BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS

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JULY, 1943

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

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

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I.—SUB-ATOMICS.

Atomic spectra of rare earth elements. W. F. Meggers (*Rev. Mod. Physics*, 1942, **14**, 96—103).—The ground states and ionisation potentials of rare earth elements, as known at present, are collected and discussed, and lines of future investigation are indicated. A. J. M.

Absorption spectra of potassium, rubidium, and cæsium. H. R. Kratz and J. E. Mack (*Rev. Mod. Physics*, 1942, **14**, 104).—The long optical path needed to reduce resonance broadening was obtained by repeated traversal between a concave spherical mirror at one end of an Fe tube and a totally-reflecting prism at the other. It was possible to resolve the principal series doublets to the 14th member for K, the 22nd for Rb, and the 15th for Cs. Unresolved higher members were recorded to the 76th member for K, the 73rd for Rb, and the 66th for Cs. The doublet separations agree with the inverse cube law. It was not possible to deduce a Ritz formula to cover the principal series of K. A. J. M.

Direct determination of the charge of the β-particle. Y. Beers (*Physical Rev.*, 1943, [ii], **63**, 77—85; cf. A., 1941, I, 22).—The charge of Ra-*E* β-particles was determined by measuring the charge carried per sec. by a magnetically analysed beam and then, after the beam had been reduced by a known fraction by the decay of the source, by counting the no. of particles per sec. in the beam. The average val. obtained was $-4{\cdot}80_0 \pm 0{\cdot}03_5 \times 10^{-10}$ e.s.u., in agreement with the accepted val. The observed half-life of Ra-*E* was $4{\cdot}99_0$ days. No dependence of charge or half-life on $H\rho$ was detected. N. M. B.

Simple method of investigating secondary electrons excited by γ-rays and the interference of these electrons with measurements of primary β-ray spectra. L. Meitner (*Physical Rev.*, 1943, [ii], **63**, 73—76, 384).—The special directional distribution of the Compton electrons can be used to obtain their absorption curve and upper energy limit without coincidence measurements, and this must be taken into account in studying primary β-spectra by absorption measurements. The complexity of the primary β-ray spectrum of ^{59}Fe (cf. Livingood, A., 1938, I, 427) is apparently due to the interference of secondary electrons. N. M. B.

Positive and negative point-to-plane corona in pure and impure hydrogen, nitrogen, and argon. G. L. Weissler (*Physical Rev.*, 1943, [ii], **63**, 96—107).—In accordance with theory, no pre-onset streamers or burst pulses were observed in pure H_2 and N_2. At high fields weak streamers developed which ultimately led to breakdown. Adding traces of O_2 to H_2 or N_2 at once produced weak pre-onset streamers, and at higher concns. produced burst pulses. Trichel pulses are not observed in pure H_2 and N_2, but are at once produced on addition of traces of O_2; potentials for negative corona are < for positive corona. For A, with positive point potential, the first streamer formed caused spark breakdown, and with negative point potential a heavy arc replaced the corona. Contamination of the A with H_2 or N_2 introduced streamers for the positive corona, similar to those in air, an effect attributed to the suppression of metastable atoms in A by the impurity. For the negative corona, 0·1—0·5% of H_2 or N_2 prevented arcing and yielded a strong corona with glow discharge characteristics but no Trichel pulses. Addition of sufficient O_2 causes A to act in all respects like air except that the onset potentials were ≪ in air. A clean-up of impurities in the negative corona in H_2 is due to formation and absorption of H_2O vapour. N. M. B.

Theory of the magnetron. III. L. Brillouin (*Physical Rev.*, 1943, [ii], **63**, 127—136; cf. A., 1942, I, 381).—Mathematical. N. M. B.

Theory of α-ray counting from solid sources. N. B. Keevil and W. E. Grasham (*Canad. J. Res.*, 1943, **21**, **A**, 21—36).—Theory for thin sources of at. dimensions, for layers of equiv. thickness < the range of the particle, and for thick sources is developed. For α-ray counting from rocks which normally contain 25 α-ray emitters, resultant equations and curves are given which can be used directly in computing actual emission from observed count. A test of the theory by experimental results on granite is given. N. M. B.

Search for element no. 87. F. R. Hirsh, jun. (*Physical Rev.*, 1943, [ii], **63**, 93—95; cf. A., 1937, I, 274).—With fluorescent $CsHSO_4$ from lepidolite (**I**) in which free Tl has been found, there was no trace of the $La_{1,2}$ *X*-ray lines of element 87 in fluorescence spectra. There is evidence that the free Tl is derived from unstable element 87 atoms which had been present in the (**I**) mol. N. M. B.

Inelastic scattering of protons. R. H. Dicke and J. Marshall, jun. (*Physical Rev.*, 1943, [ii], **63**, 86—90).—Protons scattered at 135° by a thin foil are detected by a proportional counter feeding a scaling circuit biased to count only the large pulses resulting from slowly moving protons. Al stopping foils slow down the scattered protons so that protons of a particular energy group move through the counter slowly and are counted. The no. of these plotted against thickness of stopping foil gives a curve in which peaks represent different proton energy groups. Well-defined peaks corresponding with inelastically scattered protons are illustrated with curves and data for Al, Cr, Mg, and S, and excitation energies are computed. N. M. B.

Radioactive isotopes of lanthanum. (Miss) K. E. Weimer, M. L. Pool, and J. D. Kurbatov (*Physical Rev.*, 1943, [ii], **63**, 67—72).—^{140}La, previously produced by deuteron and slow-neutron bombardment of La, has been produced by the reaction ^{140}Ce (*n*, *p*) ^{140}La; the half-life is $40{\cdot}0 \pm 0{\cdot}3$ hr. There is evidence of the reaction ^{138}Ba (*d*, *y*) ^{140}La. ^{140}La decays with emission of $1{\cdot}41 \pm 0{\cdot}05$-Me.v. electrons and $2{\cdot}00 \pm 0{\cdot}05$-Me.v. γ-rays. Deuteron or proton bombardment of Ba produces a new activity of half-life $17{\cdot}5 \pm 0{\cdot}5$ hr., assigned to ^{137}La, and decaying by *K*-electron capture with emission of *X*-rays identified as characteristic *K*-radiation of Ba. The presence of a low-intensity $0{\cdot}88 \pm 0{\cdot}1$-Me.v. γ-ray indicates that the resulting Ba nucleus may be left in an excited state. N. M. B.

γ-Rays from ^{76}As. C. E. Mandeville (*Physical Rev.*, 1943, [ii], **63**, 91—93).—The recoil electron spectrum of the γ-rays from ^{76}As, examined in a magnetic spectrograph (cf. A., 1943, I, 47), is composed of two electron groups corresponding with energies $0{\cdot}83 \pm 0{\cdot}02$ and $1{\cdot}94 \pm 0{\cdot}04$ Me.v., and intensity ratio 3·8 : 1. Results suggest excitation levels at 0·8 and 2·8 Me.v. in the ^{76}Se residual nucleus. N. M. B.

Specific primary ionisation of cosmic rays in helium. W. E. Hazen (*Physical Rev.*, 1943, [ii], **63**, 107—110).—A magnetic field allowed separation of 46 cosmic-ray tracks in cloud-chamber photographs into a group of 21 electrons with energies near the min. ionisation energy and with a mean ionisation of $7{\cdot}33 \pm 0{\cdot}12$ per cm., and 25 mesotrons with energies > the min. ionisation energy and with $7{\cdot}23 \pm 0{\cdot}12$ per cm. mean ionisation, compared with the expected val. 8·80 ions per cm., taking into account a logarithmic rise of ionisation with energy. The experimental min. sp. primary ionisation in He (corr. for ionisation in the vapour) is $6{\cdot}5 \pm 0{\cdot}1$ at n.t.p. N. M. B.

Thermal equilibrium between elementary particles. G. Wataghin (*Physical Rev.*, 1943, [ii], **63**, 137).—Mathematical considerations, in extension of an earlier study (cf. A., 1934, 712), arising from recent papers on the prestellar stage of the universe. N. M. B.

Physical theory of comets in the light of spectroscopic data. N. T. Bobrovnikoff (*Rev. Mod. Physics*, 1942, **14**, 164—178).—The problems raised by new spectroscopic data concerning comets are discussed. An extensive bibliography is given. A. J. M.

II.—MOLECULAR STRUCTURE.

Emission spectrum of the ion CO_2^+. S. Mrozowski (*Rev. Mod. Physics*, 1942, **14**, 216—218).—The emission spectrum of CO_2^+ and its analysis are discussed. A selection rule of unknown nature appears to operate. A. J. M.

Molecular bands in cometary spectra. Identifications. P. Swings (*Rev. Mod. Physics*, 1942, **14**, 190—194).—Bands due to OH, NH, CN, CH, C_2, CH^+, CO^+, and N_2^+ have been identified in cometary spectra. Identification is hampered by the peculiar intensity distributions found. Work on the identification of the λ 4050 A. group of strong lines is reviewed, the most satisfactory conclusion being that it is due to CH_2. A. J. M.

Intensity measurements on emission bands in cometary spectra. A. McKellar (*Rev. Mod. Physics*, 1942, **14**, 179—189).—The excit-

ation of cometary bands is discussed, with particular reference to the excitation of CN, CH, and C_2 in the cometary nucleus and head. Intensity measurements on bands in the spectra of comets 1939*d* and 1940*c* are given. There is considerable evidence that the CN bands are produced by the absorption and subsequent re-emission of solar radiation of their own λ. The brightness and form of the CN bands are related to the radial velocity of the comet with respect to the sun. The intensity distributions differ considerably from smooth, low-temp. distributions of the Boltzmann type. A. J. M.

Evidence for the presence of CH_2 molecules in comets. G. Herzberg (*Rev. Mod. Physics*, 1942, **14**, 195—197).—The structure of the λ 4050 A. group of strong lines in cometary spectra agrees most satisfactorily with its assignment to CH_2. Such a group can be produced in the laboratory in a discharge through rapidly streaming CH_4. A. J. M.

***l*-Type doubling in linear polyatomic molecules.** G. Herzberg (*Rev. Mod. Physics*, 1942, **14**, 219—223).—The infra-red spectra of C_2H_2, HCN, and CO_2 give evidence of a splitting of the Π vibrational levels into two components, which is called *l*-type doubling. The evidence is summarised for C_2H_2, and further evidence is added for HCN and CO_2. The existence of the *l*-type doubling explains the fact that the fundamental bands of HCN and C_2H_2 do not show a convergence of the *P* and *R* branches, whilst the *Q* branch is distinctly shaded to shorter λλ. A preliminary theoretical discussion is given. The rotational consts. of CO_2 have been re-evaluated, *l*-type doubling being taken into account. The moment of inertia, $I_e = 71{\cdot}67 \times 10^{-40}$ g.-cm.^{2}, and the C—O distance $r_e = 1{\cdot}1615$ A. A. J. M.

***l*-Type doubling in linear polyatomic molecules.** H. H. Nielsen and W. H. Shaffer (*J. Chem. Physics*, 1943, **11**, 140—144).—Mathematical. Certain Coriolis interaction terms in the rotation–vibration Hamiltonian of a linear polyat. mol. give second-order contributions to the energy which remove degeneracy of *l*-levels of internal angular momentum arising from a doubly degenerate perpendicular mode of oscillation. This is called "*l*-doubling," and exists for all states having a quantum no. $l_k \neq 0$. It is likely that only in Π vibration states is the effect large enough to be of importance in spectral interpretation. The *l*-type splitting must also occur in perpendicular states of axially symmetrical mols. A. J. M.

Vibrational frequencies of isotopic water molecules; equilibria with the isotopic hydrogens. W. F. Libby (*J. Chem. Physics*, 1943, **11**, 101—109).—The fundamental frequencies, anharmonicities, and vibrational modes for the mols. HDO, HTO, DTO, and T_2O are calc. on the basis of the analysis of the vibrational spectrum of H_2O made by Dennison and Darling (A., 1940, I, 146). The isotopic equilibria between "water" and "H_2" mols. are examined and the equilibrium consts. for nine reactions between H_2O, D_2O, T_2O, HD, HT, and DT are evaluated. Experimental vals. for the reactions $HD + H_2O = H_2 + HDO$ and $HT + H_2O = H_2 + HTO$ are compared with the calc. vals. The results indicate the validity of the assumption that the vibrational potential function of a mol. is independent of the isotopic composition of its constituent elements. A. J. M.

Absorption of infra-red radiation by water vapour and carbon dioxide. M. McCaig (*Phil. Mag.*, 1943, [vii], **34**, 321—342).—The absorption of black-body radiation by H_2O vapour, CO_2, and mixtures of these gases with each other and with N_2 has been measured over a total pressure (*P*) range of 0·1—2 atm. and a path-length of 25—100 cm. Beer's law holds for CO_2–N_2, and H_2O–N_2 mixtures if *P* is const. If *P* is increased, absorption increases. Beer's law does not hold for H_2O vapour, even when *P* is kept const., increase of partial pressure resulting in increased absorption. The effect of change of temp. and of source of radiation on the absorption has been investigated. Theoretical reasons for departures from Beer's law are discussed. A. J. M.

Electronic structures and spectra of triatomic oxide molecules. R. S. Mulliken (*Rev. Mod. Physics*, 1942, **14**, 204—215).—The existing knowledge of the forms and electronic spectra of SO_2, ClO_2, NO_2, O_3, CO_2, and CS_2 is reviewed. New conclusions regarding the electronic structure of O_3 are reached. A diagram showing ionisation energy of the various normal and excited valency shell mol. orbitals as a function of the apex angle is given, and it is shown that this, or a similar diagram, is of considerable use in explaining electronic structures and spectra of the mols. concerned. The form of the mol. orbitals of CO_2 is reviewed, and some modifications are suggested. A. J. M.

Absorption spectra of solids. R. C. Waller (*Iowa State Coll. J. Sci.*, 1942, **17**, 149—151).—The absorption spectrum of Pr_2O_3 contained in various crystal forms of La_2O_3 and Eu_2O_3 has been measured at 78° and 300° K. Two energy levels differing by 99 cm.$^{-1}$ at 78° K. and 108 cm.$^{-1}$ at 300° K. have been identified. The spectrum includes a red multiplet at 6000 A., corresponding to the transition $^3H_4 \rightarrow {}^1I_6$, and three strong multiplets in the blue region corresponding to the transitions from $^3H_4$ to $^3P_0$, $^3P_1$, and $^3P_2$. J. W. S.

Absorption spectra of some neodymium compounds. J. F. Palmer, jun. (*Iowa State Coll. J. Sci.*, 1942, **17**, 106—107).—The absorption spectra of solid $Nd(BrO_3)_3,9H_2O$ and α-Nd_2O_3 have been measured over the λ range 3800—8500 A. and at 80°, 170°, 200°, and 300° K. Const. ν differences, which vary with temp. according to the Boltzmann relation, are 116 and 380 cm.$^{-1}$ for $Nd(BrO_3)_3,9H_2O$ and 245 cm.$^{-1}$ for Nd_2O_3. The theoretical curve relating magnetic susceptibility with temp., deduced from these data, follows the observed vals. to fairly high temp. J. W. S.

Structure and ultra-violet spectra of ethylene, butadiene, and their alkyl derivatives. R. S. Mulliken (*Rev. Mod. Physics*, 1942, **14**, 265—274).—A review of work on the absorption spectra of C_2H_4, butadiene (**I**), and their alkyl derivatives in the neighbourhood of 2000 A. is given. Quantum-mechanical calculations on electronic term vals. and red shifts due to hyperconjugation with alkyl groups are given, and it is concluded that decreases in ionisation potential on alkyl substitution are due chiefly to charge transfer, but that red shifts are due partly to this and partly to hyperconjugation. Spectroscopic and refractivity data indicate that the *sym.-trans*-form is the stable form of (**I**) and its open-chain derivatives. The stability of the planar arrangement in the *N*, *V*, and *R* electronic states of the mol. and its positive ion is discussed. The planar form is not very stable in the ion. A. J. M.

Absorption spectra of a series of dienes. E. P. Carr, L. W. Pickett, and H. Stücklen (*Rev. Mod. Physics*, 1942, **14**, 260—264).—The absorption spectra of 18 mono-olefines and 2 cyclic hydrocarbons with one double bond are reviewed. In every case there is low-intensity absorption in the neighbourhood of 40,000 cm.$^{-1}$, followed by intense and very characteristic absorption above 43,000 cm.$^{-1}$ The absorption spectra of 11 aliphatic dienes and 3 cyclic dienes have been examined. They differ considerably according to whether the double bonds are isolated, conjugated, or adjacent. The effect of substitution of Me is discussed, and the displacement of corresponding bands with respect to those of butadiene is obtained and discussed. A. J. M.

Ultra-violet absorption spectra of nitrogenous heterocycles. Blocking effect of methyl groups on the ultra-violet absorption spectra of hydroxypurines and pyrimidines.—See A., 1943, II, 208.

Photoluminescence and association of ions in lead salt solutions. B. E. Gordon (*J. Phys. Chem. Russ.*, 1941, **15**, 448—458).—Ultra-violet illumination of $PbCl_2$ solutions produces a green luminescence, the intensity (*I*) of which increases with $[PbCl_2]$; when KCl is added to a $Pb(ClO_4)_2$ solution, *I* has a max. at M-KCl. The λ range of the luminescence is shifted towards blue when $[PbCl_2]$ and [KCl] are increased. The [Cl′] of these solutions is determined potentiometrically, and it is concluded that the luminescence is due to PbCl′ and varies with the thickness of the ionic atm. Solutions of K_2PbO_2 show a yellow luminescence. J. J. B.

Raman spectra of sugars. R. F. Stamm (*Iowa State Coll. J. Sci.*, 1942, **17**, 136—137).—The Raman spectra of solid α- and β-*d*-glucose, equilibrium aq. solutions of *d*-glucose (5, 15, and 50 mols. of H_2O per mol. of glucose), solid β-*d*-mannose, and sucrose have been measured, the Hg 2537 A. line being used for excitation. α-*d*-Glucose, sucrose, and β-*d*-mannose show a sharp frequency at 850 cm.$^{-1}$ which is attributed to the breathing frequency of the pyranose ring. It is concluded that the vibration frequencies could be used for qual., and possibly quant., analysis of simple mixtures of sugars. J. W. S.

Ionisation and dissociation by electron impact: methyl and ethyl radicals. J. A. Hipple and D. P. Stevenson (*Physical Rev.*, 1943, [ii], **63**, 121—126).—$PbMe_4$ and $PbEt_4$ were decomposed to yield free Me and Et radicals in a special furnace built into the ionisation chamber of a 180° mass-spectrometer tube. From the initial breaks in the ionisation efficiency curves of Me^+ and Et^+ ions, the vertical ionisation potentials of the respective radicals are $10{\cdot}0_0 \pm 0{\cdot}1$ and $8{\cdot}6_0 \pm 0{\cdot}1$ e.v., in good agreement with vals. calc. indirectly from other electron impact data on hydrocarbons. N. M. B.

Dipole moments and intermolecular association of polyhydric alcohols. Y. L. Wang (*Z. physikal. Chem.*, 1940, **B**, **45**, 323—328).—The following vals. (in D.) are given: H_2O 1·91; $(CH_2{\cdot}OH)_2$ 2·18, $OH{\cdot}[CH_2]_4{\cdot}OH$ 2·40, $OH{\cdot}[CH_2]_{10}{\cdot}OH$ 2·36, glycerol 2·67, $OH{\cdot}[CH_2]_2{\cdot}CH(CH_2{\cdot}OH)_2$ 2·76 (in dioxan); EtSH 1·38 (in C_6H_6). W. R. A.

Stereochemistry of labile compounds. W. H. Mills (*J.C.S.*, 1943, 194—199).—The difficulties of demonstrating the optical activity of asymmetric N^{III} compounds and the possibilities of surmounting them are discussed. Substituting groups of varying size or of different polarities will not have the desired effect of increasing to any great extent the stability of the N valency system of NH_3. The salts of the amidines and substituted amides, which exhibit torsional rigidity, are considered suitable for investigating mol. dissymmetry, although the difficulties of preparing an optically active amidine salt are probably great. Methods of resolution are also discussed. C. R. H.

Tautomerism of benzoquinone-*p*-nitrosophenol systems. 3-Fluoro-4-nitrosophenol.—See A., 1943, II, 159.

Structure of boron hydrides. J. K. Sirkin and M. E. Diatkina (*J. Phys. Chem. Russ.*, 1941, **15**, 459—469).—B_2H_6 has the structure $BH_2^+ \cdot BH_4^-$; the other B hydrides are also compounds of cations and anions containing B and H. The theory explains the non-existence of B hydrides with an odd no. of electrons. J. J. B.

Parachors and radii. K. H. Sun and A. Silverman (*J. Physical Chem.*, 1943, **47**, 50—59).—New ionic parachor factors (ϕ) are assigned to a no. of elements and groups. The following relation has been derived theoretically and applies to ionic linkings at 1000°: $\phi = kr^c$, where $k = 28$, r = ionic radius in A., and $c = 2{\cdot}25$. The same relation has been derived empirically for covalent linkings, in which case r = covalent radius, $k = 12n - 28$, and $c = (10 - n)/2$, where n = group no. of the element. Calc. parachors for Na_2O–SiO_2 glasses at 1000° agree with published data. C. R. H.

Physical representation of mechanisms of energy transfer in the zone of interaction between radiation and molecules in biological processes initiated by radiation. See A., 1943, III, 425.

III.—CRYSTAL STRUCTURE.

Method for the summation of the Fourier series used in the *X*-ray analysis of crystal structures. A. L. Patterson and G. Tunell (*Amer. Min.*, 1942, **27**, 655—679).—A method for the summation of one-dimensional Fourier series is detailed, and a procedure that enables this method to be applied to the summation of two-dimensional series, such as those by which the electron density of a crystal is represented as a function of the co-ordinates in the projection of the unit on a particular plane, is described. The method is suitable for the range of *F*-vals. (or of $|F|^2$-vals.) from 0 to 1000. L. S. T.

Gnomonic projection in the hexagonal system. L. S. Ramsdell (*Amer. Min.*, 1942, **27**, 819—823).—The continued use of the G_2 setting, either for hexagonal or rhombohedral crystals, is unnecessary. L. S. T.

Basic principles involved in the glassy state. B. E. Warren (*J. Appl. Physics*, 1942, **13**, 602—610).—Materials used in making glasses may be divided into network-formers, *e.g.*, SiO_2, B_2O_3, P_2O_5, and modifiers, *e.g.*, Na_2O, K_2O, CaO, MgO, PbO. The at. arrangement in glass in general and the structure of the silicate glasses are discussed. The effects of disorder in vitreous SiO_2 compared with the ordered arrangement in the cryst. form are indicated. The factors determining immiscibility in the CaO–SiO_2 system are considered from the point of view of free energy and the no. of ions available at various concns. for the formation of bonds. The expansion of B_2O_3 glasses and the effect of introduction of SiO_2 and Na_2O into these glasses are discussed. A. J. M.

Crystal structure of gadolinium formate, $(HCO_2)_3Gd$. A. Pabst (*J. Chem. Physics*, 1943, **11**, 145—149).—Laue, rotation, and powder methods have been used. The lattice is rhombohedral, $a_0 = 6{\cdot}17$ A., $\alpha = 115°\ 30'$; unit cell contains 1 mol.; $\rho_{calc.}$ 3·85, $\rho_{obs.}$ 3·77. The space-group is probably C_{3v}^5—$R3m$. The radius of the $Gd^{\cdot\cdot\cdot}$ ion in $(HCO_2)_3Gd$ is 0·98 A., in agreement with other determinations. A. J. M.

Configuration of starch and its crystalline degradation products. D. French (*Iowa State Coll. J. Sci.*, 1942, **17**, 60—62).—Maltose hydrate is monoclinic, lattice a_0 4·9, b_0 15·2, c_0 10·7 A., β 82·5°, space-group C_2^2—$P2_1$. The unit cell contains 2 mols. and the packing dimensions are 4·9, 7·6, and 10·7 A. For the Schardinger α- and β-dextrins the vals. are a_0 15·49, b_0 24·06, c_0 13·93 A., space-group V^4, 4 mols. per cell of 24·03 glucose residues, and a_0 15·27, b_0 10·24, c_0 20·93 A., β 68·0°, space-group C_2^2, 2 mols. per cell of 14·05 glucose residues, respectively; these compounds are therefore *cyclo*hexa- (**I**) and *cyclo*hepta-amylose. Consts. are recorded for four other modifications of (**I**). $(C_6H_{10}O_5)_6,I_2,KI$ has a_0 16·00, c_0 39·7 A., space-group $D_6^{4\ or\ 5}$, with 6 mols. per unit cell. The mechanism of starch hydrolysis is discussed. F. R. G.

Quantitative investigations of amino-acids and peptides. XII. Structural characteristics of some amino-acids. G. Albrecht, G. W. Schnakenberg, M. S. Dunn., and J. D. McCullough (*J. Physical Chem.*, 1943, **47**, 24—30).—Photomicrographs, *d*, axial ratios, space-groups, unit cells, and no. of mols. per unit cell (n) are given for *dl*-valine (**I**), -threonine (**II**), -serine (**III**), -norleucine (**IV**), -methionine (**V**), -alanine, -aspartic acid, -glycine, and *l*(+)-glutamic acid. Data for (**I**)—(**V**) are: (**I**) $a : b : c = 0{\cdot}235 : 1 : 0{\cdot}244$, β 70° 58′, space-group C_2^2—$P2_1$; (**II**) 1·675 : 1 : 0·6644, C_{2v}^1—Pmm; (**III**) 1·194 : 1 : 0·522, 73° 47′, C_{2h}^5—$P2_1/a$; (**IV**) 3·46 : 1 : 2·10, 75° 17′, C_{2h}^5—$P2_1/c$; (**V**) 2·09 : 1 : 3·43, 102° 7′, C_2^1—$P2$. For each of the acids (**I**)—(**V**), $n = 4$. C. R. H.

Structure of molecular compounds. I. Crystal structure of *p*-iodoaniline–*s*-trinitrobenzene. H. M. Powell, G. Huse, and P. W. Cooke (*J.C.S.*, 1943, 153—157).—Crystals of p-$C_6H_4I \cdot NH_2$–s-$C_6H_3(NO_2)_3$ belong to the space-group $P2_1/c$, the cell dimensions being a 7·43, b 7·39, c 28·3 A.; β 103° 25′. The unit cell contains 4 mols. There is no evidence of covalency between the two components. The shortest interat. distances are 3·1 and 3·2 A. between the N of the NH_2-group and the two O of a NO_2-group. All the C—C distances are >3·5 A. One NO_2-group approaches the aromatic ring of the p-$C_6H_4I \cdot NH_2$ mol., and mol. interaction may occur here. C. R. H.

Rate of crystal growth in drawn tungsten wires as a function of temperature. C. S. Robinson, jun. (*J. Appl. Physics*, 1942, **13**, 647—651).—Large single-crystals of W were grown in wires by vac. heating at const. temp. in the range 1900—2200° K. The growth was followed by observation of the thermionic emission pattern, a cylindrical electron-projection tube with a fluorescent screen being used. The rate of growth increases exponentially with temp., and is smaller in thinner wires. This can be explained by the small grain hypothesis, which supposes that large crystals are formed from fibres, through the stage of small grains. A. J. M.

Variation with temperature of the crystal photo-electric effect. T. Mendelssohn (*Rev. Fac. Sci. Univ. Istanbul*, 1941, **6**, 224—236).—Frenkel's diffusion theory predicts proportionality of photo-electric e.m.f. (e) to T at low temp., and decrease of e with increasing T at high temp. Temp. of max. e are calc. for Cu_2O, ZnS, and diamond as −160°, 300°, and 550°. Measurements on Cu_2O show a linear decrease of e with increasing temp. to 110°, a min. followed by a max. val. in the region 110—250°, and a further decrease above 250°. The max. and min. correspond with those of conductivity. Dependence of e on light intensity is more marked at high than at low temp., in better agreement with Frenkel's than with Landau and Lifschitz's theory. Preliminary data for fluorite also show better agreement with Frenkel's theory. L. J. J.

Darkening of materials by light. F. Seitz (*J. Appl. Physics*, 1942, **13**, 639—643).—A review dealing with the colorations produced in alkali halide crystals, and the darkening of AgBr, ZnS, and $PbCrO_4$. A. J. M.

Optical and photochemical properties of colloidal centres in silver halide crystals. I—III. S. V. Tscherdinzev (*J. Phys. Chem. Russ.*, 1941, **15**, 419—429, 430—441, 441—447).—I. Thin (50 μ.) films of AgCl sensitised with CuCl are irradiated with a C arc and the scattering (S) of light by the film and by the individual grains in it is determined in a dark-field apparatus. The S–λ curves (λ = wave-length of scattered light) agree with Mie's theory. Long (1 hr.) irradiation of the film with light in the green to red range lowers S, especially for the $\lambda\lambda$ used for irradiation. Violet and ultra-violet irradiation raises S. Heating at 120° gradually eliminates S.

II. AgCl (+ CuCl) and AgBr (+ CuBr) films, after irradiation with polarised light, exhibit dichroism and "di-tyndallism" (variation of S in a given direction when the plane of polarisation of the incident light vary); di-tyndallism is also shown by individual grains. The reflexion of these films also depends on the direction of polarisation, and both reflexion and S depend on λ in a similar way.

III. Photodichroism etc. are due to destruction of anisotropic Ag grains, the orientation of which coincides with that of polarisation. The mechanism of this destruction is discussed. J. J. B.

Polymorphism of riboflavin. J. A. Means, T. C. Grenfell, and F. H. Hedger (*J. Amer. Pharm. Assoc.*, 1943, **32**, 51—53).—An aq. solution of riboflavin (**I**) saturated at 80° is cooled to room temp., filtered, and the filtrate conc. in vac., to give small needles, m.p. 281—282°. When (**I**) is heated with less H_2O than is required for complete dissolution, a form of m.p. 295—296° is obtained; conversion of any type of (**I**) of lower m.p. into these long needles can be followed under the microscope. A third form of (**I**), plates, m.p. 281—282°, can be isolated when a saturated aq. solution at 100° is cooled to 80°, quickly filtered, and the filtrate allowed to cool slowly. The above facts may help to clarify divergent literature references on m.p. of (**I**). A. T. P.

IV.—PHYSICAL PROPERTIES OF SUBSTANCES.

Paraffin hydrocarbons. Correlation of physical properties. A. W. Francis (*Ind. Eng. Chem.*, 1943, **35**, 442—449).—B.p., d_4^{20}, and n_D^{20} of all the isomerides of C_6—C_{11} paraffins have been calc. from the properties of the next lower paraffin on the assumption that the same change in structure in a portion of a paraffin mol. produces substantially the same change in physical properties regardless of the remainder of the mol. Paraffin isomerides with two branches on non-adjacent C atoms have almost identical b.p. C. R. H.

Vapour pressure of metallic indium. J. S. Anderson (*J.C.S.*, 1943, 141—143).—Data obtained by the effusion method for the v.p. (p) of In show that p can be represented by $\log p = -12{,}180/T + 8{\cdot}003$ over the range 727—1075° with a max. error of 8%. The b.p. of In, calc. from the data, is ~2100°/760 mm. C. R. H.

Thermodynamics of the liquid state. Generalised prediction of properties. K. M. Watson (*Ind. Eng. Chem.*, 1943, **35**, 398—406).—On the basis of a modified application of the theorem of corresponding states requiring knowledge only of b.p., crit. temp. and pressure, and liquid d at a given temp., expressions have been derived for predicting the following properties of liquids: thermal expansion

and compressibility, pressure corrections to enthalpy, entropy, and heat capacity at const. pressure, heat of vaporisation, difference between heat capacity of a saturated liquid and its ideal gas, and the difference between heat capacity of a saturated liquid and the heat capacity at const. pressure. C. R. H.

Thermal conductivity of non-metallic single crystals. W. J. Knapp (*J. Amer. Ceram. Soc.*, 1943, **26**, 48—55).—Measurements of the thermal conductivity (C) of single crystals (1 cm.^{3}) of quartz, corundum, sapphire, beryl, tourmaline, synthetic LiF, topaz, zircon, and periclase and samples of electrocast mullite, a Na_2O–CaO glass, Pyrex, and pure fused SiO_2 were made at 100—500°. The C of crystals along the various crystallographic axes differed markedly, but the difference decreased at higher temp. Single crystals give a min. C with rising temp., which agrees with Compton's theory. C of glasses increases approx. linearly with temp. J. A. S.

V.—SOLUTIONS, DISPERSIONS, AND MIXTURES.

Diffusion of air through monel metal. H. S. Coleman and H. L. Yeagley (*J. Chem. Physics*, 1943, **11**, 135—139).—The rate at which atm. gases diffuse through monel metal at various temp. has been determined. A metal tube was closed at one end, and the other end, connected to a vac. system, was heated in a furnace. The diffusion of gases through the metal was determined by noting the rate at which the pressure increased on the inside of the tube. Curves of log (diffusion rate) against 1/(abs. temp.) are chiefly linear, but show distortions at 900°, indicating some change in the nature of the metal at this temp., possibly the formation of a solid solution of NiO in Ni, or an order–disorder phenomenon. These breaks are reproducible and are confirmed by dilatometric determinations. A. J. M.

Propagation of supersonic waves in liquid mixtures and intermolecular forces. III. Ether and acetone in chloroform. R. Parshad (*Indian J. Physics*, 1942, **16**, 307—315; cf. A., 1942, I, 201).—The adiabatic compressibility–mol. fraction curve for Et_2O–$CHCl_3$ solutions lies below, whilst that for $COMe_2$–$CHCl_3$ solutions lies above, the straight line corresponding to ideal solutions. In the former case the supersonic velocity–mol. fraction curve shows a sharp min. at 25 mol.-% Et_2O. The effect can be explained by preponderance of dipole association in the former and H bond formation in the latter case as the mechanism of mol. interaction. L. J. J.

Refractive index and density of solutions in aqueous alcohol. N. S. Filippova, I. S. Tartakovski, and M. E. Manshelei (*J. Phys. Chem. Russ.*, 1941, **15**, 515—524).—Vals. are given for n of several NH_4NO_3 solutions at 15°, 20°, and 25° and several NaOAc solutions at 10°, 15°, and 20°, and for d of several NaOAc solutions at 20°, the solvent in all cases being 68·9 wt.-% EtOH. J. J. B.

Partial specific volumes in binary and ternary solutions. C. Drucker (*Arkiv. Kemi, Min., Geol.*, 1941, **14, A**, No. 15, 48 pp.).—Errors arising in the pyknometric method for measuring d are discussed and methods for increasing the accuracy in relative determinations to $\pm 5\times10^{-4}$% have been developed. The partial sp. vols. (v) in aq. solutions of $CO(NH_2)_2$, glycine, and salts do not vary linearly with concn. and empirical relations expressing the variation are deduced. v is increased by the presence of a second solute. The effect of ionisation and complex ion formation on v has also been studied. v data for solutions of various org. compounds in C_6H_6 and xylene and of hæmoglobin in H_2O and in aq. $CO(NH_2)_2$ are also recorded. J. W. S.

Statistical mechanics of binary mixtures. F. Kottler (*J. Chem. Physics*, 1943, **11**, 153—155).—The direct treatment of the statistical mechanics of binary mixtures by Alfrey *et al.* (A., 1942, I, 293) is not mathematically consistent. A. J. M.

Theory of azeotropic mixtures. V. A. Kireev (*J. Phys. Chem. Russ.*, 1941, **15**, 481—491).—The composition of azeotropic mixtures depends on the ratio of the v.p. of the pure components and on the degree of deviation of the v.p. of the mixture from Raoult's law. The temp. coeff. of the composition depends on the difference between the heats of vaporisation of the pure components and the free energy of mixing. J. J. B.

Diffusion in ionic crystals. E. Wietig (*Z. physikal. Chem.*, 1940, **B**, **45**, 374—388).—A method for the investigation of pure diffusion phenomena in crystals of Ba salts is described. A sparingly sol. and a readily sol. Ba salt were mixed, one of them containing a radioactive indicator. After diffusion has taken place the salts are separated by dissolution. The observed migration of the indicator is a measure of the diffusion of the $Ba^{\cdot\cdot}$. It is shown that ionic exchange occurs to some extent even at room temp. At higher temp. the diffusion is largely dependent on the degree of compression. The diffusion varies exponentially with temp. The velocity of diffusion of $BaSO_4 \rightarrow BaCl_2$ is $>$ for $BaCl_2 \rightarrow BaSO_4$ at the same temp. The diffusion velocity at const. temp. is largely dependent on changes brought about in the crystals by repeated compression. A. J. M.

Solubility of solid methane in liquid nitrogen and oxygen. V. G. Fastovski and J. A. Krestinski (*J. Phys. Chem. Russ.*, 1941, **15**, 525—531).—The mol. fraction N of CH_4 in its saturated solutions in N_2 between 70° and 79° K. and in O_2 between 69° and 74° K. satisfies the equations $\log N = 1{\cdot}36576 - 120{\cdot}48/T$ and $\log N = 0{\cdot}97986 - 85{\cdot}822/T$ respectively. J. J. B.

Distribution equilibria in the system tin–stannous sulphide. J. S. Anderson and M. J. Ridge (*Trans. Faraday Soc.*, 1943, **39**, 93—98; cf. A., 1943, I 181).—The distribution of Cu, Ag, and Pb, present in low total concn., between the two liquid phases at 910° is such that Pb is slightly and Ag strongly conc. in the metallic phase, whilst Cu is conc. preferentially in the sulphide phase. Distributions calc. from thermodynamic data do not agree with those observed. F. L. U.

Equilibrium and surface phenomena in the system phenol–sodium oleate–water. III. N. N. Petin and K. V. Toptschieva (*J. Phys. Chem. Russ.*, 1941, **15**, 507—514).—Distribution of Na oleate between PhOH and H_2O, and the electric conductivity of the co-existing layers, are measured. The interfacial tension between the layers increases with the concn. of Na oleate although the miscibility increases as well. J. J. B.

Interfacial-tension studies of sodium laurate solutions. J. K. Davis and F. E. Bartell (*J. Physical Chem.*, 1943, **47**, 40—50).—The pendent-drop method has been used to measure the interfacial tension (γ) at the dineric boundary between aq. Na laurate (**I**) and n-C_7H_{16}. For unhydrolysed solutions of (**I**) (pH $\sim$11) ageing lowers γ only slightly, but in more acid solutions there is a rapid decrease of γ with time. This lowering is due to the migration of free lauric acid across the interface, thus disturbing the equilibrium so that more of (**I**) hydrolyses and γ decreases progressively. For good emulsification there must be high concns. of (**I**) in the aq. phase and of lauric acid in the non-polar liquid. C. R. H.

Structure of collodion membrane and its electrical behaviour. VI. Protamine–collodion membrane, a new electropositive membrane. I. Abrams and K. Sollner (*J. Gen. Physiol.*, 1943, **26**, 369—379; cf. A., 1943, I, 125).—Strongly electropositive porous membranes are obtained when salmine is adsorbed on porous collodion membranes, and they retain their characteristic electrochemical properties unaltered for at least 1 year. They are distinctly electropositive between pH 1 and 10, the max. effect being observed between pH 3 and 8. The rates of filtration and ohmic resistance of these membranes are very similar to those of similar uncoated membranes. The porous protamine–collodion membranes exhibit very marked positive anomalous osmosis and the behaviour observed with proper electrolytes is similar to that of oxidised collodion membranes. They also show very pronounced negative osmosis with strong acids. Protamine–collodion membranes which correspond in properties with activated dried collodion membranes are formed by adsorption of protamine on porous collodion membranes followed by drying in air. The concn. potentials across such membranes approach the thermodynamically possible max. J. N. A.

Electrical capacity of the double layer. W. G. Eversole and C. R. Estee (*J. Chem. Physics*, 1943, **11**, 156).—The range of potentials and concns. for which the equations previously put forward (A., 1943, I, 128) are reasonably valid are obtained. A. J. M.

Rapid method of dialysis.—See A., 1943, I, 167.

Freezing out of colloids and colloid mixtures with reference to the plasmatic resistance of plants to frost.—See A., 1943, III, 426.

Behaviour of thixotropic colloids under pressure. I. Setting of iron hydroxide. O. I. Leipunski and P. E. Frank (*J. Phys. Chem. Russ.*, 1941, **15**, 504—506).—The time of setting of thixotropic $Fe(OH)_3$ sols is increased by keeping the sol at a high pressure ($<$2000 atm.) for $\sim$1 hr. J. J. B.

Gel formation by mutual interaction of oppositely charged sols. M. Prasad and S. D. Mehta (*Current Sci.*, 1943, **12**, 19).—Gels have been obtained on mixing a sol of $Al(OH)_3$ with sols of MnO_2, Sb_2S_3, and silicic acid, and $Fe(OH)_3$ sol with silicic acid. W. R. A.

Osmotic pressures of polyvinyl chloride solutions by a dynamic method. R. M. Fuoss and D. J. Mead (*J. Physical Chem.*, 1943, **47**, 59—70).—A dynamic osmometer suitable for solutions in org. solvents has been designed and its application to the measurement of the osmotic pressure of $COMe{\cdot}C_5H_{11}$ solutions of vinyl chloride polymers is described. The vals. agree with those obtained viscometrically and by the ultracentrifuge method. C. R. H.

Heat capacity and bound water in starch suspensions. M. E. Freeman (*Arch. Biochem.*, 1942, **1**, 27—39).—Starch–H_2O mixtures and dextrin sols have abnormally high thermal capacities. With increasing temp. bound H_2O decreases and heat is absorbed in the process. Robinson's equation for the sp. heat of biological systems (A., 1931, 1177) is invalid for starch and dextrin systems. A max. of 23% of H_2O is adsorbed by starch and a part of this is desorbed when the temp. rises from 0° to 40°. Sand–H_2O mixtures behave normally. E. R. S.

Reactions of cellulose in liquid sulphur dioxide.—See B., 1943, II, 179.

Structure of μ-peroxo-Co^{III}–Co^{IV}-ammines. L. Malatesta (*Gazzetta*, 1942, **72**, 287—292).—The salts $[(NH_3)_5Co^{III}–O_2–Co^{IV}(NH_3)_5](NO_3)_5$, $[(NH_3)_4Co^{III}(O_2)(NH_2)Co^{IV}(NH_3)_4](SO_4)_2,2H_2O$, and $[en_2Co^{III}(O_2)(NH_2)Co^{IV}en_2](NO_3)_4$ [en = $(CH_2·NH_2)_2$] all have a magnetic moment of 1·6—1·7 Bohr magnetons at 18°. It is suggested that they exhibit the following mesomerism: $[Co^{III}–O_2–Co^{IV}] \rightleftharpoons [Co^{III}–O_2 \rightarrow Co^{III}] \rightleftharpoons [Co^{III} \leftarrow O_2–Co^{IV}] \rightleftharpoons [Co^{IV}–O_2–Co^{III}]$.
E. W. W.

VI.—KINETIC THEORY. THERMODYNAMICS.

Quantitative investigations of amino-acids and peptides. X. Equilibria between amino-acids and formaldehyde. Leucine and N-methyl-leucine. XI. Equilibria between amino-acids and formaldehyde. Glutamic acid. E. H. Frieden, M. S. Dunn, and C. D. Coryell (*J. Physical Chem.*, 1943, **47**, 10—20, 20—24).—X. The equilibrium between CH_2O and *d*(−)-*N*-methyl-leucine has been examined by polarimetric and potentiometric methods and that between CH_2O and *l*(−)-leucine has been examined polarimetrically. The equilibrium consts. for the latter system agree with potentiometric data by other investigators. The equilibrium const. of the former system as determined polarimetrically is approx. half of that obtained potentiometrically. A general solution for the four parameter equations denoting the change in rotation of leucine solutions on addition of CH_2O is given.

XI. Equilibrium consts. for the CH_2O–*l*(+)-glutamic acid system obtained polarimetrically are > vals. obtained potentiometrically.
C. R. H.

Theory of the isoelectric point. IV. Applications to weak acids and bases and to their intermediate salts. The relative isoelectric point. T. L. Hill (*J. Physical Chem.*, 1943, **47**, 70—83).—Theoretical. The previous treatment (cf. A., 1942, I, 267, 328, 367) is extended to solutions saturated with respect to salts of weak acids and bases. The relative isoelectric point is defined and shown to include the ordinary isoelectric point as a special case. With its aid ampholytes, weak acids, and weak bases, and salts of all these can be considered as members of one class and treated simultaneously.
C. R. H.

Activity coefficients of zinc chloride, bromide, and iodide from electromotive forces. (Miss) D. M. Egan and J. R. Partington (*J.C.S.*, 1943, 157—168).—Published activity coeff. data are reviewed. Activity coeffs. of $ZnCl_2$ (0·5—0·001M), $ZnBr_2$ (0·36—0·001M.), and ZnI_2 (0·25—0·002M.) have been calc. from e.m.f. data at 25° and 35° by a graphical extrapolation method and by correlation with La Mer's equation. La Mer's equation gives good agreement with experiment in the case of $ZnCl_2$ and $ZnBr_2$, which evidently behave as strong electrolytes, but the coeffs. for ZnI_2 are < the calc. vals., especially in conc. solutions. The data can be explained by the formation of a complex anion ZnI_3' or ZnI_4''.
C. R. H.

Activity coefficient of potassium iodide in sulphur dioxide from vapour pressure measurements. W. G. Eversole and A. J. Hanson (*J. Physical Chem.*, 1943, **47**, 1—9).—The activity coeff. (*f*) of KI dissolved in liquid SO_2 has been calc. from v.p. data at 10°, 15°, 20°, and 25° and over the concn. range 0—3M. The vals. of *f* range from ~0·8 at the lowest to 0·005—0·008 at the highest concns. When log *f* is plotted against $\sqrt{N}$, where N = mol. fraction of solute, the resulting curve shows three distinct regions. From N = 0 to 0·015 it is linear and corresponds with the Debye theory, between 0·015 and 0·18 it is exponential, and above 0·18 it passes through a min. at N = ~0·20. Solvation, with the consequent immobilisation of solvent mols., is suggested as the cause of this min.
C. R. H.

System tin–stannous sulphide. J. S. Anderson and M. J. Ridge (*Trans. Faraday Soc.*, 1943, **39**, 98—102).—The composition of the conjugate liquid phases has been determined from the m.p. (858°) to 1180°, over which range there is little change (S 2·2—2·5% in metal phase, 19·7—19·9% in sulphide phase). (Cf. A., 1943, I, 180.)
F. L. U.

Application of the method of conodes to drawing of univariant curves in the systems of eutectic mixtures of three and four components forming solid solutions. D. A. Petrov (*J. Phys. Chem. Russ.*, 1941, **15**, 500—503).—Geometrical.
J. J. B.

System $CaO–SiO_2–P_2O_5$. R. L. Barrett and W. J. McCaughey (*Amer. Min.*, 1942, **27**, 680—695).—The equilibrium diagram is given. The solid phases have been identified by their optical properties and *X*-ray diffraction data. In addition to known binary compounds, two ternary phases, nagelschmidtite (**I**) and silicocarnotite (**II**), hitherto known in certain slags, exist in the system. The diagram shows an extensive region of liquid immiscibility in which two liquids in equilibrium with cristobalite are formed. Extensive solid solution prevails in the phases Ca_2SiO_4, (**I**), (**II**), and $Ca_3(PO_4)_2$, which form a binary system with Ca_2SiO_4 and $Ca_3(PO_4)_2$ as end members. Ca_2SiO_4 may contain up to 10% P_2O_5 in solid solution, and (**I**) ($Ca_7Si_2P_2O_{16}$) can have 12—24% P_2O_5. A binary diagram showing homogeneity ranges and variation in *n* resulting from solid solution is given. *n* decreases as P_2O_5 content increases.
L. S. T.

Ternary iron–zirconium–sulphur system. R. Vogel and A. Hartung (*Arch. Eisenhüttenw.*, 1942, **18**, 413—418; *Bull. Iron Steel Inst.*, 1943, No. 88, 222A).—The constitutional diagram of the Fe–FeS–ZrS_2–Fe_2Zr system has been constructed from the results of thermal, chemical, and microstructural studies. In the liquid phase there is a large miscibility gap. The m.p. of synthetic ZrS_2 was ~1550°. The diagram for the FeS–ZrS_2 system was developed.
R. B. C.

Laboratory determination of the heat of transition of sulphur. P. P. Sutton (*J. Chem. Educ.*, 1942, **19**, 459).
L. S. T.

Pressure and composition of the vapour and heat of vaporisation of methanol–chloroform mixtures, and change of free energy and entropy associated with their formation. V. A. Kireev and I. P. Sitnikov (*J. Phys. Chem. Russ.*, 1941, **15**, 492—499).—Total and partial v.p. of MeOH–$CHCl_3$ mixtures are measured at 20°, 35°, and 49·3°; the azeotropic mixtures contain 74·5, 70·0, and 65·9 mol.-% of $CHCl_3$ respectively. Free energy and entropy of mixing are calc.
J. J. B.

VII.—ELECTROCHEMISTRY.

Ohmic resistance of local elements in dissolution of metals in acids. V. G. Levitsch and A. N. Frumkin (*J. Phys. Chem. Russ.*, 1941, **15**, 748—759).—Resistance is max. at the centre of the cathode (a small disc of Sb or Zn embedded in a large Pb or Ni anode, the whole being immersed in 8N-H_2SO_4), and is expressed by $2r/\pi\kappa$ ohms per sq. cm., where *r* is the radius of the disc, and κ is the sp. conductivity of the electrolyte. In the case of a Zn cathode in Ni, $r = 10^{-4}$ cm. and the ohmic fall of potential is ≯13 mv.
R. T.

Electrode potentials of metals. A. H. Turnbull and H. C. Davis (*Aero. Res. Com. Rept. Mem.*, No. 1901, 1942, 16 pp.).—The p.d. between a saturated Hg_2Cl_2 electrode and 48 metals, alloys, and plated specimens have been determined at 22°. Sea-H_2O and 3% NaCl were used as electrolytes. With the exception of Ag-plated Cu, all the specimens were electronegative with respect to Hg_2Cl_2. The influence of abrasion of the metal surface is discussed. Abrasion is advised before measuring potentials so as to remove protective films, but the abrasion should be light so as to avoid cold-working the specimen.
C. R. H.

Diffusion potentials in models and living cells.—See A., 1943, III, 425.

Movement of solution near a dropping cathode. II. Velocity of movement of solution and increase of the current strength on the polarographic curve "current strength–voltage." T. A. Kriukova and B. N. Kabanov (*J. Phys.Chem. Russ.*, 1941, **15**, 475—480).—The additional current strength due to the stirring of the solution by the expanding Hg drop is ∝ *clv*, *c* being the concn. of the ions which are reduced at the cathode, *l* their mobility, and *v* the velocity of the solution near the drop; *v* is determined by observing graphite particles suspended in the solution. This proportionality is confirmed for Cd, Pb, Mn, Co, Cu, Fe, Cr, and Th ions in conc. KCl solution.
J. J. B.

Conductometric titrations. I. Titration of acids of varying strength in acetone–water mixtures. II. Analysis of complex mixtures of acids and salts. R. S. Airs and M. P. Balfe (*Trans. Faraday Soc.*, 1943, **39**, 102—107, 107—114).—I. Curves are given for the titration of HCl, H_2SO_4, H_2SO_3, $H_2C_2O_4$, $PhSO_3H$, HCO_2H, AcOH, and tartaric and picric acids in aq. $COMe_2$ (30—90%), chiefly at a concn. of 0·002N., with 0·1N. alcoholic NaOH. Acids with p*K* <2 are exactly titrated at the min. conductivity ($\kappa_{min.}$) when the solvent contains ≯40% of $COMe_2$, whilst those with p*K* <1 are similarly neutralised in ≯80% of $COMe_2$. Vals. of $\kappa_{min.}$ for the weaker (p*K* >2) acids in aq. $COMe_2$ do not correspond with complete neutralisation; *e.g.*, with AcOH <2% is titrated at $\kappa_{min.}$ in 40% $COMe_2$. H_2SO_4 behaves as a monobasic acid in 80% and as a dibasic acid in 40% $COMe_2$, and at intermediate concns. $\kappa_{min.}$ moves progressively between the first and second neutralisations. The first dissociations of H_2SO_3 and of $H_2C_2O_4$ are exactly neutralised at $\kappa_{min.}$ in 40% $COMe_2$, whilst that of tartaric acid is incompletely neutralised.

II. Acids present in a dil. aq. solution are classified by conductometric titration in 80% $COMe_2$ (*A*), 40% $COMe_2$ (*B*), and H_2O (*C*). Strong acids (p*K* <1) are recorded in *A*, those of p*K* 1—2 are equiv. to *B* − *A*, and those of p*K* 2—7 to *C* − *B*. Salt content is determined by the difference between titrations before and after the bases have been removed by treatment of the solution with a

synthetic resin. The procedure described is designed primarily for the examination of tanning liquors; it records all carboxylic acids and in general excludes phenolic groups. F. L. U.

VIII.—REACTIONS.

Mechanisms of ignition of gas mixtures. M. V. Poljakov and L. P. Kuleshina (*J. Phys. Chem. Russ.*, 1941, **15**, 470—474).—The min. pressure at which CH_4–O_2–N_2 mixtures can be ignited by a hot wire conforms to Semenov's equation $d^2P_1P_2[1 + \alpha P_3/(P_1 + P_2)]$ = const., where P_1, P_2, and P_3 are the pressures of CH_4, O_2, and N_2 respectively, and d is the diameter of the reaction vessel. The validity of this equation depends on the existence of an induction period; it is not valid when the gas is ignited by a spark. J. J. B.

Influence of temperature on the detonation limit of hydrogen–air mixtures. I. M. A. Rivin. **II.** A. S. Sokolik (*J. Phys. Chem. Russ.*, 1941, **15**, 533—550, 551—555).—I. Sokolik's work (cf. A., 1940, I, 29) is criticised and the mechanism of propagation of the detonation wave discussed in detail.

II. A reply. J. J. B.

Master reaction in oxidation chains. R. W. Gurney (*Arkiv Kemi, Min., Geol.*, 1941, **14**, **B**, No. 17, 4 pp.).—For chain reactions in which each mol. of one substance reacts alternately with mols. of two other substances it is shown that the max. rate of the whole chain process is equal to that of the slowest link if the links adjacent to the slowest link are very much more rapid. The presence of other slow links is immaterial provided they are not adjacent to the slowest link. J. W. S.

Electrostatic influence of substituents on reaction rates. IV. D. Price and F. H. Westheimer (*J. Chem. Physics*, 1943, **11**, 150—153).—Rates of hydrolysis of EtOBz, Et toluate and anisate, p-$C_6H_4Cl{\cdot}CO_2Et$, and p-$NO_2{\cdot}C_6H_4{\cdot}CO_2Et$ have been determined in EtOH–H_2O mixtures (30, 60, and 90% EtOH) at 50°. The relative rates of hydrolysis of the above compounds are compared with the vals. calc. by the Kirkwood and Westheimer theory (cf. A., 1938, I, 574; 1939, I, 472). A. J. M.

Reaction mechanism in double decomposition between oxides and salts of oxy-acids in powder mixtures. I. R. Jagitsch (*Arkiv Kemi, Min., Geol.*, 1942, **15**, **A**, No. 17, 37 pp.).—The phenomena of reaction kinetics in solid mixtures are briefly reviewed. A study of self-diffusion processes in MgO, CaO, SrO, and BaO by a radioactive indicator method shows that dissociation of the oxides does not account for the constancy of the temp. (T_r) at which their reactions with oxy-salts become detectable by thermal effects. Data for the extent of metathesis after heating for const. time at different temp. are given for the systems CaO–Ag_3PO_4, –$Co_3(PO_4)_2$, –$CoSO_4$, SrO–Ag_3PO_4, MgO–Ag_3PO_4, –$Co_3(PO_4)_2$, –$CoSO_4$, and BaO–Ag_3PO_4. For the four oxides T_r/T_s (where T_s = m.p.) = ~0·277; reaction is governed by transfer of particles from the oxide into the oxy-salt phase, and not by diffusion of anhydride mols. from the oxy-salt into the oxide. Absorption of CO_2 by powdered CaO or SrO and of SO_3 by CaO proceeds only until a certain fraction of the oxide, which is const. at a given temp., has reacted. Reaction between MgO and $CoSO_4$ at an interface between compressed tablets occurs only in the surface layers, showing that lattice diffusion does not occur. These results are discussed with reference to the mechanism of reaction in the systems considered. A. J. E. W.

Transition state theory of formation of thin oxide films on metals. E. A. Gulbransen (*Trans. Electrochem. Soc.*, 1943, **83**, *Preprint* 4, 13 pp.; cf. B., 1942, I, 351; A., 1943, I, 68).—The transition state theory of diffusion is applied to the rate of oxidation of metals as a function of temp. The expression involves an entropy as well as an energy of activation. The oxidation of Fe, stainless steel, and Cu follows the parabolic law for certain temp. and pressure ranges after an initial period. The rate coeffs. lie on a straight line when log K is plotted against T^{-1}. Energies of activation of 22,600, 29,600, and 24,900 g.-cal. and entropies of activation of −31, −35, and −6·8 g.-cal. per 1° are found for Fe, stainless steel, and Cu, respectively. The importance of entropy factor is considered briefly. C. E. H.

Anticatalysis and temperature, mutual restriction and auto-restriction. E. Baur and H. Rüf (*Helv. Chim. Acta*, 1943, **26**, 441—449).—The diminution of the rate of oxidation of quinol (**I**) due to p-$NH_2{\cdot}C_6H_4{\cdot}CO_2H$ is nearly independent of the temp. Mutual restriction is shown by SO_3–(**I**), PhCHO–(**I**) and metol–(**I**). Evidence of autorestriction is found in the oxidation of (**I**) in the absence of added inhibitor. H. W.

Surface recombination of H atoms and OH radicals. W. V. Smith (*J. Chem. Physics*, 1943, **11**, 110—125).—Atoms formed by a low-pressure gas discharge are allowed to diffuse through a side arm, part of the surface of which is coated with the material under test. The atoms which pass through the side arm are detected by the heat of recombination liberated at a small surface coated with a highly catalytic substance (Pt for H, and KCl for OH). By varying the distance of this test surface the decay in at. concn. with distance can be found, and hence the coeff. of recombination, γ. γ has been found for H and OH on Pyrex for a temp. range of 500°. Vals. of $\gamma \sim 10^{-5}$ are obtained at room temp. The recombination of H on a no. of compounds (KCl, KOH, K_2CO_3, K_2SiO_3, Na_3PO_4) has been determined over smaller temp. ranges. γ depends to a great extent on the dryness of the surface. All salts investigated, except KCl, cause strong recombination of H when dry, but only slight recombination when damp. KCl causes strong recombination of OH. A dehydrogenating catalyst (ZnO,Cr_2O_3) and a dehydrating catalyst (Al_2O_3) showed no difference in the promotion of H and OH recombination. A. J. M.

Catalytic alkylation of benzene with ethylene.—See B., 1943, II, 165.

Catalytic oxidations of naphthalene series.—See B., 1943, II, 166.

Electrolysis of mixtures of nitrate with malonic acid, ethyl- and dimethyl-malonic acid, and succinic acid.—See A., 1942, II, 183.

Photographic action of electrons in the range 40—212 kv. R. J. Baker, E. G. Ramberg, and J. Hillier (*J. Appl. Physics*, 1943, **14**, 39).—Errata (cf. A., 1942, I, 373).

IX.—PREPARATION OF INORGANIC SUBSTANCES.

Reagent chemicals—preparation and properties. G. Dimsey (*Soc. Chem. Ind. Victoria J.*, 1942, **42**, 396—405).—A review.

Nascent state. J. H. Reedy and E. D. Biggers (*J. Chem. Educ.*, 1942, **19**, 403—406).—Theories concerning nascent action are reviewed, and some additional experiments recorded. L. S. T.

Progress in the preparation and determination of the properties of boron. A. W. Laubengayer, A. E. Newkirk, and R. L. Brandaur (*J. Chem. Educ.*, 1942, **19**, 382—385).—A review. L. S. T.

Thallous salts as derivatives of sulphonic acids.—See A., 1943, II, 157.

Preparation of ammonium hydroxide in the laboratory. L. E. West and A. Wilson (*J. Chem. Educ.*, 1942, **19**, 418—419).—NH_3 from a cylinder is passed into H_2O in a 40-l. carboy which is cooled externally by running H_2O sprayed from a ring burner fitted over the neck. L. S. T.

X.—ANALYSIS.

Determination of water in absolute alcohol.—See B., 1943, III, 127.

Determination of water [in coal] by distillation with xylene.—See B., 1943, I, 229.

Determination of high chlorine residuals [in water].—See B., 1943, III, 114.

Determination of iodate in presence of bromate and chlorate. I. M. Kolthoff and D. N. Hume (*Ind. Eng. Chem.* [*Anal.*], 1943, **15**, 174—175).—IO_3' can be determined iodometrically in presence of a four-fold excess of BrO_3' or ClO_3' in a solution buffered to pH 4·0 by means of H phthalate. pH increases during the reaction between IO_3' and I' to a val. at which the rate of reaction between BrO_3' and I' is negligibly small. Details of procedure, and data showing the effect of H phthalate and BrO_3' concns. on accuracy, are recorded. L. S. T.

Simple determination of hydrogen sulphide [in sewage or sewage gas].—See B., 1943, III, 138.

Determination of sulphur dioxide in beer.—See B., 1943, III, 127.

Rapid qualitative test for tellurium [in minerals]. H. Goudey (*Amer. Min.*, 1942, **27**, 592).—A fragment of the mineral is heated in the reducing blow-pipe flame in an inclined porcelain crucible, and the black sublimate of Te dissolved in conc. H_2SO_4 to give the usual red colour. The test is applicable to all types of Te minerals. L. S. T.

Assay of iron and ammonium citro-arsenite for arsenic trioxide.—See B., 1943, III, 108.

Determination of hydrocyanic acid produced by almonds.—See B., 1943, III, 105.

Effect of ethyl alcohol concentration on purity of potassium platinichloride in determination of potash in fertilisers.—See B., 1943, III, 119.

Selective reagent for lithium. Application to the rapid volumetric determination of lithium in presence of potassium and sodium. L. B. Rogers and E. R. Caley (*Ind. Eng. Chem.* [*Anal.*], 1943, **15**, 209—211).—Li is quantitatively pptd. as a complex periodate by aq. KOH + KIO_4. With 1 ml. each of reagent and test solution at 70°, 0·1 mg. of Li can be detected. $Na^{\cdot}$, $K^{\cdot}$, and $NH_4^{\cdot}$ give no ppt., but $NH_4^{\cdot}$ reduces the sensitivity of the test. Metals must be absent, but Cl', NO_3', SO_4'', and moderate concns. of acids do not interfere. The ppt. is insol. only in strongly alkaline solutions. The ratio of Li : I is not stoicheiometric, but under controlled conditions of pptn. is sufficiently const. to permit iodometric determination of the IO_3' with KI and $Na_2S_2O_3$, or aq. Na_3AsO_3. A gravimetric determin-

ation is not possible. Details of procedure, and test data for Li alone and in presence of $Na^{\cdot}$, $NH_4^{\cdot}$, dil. HCl, $HClO_4$, KNO_3, and K_2SO_4, are recorded. L. S. T.

Semi-micro-determination of silver. S. Reznek (*J. Assoc. Off. Agric. Chem.*, 1943, **26**, 155—157).—Ag is pptd. as AgI, which is treated with Br, affording $AgBr + HIO_3$; KI is then added, and the liberated I is titrated. The error, using ~1 mg., is ~2%. A. A. E.

Electrolytic determination of zinc in aluminium alloys.—See B., 1943, I, 254.

Determination of lead. Dithizone method and its interferences. P. A. Clifford (*J. Assoc. Off. Agric. Chem.*, 1943, **26**, 26—53).—A list is given of metals which form dithizone (I) complexes, together with the pH of reaction, colours in CCl_4, and absorption max. in CCl_4. Photometric methods of detection of interference by Bi and Sn are given. Procedure for the separation of small quantities of Pb and Tl is outlined. The method is satisfactory for the determination of Pb in urine; Cu, Zn, and oxidation products of (I) do not interfere. A. A. E.

Qualitative analysis of microgram samples. Separation, estimation, and identification of the more common ions of the hydrogen sulphide group. A. A. Benedetti-Pichler and M. Ceiola (*Ind. Eng. Chem. [Anal.]*, 1943, **15**, 227—230).—The technique previously described (A., 1943, I, 68) has been applied to analyses requiring long separations, followed by sedimentation estimations, and confirmatory tests. Improvements in manipulation are described, and a method for fractionally distilling 0·1 to 0·01 cu. mm. of liquid has been developed. The complete analysis of 1 μg. of Wood's alloy requires ~12 hr. In 0·01 cu. mm. of a solution containing 0·1 μg. each of $Cu^{\cdot\cdot}$, As, Sb, and Sn, 0·1, 0·06, 0·1, and 0·24 μg. of the respective ions were found; in 0·01 cu. mm. containing 0·1 μg. each of $Hg^{\cdot\cdot}$, Pb, Bi, Cd, and Sb, 0·1 μg. of Hg, Pb, Bi, and Sb and 0·8 μg. of Cd were found. L. S. T.

Assay of mercury in certain [medicinal] organic compounds.—See B., 1943, III, 109.

Analysis of pigments.—See B., 1943, II, 191.

Colorimetric determination of chromium in [tannery] exhaust liquors.—See B., 1943, II, 202.

Spectrochemical determination of tungsten in siliceous material. L. H. Ahrens (*J. S. African Chem. Inst.*, 1943, **26**, 21—26).—The method described uses Si as an internal standard. For a range of 0·03—5·0% WO_3, the mean error is ~4·5% of the total, and 6·5% when much Fe is present. 30—40 determinations per day can be made. L. S. T.

Decomposition of tin alloys with hydrochloric acid and the iodometric determination of tin.—See B., 1943, I, 253.

XI.—APPARATUS ETC.

Electrically-heated m.p. apparatus. E. Dowzard and M. Russo (*Ind. Eng. Chem. [Anal.]*, 1943, **15**, 219—221).—Apparatus designed to give the heating ratio prescribed by the U.S. Pharmacopæia is described. L. S. T.

Activating light sources for luminescent materials. E. W. Beggs (*J. Opt. Soc. Amer.*, 1943, **33**, 61—70).—The relative efficiency for activation of phosphors and fluorescent materials of high- and low-pressure Hg vapour, fluorescent, A glow, and 60-w. filament lamps have been examined. Their respective ranges of technical application are discussed. L. J. J.

Mercury arc lamps: effect of electrode on energy distribution. W. T. Anderson, jun., (*J. Opt. Soc. Amer.*, 1943, **33**, 104—108).—The spectral energy distribution of the radiation from two identical high-pressure Hg arc lamps, one with pure W electrodes and one with Ba-activated W electrodes, has been compared at standard total radiation. Ba activation reduces the work function of the electrodes from 4·53 to 1·1 v. For max. ultra-violet emission, activated electrodes of low work function acting at low temp. are necessary. With such electrodes the rate of ultra-violet depreciation is also diminished. L. J. J.

Grating spectrograph for use in qualitative analysis. W. S. von Arx (*J. Chem. Educ.*, 1942, **19**, 407—410). L. S. T.

Use of powders in spectrochemical analysis. A. E. Ruehle and E. K. Jaycox (*J. Opt. Soc. Amer.*, 1943, **33**, 109—112).—A method employing dry oxide–nitrate mixtures, applicable to Pb–Sn solders, is described. L. J. J.

Analytical experiments in spectrophotometry. M. G. Mellon (*J. Chem. Educ.*, 1942, **19**, 415—418).—Experiments designed to serve as an introduction to the use of spectrophotometers in chemical analysis are described. L. S. T.

Spectrophotometer [in the textile industry].—See B., 1943, II, 153.

[Apparatus for] absorption spectro-analytical determinations of small samples of mixtures of volatile organic substances.—See B., 1943, II, 165.

Primary standard of wave-length. W. F. Meggers (*Rev. Mod. Physics*, 1942, **14**, 59—63).—The use of the Michelson Cd lamp and of commercial Cd-vapour lamps for providing the Cd red line as a λ standard is discussed. The desirable characteristics of a primary standard of λ are discussed, and it is shown that these conditions are best fulfilled by the Cd red line as proposed by Michelson. A. J. M.

Construction and use of reflexion echelons. W. E. Williams (*Rev. Mod. Physics*, 1942, **14**, 64—65).—The reflexion echelon can be converted into a λ-measuring device which will give vac. λλ directly without compensation for phase change variation as in the Fabry–Perot interferometer. The theory of the echelon is extended to cover line displacement due to the intensity envelope of the echelon and the non-linearity of echelon dispersion. Corrections for these errors have been made to a group of Fe lines. The *n* and dispersion of normal air is best given by the dispersion curve of Meggers and Peters displaced upwards by a const. amount of 0·0032 A. A. J. M.

Identification of orders and ghosts in grating spectra by diffracting slits. H. S. Pomerance and H. G. Beutler (*Rev. Mod. Physics*, 1942, **14**, 66—67).—The λ of various orders in a grating spectrum can be directly indicated on the plates by using the direction of the spectral lines as a co-ordinate for a diffraction pattern which is narrow enough to show several orders. The distance between the diffraction min. is then a measure of λ. The various overlapping orders differentiate themselves by the widths of their patterns, which are in the ratio of small integers, viz., the reciprocals of the orders. The Lyman ghosts do not fit into this system. The widths of their diffraction patterns indicate their true λ. A disadvantage of the method is the low intensity of extended patterns, involving long exposures. A. J. M.

Spectrophotometric determination of Lovibond number in brown Lovibond glasses series No. 52, Brewer's scale. G. F. Beyer (*J. Assoc. Off. Agric. Chem.*, 1943, **26**, 164—171).—A method for correlating spectral transmittance of the glasses to the Lovibond no. has been developed. Calculations may be eliminated by means of a graph. A. A. E.

Light-and-shadow box as visual aid in measuring spectra. J. J. Hopfield (*J. Opt. Soc. Amer.*, 1943, **33**, 113—115). L. J. J.

Beryllium windows for permanently evacuated *X*-ray tubes. H. Brackney and Z. J. Atlee (*Rev. Sci. Instr.*, 1943, **14**, 59—63).—Pure Be, *e.g.*, 0·030 in thick, is superior in *X*-ray transmission to Lindemann glass, *e.g.*, 0·015 in. thick, and makes Cr target diffraction tubes practicable. The use of Be windows >0·010 in. thick is possible. L. J. J.

High-index medium for rapid impregnation of friable materials. C. P. Kaiser and H. T. U. Smith (*Amer. Min.*, 1942, **27**, 590—591).—Aroclor 4465, *n* 1·66+, is used. L. S. T.

Tube-length in photomicrography. J. R. Baker (*J. Roy. Microscop. Soc.*, 1942, [iii], **62**, 112—115).—The correction of the visual focus of a microscope to the focus required for use with a camera is achieved by extending the draw-tube to an extent which can be permanently predetermined, and depends wholly on the eyepiece. Advantages are summarised. N. M. B.

Crystallographic microscopy. E. E. Jelley (*J. Roy. Microscop. Soc.*, 1942, [iii], **62**, 93—102).—A historical review (with detailed bibliography) summarising the principles bearing on, and the use of, the polarising microscope and its accessory apparatus in various applications of optical crystallography, with special reference to chemical microscopy. N. M. B.

Photo-electric polarimeter. E. J. B. Willey (*J. Sci. Instr.*, 1943, **20**, 74—75).—A polarimeter, in which polaroid replaces the Nicol prisms, permitting wider apertures so that the amount of transmitted light is sufficient for photoelectric measurement, is described. C. R. H.

New capillary electrometer as a galvanometer substitute. F. A. Uhl (*Z. anal. Chem.*, 1942, **124**, 324—327). L. S. T.

Electron microscopy in chemistry. V. K. Zworykin (*Ind. Eng. Chem.*, 1943, **35**, 450—458).—Applications of the electron microscope to chemistry are discussed and illustrated by photomicrographs. C. R. H.

Geiger–Mueller counter pulse size. C. W. Miller (*Rev. Sci. Instr.*, 1943, **14**, 68—76).—The effect of overvoltage and pressure on pulse size and pulse distribution has been examined for gas mixtures 90% He–H_2, 90% Ne–H_2, 90% A–H_2, 100% H_2, and 90% A–O_2 at 2—30 cm. Hg, and 9·7 cm. A + 1·2 cm. EtOH. L. J. J.

Distillation receiver for use with the Tate and Warren apparatus. N. B. Biggs (*Analyst*, 1943, **68**, 147—148).—A large receiver is used to replace the graduated receiver after the normal distillation and the immiscible solvent is recovered. S. B.

High-vacuum technique. G. Burrows (*J. Sci. Instr.*, 1943, **20**, 77—78).—Some points raised in an earlier paper (cf. A., 1943, I, 103) are clarified. The reduction of effective pumping speed caused by a cold trap refers only to the "catalogue" val. of the pumping speed. The trap may bring about an increase in overall speed if a

large proportion of vapour condenses in the trap. In connexion with the "compressed-air-under-H_2O" test, a method of calculating the probable size and rate of formation of bubbles due to a given leak is given. C. R. H.

Vacuum desiccator for the synthetic organic laboratory. F. P. Pingert (*Ind. Eng. Chem.* [*Anal.*], 1943, **15**, 175). L. S. T.

Low-temperature vacuum drying apparatus. D. H. Cook (*J. Chem. Educ.*, 1942, **19**, 427, 434). L. S. T.

Vacuum-operated continuous extractor. M. C. Shelesnyak, M. S. Biskind, and M. M. Schwarzschild (*Amer. J. clin. Path. Tech. Sect.*, 1942, **6**, 96—98).—The apparatus described utilises pressure changes in place of the usual boiling–condensing mechanism. This permits extraction of substances that may be affected by heat and prevents any rise in temp. of the material extracted, which may cause secondary changes. C. J. C. B.

Vacuum regulator. J. C. Macsween (*J. Path. Bact.*, 1943, **54**, 107—109). C. J. C. B.

Accurate high-sensitivity apiezon oil McLeod gauge. J. Bannon (*Rev. Sci. Instr.*, 1943, **14**, 77; cf. A., 1943, I, 139).—Erratum. L. J. J.

Report on recommended specifications for microchemical apparatus. Sulphur and halogens. G. L. Royer, H. K. Alber, L. T. Hallett, and J. A. Kuck (*Ind. Eng. Chem.* [*Anal.*], 1943, **15**, 230—234; cf. A., 1941, II, 385).—Drawings of apparatus, with dimensions, are given. L. S. T.

Pressure stopcock. J. A. Connelly (*Ind. Eng. Chem.* [*Anal.*], 1943, **15**, 200). L. S. T.

Rolling ball viscometer. R. M. Hubbard and G. G. Brown (*Ind. Eng. Chem.* [*Anal.*], 1943, **15**, 212—218).—An investigation of the inclined tube and rolling ball as applied to the measurement of η. General relationships between the variables involved and the calibration for the rolling ball viscometer in the streamline region of fluid flow are derived. L. S. T.

[Portable] gas generator. S. Katz (*Ind. Eng. Chem.* [*Anal.*], 1943, **15**, 161). L. S. T.

Semi-micro-Kjeldahl apparatus. B. T. Dewey and N. F. Witt (*J. Amer. Pharm. Assoc.*, 1943, **32**, 55—56).—The apparatus is constructed so that distillation takes place from the flask in which the digestion has been carried out. J. E. P.

Absorption tube for investigation of gases at low pressures. P. A. Leighton and D. H. Volman (*J. Opt. Soc. Amer.*, 1943, **33**, 79—80).—A long Pyrex glass absorption vessel and high-intensity arc source for absorption spectroscopy at low pressures are described. L. J. J.

Displacement development in adsorption analysis. A. Tiselius (*Arkiv Kemi, Min., Geol.*, 1943, **16**, **A**, No. 18, 11 pp.).—It is shown that chromatographic adsorption bands should not traverse a column uniformly because of the dependence of adsorption coeff. on concn., especially at low concns. The resultant "tailing" of bands is avoided by developing with a substance which is more strongly adsorbed than those being separated; in effect adsorption throughout each zone then takes place from a solution of uniform concn. The application to the separation of sucrose from glucose on C using PhOH as developer and examining eluates interferometrically is described. A. H. C.

Determination of velocity of sound by the employment of closed resonators and the hot-wire microphone. W. S. Tucker (*Phil. Mag.*, 1943, [vii], **34**, 217—235).—A modified double Helmholtz resonator, the response of which is measured by the change of resistance of a hot wire in the neck, is described. Vals. obtained for velocity of sound in air, H_2O vapour, Et_2O vapour, and $COMe_2$ vapour from response–frequency curves agree with existing data, and confirm a linear relation between velocity and resonance-frequency. L. J. J.

XII.—LECTURE EXPERIMENTS AND HISTORICAL.

Graphic representation of ionic radii. T. Moeller (*J. Chem. Educ.*, 1942, **19**, 428). L. S. T.

Mathematical expression and interpretation of scientific measurements. W. W. Razim (*J. Chem. Educ.*, 1942, **19**, 411—414).—A condensation of the theory of errors and related topics to a form serviceable in the laboratory. L. S. T.

Ludwig Gattermann. R. E. Oesper (*J. Chem. Educ.*, 1942, **19**, 444—445). L. S. T.

William Murdoch. W. Cullen (*Chem. and Ind.*, 1943, 201—203).

Ross Aiken Gortner. 1885—1942. C. H. Bailey (*Cereal Chem.*, 1943, **20**, 1—2). N. L. K.

XIII.—GEOCHEMISTRY.

Geochemistry of the atmosphere and constitution of terrestrial planets. R. Wildt (*Rev. Mod. Physics*, 1942, **14**, 151—159).—The compositions of the atm. of the earth, Venus, Mercury, Mars, and the Moon are reviewed. Geochemical aspects of planetary evolution and the chemical differentiation of the above planets are also considered. A. J. M.

Discovery of deposits of sodium sulphate at Didwana [Jodhpur]. H. B. Dunnicliff (*Current Sci.*, 1943, **12**, 7—12).—The discovery and utilisation of NaCl and $Na_2SO_4,10H_2O$ in these deposits are discussed. W. R. A.

***X*-Ray study of monetites.**—See A., 1943, I, 145.

American synthetic emerald. A. F. Rogers and F. J. Sperisen (*Amer. Min.*, 1942, **27**, 762—768).—Results of a microscopical and chemical examination of emeralds synthesised by C. F. Chatham are described. The synthetic emerald, $\rho_{obs.}$ 2·667, is of good quality, and approaches in colour the better grades of Colombian emeralds. The synthetic can be distinguished from the natural product by the character of its inclusions. A chemical analysis is given. L. S. T.

Minor chemical elements in fluorites from Jamestown, Colorado. J. M. Bray (*Amer. Min.*, 1942, **27**, 769—775).—Spectrographic analyses of four fluorites (**I**) showed the presence of 20 minor elements, the most abundant of which are Sr, Ba, Fe, Y, Cu, Mg, Al, and Si. These probably substitute for Ca in the ionic fluorite structure. The oldest and the most fine-grained (**I**) was the most impure, and the youngest, from a pyritic Au-vein, the purest. Correlation between minor elements present and geological environment, but not radioactivity, fluorescence, or type of wall rock, is established. L. S. T.

Spectrographic data concerning the presence of the less common elements in rocks. G. O. Freeman (*Amer. Min.*, 1942, **27**, 776—779).—Results obtained in the spectrographic analysis of 425 miscellaneous samples of rocks are classified and discussed. Y was found in a sample consisting of 50% fluorite and 40% quartz, Te in a sample of sand that contained Au and Bi, Ge in a sample of a mixture of pyrite and quartz which also contained Pb, As, Zn, and Cd, and Nb in a large crystal of orthoclase. L. S. T.

Potash-oligoclase in Hawaiian lavas. G. A. Macdonald (*Amer. Min.*, 1942, **27**, 793—800).—Interstitial felspar in these lavas with the n of oligoclase or andesine has an abnormally small positive optical angle. This is due, not to admixture with nepheline or carnegieite, but to potash felspar. Numerous chemical analyses of the lavas are recorded. L. S. T.

New data on thortveitite. J. P. Marble and (Miss) J. J. Glass (*Amer. Min.*, 1942, **27**, 696—698).—Thortveitite (**I**) from Eptevann, Iveland District, S. Norway, has hardness 6—7, ρ 3·58, α 1·751, β 1·789, γ 1·803, SiO_2 45·79, CaO 0·24, MgO 0·17, MnO 0·53, ThO_2 0·09, Sc_2O_3 34·32, La_2O_3 etc. 1·48, Y_2O_3 etc. 9·52, Fe_2O_3 2·95, Al_2O_3 4·95, TiO_2 <0·01; U_3O_8, Pb, and ZrO_2 0·00, H_2O- 0·07, $H_2O_{110°}$ 0·00, total 100·11%. (**I**) is very refractory. L. S. T.

***X*-Ray evidence of the existence of the mineral digenite, Cu_9S_5.** N. W. Buerger (*Amer. Min.*, 1942, **27**, 712—716).—*X*-Ray investigation of the system Cu_2S–CuS shows the existence of the compound Cu_9S_5, the diffraction pattern of which corresponds with that of a type specimen of digenite. This mineral is the same as "isometric chalcocite," or "blue chalcocite," and must be re-established as a mineral species. L. S. T.

Inter-trappean beds at Upparhatti [Belgaum District]. K. V. Kelkar and R. B. Gupte (*J. Univ. Bombay*, 1943, **11**, **A**, Part 5, 121—125).—The red sandy marl, containing up to 10% of $CaCO_3$ as calcite and fine calcareous dust, and its accessory constituents are described. L. S. T.

Dharwar rocks occurring around Murgod in Belgaum District. L. V. Agashe (*J. Univ. Bombay*, 1943, **11**, **A**, Part 5, 126—137).—The epidiorite and the argillite groups of rocks, the banded hæmatite-quartzites, and the marbles and chloritic marbles are described, and their origin is discussed. Chemical analyses are recorded. L. S. T.

Caliche deposits on Southern High Plains, Texas. R. Sidwell (*Amer. J. Sci.*, 1943, **241**, 257—261).—These deposits overlie Tertiary sediments; they are 42—68 ft. thick, and consist mainly of $CaCO_3$, SiO_2, clay minerals, and volcanic ash. Sol. carbonates vary from small amounts to 90% of the deposit. Insol. materials consist of SiO_2 nodules and lenses, some heavy minerals, clay minerals, quartz grains, and nearly pure beds of volcanic ash. Most of the caliche sediments, except SiO_2, suggest Æolian origin. The SiO_2 is probably secondary. L. S. T.

Merwinite in the system CaO–MgO–SiO_2. T. W. Parker and R. W. Nurse (*Iron and Steel Inst.*, May 1943, *Advance copy*, 12 pp.).—The primary phase field of merwinite (**I**) in the system CaO–MgO–SiO_2 is established, and the position of the invariant points with the neighbouring fields of larnite, akermanite, monticellite, and periclase given. Pure (**I**) melts incongruently at 1590°, forming $2CaO,SiO_2$ and liquid. Application of the data to the stabilisation of blast-furnace slags and of dolomite refractories is discussed. L. S. T.

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