**, 35—37).—An apparatus consisting of two ionisation chambers, an electrometer tube the grid of which is disconnected during the X-ray exposure, and a specially designed shielded switch has been constructed for measuring electric charges ~1.5×10^{-11} coulomb with an accuracy of $\pm 1\%$. It is designed to measure the ionisation produced in air by roentgenographic apparatus.   J. L. E.

Improved cosmic-ray radio sonde. W. H. Pickering (*Rev. Sci. Instr.*, 1943, **14**, 171—173).—The instrument described embodies a new means of modulating the transmitter, a new receiver, and a new recorder, enabling the scaling down of the cosmic-ray counts to be done at the ground station instead of at the transmitter.   N. M. B.

New switching device for a counter worked by a thyratron. J. Schintlmeister and W. Czulius (*Physikal. Z.*, 1940, **41**, 269—271).—A circuit for switching out the thyratron in a counter apparatus is given.   A. J. M.

Synchronised calibrator for sweep and gain in cathode-ray recording. S. A. Talbot (*Rev. Sci. Instr.*, 1943, **14**, 184—186).—The circuit comprises an oscillator and multivibrator generating three timing scales suited to calibrate a wide range of sweep speeds. A square pulse with adjustable duration is provided to calibrate the gain and to record the frequency characteristics of an amplifier. Both calibrations are synchronised with the sweep.   N. M. B.

Electrodynamic determination of the magnetic moment of plates. E. T. Benedikt (*Rev. Sci. Instr.*, 1943, **14**, 43—45).   J. L. E.

Gas burette with mechanical reduction of the gas volume to normal conditions. R. Thilenius (*Z. anal. Chem.*, 1941, **122**, 385—395).—The gas is measured, over H_2O, at the same temp. and pressure as that in a compensating vessel containing H_2O and the quantity of air which, if dry, would exert 760 mm. at 0°.   S. A. M.

Theory of chromatography. J. Weiss (*J.C.S.*, 1943, 297—303).—The theory of the formation of the chromatogram in a column of an adsorbent from a single substance and the process of development is discussed for several adsorption isotherms (linear, Langmuir, and Freundlich). The theory assumes practically instantaneous equilibrium between solution and adsorbent, but non-equilibrium conditions are also mentioned. The structure and shape of the band are discussed.   A. J. M.

Experimental study of chromatography. H. Weil-Malherbe (*J.C.S.*, 1943, 303—312).—A quant. investigation of the phenomena associated with chromatography has been made for the simplest type of system, where there is one adsorbent (SiO_2 gel or Al_2O_3), one adsorptive (usually benzpyrene), and one solvent. The vol. of adsorptive in the filtrate was plotted against the total vol. of filtrate. The shape of the elution curve thus obtained is discussed. It is sigmoid in form, and its shape depends on the adsorbent used. It also depends on the exponential coeff. α of the Freundlich adsorption isotherm. If α is ~1, the curve is approx. symmetrical, but if α is <1, it shows a tail. The shape of the adsorption column has some effect, but it is not crit. The mean concn. of the eluate is $\propto 1/V_t$ ($V_t = $ "threshold vol.," the vol. of filtrate collected up to the beginning of elution). The variation of V_t with vol. and concn. of the original solution and the quantity of adsorbent was studied. The results are discussed in relation to the theory of Weiss (see preceding abstract).   A. J. M.

Recommended specifications for microchemical apparatus. Correction in the design of the Dumas nitrogen stopcock. G. L. Royer, H. K. Alber, L. T. Hallett, and J. A. Kuck (*Ind. Eng. Chem.* [*Anal.*], 1943, **15**, 476; cf. A., 1941, II, 385).   L. S. T.

Simple micro-filtration apparatus. A. G. Howkins (*Chem. and Ind.*, 1943, 291).—The apparatus described is a boiling tube with a constriction near the open end which is opened out to form a funnel into which is ground a filter-funnel and a side-arm sealed on below the constriction.   F. R. G.

Glass laboratory pump for gases or liquids. W. T. Olson and R. A. Spurr (*Ind. Eng. Chem.* [*Anal.*], 1943, **15**, 467).—The pump delivers gas at 250 ml. per min. against a head of 1 cm. of Hg; the limiting head for gas is 25 cm. of Hg.   L. S. T.

Spot plate for drop tests. P. W. West (*Ind. Eng. Chem.* [*Anal.*], 1943, **15**, 475).—Half of the white depressions are glazed black to permit examination of ppts. and coloured solutions.   L. S. T.

Delivery of liquids at low and constant rates. E. C. Page, jun., and J. C. Whitwell (*Ind. Eng. Chem.* [*Anal.*], 1943, **15**, 435—437).—Apparatus for the delivery of small batches of fluid at low and const. rates is presented. An equation useful in designing a unit of proper size for any desired installation is given.   L. S. T.

Viscometers.—See B., 1943, I, 349.

Apparatus for automatic determination of cadmium in the bath electrolyte of zinc plants.—See B., 1943, I, 377.

Apparatus for storage and use of carbonate-free alkalis. B. S. Van Zile, R. H. Moult, and E. W. Blank (*Oil and Soap*, 1943, **20**, 122).—CO_2''-free alkali is siphoned into a bottle swept free from CO_2 by air drawn over ascarite. The tip of a burette, similarly swept, is inserted in the rubber collar of the filling tube, and filled in the usual way.   E. L.

Easily-constructed precision m.p. apparatus [and valve for regulating the flame of a micro-burner]. E. O. Holmes, jun. (*J. Chem. Educ.*, 1943, **20**, 239—240).   L. S. T.

Hydrogen sulphide generator (Kipp principle). C. J. Heimerzheim (*J. Chem. Educ.*, 1943, **20**, 136).   L. S. T.

Portable gas generator. R. Sutcliffe (*Chem. and Ind.*, 1943, 310).—A modified small-type Kipp apparatus is described.   S. M.

Method of increasing the sensitivity of Bourdon gauges. S. Barnartt and J. B. Ferguson (*Rev. Sci. Instr.*, 1943, **14**, 46—47).—The sensitivity of concavo-convex Bourdon gauges has been increased by a factor of 545 by using an optical lever system, thus enabling direct pressure measurements to the nearest 0·005 mm. of Hg to be made.   J. L. E.

Ring method for measuring elastic moduli. A. King (*Rev. Sci. Instr.*, 1943, **14**, 33—34).—The mathematical theory of the ring method for measuring shear moduli of wire specimens is presented,

experimental results obtained for Cu and Mo wires agreeing with those obtained by the torsion pendulum method. J. L. E.

Cutting wide-bore glass tubing and glass bottles. A. G. Lipscomb (*Chem. and Ind.*, 1943, 303).—Friction by a loop of string around the glass is applied until the string scorches, H_2O is at once poured over the hot point, and a clean fracture is obtained. N. M. B.

Indicator for the level of liquids. A. D. Power (*Rev. Sci. Instr.*, 1943, **14**, 188).—For liquid surfaces which cannot be observed visually (*e.g.*, liquid air) the movement of coloured oil in a U at the top of a vertical glass tube can be used. An alternative method depends on the change of resistance with temp. of a fine wire coil connected to a lamp and cell; the lamp glow indicates contact of the coil and liquid surface. N. M. B.

Liquid flow at small constant rates. R. O. King and R. R. Davidson (*Canad., J. Res.* 1943, **21**, A, 65—67).—Two forms of apparatus are described whereby a very small const. flow of liquid is maintained by the pressure of gas produced by electrolysis of $Ba(OH)_2$ at const. temp. A. Li.

Automatic recording devices used in medical research. J. Gorrell (*Trans. Electrochem. Soc.*, 1943, **83**, Preprint 22, 253—258).—The monodrum and the dualdrum are described in detail. A stylus attached to a lever and actuated by changes in liquid level, pressure, etc. automatically records the changes on a moving strip of paper. The speed of the paper can be varied over a wide range. The suitability of types of stylus and paper is discussed. C. E. H.

[Apparatus for] laboratory hot air blast. R. E. Dunbar (*J. Chem. Educ.*, 1943, **20**, 130). L. S. T.

Improved Kundt's tube. M. B. Reynolds (*J. Chem. Educ.*, 1943, **20**, 121—122).—An electrical set-up is described. L. S. T.

Molecular still of new design. F. W. Quackenbush and H. Steenbock (*Ind. Eng. Chem. [Anal.]*, 1943, **15**, 468—470).—Construction and performance of a glass-surfaced cyclic still for use in purifying large or small quantities of material are described. L. S. T.

Vacuum distillation equipment for volatile solids. L. Bolstad and R. E. Dunbar (*Ind. Eng. Chem., [Anal.]*, 1943, **15**, 464). L. S. T.

Vacuum sublimation and molecular distillation apparatus. B. Riegel, J. Beiswanger, and G. Lanzl (*Ind. Eng. Chem. [Anal.]*, 1943, **15**, 417—421).—The mol. distillation and vac. sublimation apparatus described for laboratory use consists of a manifold maintained at 10^{-5} mm. and an auxiliary degassing line. The manifold is equipped with openings of different sizes for use with different stills the design of some of which is described. L. S. T.

Vacuum sublimation. M. H. Hubacher (*Ind. Eng. Chem. [Anal.]*, 1943, **15**, 448—450).—Apparatus for sublimation on a macro-scale, and its application to the separation of pharmaceutical products and the determination of the rates of sublimation of numerous org. substances, are described. L. S. T.

Nomograph for the estimation of the activation energies of unimolecular reactions. E. Warwick (*J. Chem. Educ.*, 1943, **20**, 134—135). L. S. T.

Graphical method of calculating pH in acid, base, and salt solutions. H. Flood (*Z. Elektrochem.*, 1940, **46**, 669—576).—A graphical method of calculating pH, applicable to acids, bases, salts, amphoteric electrolytes, and buffer solutions, is described. Examples given are aq. NH_3, H_2CO_3, NH_4HCO_3, $(NH_4)_2CO_3$, and $AcOH$–OAc' buffer solutions. R. Ke.

XIII.—GEOCHEMISTRY.

X-Ray study of diamonds artificially prepared by J. B. Hannay in 1880. F. A. Bannister and (Mrs.) K. Lonsdale (*Min. Mag.*, 1943, **26**, 315—324).—The minute ($\frac{1}{2}$ mm.) crystals of diamond prepared by Hannay (A., 1880, 707; 1881, 1019; 1882, 218) were identified by Story-Maskelyne (*Chem. News*, 1880, **41**, 97; *Nature*, 1880, **22**, 404) and this determination is now confirmed by *X*-ray examination of the original material preserved in the British Museum. One of the 12 fragments proves to be the rare type II with lamellar and mosaic structure of Robertson *et al.* (A., 1934, 583; 1937, I, 166). L. J. S.

Minyulite (hydrous K Al fluophosphate) from South Australia. L. J. Spencer, F. A. Bannister, M. H. Hey, and (Miss) H. Bennett (*Min. Mag.*, 1943, **26**, 309—314).—Minute crystals lining cavities in rock phosphate from Noarlunga were determined in 1908 to be orthorhombic and evidently a new mineral. They are now identified with minyulite, described by Simpson and LeMesurier in 1933 from Minyulo Well, Western Australia (A., 1935, 1479), and a new analysis confirms the formula $KAl_2(PO_4)_2(OH,F),4H_2O$. Additional data are ρ 2·46, n_a 1·525, n_γ 1·530; the unit cell, a 9·35, b 9·74, c 5·52 A. $(a : b : c = 0·960 : 1 : 0·567)$, contains two mols.; space-group C_{2v}^1. Previous analyses of K Al phosphates are tabulated; some contain also $(NH_4)_2O$, indicating val. as plant fertilisers. L. J. S.

Cheviot granite. A. G. Jhingran (*Quart. J. Geol. Soc.*, 1942, **98**, 241—254).—The different varieties of granite are described. Modal and chemical analyses and variation diagrams are given. L. S. T.

Graphic granite. W. T. Schaller (*Amer. Min.*, 1942, **27**, 233).—In usual specimens from New Hampshire and California, the quartz has been completely removed without any change in the microcline. L. S. T.

The Cnoc nan Cuilean area of the Ben Loyal igneous complex. B. C. King (*Quart. J. Geol. Soc.*, 1942, **98**, 147—185).—The rocks, their metasomatism, rheomorphism, and hybridism are described, and chemical analyses given. L. S. T.

Mutual melting relations of pyroxenoids, melilites, and olivines in the quaternary system CaO–FeO–Al_2O_3–SiO_2. J. F. Schairer (*Amer. Min.*, 1942, **27**, 233).—Liquidus data for five planes (joins) through a tetrahedron representing this system have been completed. The joins studied are SiO_2–anorthite (I)–FeO, (I)–Al_2O_3–FeO, $CaSiO_3$–(I)–FeO, gehlenite–(I)–FeO, and $CaSiO_3$–(I)–FeO. The data give the approx. temp. and locations of 11 of the quaternary invariant points. L. S. T.

X-Ray crystallography of burkeite, $2Na_2SO_4,Na_2CO_3$. L. S. Ramsdell (*Amer. Min.*, 1942, **27**, 230—231).—Rotation and Weissenberg photographs of single crystals of synthetic burkeite indicate an orthorhombic cell with a_0 5·16, b_0 9·21, and c_0 7·05 A. The cell indicated, viz., 4/3 $(2Na_2SO_4,Na_2CO_3)$, is only a pseudo-cell; the true unit cell probably has 12 formula wts. L. S. T.

Structural relations between high- and low-chalcocite. M. J. Buerger and N. W. Buerger (*Amer. Min.*, 1942, **27**, 216—217).—Investigation of Bristol chalcocite by the equi-inclination Weissenberg technique at 112° gives a_0 3·89, c_0 6·68 A.; probable space-group $C6/mmc$, with $2Cu_2S$ in the unit cell. A structure composed of S atoms in hexagonal close-packing with Cu flowing within interstitial channels is suggested. Investigation at room temp. shows that low-chalcocite (I) contains 96 Cu_2S, and has a_0 11·90, b_0 27·28, c_0 13·41 A.; probable space-group $Ab2m$. The structure is based on hexagonal close-packed S atoms with Cu in fixed positions in the interstices. The multiplicity of the superstructure of (I) is 24. L. S. T.

Unit cell and space-group of kaliophilite. J. S. Lukesh and M. J. Buerger (*Amer. Min.*, 1942, **27**, 226—227).—The hexagonal nature of the cell and the lattice consts. as determined by Bannister are confirmed; a_0 is 26·94 A. and c_0 8·55 A.; space-group $C6_32$ (D_6^6). ρ 2·60 gives 54 $KAlSiO_4$ per unit cell. L. S. T.

Mafic and ultramafic rocks of the Baie Verte area, Newfoundland. K. de P. Watson (*J. Geol.*, 1943, **51**, 116—130).—Field relationships, petrography, and chemical analyses of a group of igneous rocks characteristic of geosynclinal belts, viz., greenstone, ultramafics, and gabbro, that occurs in this area are discussed. L. S. T.

New Almaden [mercury] mine, the first chemical industry in California. H. M. Leicester (*J. Chem. Educ.*, 1943, **20**, 235—238). L. S. T.

Structure and metamorphism of Early Precambrian rocks between Gordon and Great Slave lakes, North West Territories. J. F. Henderson (*Amer. J. Sci.*, 1943, **241**, 430—446).—The Yellowknife group of Early Precambrian rocks, consisting of lavas overlain by graywackes and slates, has undergone at least two stages of metamorphism and deformation. The chloritic graywackes and slates were invaded by granite batholiths that thermally metamorphosed them over wide areas to knotted quartz-mica schist and hornfels. L. S. T.

Greenockite from Llallagua, Bolivia. S. G. Gordon (*Not. Naturæ*, 1939, No. 1, 6 pp.).—Greenockite from the Sn mines of this locality is described and illustrated; it is remarkable for its red colour and cyclic twinned crystals. L. S. T.

Thorium-free monazite from Llallagua, Bolivia. S. G. Gordon (*Not. Naturæ*, 1939, No. 2, 6 pp.).—The monazite, ρ 5·173, a 1·785, β 1·787, γ 1·840 (all $\pm 0·005$), occurs in the Sn mine as flesh-pink, coarse granular aggregates of crystals intergrown with cassiterite. Spectrographic and radioactivity evidence shows that Th is absent. A chemical analysis is recorded. L. S. T.

Slavikite, butlerite, and parabutlerite from Argentina. S. G. Gordon (*Not. Naturæ*, 1941, No. 89, 8 pp.).—Occurrences, crystallography, and physical and optical properties are described. A chemical analysis of slavikite is recorded. L. S. T.

Magnetic properties of magnetites.—See A., 1943, I, 252.

X-Ray study of chrysotile asbestos. B. E. Warren (*Amer. Min.*, 1942, **27**, 235).—A ribbon structure involving long but narrow Si_4O_{10} sheets is more probable than that of Si_4O_{11} chains previously proposed. $Si_2O_5Mg_3(OH)_4$ has a Si : O ratio indicating a sheet structure, and it was only the fibrous nature of the material which suggested a chain structure. Chrysotile from Thetford Mines gives reflexions indicating a monoclinic cell with a_0 14·66, b_0 9·24, c_0 5·33 A., and β 93° 16′, with c the fibre axis. The most obvious layer structure is one built up by the sequence 3O, 2Si, 2OOH, 3Mg, 3OH. Diffuse reflexions are due to randomness in the stacking together of successive layers. L. S. T.

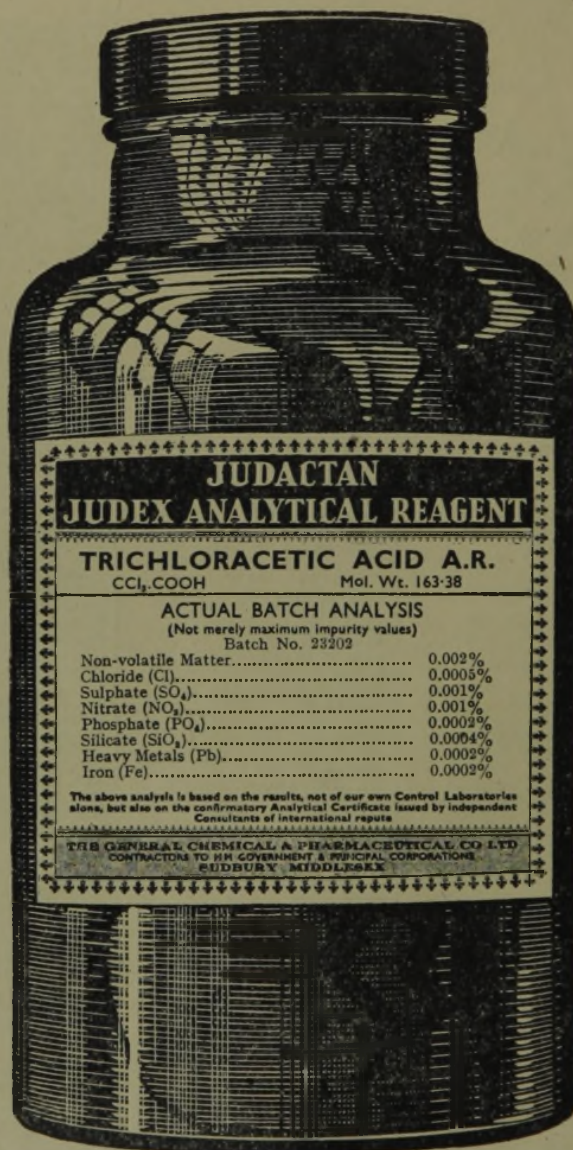# INDEX OF AUTHORS' NAMES, A., I.

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