BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS

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

SEPTEMBER, 1942.

I.—SUB-ATOMICS.

Resonance broadening of cæsium. C. Gregory (*Physical Rev.*, 1942, [ii], **61**, 465—469).—Studies of broadening by the contour method and of intensities by the method of "astigmatic photometry," with homogeneous Cs vapour at 10^{-2}—17·5 mm. pressure, show that the half-breadth (γ) $\propto$ the no. of atoms per unit vol., with $(\gamma_1/N)10^7 = 1{\cdot}45$ and $(\gamma_2/N)10^7 = 0{\cdot}84$ for the $^2P_{3/2}$ and $^2P_{1/2}$ components of the resonance lines, respectively. The average val. of the ratio of half-breadths γ_1/γ_2 is 1·8. A band on the red side of the $^3P_{3/2}$ component and one on the violet side of the $^3P_{1/2}$ are observed. N. M. B.

New type of vector coupling in complex spectra. G. Racah (*Physical Rev.*, 1942, [ii], **61**, 537).—Mathematical. A (jl) coupling is examined. N. M. B.

Deep configuration of cobalt. G. Racah (*Physical Rev.*, 1942, [ii], **61**, 537—539).—Marvin's theoretical work (cf. A., 1935, 675) as a basis for assignments by Russell (cf. A., 1940, I, 423) is disputed, and revised assignments are proposed and tabulated. N. M. B.

Forbidden doublet ^4S–^2D of the neutral nitrogen atom in the spectra of certain auroras seen at low latitudes. J. Dufay and M. L. Tcheng (*Compt. rend.*, 1941, **213**, 692—694).—Observations of this doublet are recorded, indicating that there must be a high concn. of N atoms excited to the ^2D level in the higher atm. A. J. M.

Presence of forbidden lines in the night sky and the aurora spectra, and the constitution of the upper atmosphere. J. Gauzit (*Compt. rend.*, 1941, **213**, 695—697).—Consequences of the occurrence of forbidden lines in these spectra are discussed. At a height of 100 km. N and O must exist almost entirely in the at. state. A. J. M.

L-Emission and absorption spectra and characteristic levels of tantalum (^{73}Ta). (Mlle.) I. Manescu (*Compt. rend.*, 1941, **213**, 1007—1010).—The L-spectra of Ta are investigated and new lines measured. The characteristic L, M, N, and O levels are evaluated. A. J. M.

K-Absorption edges of metal ions in aqueous solution. W. W. Beeman and J. A. Bearden (*Physical Rev.*, 1942, [ii], **61**, 455—458).—Measurements with a double-crystal spectrometer show that Ni^{++}, Cu^{++}, and Zn^{++} have similar edges, each consisting of two absorption max. arising from the excitation of K electrons into the empty $4p$ and $5p$ levels of the ion. $Cu(NH_3)_4^{++}$ and $Cu_2(CN)_4^{--}$ have entirely different structures, arising probably from the scattering of the photo-electrons by the other atoms of the ion. N. M. B.

Radiofrequency spectrum of indium. Nuclear spin of ^{113}In. T. C. Hardy and S. Millman (*Physical Rev.*, 1942, [ii], **61**, 459—465).—The at. beam method is applied, and lines of the transitions $\Delta F = 0$, $\Delta m = \pm 1$ are observed, in magnetic fields of 3000—7000 gauss, for ^{113}In and ^{115}In. A nuclear spin of 9/2 for ^{113}In is confirmed, and the moment, as for ^{115}In, is positive. The ^{115}In/^{113}In hyperfine separation ratio of the ground state is $1{\cdot}00224 \pm 0{\cdot}00010$, and this is also the ratio of the magnetic moments. For ^{115}In, the hyperfine structure val. is $(11413 \pm 3)10^6$ cycles per sec., and the nuclear moment $5{\cdot}49 \pm 0{\cdot}04$ nuclear magnetons. N. M. B.

Photo-electric instrument measuring quality and quantity of X-rays for radiographic purposes.—See A., 1942, I, 280.

Properties and applications of the Geiger–Müller photo-electron counter.—See A., 1942, I, 281.

Thermionic properties of the iron group. H. B. Wahlin (*Physical Rev.*, 1942, [ii], **61**, 509—512).—The temp. scales for Fe, Ni, and Co are determined for vac.-heat-treated specimens. The thermionic work functions are β-Fe 4·48, γ-Fe 4·23, Ni 4·61, and Co 4·40 e.v. Discrepancies from available data and the effect of traces of impurities are discussed. N. M. B.

Temperature scale, thermionics, and thermatomics of tantalum. M. D. Fiske (*Physical Rev.*, 1942, [ii], **61**, 513—519).—Following a determination of the temp. scale with emissivity, data found were: electron work function $\phi_0^- = 4{\cdot}19$, positive ion function $\phi_0^+ = 10{\cdot}0$, work function of the neutral atom $\phi_0^0 = 7{\cdot}97$, estimated ionisation potential $V = 7{\cdot}3$ e.v. These vals. fail to close the cycle $\phi_0^- + \phi_0^+ = \phi_0^0 + V$ by 1·1 e.v., which is probably outside experimental error. N. M. B.

V^3I Relation for vaporising molybdenum. F. T. Worrell (*Physical Rev.*, 1942, [ii], **61**, 520—524).—Langmuir's relation V^3I = const., for filaments electrically heated to const. temp. in vac., is investigated. For 500-min. operation at 2250° K., V^3I decreases by 0·49—0·85%. N. M. B.

Ionospheric measurements during the total solar eclipse of Oct. 1, 1940. A. J. Higgs (*Month. Not. Roy. Astr. Soc.*, 1942, **102**, 24—34).—The ionisation curve indicates that the radiation producing the E region comes mainly from regions of the sun's disc near patches of bright H and is not emitted uniformly. The F_1 region is more complex than is generally supposed. There is an ultra-violet effect in the F_2 region, but no corpuscular effect. W. J.

Canal-ray positive-ion sources.—See A., 1942, I, 280.

Coincidence ionisation amplifier.—See A., 1942, I, 280.

Behaviour of proportional counter amplification at low voltages.—See A., 1942, I, 280.

Temperature coefficients in self-quenching counters.—See A., 1942, I, 281.

Increase in resolving power of the emission electron microscope.—See A., 1942, I, 281.

Universal electron microscope.—See A., 1942, I, 281.

Resolving power of electron microscopes.—See A., 1942, I, 281.

Emission regulating circuit for an ionisation gauge.—See A., 1942, I, 281.

Detection of radon by means of a proportional counter.—See A., 1942, I, 281.

Radio-elements in non-equilibrium systems. W. D. Urry (*Amer. J. Sci.*, 1942, **240**, 426—436).—An equation for the relative amounts of the long-lived members of the ^{238}U series at any time prior to the establishment of radioactive equilibrium is derived. L. S. T.

Resonance absorption of neutrons in rhodium, antimony, and gold. H. Feeny, C. Lapointe, and F. Rasetti (*Physical Rev.*, 1942, [ii], **61**, 469—475).—The experiments reported for the resonance neutrons of Rh, ^{121}Sb, and Au are absorption in the element itself, absorption in B, and measurement of the total activation in an extended vol. of homogeneous material. The consts. evaluated are the resonance energy E_r, the absorption coeff. for self-indication K_r, and the level width Γ. The vals. found were: for Rh, $\Gamma = 0{\cdot}16$ e.v.; for Sb, $E_r = 14$ e.v., $K_r = 4$ sq. cm. per g., $\Gamma = 0{\cdot}8$ e.v.; for Au, $E_r = 2{\cdot}6$ e.v., $K_r = 40$ sq. cm. per g., $\Gamma = 0{\cdot}11$ e.v. The observed absorption coeff. for thermal neutrons in Rh and Au agrees with calculation; in Sb the calc. val. is $\sim$6 times the observed val., suggesting the interference effect of negative levels. N. M. B.

Angular distribution of protons scattered by high-energy neutrons. H. Tatel (*Physical Rev.*, 1942, [ii], **61**, 450—454).—11-Me.v. Be neutrons are scattered in H_2 and the recoil protons observed at two different angles. The proton intensity $\propto \cos\theta$ (θ = scattering angle); hence the scattering in the centre of gravity system is isotropic to within 10%. N. M. B.

Importance of neutrons in chemistry. H. Suess (*Angew. Chem.*, 1940, **53**, 522—524).—The production and properties of the neutron and its use in connexion with nuclear transformations are discussed. Possible uses in chemical and biological research are outlined. C. R. H.

Radioactive isotopes of nickel and their assignments. M. E. Nelson, M. L. Pool, and J. D. Kurbatov (*Physical Rev.*, 1942, [ii], **61**, 428—431; cf. Livingood, A., 1938, I, 339; Doran, A., 1941, I, 439).—An investigation of the reactions Fe (α, n), Co (d, $2n$), Ni (d, p), Ni (n, γ), and Ni (n, $2n$) indicates the assignments ^{63}Ni (2·6 hr.) and ^{57}Ni (36 hr.). Ni (2·1 min.) is not confirmed. N. M. B.

Forbidden transitions in β-decay and orbital electron capture and spins of nuclei. R. E. Marshak (*Physical Rev.*, 1942, [ii], **61**, 431—449).—Mathematical. A general formula for min. lifetimes for the transitions is derived. The Gamow–Teller selection rules are supported. Results applied to ^{40}K, ^{87}Rb, ^{176}Lu, ^{10}Be, and ^{14}C are discussed. N. M. B.

Thick-target yield of ^{24}Na under deuteron bombardment. C. L. Bailey and J. H. Williams (*Physical Rev.*, 1942, [ii], **61**, 539).—The yield from the reaction $^{23}Na + {}^{2}H \rightarrow {}^{24}Na + {}^{1}H$ is studied in the range 1·5—3·0 Me.v. and plotted. Results fit the Gamow thin-target formula plotted for two vals. of nuclear radius. N. M. B.

Disruption of heavy nuclei. F. Strassmann (*Angew. Chem.*, 1941, **54**, 249—252).—A review. H. W.

Formation of penetrating particles of great divergence by cosmic radiation. J. Daudin (*Compt. rend.*, 1941, **213**, 348—351; cf. A., 1942, I, 256). J. W. S.

Measurement of the mass of mesotrons by elastic collision. R. Richard-Foy (*Compt. rend.*, 1941, **213**, 724—726).—A mathematical consideration of the scope of the collision method for determining the mass of mesotrons in the Wilson chamber. J. L. E.

Effect of cosmic rays on the conductivity of hexane. G. Moulinier (*Compt. rend.*, 1941, **213**, 802—803).—There is evidence that highly purified hexane surrounded by 6 cm. of Pb undergoes ionisation by the action of cosmic rays. N. M. B.

Hypothesis as to the origin of cosmic rays and its experimental testing in India and elsewhere. R. A. Millikan, H. V. Neher, and W. H. Pickering (*Physical Rev.*, 1942, [ii], **61**, 397—407).—There is support for a theory involving the existence of 5 distinct bands, those of Si, O–N, C, and He, each reaching the earth in a particular latitude, and of 4 plateaux of unchanging cosmic-ray intensity. N. M. B.

High-altitude cosmic-ray survey near the magnetic equator. H. V. Neher and W. H. Pickering (*Physical Rev.*, 1942, [ii], **61**, 407—413). N. M. B.

Cosmic-ray electrons of low energy in the atmosphere. B. Rossi and S. J. Klapman (*Physical Rev.*, 1942, [ii], **61**, 414—421).—Mathematical. N. M. B.

Production of neutrons and protons by the cosmic radiation at 14,125 feet. S. A. Korff and E. T. Clarke (*Physical Rev.*, 1942, [ii], **61**, 422—427).—Rates of production are investigated by means of BF_3-filled counters for slow neutrons produced in H_2O, and by CH_4-filled counters for protons produced in Pb, Al, and Cu. N. M. B.

Distribution function. C. W. Ufford and E. P. Wigner (*Physical Rev.*, 1942, [ii], **61**, 524—527).—The function for particles in a large circle is calc. for a long-range repulsive potential and compared with the solution of a Debye–Hückel type equation. N. M. B.

II.—MOLECULAR STRUCTURE.

Possible presence of Lyman bands of nitrogen in the ultra-violet radiation from the night sky. G. Déjardin (*Compt. rend.*, 1941, **213**, 360—363).—A no. of bands observed in the night-sky spectrum in the λ range 2850—3650 A. coincide with calc. $\lambda\lambda$ of Lyman ($a\,^1\Pi \rightarrow X\,^1\Sigma$) bands (cf. Birge and Hopfield, A., 1928, 964) with v', v'' vals. ranging from 0, 16 to 9, 27. J. W. S.

Sodium hydroxide in interstellar space. R. C. Pankhurst and R. W. B. Pearse (*Nature*, 1942, **149**, 612—612).—Consideration of calc. and observed intensities of $R(0)$ lines of $v' \leftarrow 0$ bands of NaH supports Adams' assignment of an interstellar line, λ 3934·3, to NaH (cf. A., 1942, I, 221), but indicates that other interstellar NaH lines should be identified if the assignment is correct. W. J.

Potential energy curve of the excited state of KH. G. M. Almy and A. C. Beiler (*Physical. Rev.*, 1942, [ii], **61**, 476—481).—An analysis of the 4150—4650 A. region of the $^1\Sigma \rightarrow {}^1\Sigma$ band-system of KH is reported and compared with available data. Mulliken's explanation of the excited state anomaly of an alkali hydride is supported, for KH, by the construction of a potential curve. As in LiH, the curve of the excited state crosses the ionic curve of K^+ and H^- and dissociates apparently into K (^2P) and H (^2S). N. M. B.

Vibration–rotation energies of polyatomic molecules. H. H. Nielsen (*Physical Rev.*, 1942, [ii], **61**, 540; cf. A., 1942, I, 131).—Mathematical corrections. N. M. B.

Infra-red absorption spectra of the water molecule in crystals. W. Lyon and E. L. Kinsey (*Physical Rev.*, 1942, [ii], **61**, 482—489).—Absorption spectra near 3 μ., observed under high resolution and dispersion, as produced by H_2O in various bound states, are reported for $NaBr,2H_2O$ (3—2 μ.), $NaI,2H_2O$ (near 2·5 μ.), $BaCl_2,2H_2O$, beryl, mica, topaz, and quartz. The bands in beryl, very similar to the bands of H_2O in CCl_4, are caused by monomeric H_2O or vapour-like mols. in solid solution in the open crystal lattice. In mica only bound OH groups are present; in topaz both bound OH groups and highly perturbed co-ordinated H_2O exist; and in fused quartz H_2O exists, in some samples, in solid solution. N. M. B.

Comparison of absorption spectra of sodium chloride in heavy and in ordinary water. (Mlle.) J. Doucet and B. Vodar (*Compt. rend.*, 1941, **213**, 996—998).—At all concns. studied D_2O solutions of NaCl absorb less than H_2O solutions of the same concn. The weak band at 2700 A. is in exactly the same place and has approx. the same intensity for solutions in H_2O and D_2O, making it probable that it is due to Cl^-. A. J. M.

Effect of temperature and dilution on the near infra-red absorption spectrum of nitric acid. Associations of acid and oxygenic components. R. Dalmon (*Compt. rend.*, 1941, **213**, 782—785).—Variation of intensity with temp. indicates two components for the 1017 μ. band; this is confirmed by a study of the spectra of solutions of pure HNO_3 in CCl_4 and in $CHCl_3$. The components are compared with the alcoholic OH bands. The spectra of HNO_3 in Et_2O and dioxan are discussed. N. M. B.

Ultra-violet absorption of aqueous ammonia solutions. (Mlle.) G. Delivre, (Mlle.) M. Tintant, P. Guenin, and B. Vodar (*Compt. rend.*, 1941, **213**, 566—568; cf. A., 1935, 1298).—Extinction coeffs. (ϵ) at 2190, 2200, and 2210 A. are recorded graphically for 0·02—16M-NH_3 at 20°. At 2000 A. and c = 0·005—1M. Beer's law is approx. verified, but at ~2200 A. the ϵ curves have a min. at c = ~4M., due to an equilibrium between NH_4^+,nH_2O (predominating at low c) and NH_3,nH_2O. At c <4M. ϵ rises steadily owing to increasing solvation. A. J. E. W.

Infra-red spectra of ammonium halides. D. Williams (*J. Amer. Chem. Soc.*, 1942, **64**, 857—860).—The transmissions of powdered and aq. NH_4F, NH_4Cl, and NH_4Br have been measured and near 7 μ. agree with the results of Reinkober (A., 1926, 108). The bands at 5·8 and 7 μ. appear at lower $\lambda\lambda$ in solutions. W. R. A.

Light absorption of cobalt chloride solutions. II. Non-aqueous solutions. A. von Kiss and M. Richter (*Z. physikal. Chem.*, 1940, **A, 187**, 211—226; cf. A., 1937, I, 517).—The absorption spectra, at $\lambda\lambda$ 200—700 mμ., of solutions of $CoCl_2$ in H_2O and various H_2O–non-electrolyte mixtures, and of anhyd. $CoCl_2$ and the $CoCl_2$–C_2H_6N and –quinoline complexes in org. solvents are measured. The formation of complexes of the type $CoCl_2$(Liq.)$_2$ or, in the presence of excess of Cl′ ion, $CoCl_4$ is indicated. $CoCl_4(C_5H_5N)_2$ is formed in C_5H_5N solution in the presence of excess of Cl′ ion, and dissolves in $GHCl_3$ probably to $CoCl_2(C_5H_5N)_2(CHCl_3)_2$. O. D. S.

Infra-red absorption spectra and modes of vibration of thiosulphates. Modes of vibration of the SO_3 group in these salts and in some other metallic salts. (Mme.) R. Duval and J. Lecomte (*Compt. rend.*, 1941, **213**, 998—1000).—There are 4 principal regions of absorption. The SO_3 ion possesses a pyramidal structure, the angle at the apex being 125—145°. A. J. M.

Ultra-violet absorption spectra by reflexion of solid metallic oxalates. A. Berton (*Compt. rend.*, 1941, **213**, 1001—1003).—Many metallic oxalates have an absorption band at 2500—4000 cm.$^{-1}$, the max. of which varies with the metal, but lies between 2600 and 2450 A. This corresponds to the two CO_2 groups. $H_2C_2O_4$ itself has an absorption band towards longer λ. For a certain no. of oxalates a series of narrow bands is observed at regular intervals ~1500 cm.$^{-1}$ They are not found with aq. solutions of oxalates. H_2O of crystallisation displaces the bands towards longer λ by 50—100 A. H oxalates give a wide band similar to that of $H_2C_2O_4$. Double oxalates have different absorption spectra from the normal salts, probably due to formation of complex ions. A. J. M.

Approximate calculation of the fundamental frequencies of vibration of branched-chain saturated aliphatic hydrocarbons. M. Parodi (*Compt. rend.*, 1941, **213**, 1005—1007).—A method of calculating the fundamental ν of some of the plane vibrations of a mol. of the type $Pr^{\beta}\cdot[CH_2]_n\cdot Me$ is given. It gives reasonable agreement with experiment when applied to *iso*-C_5H_{12}, -C_6H_{14}, and -C_8H_{18}. A. J. M.

Ultra-violet absorption spectrum of coronene. J. W. Patterson (*J. Amer. Chem. Soc.*, 1942, **64**, 1485—1486).—Positions and intensities of absorption bands between 2500 and 5000 A. are tabulated and plotted. W. R. A.

Association effects in the Raman spectra of solutions of thiophenol in donor solvents. R. H. Saunders, M. J. Murray, and F. F. Cleveland (*J. Amer. Chem. Soc.*, 1942, **64**, 1230—1231).—Raman spectra of PhSH and its solutions in C_6H_6, C_6H_5N, Pr^{β}_2O, $COBu^{\beta}_2$, $NH(CH_2Ph)_2$, and dioxan have been investigated. No modification in the no. or position of lines has been found except with dioxan, which exhibits two SH $\nu\nu$, the new one at 2536 cm.$^{-1}$ being weak and broad. W. R. A.

Raman spectra of aromatic carbonyl and nitro-compounds. M. J. Murray, F. F. Cleveland, and R. H. Saunders (*J. Amer. Chem. Soc.*, 1942, **42**, 1181—1184).—Raman $\nu\nu$, intensities, and depolarisation factors are given for COPhMe, mesitaldehyde, acetylmesitylene, 2 : 4 : 6 : 1-$C_6H_2Me_3\cdot CO_2Me$ and -$C_6H_2Me_3\cdot COCl$, and $\nu\nu$ and intensities for acetyldurene and nitromesitylene. W. R. A.

Infra-red and Raman spectra of some alkyl nitrates; molecular structure and mode of vibration. J. Lecomte and J. P. Mathieu (*Compt. rend.*, 1941, **213**, 721—723).—The infra-red and Raman spectra of $MeO\cdot NO_2$ have been redetermined and the results are discussed in connexion with the spectra of Et, Pr, and Bu nitrates. J. L. E.

Application of the new analysis of molecular spectra to some interesting molecules. Biological chemicals. H. Deslandres (*Compt. rend.*, 1941, **213**, 749—753; cf. A., 1940, I, 55).—The analysis previously described is applied to Raman $\nu\nu$ for CO, CO_2, CH_2O, glycollic acid, glycerol, and cholesterol. N. M. B.

Application of the new analysis of molecular spectra to some interesting molecules. Biochemical substances. H. Deslandres (*Compt. rend.*, 1941, **213**, 957—961).—An analysis of the infra-red frequencies of HCN, $CO(NH_2)_2$, pyrrole, glycine, and tyrosine is given and discussed. A. J. M.

Classification of Raman frequencies according to crystalline system. J. Barriol (*Compt. rend.*, 1941, **213**, 734—736).—Cryst. systems are classified into six groups which give characteristic Raman spectra. J. L. E.

Fluorescent lamp as voltage stabiliser.—See A., 1942, I, 281.

Dispersion of the dielectric constant of the alums. R. Guillien (*Compt. rend.*, 1941, **213**, 991—993).—The dispersion of the dielectric const. ϵ, of Fe NH_4, Cr NH_4, Al NH_4, and Al K alums is investigated at $\nu\nu$ up to $1{\cdot}36 \times 10^7$. Electrical absorption ϵ' is measured at $\nu\nu$ 50—$1{\cdot}36 \times 10^7$. The temp. at which ϵ and ϵ' are max. are the lower the lower is ν. At const. temp. ϵ decreases with increasing ν, the curve being S-shaped. ϵ' reaches a max. for a certain ν. A. J. M.

Dielectric behaviour, supercooling, and vitrification of chlorobutanes and chloropentanes. A. Turkevich and C. P. Smyth (*J. Amer. Chem. Soc.*, 1942, **64**, 737—745).—Dielectric consts. and sp. conductances of $Bu^{\beta}Cl$, *iso*- and *tert*.-$C_5H_{11}Cl$, and $CH_2Cl{\cdot}CClMe_2$ (**I**) have been measured at various frequencies over a wide range of temp. and the behaviour at various temp. has been studied with the polarising microscope. None of them rotates in the cryst. state. Both $C_5H_{11}Cl$ show supercooling, and $Bu^{\beta}Cl$ and (**I**) vitrify. The solid transition of $EtBu^{\gamma}$ is enantiotropic, the high-temp. form being isotropic and the low-temp. form anisotropic. Irregularity of mol. form and possible co-existence of two more mol. shapes appear to cause a tendency to vitrification, which is greatly affected by a small difference in the size of an atom or group in a mol. W. R. A.

Dipole moments and structures of diketen, and of acid anhydrides and related oxygen and sulphur compounds. P. F. Oesper and C. P. Smyth (*J. Amer. Chem. Soc.*, 1942, **64**, 768—771).—Vals. of the dipole moment (μ), in C_6H_6, are given for diketen (**I**), Bz_2O, Ph_2SO_2, Bz_2O_2, and Bz_2S_2. μ for (**I**) does not uniquely distinguish between its probable structures. Cyclic anhydrides have vals. of $\mu >$ those for similar alicyclic anhydrides, and aromatic anhydrides have their moments increased by resonance contributions from highly polar structures. μ for Bz_2O_2 and Bz_2S_2 are $\ll$ for Bz_2O. The high val. for Ph_2SO_2 is consistent with a structure of two tetrahedra sharing an apex. W. R. A.

Reduction of dipole moment by steric hindrance in di*tert*.-butylquinol and its dimethyl ether. P. F. Oesper, C. P. Smyth, and M. S. Kharasch (*J. Amer. Chem. Soc.*, 1942, **64**, 937—940).—The dipole moments of di*tert*.-butylquinol and its Me_2 ether are 1·68 and 1·47 D. The steric repulsion of Bu^{γ} groups restricts the rotational freedom of the OH and OMe groups and reduces the moment. These data and vals. for hydroxy- and methoxy-benzenes suggest that the bond between O and the ring has only small double-bond character. W. R. A.

Dipole moment and resonance in heterocylic molecules containing nitrogen and sulphur. P. F. Oesper, G. L. Lewis, and C. P. Smyth (*J. Amer. Chem. Soc.*, 1942, **64**, 1130—1133).—Vals. for μ in C_6H_6 are given (and discussed) for 2-nitrothiophen, 4 : 5-diphenyl-2-methyloxazole, benzthiazole, 1-thiol-, 1-methylthiol-, 1-thiol-3- and 5-methyl-, and 1-methyl-benzthiazole. W. R. A.

Dipole moment of a free radical. J. Turkevich, P. F. Oesper, and C. P. Smyth (*J. Amer. Chem. Soc.*, 1942, **64**, 1179—1180).—The dipole moments, in C_6H_6, of $\alpha\alpha$-diphenyl-β-picryl-hydrazine (**I**) and -hydrazyl (**II**) have been measured. μ of (**I**) is $\gg \mu$ for phenylhydrazines, indicating resonance with large contributions from polar structures. μ of (**II**) is $> \mu$ of (**I**) owing to increased resonance. No evidence of localisation of the odd electron in (**II**) to form a dipole similar to those associated with bonds could be found. W. R. A.

Mol. refraction–critical temperature nomograph. D. S. Davis (*Ind. Eng. Chem.*, 1942, **34**, 689).—A nomograph is given for org. acids, alcohols, esters, ethers, hydrocarbons, and nitriles. D. F. R.

Elastic relaxation and double refraction of rolled polystyrene. E. Jenckel and F. Nagel (*Kolloid-Z.*, 1941, **97**, 37—46).—The sp. double refraction of rolled plates of polystyrene $\propto$ their deformation, and for a given deformation decreases with rising temp. The rate of elastic relaxation, measured by the shrinkage, increases with rising temp., but less rapidly than the double refraction decreases. For plates rolled at different temp., the rate of relaxation at temp. $>90°$ decreases slightly with decrease of the temp. of rolling between 70° and 40°. The observations are explained by reference to a mechanical model. F. L. U.

Evaluation of functions related to Tait's mean free path. P. Rosenberg (*Physical Rev.*, 1942, [ii], **61**, 528—530).—Tabular data for functions in kinetics and scattering. N. M. B.

Disperse structure of solid systems and its thermodynamic basis. V. D. Balarev (*Kolloid-Z.*, 1941, **97**, 300—304; cf. A., 1935, 445).—Cryst. $BaSO_4$ containing Na_2SO_4, K_2SO_4, Rb_2SO_4, or Cs_2SO_4 as impurities, when washed or shaken with H_2O, yields sols in which the particles are slightly <1 μ. in size. $BaSO_4$ containing $BaCl_2$ behaves similarly, but yields sols with still finer particles. Sol formation continues after washing for many weeks, and is attributed to the slow removal of sol. impurity from the interstices between the elementary crystals of which the visible crystals are built up. Other evidence for the author's theory is summarised. F. L. U.

Organic parachors. V. Constitutive variations of the parachors of a series of normal ketones. (Miss) K. Owen, Q. R. Quayle, and W. J. Clegg (*J. Amer. Chem. Soc.*, 1942, **64**, 1294—1296).—Vals. of γ, ρ, and parachors of the fifteen *n*-ketones of $\not>11$ C have been determined. The parachor val. for C:O is constitutive, and decreases with the size of the attached alkyl groups. W. R. A.

Structures of nitrous oxide and hydrogen azide. V. Schomaker and R. Spurr (*J. Amer. Chem. Soc.*, 1942, **64**, 1184—1187).—The structures of N_2O and NH_3 have been investigated by the electron diffraction method and the ratios of the interat. distances in N_2O and in N_3' are discussed from the viewpoints of Pauling's and Badger's rules. W. R. A.

Electron-micrographs of preparations of fibrous materials. E. Franz, L. Wallner, and E. Schiebold (*Kolloid-Z.*, 1941, **97**, 36—37).—Electron-micrographs of microtome sections of a film of viscose 20 μ. thick show that the bounding surfaces are not even approx. plane, but are deeply corrugated or serrated. The local darkening previously observed in electron-micrographs of viscose films is due to changes produced by the electron bombardment during the exposure. F. L. U.

III.—CRYSTAL STRUCTURE.

Grid-controlled *X*-ray diffraction tube.—See A., 1942, I, 281.

***X*-Ray study of crystal dynamics.** (Mrs.) K. Lonsdale (*Proc. Physical Soc.*, 1942, **54**, 314—353).—An historical and critical lecture-survey (followed by a discussion) of experiment and theory. N. M. B.

Secondary *X*-ray spectrum of sylvine. (Sir) W. Bragg (*Proc. Physical Soc.*, 1942, **54**, 354—361).—The co-existence in a crystal of large and small groups of atoms, with loss of continuity in phase relationship, would predict, for KCl, nearly circular diffuse spots at small angles of total deflexion, whereas the Faxén–Waller theory, using known vals. of the elastic consts., predicts diffuse spots in the shape of elongated ellipsoids of max. intensity at the centre. This accords better with observation than the view that the crystal remains a single crystal distorted by the heat waves, but with no loss of continuity. N. M. B.

Lattice dynamics and *X*-ray scattering. M. Born (*Proc. Physical Soc.*, 1942, **54**, 362—376).—Mathematical. A refutation of Raman's criticism of the explanation of the "extra spots" in Laue photographs on a thermal basis. The method of the cyclic lattice in lattice vibrations gives a solution agreeing with the rigorous dynamical solution. The "extra spots" are due to acoustical, and not to optical, branches. N. M. B.

Crystal structure of Cu_3N. R. Juza (*Z. anorg. Chem.*, 1941, **248**, 118—120).—Cu_3N is anti-isomorphous with ReO_3, DO_9 type. F. J. G.

***X*-Ray investigations on magnesium amalgams. I.** G. Brauer and R. Rudolf (*Z. anorg. Chem.*, 1941, **248**, 405—424).—Powder photographs of Mg amalgams indicate the existence of the following phases: α, solid solutions of Hg in Mg; β, Mg_3Hg; γ, Mg_5Hg_2; δ, Mg_2Hg; ϵ, Mg_5Hg_3; ζ, MgHg; and η, $MgHg_2$. β is hexagonal, with a 4·858, c 8·639 A., ρ 5·16, and two mols. in the unit cell. ϵ is hexagonal with a 8·243, c 5·919 A., ρ 7·02, and two mols. in the unit cell. η is in equilibrium with liquid at room temp. It is tetragonal with a 3·830, c 8·781 A., ρ 10·92, two mols. in the unit cell, $MoSi_2$ type; at. positions are given. F. J. G.

Structure of complex fluorides. Potassium oxyhexafluoniobate, K_3NbOF_6. M. B. Williams and J. L. Hoard (*J. Amer. Chem. Soc.*, 1942, **64**, 1139—1141).—*X*-Ray photographs of K_3NbOF_6 show holohedral symmetry, a face-centred unit, a 8·87 A., containing 4 stoicheiometric mols., and the crystals are aggregates of $K^{\cdot}$ and $NbOF_6'''$ with some randomness. The $NbOF_6'''$ and ZrF_7''' ions are of the same structural type and quite different from NbF_7'' ions. W. R. A.

Structures of complex fluorides. Rubidium hexafluogermanate. W. B. Vincent and J. L. Hoard (*J. Amer. Chem. Soc.*, 1942, **64**,

1233—1234).—New X-ray data on Rb_2GeF_6, in contradiction to earlier results (A., 1939, I, 600), indicate that Rb_2GeF_6 is isomorphous with $(NH_4)_2GeF_6$ and K_2GeF_6, has a 5·82, c 4·79 A., and space-group D_{3d}^3—$C\bar{3}m$, and is an aggregate of Rb^+ and practically regular octahedral GeF_6'' ions. W. R. A.

X-Ray investigation of calcium bismuth oxychlorides and oxybromides. L. G. Sillén and (Miss) A. S. Gjörling-Husberg (*Z. anorg. Chem.*, 1941, **248**, 121—134).—A no. of tetragonal phases having layer lattices occur in the systems Ca–Bi–O–Cl and Ca–Bi–O–Br. $Ca_{2-3x}Bi_{1+2x}O_2Cl_5$ ($x \sim 0{\cdot}25$) has a 3·897, c 21·69 A.; at. positions and interat. distances are given. $Ca_{2-3x}Bi_{3+2x}O_4Cl_5$ (x undetermined) has a 3·889, c 36·38 A; at. positions are given. $CaBi_2O_3Br_2$ has a 3·915, $c \sim 20{\cdot}7$ A; at. positions are given. Another tetragonal Ca Bi oxybromide has a 3·91, c 28·8 A.; structure and composition undetermined. F. J. G.

Compounds $BaBiO_2Cl$ and $BaBiO_2Br$. L. G. Sillén and (Miss) A. S. Gjörling-Husberg (*Z. anorg. Chem.*, 1941, **248**, 135—136).—$BaBiO_2Cl$ is of type D_{4h}^{17}—$14/mmm$, with a 4·019, c 12·98 A. $BaBiO_2Br$ has the same structure with a 4·080, c 13·27 A. At. positions and interat. distances are given. F. J. G.

Recent results in starch investigation. IV. X-Ray diffraction patterns of starches. M. Samec and M. Blinc (*Kolloid Beih.*, 1940, **52**, 57—86).—A review of the literature under the following headings: fundamental structure, patterns of different starches, effect of drying, effect of gelatinisation, changes in patterns due to ageing, patterns of starch degradation products, patterns of bread, patterns of nitrostarches, and ice-lines in the X-ray patterns of starches. N. G.

Deformation mechanism and fine structure of regenerated cellulose. XVIII. Limitations and comparison of qualitative methods of determining the degree of orientation of stretched cellulose fibres. P. H. Hermans. **XIX. Derivation of an "average angle of orientation" from X-ray diagrams.** J. de Booys and P. H. Hermans (*Kolloid-Z.*, 1941, **97**, 223—228, 229—231).—XVIII. Discussion. XIX. Theoretical. C. R. H.

Crystal structure of β-isoprene sulphone. E. G. Cox and G. A. Jeffrey (*Trans. Faraday Soc.*, 1942, **38**, 241—247).—Detailed X-ray analysis shows the mol. of β-isoprene sulphone to have a heterocyclic structure in which resonance occurs between the three C–C bonds of the C_4S ring. The bond lengths are: C—C (ring) 1·41, C (ring)—C(Me) 1·54, C—S 1·75, S—P 1·44 A., all ±0·02 A. The distribution of the four S bonds is approx. tetrahedral. F. L. U.

Subsidiary maxima in electron diffraction and X-ray diffraction patterns from single crystals. A. Charlesby (*Proc. Physical Soc.*, 1942, **54**, 379—387).—A qual. comparison of the Faxén–Waller theory with the explanation of diffuse bands in electron diffraction shows that the non-appearance of the latter in X-ray diffraction is due to differences in λ, intensity, crystal size, etc. N. M. B.

Examination of electrolytically produced and annealed films of aluminium oxide by electron diffraction and in the electron microscope. G. Hass and H. Kehler (*Kolloid-Z.*, 1941, **97**, 27—35).—The Al_2O_3 films described previously (A., 1942, I, 250) remain amorphous when heated for 1 hr. at 650°, but at 700—900° they break down and become cryst., with a lattice const. (face-centred cubic) of 8·06 A. No conversion into α-Al_2O_3 at 900° could be detected, but such conversion is observed after intense bombardment with fast electrons. F. L. U.

Disperse structure of solid systems. II. D. Balarev (*Kolloid Beih.*, 1940, **52**, 45—56; cf. A., 1939, I, 369).—Polemical, largely against Kossel's theory of crystal growth. A. J. E. W.

Orientation of liquid crystals by rubbed surfaces. P. Chatelain (*Compt. rend.*, 1941, **213**, 875—876).—When azoxyanisole is placed between surfaces rubbed in a given direction, the mols. are oriented in the plane of the normal to the surface and the direction of rubbing, but the orientation gradually changes. The effect is observed with the nematic state, but not with the smectic state. A. J. M.

Plasticity of ice. F. Höppler (*Kolloid-Z.*, 1941, **97**, 154—160).—Flow curves of ice at varying shearing stresses show that the quasi-η increases from $1{\cdot}72 \times 10^{11}$ to $2{\cdot}13 \times 10^{15}$ centipoises as the temp. decreases from −1° to −30°. C. R. H.

IV.—PHYSICAL PROPERTIES OF PURE SUBSTANCES.

Paramagnetism of hydrated calcium ferrites. (Mlle.) J. Foret (*Compt. rend.*, 1941, **213**, 525—526).—The paramagnetism of the Fe oxide in the ferrite is independent of the decomp. and colour change of the ferrite, and shows no appreciable relation to the [NaOH] used in the pptn. of the ferrite. N. M. B.

Configuration of complex kojates formed with transition elements as determined by magnetic susceptibility measurements. J. W. Wiley, G. N. Tyson, jun., and J. S. Steller (*J. Amer. Chem. Soc.*, 1942, **64**, 963—964).—Complex *kojates* of Cu^{II}, Co^{II}, Ni^{II}, Fe^{II}, and Mn^{II} have been synthesised; from χ determinations the Cu complex is either tetrahedral or planar, whilst the others are tetrahedral. The first three compounds are $+0{\cdot}5H_2O$; the other two are anhyd. W. R. A.

Supersonic absorption and Stokes' viscosity relation. L. Tisza (*Physical Rev.*, 1942, [ii], **61**, 531—536). N. M. B.

Raman's theory of the specific heat of solids. M. Blackman (*Proc. Physical Soc.*, 1942, **54**, 377—379).—Raman's rejection of the Debye and lattice theory is critically examined; the lattice theory gives better agreement with experiment. N. M. B.

Heat capacity and vapour pressure hysteresis in liquid *iso*pentane. Isomerides due to hindered rotation. J. G. Aston and S. C. Schumann (*J. Amer. Chem. Soc.*, 1942, **64**, 1034—1038).—In the region 180° to 240° K. C_p and v.p. data show hysteresis effects to ~100 times the precision of measurements, possibly on account of a slow transformation into an isomeric form as a result of restricted rotation. W. R. A.

Heat capacity and entropy, heats of fusion and vaporisation, and vapour pressure of *iso*pentane. S. C. Schumann, J. G. Aston, and M. Sagenkahn (*J. Amer. Chem. Soc.*, 1942, **64**, 1039—1043).—Vals. of C_p from 12° to 290° K. have been measured calorimetrically; v.p. measurements accord with $\log P_{mm.} = -9170{\cdot}850/T - 194{\cdot}4680 \times \log T + 0{\cdot}3108920T - 1{\cdot}936031 \times 10^{-4}T^2 - 439{\cdot}3143$; m.p. 113·39° ±0·05° K.; b.p. 300·90° ±0·05° K.; heats of fusion and vaporisation, 1226·3±0·5 and 5878 ±5 g.-cal. per mol.; entropies from thermal and spectroscopic data for the ideal gas at 298·16° K. and 1 atm. are 82·01±0·55 and 73·180 g.-cal. per degree per mol. The potential of the torsional motion between Et and Pr^{β} groups is calc. and free energies of formation of n-, *iso*-, and neo-pentane are derived from these and recorded data. W. R. A.

Heat capacity of organic vapours. III. Nitromethane. T. D. Vries and B. T. Collins (*J. Amer. Chem. Soc.*, 1942, **64**, 1224—1225).—Data confirm those of Pitzer and Gwinn (A., 1942, I, 138). W. R. A.

Heat of fusion and heat capacities of solid and liquid white phosphorus. F. E. Young and J. H. Hildebrand (*J. Amer. Chem. Soc.*, 1942, **64**, 839—840).—From 0° to 44·2°, C_p of solid white P_4 is given by $C_p = 21{\cdot}46 + 2{\cdot}872 \times 10^{-2}\theta$. For liquid P_4 in the range 25—97° $C_p = 24{\cdot}47 - 9{\cdot}521 \times 10^{-3}\theta - 3{\cdot}927 \times 10^{-5}\theta^2$. At the m.p., 44·2°, the heat of fusion is 601 g.-cal. per mol. W. R. A.

Phase equilibria in hydrocarbon systems. Thermodynamic properties of *n*-pentane. B. H. Sage and W. N. Lacey (*Ind. Eng. Chem.*, 1942, **34**, 730—737).—The sp. vol. and v.p. of n-C_5H_{12} are determined between 100° and 460° F. and up to 10^4 lb. per sq. in. The volumetric behaviour in the crit. region is studied in detail. Enthalpy–pressure coeffs. in the liquid and gaseous regions, and vals. of the isothermal enthalpy changes and of the fugacity of n-C_5H_{12}, are calc. D. F. R.

Viscosity of gases and vapours and their measurement in the Höppler viscometer. R. Wobser and F. Müller (*Kolloid Beih.*, 1941, **52**, 165—276).—A Höppler viscometer (A., 1933, 367) of variable angle allows measurement, accurate to 0·1—0·15%, of η up to 10^3 poises of liquids or gases at pressures ≮250 mm. and temp. from 0° to 100°. η of air, by comparison with liquid H_2O, is 1815×10^{-7} poise at 20°, agreeing with the vals. of Shiba (A., 1932, 1187), Houston (A., 1938, I, 22), and Rigden (*ibid.*, 131, 393). The Sutherland const. C of air between 20° and 100° is 113. The following vals. of η at 20° (in poises $\times 10^{-7}$) and C (in that order) were also obtained; O_2, 2030, 127; N_2 1751, 104; H_2 879·3, 66·8; Cl_2 1333, 345; A 2228, 148; He 1956, 72·9; Ne 3118, 64·1; NH_3 986·6, 505; CO_2 1465, 253; CO 1753, 102; SO_2 1254, 404; NO 1882, 133; N_2O 1462, 263; C_2H_2 997·7, 320; CH_4 1093, 169; C_3H_8 802·9, 288; n-C_4H_{10} 734·3, 309. Vals. of n in the equation $\eta_2/\eta_1 = (\theta_2/\theta_1)^n$ are tabulated and lie between 1·1 and 0·6 for the θ range 20° to 100°. O. D. S.

Correlation between elastic moduli and viscosity of liquids and plastics. A. Gemant (*J. Appl. Physics*, 1941, **12**, 680—685).—An equation connecting elastic moduli (bulk and Young's) of liquids and plastics with their η is deduced. The equation is applicable to a pure substance, or to chemically related substances. The equation is applied to simple hydrocarbons, petroleum fractions, polyvinyl plastics, and glasses. A. J. M.

Theory of fusion. J. G. Kirkwood and (Miss) E. M. Boggs (*J. Chem. Physics*, 1942, **10**, 307).—The distribution function used (cf. Kirkwood and Monroe, A., 1941, I, 400) can represent a non-uniform density distribution with the period of a specified space lattice provided the position and orientation of the crystal are fixed by external forces. L. J. J.

Structure and dynamics of liquids. W. E. Roseveare, R. E. Powell, and H. Eyring (*J. Appl. Physics*, 1941, **12**, 669—679).—A liquid may be regarded as a solid to which a large no. of empty equilibrium positions are added. Expansion on melting and on heating arises almost entirely from the presence of new equilibrium positions. Consideration of fluidity and of the theory of melting gives information concerning the no., size, and energy of formation of these empty lattice points. A. J. M.

V.—SOLUTIONS AND MIXTURES (INCLUDING COLLOIDS).

Statistical mechanics of binary mixtures. T. Alfrey and H. Mark (*J. Chem. Physics*, 1942, **10**, 303—304).—The configurational partition function is derived by specification of occupants of a set of lattice point pairs. L. J. J.

Interconversions of binary compositions by simple graphical methods. K. H. Sun and A. Silverman (*Ind. Eng. Chem.*, 1942, **34**, 682—684).—Two methods are given for the interconversion of wt., vol., and mol. fractions, and for conversion into these fractions from compositions expressed in parts by wt., or otherwise, in a binary system. D. F. R.

Structure mechanics of viscous-elastic continua. V. Viscosity and mol. wt. H. Umstätter (*Kolloid-Z.*, 1941, **97**, 53—61; cf. A., 1940, I, 203).—An expression for the temp.-variation of η of a liquid, formally similar to the Clapeyron v.p. equation, is deduced, its validity being restricted to temp. in the neighbourhood of half the abs. crit. temp. ($\frac{1}{2}T_c$) of the liquid. For liquids in which the internal friction appears wholly as heat, the mol. wts. of different liquids $\propto (\frac{1}{2}T_c)^2$ when their internal pressures and the vals. of $d\eta/dT$ are the same. This is also true for solutions so dil. that the internal pressure of the solvent remains substantially unchanged, so that by determining the val. of $\frac{1}{2}T_c$ for the solution its mean mol. wt., and hence the mol. wt. of the solute, can be calc. A simple graphical method of obtaining T_c vals. is explained. Since the temp. differences involved are several times as great as those measured in the ebullioscopic and cryoscopic methods mol. wts. can be determined from η measurements with the same accuracy by the use of an ordinary thermometer. The method has not yet been extended to colloidal solutions, but gives good results with hydrocarbons of mol. wts. 280—440 dissolved in C_6H_6. F. L. U.

Molal volumes of solutes. VI. Potassium chlorate and hydrochloric acid. O. Redlich and J. Bigeleisen. **VII. Sodium acetate and acetic acid.** O. Redlich and L. E. Nielsen (*J. Amer. Chem. Soc.*, 1942, **64**, 758—760, 761—762).—VI. The limiting law of the molal vol. has been confirmed by the determination of ρ of aq. $KClO_3$ and HCl with a precision of $\sim 4 \times 10^{-7}$ at high dilution. These substances do not exhibit any anomaly.

VII. The apparent molal vols. of aq. NaOAc and AcOH at 25·00° required for a test of Born's equation have been determined with an estimated uncertainty of 0·03 and 0·01 c.c. per mol., respectively. W. R. A.

B.p.–composition data for the methyl alcohol–dioxan system. F. L. Padgitt, E. S. Amis, and D. W. Hughes (*J. Amer. Chem. Soc.*, 1942, **64**, 1231—1232).—The b.p.–composition curves for liquid and vapour phases have been determined. W. R. A.

Vapour pressures of aqueous solutions at high temperatures. N. B. Keevil (*J. Amer. Chem. Soc.*, 1942, **64**, 841—850).—V.p. data between 150° and 650° are given for saturated aq. solutions of NaCl, NaBr, NaI, KCl, KI, Na_2CO_3, Na_2SO_4, $Ca(NO_3)_2$, and a mixture of KCl and NaBr. Crit. conditions near the crit. point of H_2O have been confirmed for Na_2CO_3 and Na_2SO_4. Continuous curves are given by very sol. salts showing max. v.p. at temp. between the triple points of H_2O and of salt and no crit. region. Max. v.p. is the less the greater is the initial temp. coeff. of solubility and the lower is the m.p. of the salt. W. R. A.

Temperature and composition coefficients of the density, refractive index, and viscosity of the methyl alcohol–dioxan system. E. S. Amis, A. R. Choppin, and F. L. Padgitt (*J. Amer. Chem. Soc.*, 1942, **64**, 1207—1212).—Vals. of ρ, n, and η of MeOH, dioxan, and their mixtures have been measured at various temp. and composition and temp. coeff. equations have been derived. W. R. A.

Influence of solvation on the viscosity of solutions. Paraffin derivatives. W. Philippoff and K. Hess (*Kolloid-Z.*, 1941, **97**, 170—176).—η_{20} data for aq. EtOH, AcOH, and dioxan solutions of RMe, RCO_2H, RCO_2Na, RCO_2K, RCO_2Tl, RC_5H_5NCl, NMe_3RBr, and $NaRSO_4$ ($R = n\text{-}C_{11}H_{23}$) are applied to a discussion of the influences of chain length, presence of active groups, and nature of the solvent on η. C. R. H.

Dielectric polarisation of benzyl alcohol. W. Hückel and U. Wenzke (*Z. physikal. Chem.*, 1942, **B**, **51**, 144—156).—The ϵ and d of various solutions of $CH_2Ph{\cdot}OH$ in *cyclo*hexane, C_6H_6, and CCl_4 have been determined at 0—60° and the dielectric polarisation P of $CH_2Ph{\cdot}OH$ deduced. In *cyclo*hexane P decreases initially with increasing [$CH_2Ph{\cdot}OH$], then rises to a max. and gradually decreases again. The same behaviour is observed in C_6H_6 at low temp., but at higher temp. the curve changes in form, the val. of P being depressed considerably at low concns. It is suggested that at lower temp. highly dipolar $(CH_2Ph{\cdot}OH)_3$ aggregates are present, but that at higher temp. and low concns. the non-dipolar $(CH_2Ph{\cdot}OH)_2$ mols. predominate. J. W. S.

Electric moments of organomercuric halides in dioxan. B. C. Curran (*J. Amer. Chem. Soc.*, 1942, **64**, 830—833).—The electric moments of Hg Ph, p-C_6H_4Me, p-C_6H_4Cl, Bu, and C_5H_{11} bromides in dioxan and of $C_5H_{11}{\cdot}HgCl$ in dioxan and in C_6H_6 have been measured and results show that the mols. are non-linear, that the C(phenyl)–Hg bond has practically no double bond character, that co-ordinate bonds are not formed between solvent and halide, and that dipole–dipole bonds exist between O and Hg in dioxan. W. R. A.

Determination of molecular and ionic weights of dissolved substanes by methods of dialysis and free diffusion. II. G. Jander and H. Spandau (*Z. physikal. Chem.*, 1940, **A**, **187**, 13—26; cf. A., 1940, I, 204).—"Cellafilters" with mean pore radius ~500 A. are suitable for the dialysis method up to particle wts. ~5000. Within this range the dialysis coeffs. (λ) obtained are $\propto$ diffusion coeffs. obtained by free diffusion, and $\lambda\eta$ is const. for a given diffusing particle. The latter relation enables λ vals. for different substances in different foreign electrolyte solutions to be correlated. L. J. J.

Anomalous mixed crystals and oriented crystallisation. A. Neuhaus (*Angew. Chem.*, 1941, **54**, 527—536).—Review. A. J. E. W.

F.p. of binary mixtures of diphenylamine and other organic compounds. O. A. Nelson and L. E. Smith (*J. Amer. Chem. Soc.*, 1942, **64**, 1057—1059).—Crystallisation temp., eutectic composition and temp. have been determined for $NHPh_2$ with phenoxathiin, p-nitrophenetole, 1-$C_{10}H_7{\cdot}NO_2$, dibenzfuran, and phenothiazine. F.p. consts. have been calc. W. R. A.

Ferrous sulphide mixed crystals. H. Haraldsen (*Z. anorg. Chem.*, 1941, **246**, 169—194).—The system FeS–S has been studied in the region 50—55 total at.-% S by X-ray, density, and magnetic methods. With 50—51 at.-% S an overstructure region exists which at higher [S] passes into a matrix $B.8$ structure which is stable up to 53·4 at.-% S, after which the pyrites lattice is developed, with a rapid decrease in mol. vol. At the transition point between the overstructure and $B.8$ structure regions the paramagnetism changes only slightly but discontinuously. The behaviour can be explained by assuming that besides the at. linkings with antiparallel spin in the direction of the c axis, similar linkings also occur in the direction of the a axis but are broken in the transition from the overstructure to $B.8$ structure. Transition from antiferromagnetism to ferromagnetism occurs with >52·2 at.-% S, and the susceptibility becomes a max. at ~53·4 at.-% S where the no. of vacant positions in the pyrites lattice is a max. J. W. S.

X-Ray study of the calcium–strontium alloy series. A. J. King (*J. Amer. Chem. Soc.*, 1942, **64**, 1226—1227).—Ca–Sr alloys have been analysed by an X-ray diffraction method. All crystallise with a face-centred cubic lattice, the a_0 of which increases with Sr content. Thus Ca and Sr form a continuous series of solid solutions at room temp. W. R. A.

Behaviour of the alkaline earth metals to one another. W. Klemm and G. Mika (*Z. anorg. Chem.*, 1941, **248**, 155—166).—X-Ray investigation shows that Ca and Sr form a complete series of mixed crystals, whereas the systems Ca–Ba and Sr–Ba each show two series of mixed crystals separated by a two-phase region. F. J. G.

Thermodynamic study of the tin–bismuth system. H. Seltz and F. J. Dunkerley (*J. Amer. Chem. Soc.*, 1942, **64**, 1392—1395).—The activities and relative heat contents of Sn and Bi in their liquid alloys have been found from e.m.f. measurements. The β solid solution at the eutectic point contains 20% of Bi whilst the α solid solution contains 2·4% of Sn. Endo's curve (B., 1926, 327) appears to be too low, but the α liquidus points obtained by Würschmidt (A., 1921, ii, 646) are in good agreement with those calc. from presented data. W. R. A.

Liquid–liquid extraction data. Toluene and acetaldehyde systems. D. F. Othmer and P. E. Tobias (*Ind. Eng. Chem.*, 1942, **34**, 690—692).—Solubility data are given for the separation of PhMe from excess of C_7 aliphatic hydrocarbons (*e.g.*, n-C_7H_{16}) using 97—98% AcOH, and of MeCHO from H_2O using PhMe, C_6H_6, n-$C_5H_{11}{\cdot}OH$, or furfuraldehyde. A graphical method is given for applying the lever rule in locating tie lines in ternary solubility diagrams. D. F. R.

Recovery of nitrous gases by adsorption. IV. Heat of adsorption of nitric oxide by silica gel. E. Briner and B. Sguaitamatti (*Helv. Chem. Acta*, 1942, **25**, 370—375).—The heat of adsorption (q) of NO on SiO_2 gel at room temp., measured calorimetrically, varies from −5800 to −6600 g.-cal. per g.-mol., according to the degree of desiccation of the gel, suggesting that no chemical reaction occurs. Calculation of q from the adsorption isotherm leads to vals. nearest in accord with observation if it is assumed that the adsorption comprises condensation rather than assimilation of the gas. J. W. S.

Dielectric properties of a substance in the sorbed state. I. Higuti (*Bull. Inst. Phys. Chem. Res. Japan*, 1941, **20**, 489—513).—The dielectric const., ϵ, of $Pr^{\alpha}OH$ sorbed by TiO_2 gel was measured between 70° and −70°. Vals. of ϵ in the adsorbed state and in the state of capillary condensation from −60° to 40° are calc.;

vals. of ϵ for the former are <those for the latter, and both are < those for the bulk liquid, the differences increasing with fall of temp. D. F. R.

Adsorption of hydroxybenzenes by fuller's earth. W. Bielenberg and H. Goldhahn (*Kolloid-Z.*, 1941, **97**, 151—153).—Data for the adsorption of mono-, di-, and tri-hydroxybenzenes show that adsorption increases in this order. C. R. H.

Ionic adsorption in solutions of silica and alumina. P. G. Nutting (*J. Washington Acad. Sci.*, 1942, **32**, 117—122).—The initial decrease in p_H on adding 0·1% aq. KOH to SiO_2 (1·5 units for solutions of 1—100 mg. per 100 c.c.) and to Al_2O_3 (up to 5 units for solutions of 0·01—10 mg. per 100 c.c.), and the initial increase in p_H on adding 0·1% aq. HCl to K_2SiO_3 and $KAlO_2$ solutions, is attributed to selective ionic adsorption. E. R. R.

Application of the Gibbs adsorption equation to solutions of colloidal electrolytes. A. E. Alexander (*Trans. Faraday Soc.*, 1942, **38**, 248—254).—In a discussion of discrepancies between the surface adsorption observed in solutions of colloidal electrolytes (paraffin-chain salts, dyes) and that calc. from the Gibbs equation it is shown that the condition of $d\gamma/dC = 0$ does not necessarily imply that the total adsorption = 0, since this condition might be due to the concn. of single mols. (c_s) becoming approx. independent of the total concn. C. Application of the law of mass action indicates that c_s becomes sensibly const. when once aggregation has set in, hence, since the adsorption should be calc. from the relation of γ to c_s rather than to C, there is no anomaly. This explanation may also hold for apparent anomalies in non-aq. solutions (cf. McBain and Perry, A., 1940, I, 252), but cannot be applied to some results with dyes, which may show no adsorption experimentally when $d\gamma/dC = 0$. F. L. U.

Surface diffusion of carbon dioxide in activated carbon. E. Wicke and R. Kallenbach (*Kolloid-Z.*, 1941, **97**, 135—151).—Data obtained for the diffusion of CO_2 through activated C, clay, and fritted glass over the pressure range 760—100 mm. at 0° and over the temp. range 0—200° at 760 mm. are presented and discussed. C. R. H.

Superliquid in two dimensions and first-order change in condensed monolayer. I. Energy, compressibility, and order of phase transformations. W. D. Harkins and L. E. Copeland (*J. Chem. Physics*, 1942, **10**, 272—286).—Monolayers of *n*-paraffin long-chain alcohols show an apparently first-order (Ehrenfest's terminology) transition from an L_2 ("liquid condensed," Adam) to an S (solid) phase. The first-order character in the case of $C_{18}H_{37}\cdot OH$ is confined to the temp. range 7·5—11°; outside this range the transition is second-order. The S phase exists only below 7·5°; above this temp. the stable high-pressure phase is of a new type (LS). The LS phase has low compressibility like S, but is ~10 times more fluid than L_2 at low pressures. Compressibility, energy and entropy of expansion data are recorded. Very large vals. are found for the last, *e.g.*, for n-$C_{18}H_{37}\cdot OH$ ΔS = 5·86 ergs per cm. per degree per cm.^{2} expansion at pressure 18 dynes per cm., temp. 8·06°, and mol. area 19·96 A.^{2} The properties of the highly condensed monolayers concerned change very rapidly with mol. area. L. J. J.

Energy relations of the surface of solids. I. Surface energy of the diamond. W. D. Harkins (*J. Chem. Physics*, 1942, **10**, 268—272).—Total and free surface energies (at 25°) for the (111) and (100) faces, calc. from the C–C bond energy val. 90 kg.-cal. per mol., are 5650 and 5400, and 9820 and 9400 ergs per sq. cm., respectively. The effect of long-range interaction is small. L. J. J.

Determination of foaming capacity, and consideration of the average life period (τ) as a characteristic. K. Hoffmann and H. Peter (*Kolloid-Z.*, 1941, **97**, 161—170).—Air is forced through capillaries under the surface of the liquid contained in a narrow tube, the height of the column of foam being a measure of foaming capacity. The average life period (τ) of a foam is defined and the influence of temp. and bubble size on τ is discussed. C. R. H.

Emulsifying power of α-amino-acids. J. Loiseleur (*Compt. rend.*, 1941, **213**, 351—353).—The emulsifying powers of α-NH_2-acids for paraffin (m.p. 70°) have been determined. All acids with a non-polar chain permit the production of stable emulsions, the emulsifying power being the greater the longer is the chain and being particularly high for $CH_2Ph\cdot CH(NH_2)\cdot CO_2H$. When the chain ends in a polar group, however, the acid has no emulsifying power. The emulsions produced are very stable independently of the p_H and salinity of the medium. The observations support the view that in a protein mol. the NH_2-acid groupings are arranged in a manner conditioned by the polar or non-polar character of their chains and also suggest that NH_2-acids cause emulsification of fatty materials in the intestine. J. W. S.

Emulsifying power of proteins. J. Loiseleur and J. J. Lamarca (*Compt. rend.*, 1941, **213**, 568—570).—An emulsion is prepared as follows: 0·1 g. of paraffin (m.p. 70°) is dissolved in 50 c.c. of hot EtOH, and 5 c.c. of 0·2% ovalbumin (I) [prepared by dissolving the (I) in anhyd. HCO_2H and diluting the 10% solution with MeOH] are added; the mixture is poured slowly, with vigorous stirring, into 50 c.c. of boiling H_2O. Some paraffin remains undispersed unless the EtOH–MeOH solution is boiled for ~1 hr. before addition to H_2O. Emulsification is attributed to scission of the (I) mols. and presentation of polar and apolar faces to the respective phases. Casein, edestin, and zein give similar emulsions. The emulsions are purifiable by dialysis and very stable at p_H removed from the isoelectric point of the protein. A. J. E. W.

Mechanics of flow with non-colloidal inert solids in suspension.—See B., 1942, I, 323.

Air-driven ultracentrifuges. G. Schramm (*Kolloid-Z.*, 1941, **97**, 106—115).—A review. F. L. U.

Longitudinal depolarisation of light in suspensions of crystalline particles and colloidal suspensions. S. Procopiu (*Kolloid-Z.*, 1941, **97**, 1—27).—Previous work by the author and others (cf. A., 1933, 553; 1935, 1054; 1939, I, 368, 416) is reviewed and discussed. F. L. U.

Sediment volumes and specific viscosity of suspensions and solutions in mixed liquids. E. W. J. Mardles (*Trans. Faraday Soc.*, 1942, **38**, 222—227; cf. A., 1941, I, 40, 297).—On the basis of experiments with cellulose esters, resins, and various powders dispersed or suspended in mixed liquids ($COMe_2$–H_2O, *cyclo*hexanone–$CH_2Ph\cdot OH$, EtOH–$COMe_2$–C_6H_6, PhOH–NH_2Ph–$COMe_2$) it is shown that variations in the sediment vols. and in the relative η with the composition of the liquid are parallel with the dispersing power of the latter. F. L. U.

Viscosity and structure of hydrophilic colloids. I. C. Rossi (*Kolloid-Z.*, 1941, **97**, 129—135).—η data for bentonite suspensions show that frictional hysteresis occurs, especially at low concns. η depends on velocity, and const. η is attained only if the velocity is kept const. for a sufficient time. C. R. H.

Colloidal thermoscope. II. R. E. Liesegang (*Kolloid-Z.*, 1941, **97**, 96—99).—Details are given for increasing the sensitivity of the indicator previously described (A., 1928, 835) and further observations on its behaviour are recorded. F. L. U.

Representation of stability of colloidal systems by isochrones. Observations on silicic acid sols. A. Dobrowsky (*Kolloid-Z.*, 1941, **97**, 80—87).—The stability relations of SiO_2 sols are shown in triangular diagrams, using as components Na silicate, H_2O, and acid (HCl, H_2SO_4, H_3PO_4, 2-$C_{10}H_7\cdot SO_3H$, succinic and tartaric acids). Lines joining points of equal stability, expressed as log (gelation time), are termed isochrones. Isochrones of the system studied depict a proportionality between decrease of p_H and change of stability, the isochrones being crowded where the titration curves are steepest. At high concns. 2-$C_{10}H_7SO_3H$ depresses the stability of SiO_2 sol more than do the other acids at the same mol. concn. F. L. U.

Constitution of dilute soap solutions. V. Hydrolysis of sodium decoate. P. Ekwall (*Kolloid-Z.*, 1941, **97**, 71—80).—The changes that occur in Na decoate solutions at 20° with increasing concn. are similar to those observed with Na laurate (A., 1942, I, 99), but the corresponding changes occur at higher concns. Na decoate behaves as a normal 1—1 electrolyte up to 0·021N., between which and 0·04N. double anions are formed. Triple anions occur between 0·043 and 0·055N., and association then increases slowly and reaches a limit at ~0·2N. The results support the author's hydrolysis theory. F. L. U.

Phase transition and elastic behaviour of high polymerides.—See B., 1942, II, 294.

Molecular orientation and some associated properties in macromolecular substances. (A) K. H. Meyer. (B) E. Wöhlisch. (C) F. H. Müller (*Kolloid-Z.*, 1941, **97**, 105—106; cf. A., 1942, I, 143).—Discussion of priority claims. F. L. U.

Viscosity of emulsions of highly-viscous materials as a function of concentration. H. Eilers (*Kolloid-Z.*, 1941, **97**, 313—321).—The viscosity–concn. formula of von Bredée and de Booys (A., 1937, I, 303) agrees better with the experimental results on bitumen emulsions than does that of von Houwink and Klaasens (A., 1937, I, 355), except for very conc. systems when the calc. vals. are too low. Spatial considerations show that the viscosity–concn. curve will approach an asymptote when the vol. fraction (C_v) of the dispersed phase = 0·74; for infinitely small values of C_v the former equation changes to that of Einstein. Further empirical equations are proposed for the systems investigated. N. G.

Sorption curve for isotropic cellulose. Preparation of isotropic cellulose threads. P. H. Hermans (*Kolloid-Z.*, 1941, **97**, 326—328).—Isotropic cellulose fibres (I) were prepared as described previously (A., 1938, I, 80), except that the drying fibres were not loaded; even a small load causes some anisotropy. The absorption isotherm for H_2O at 25° was determined for (I); the results agreed with those of Obermiller (B., 1926, 481) and of Kanamaru and Takoda (A., 1939, I, 418; 1940, I, 255) for viscose. N. G.

Gel structure and swelling. P. H. Hermans (*Kolloid-Z.*, 1941, **97**, 231—237).—Discussion. C. R. H.

Electron-microscopic investigation of the muscle-protein myosin. M. von Ardenne and H. H. Weber (*Kolloid-Z.*, 1941, **97**, 322—325).—Seen under the electron microscope, finely-divided myosin (**I**) consists of fine threads, which are a few thousand mμ. long and 5—10 mμ. thick. Gaps seen in the threads are probably bridged by links too fine to be seen. These very fine threads and those 5 μ. thick are similar in thickness to single threads of (**I**), hence both micelle bundles and single micelles can arrange themselves into threads. The relation of this to the general interlinking of micelles is discussed. The irreversible destruction of the double refraction of (**I**) by urea is accompanied by an irreversible destruction of the thread-like structure. N. G.

Electron microscope observations on collagen. C. E. Hall, M. A. Jakus, and F. O. Schmitt (*J. Amer. Chem. Soc.*, 1942, **64**, 1234).—Collagen fibres from various sources exhibit in the electron microscope cross-striations which extend uniformly across the fibre, the distance between bands being between 522 and 902 A. *X*-Ray diffraction data (cf. A., 1942, I, 231) show a fibre axis periodicity of ~640 A. The concordance between the two sets of data indicates that the periodicity arises from the structure and arrangement of collagen mols. in the fibres. W. R. A.

Electrokinetic behaviour of carborundum. A. J. Ham and W. Hodgson (*Trans. Faraday Soc.*, 1942, **38**, 217—221).—Electro-osmotic measurements with carborundum (**I**) in presence of 0·01N-Na^+ are recorded. In the p_H range 1·90—11·90 the ζ-potential becomes continuously more negative with increase of p_H, isoelectric point being between 2 and 3. In view of its stability and of the reproducibility of the results (**I**) is a suitable standard substance for electrokinetic measurements, in which it behaves as a non-conductor. The ζ–p_H curves for (**I**) and m-$C_6H_4(NO_2)_2$ are similar, and indicate that OH' adsorption is the cause of the negative charge. F. L. U.

Effect of carbamide on the electrophoretic patterns of serum-proteins. D. H. Moore (*J. Amer. Chem. Soc.*, 1942, **64**, 1090—1092).—Electrophoresis of human serum in 2·8M-$CO(NH_2)_2$ at 1·5° indicates numerous components, but this is entirely due to convection currents, the temp. coeff. of d of the solution being large at 0—4°. d–temp. curves are given for some solutions. R. S. C.

VI.—KINETIC THEORY. THERMODYNAMICS.

Ionic competition in base-exchange reactions. R. H. Bray (*J. Amer. Chem. Soc.*, 1942, **64**, 954—963).—Immediate equilibria between mixtures of exchangeable cations, *e.g.*, in clays, and small amounts of an added cation have been studied and cation-exchange equations have been developed by which the release or adsorption of an individual cation present with complementary cations on the colloid can be calc. The consts. of "ease of release" of cations are Na > K > Mg > Ca > H. The effect of the Al of the silicate lattice on the p_H of the supernatant solution in acid clay is discussed in relation to base-exchange equations. W. R. A.

Dissociation constants of phosphorous acid. Y. Takahashi and N. Yui (*Bull. Inst. Phys. Chem. Res. Japan*, 1941, **20**, 521—528).—The dissociation consts., obtained by titrating with NaOH and measuring the p_H with a glass electrode, are 0·031—0·021 and 1·5 × 10^{-7} in the concn. range 0·04—0·01M. The first const. increased with the acid concn., possibly owing to the formation of an acid polymeride such as $H_6P_2O_6$. D. F. R.

Ionisation constant of benzoic acid in methanol–water mixtures. H. N. Parton and J. Rogers (*Trans. Faraday Soc.*, 1942, **38**, 238—240).—E.m.f. of the cell $H_2|BzOH(m_1)|NaOBz(m_2)|NaCl(m_3)|AgCl|Ag$ were measured at 5° intervals from 15° to 45°, and the ionisation const. (K) of BzOH calc. by the method of Harned and Ehlers (cf. A., 1933, 350). Vals. of K are tabulated for solutions in 10% and 20% MeOH; at 25° they are respectively 4·10 and 1·90 × 10^{-5}. Vals. of $\Delta H°$, $\Delta C_p°$, and $\Delta S°$ are also calc. F. L. U.

Dissociation constants of hydroxylysine. F. W. Klemperer, A. B. Hastings, and D. D. van Slyke (*J. Biol. Chem.*, 1942, **143**, 433—437).—The −log dissociation const. vals. of hydroxylysine, pK'_1, pK'_2, and pK'_3, have been determined as 2·13, 8·62, and 9·67, respectively, at 38°. The vals. in each case are < those for lysine and the data are interpreted as confirming the view that the OH in hydroxylysine is in the δ- or ε-position relative to the CO_2H and the second NH_2 is in the ε- or δ-position. J. W. S.

Electrochemistry of non-aqueous solutions. II. Precision measurements of f.p. and conductivity in anhydrous formic acid. J. Lange (*Z. physikal. Chem.*, 1940, **A**, **187**, 27—42; cf. *ibid.*, 1940, **A**, **186**, 291).—Osmotic properties of HCO_2H solutions of KCl, NMe_4Cl, K picrate, and methylene-blue hydrochloride (**I**) have been investigated by f.p. measurements. When ionic radii are taken into account, full agreement with Debye and Hückel's theory is found for concns. ≯0·1N. The relation between f.p. and Λ found with H_2O solutions also holds for HCO_2H solutions. The val. $K_{8\cdot5°}$ = 2·1 × 10^{-8} is found for HCO_2H, giving practically complete solvolysis for K picrate and (**I**). Non-association of NMe_4^+ ions in HCO_2H indicates that ideal behaviour depends more on affinity with the solvent than on ε. L. J. J.

Indium. V. Hydrolysis constants for indium tribromide and triiodide solutions. T. Moeller (*J. Amer. Chem. Soc.*, 1942, **64**, 953—954).—Variations of p_H with concn. at 25° are given for pure $InBr_3$ and InI_3 solutions. Assuming that the hydrolysis products are $[In(H_2O)_5(OH)]^{++} + H_3O^+$ the calculation of hydrolysis consts. gives average vals. of 1·4 × 10^{-5} and 1·8 × 10^{-5} for the bromide and iodide solutions. W. R. A.

Thermodynamics of bi-univalent electrolytes. VII. Activity coefficients of lead bromide from 5° to 40°. R. G. Bates (*J. Amer. Chem. Soc.*, 1942, **65**, 1136—1139).—Activity coeffs. of $PbBr_2$ have been calc. from measurements, at 5° intervals between 5° and 40°, of the e.m.f. of the cell Pb–Hg (11%)|$PbBr_2$ (0·0015—0·08M.)|AgBr–Ag. W. R. A.

Secondary ionisation and activity coefficients of selenic acid. R. W. Gelbach and G. B. King (*J. Amer. Chem. Soc.*, 1942, **64**, 1054—1057).—A new method for determing E_0 has been developed. The e.m.f. of cells of the type quinhydrone|H_2SeO_4 (0·005—0·1M.), Ag_2SeO_4|Ag have been measured and the secondary ionisation const. of H_2SeO_4 is ~10^{-2}. The standard electrode potential Ag|Ag_2SeO_4,SeO_4'' is −0·8289 v. The solubility of Ag_2SeO_4 in H_2O and in H_2SO_4 has been determined. W. R. A.

Determination of activity coefficients of methylamine hydrochlorides from f.p. data. J. H. Jones and F. J. Spuhler, with W. A. Felsing (*J. Amer. Chem. Soc.*, 1942, **64**, 965—968).—The f.p. depression of aq. solutions of the three methylamine hydrochlorides (0·0025—1·0M.) have been determined using a differential f.p. apparatus. The data are given in terms of j-vals. at rounded concn. vals., from which provisional vals. for the activity coeffs. have been calc. Conductivity data are given. W. R. A.

Solubility of sodium carbonate in fused sodium hydroxide. R. P. Seward (*J. Amer. Chem. Soc.*, 1942, **64**, 1053—1054).—From f.p. measurements on NaOH–Na_2CO_3 (up to 35% Na_2CO_3) the following data have been obtained: f.p. of NaOH 320°, transformation temp. 294°, eutectic 286° (22% Na_2CO_3), heat of fusion of NaOH 1670 g.-cal. per mol. W. R. A.

High-temperature transitions of ferrous sulphide mixed crystals. H. Haraldsen (*Z. anorg. Chem.*, 1941, **246**, 195—226).—The phase relations in the system FeS–S have been studied in the region 50—53·4 at.-% S, and at 0—400°, by *X*-ray and magnetic methods. With rise of temp. two definite phase changes occur (α- and β-changes) together with another change which involves magnetic properties only (γ-change). The phase diagram is developed from the results. J. W. S.

Tie line correlation. D. F. Othmer and P. E. Tobias (*Ind. Eng. Chem.*, 1942, **34**, 693—696).—In equilibria relating to the distribution of a solute between two immiscible or partly miscible liquids, the plot of $(1 - a)/a$ against $(1 - b)/b$ is linear, when a is the wt.-fraction of solvent in one phase and b the wt.-fraction of diluent in the other. A simple nomograph based on this relation permits the direct determination, without calculation, of the major component in each conjugate phase; vals. for the other constituents can then be obtained from the ternary solubility diagram. Examples are given. F. L. U.

Partial pressures of ternary liquid systems and the prediction of tie lines. D. F. Othmer and P. E. Tobias (*Ind. Eng. Chem.*, 1942, **34**, 696—700).—Graphical methods are given for obtaining the partial pressure of a component C in a single-phase liquid system A–B–C when the partial pressures in the binary systems A–C and B–C are known. An equation representing the partial pressure of C in the single-phase system can be used in conjunction with solubility data and the partial pressures of the binary systems to give the tie lines of systems of limited miscibility. Examples are given. F. L. U.

Nitromethane–*iso*propyl alcohol–water system. Vapour–liquid equilibria in the ternary and three related binary systems. J. E. Schumacher and H. Hunt (*Ind. Eng. Chem.*, 1942, **34**, 701—704).—Solubility data for the system $MeNO_2$–$Pr^{\beta}OH$–H_2O and vapour-liquid equilibria data for the binary and ternary systems are given. The ternary and binary mixtures form min.-boiling azeotropes. A method for the recovery of $MeNO_2$ from the three-component mixtures by the addition of NH_4NO_3 is suggested. D. F. R.

Heat of formation and depolymerisation of phosphorus paranitride. G. Wétroff (*Compt. rend.*, 1941, **213**, 780—782; cf. A., 1939, I, 508).—The heat of formation of $(PN)_n$ found from the heat of combustion is 21±1 kg.-cal. per g.-mol. Various considerations indicate a val. ~−40 to −50 kg.-cal. per g.-mol. for the heat of depolymerisation. N. M. B.

Dissolution of cadmium iodide in alcoholic solutions. M. Miyoshi and H. Hagisawa (*Bull. Inst. Phys. Chem. Res. Japan*, 1941, **20**, 514—520).—The theoretical heats of dissolution of CdI_2 in saturated

alcoholic solution, from solubility and e.m.f. measurements, are 478 g.-cal. at 30° and 445 g.-cal. at 25°. The differential free energies of dissolution of CdI_2 are more negative in alcoholic solution than in aq. solution, suggesting a greater tendency to complex ion formation in the former. D. F. R.

Thermochemistry of the rare earths. I. Heats of dissolution of the metals of the rare earths. II. Heats of dissolution and of formation of the anhydrous chlorides of the rare earths. H. Bommer and E. Hohmann. **III. Heats of dissolution and of formation of the anhydrous iodides of the rare earths.** H. Bommer (*Z. anorg. Chem.*, 1941, **248**, 357—372, 373—382, 383—396).—I. Vals. for the heat of dissolution of the rare earth metals in 0·1N-HCl are recorded as follows: Sc, 149·0; Y, 168·3; La, 176·5; Ce, 173·7; Pr, 172·9; Nd, 171·4; Gd, 168·8; Dy, 166·0; Ho, 164·0; Er, 162·6; Tm, 161·5; Lu, 160·3 kg.-cal. per g.-atom.

II. Three types of crystal structure, designated α, β, and γ, occur among the anhyd. chlorides of the rare earths. Those of La to Gd are α, $TbCl_3$ is β, $DyCl_3$ forms both β and γ types, and those of Ho to Lu, and Y, are γ. $ScCl_3$ has a different structure. Heats of dissolution are recorded as follows: $ScCl_3$, 47·1; YCl_3, 52·3; $LaCl_3$, 31·6; $CeCl_3$, 32·7; $PrCl_3$, 33·9; $NdCl_3$, 35·9; $SmCl_3$, 39·0; $EuCl_3$, 41·15; $GdCl_3$, 42·4; $TbCl_3$, 45·85; $DyCl_3$ (β), 47·3; $DyCl_3$ (γ), 50·25; $HoCl_3$, 50·0; $ErCl_3$, 49·55; $TmCl_3$, 50·9; $YbCl_3$, 50·95; $LuCl_3$, 51·3 kg.-cal. per g.-mol. These vals. combined with the heats of dissolution of the metals in HCl give the following vals. for the heats of formation of the anhyd. chlorides: $ScCl_3$, 220·7; YCl_3, 234·8; $LaCl_3$, 263·7; $CeCl_3$, 259·8; $PrCl_3$, 257·8; $NdCl_3$ 254·3; $GdCl_3$, 245·2; $DyCl_3$ (β), 237·5; $DyCl_3$ (γ), 234·5; $HoCl_3$, 232·8; $ErCl_3$, 231·8; $TmCl_3$, 229·4; $LuCl_3$, 227·8 kg.-cal. per g.-mol. The heat of dissolution of anhyd. $ScBr_3$ is 55·1 kg.-cal. per g.-mol., and that of anhyd. $MgCl_2$ is 37·85 kg.-cal. per g.-mol.

III. LaI_3, CeI_3, PrI_3, and NdI_3 have the α structure. ErI_3, TmI_3, and LuI_3 have a structure (β') which may or may not be identical with β, and the other anhyd. iodides of the rare earths have the β structure. Heats of dissolution of the anhyd. iodides are recorded as follows: Y, 64·0; La, 48·0; Ce, 49·0; Pr, 49·9; Nd, 51·6; Sm, 55·8; Gd, 60·3; Dy, 60·4 or 60·7; Ho, 61·1; Er, 61·5; Tm, 62·6; Lu, 66·0 kg.-cal. per g.-mol. and their heats of formation as follows: Y, 143·2; La, 167·4; Ce, 163·4; Pr, 161·5; Nd, 158·3; Gd, 147·6; Dy, 144·2 or 144·5; Ho, 141·8; Er, 140·1; Tm, 137·8; Lu, 133·2 kg.-cal. per g.-mol. F. J. G.

Calorimetric investigations of organic reactions. IV. Heats of ionisation of *dl*-alanine at 25°. J. M. Sturtevant (*J. Amer. Chem. Soc.*, 1942, **64**, 762—768).—Acidic and basic ionisation heats have been calc. from calorimetric measurements of the heats of neutralisation of *dl*-alanine by HCl and NaOH at 25° and are, respectively, ~0·67 and 0·9 times those of glycine. W. R. A.

Heat of adsorption of nitric oxide by silica gel.—See A., 1942, I, 294.

Energy of immersion of crystalline powders in water and organic liquids. I. G. E. Boyd and W. D. Harkins. **Binding energy between a crystalline solid and a liquid. Energy of adhesion and emersion. Energy of emersion of crystalline powders. II.** W. D. Harkins and G. E. Boyd (*J. Amer. Chem. Soc.*, 1942, **64**, 1190—1194, 1195—1204).—I. Heats of immersion (h_l) of solids in H_2O are > those in org. liquids for polar solids but for non-polar solids are more nearly equal. The calorimetric determination of h_l is described.

II. Increases in heat content or in internal energy accompanying emersion of polar solids are > those for non-polar solids in the same liquid and, for a given solid, are greater for polar than for non-polar liquids. Mol. energies of emersion, energies of adhesion, and energies of demersion have been evaluated. W. R. A.

Thermodynamic study of the tin–bismuth system.—See A., 1942, I, 294.

Third law of classical thermodynamics. P. C. Cross and H. C. Eckstrom (*J. Chem. Physics*, 1942, **10**, 287—291).—The third law is advantageously expressed: "For any real phase, $\mathrm{Lim}_{T\to 0}(\partial S/\partial x_i)_{xj,n} = 0$, and for any spontaneous isothermal process, $\mathrm{Lim}_{T\to 0}\ \Sigma_i \nu_i(\partial S/\partial n_i)_{T,y,nj} \leq 0$. n represent composition variables, x or T and y state variables, and ν the no. of mols. of the components involved. L. J. J.

Partial pressure of hydrogen chloride from its solutions in $\beta\beta'$-dichloroethyl ether and in anisole, and the calculation of the heat and entropy of solution. S. J. O'Brien (*J. Amer. Chem. Soc.*, 1942, **64**, 951—953).—The solubilities of HCl in $(Cl\cdot[CH_2]_2)_2O$ and in PhOMe have been calc. from measurements of the partial v.p. of HCl and vals. of the differential heat and entropy of solution have been derived which agree with those obtained from infra-red absorption data. W. R. A.

VII.—ELECTROCHEMISTRY.

High mol. wt. aliphatic amines and their salts. VI. Electrical conductivities of aqueous solutions of hydrochlorides of octyl-, decyl-, tetradecyl-, and hexadecyl-amines. A. W. Ralston and C. W. Hoerr (*J. Amer. Chem. Soc.*, 1942, **64**, 772—776).—ρ and Λ have been determined at 20°, 40°, and 60°. The first member of the series behaves as a simple strong electrolyte, whilst the higher homologues behave as typical colloidal electrolytes. Vals. of Λ have been discussed in terms of modern theories of colloidal electrolytes. W. R. A.

Semi-conductors and their rôle in electro-physiology. J. Reboul (*Compt. rend.*, 1941, **213**, 344—346).—The potential distribution in Cellophane during passage of a current has been studied. Thin Cellophane sheets in which thin Cu wires were fixed were compressed between ebonite plates, a p.d. being established between two wires and the potentials of the other wires measured with an electrostatic voltmeter. The potential distribution between the electrodes was analogous to that observed by Déchene (A., 1938, I, 296). Outside the electrodes the potential decreases exponentially for 5—6 mm. and then becomes zero, in accord with theory. With an oscillograph it has been shown that on closing the circuit an impulse is produced, especially on the cathode side, which extends 10—20 cm. beyond the electrode. It corresponds with a wave of velocity 1—5 m. per sec., and on increasing the applied p.d. the response increases to a definite limit. The disturbance persists for some time after the circuit is broken. The analogy of these phenomena with those observed in physiology suggests that the nervous fibres or muscles may be regarded as semi-conductors. J. W. S.

Molal electrode potential of the silver–silver chloride electrode in ethyl alcohol–water mixtures. A. Patterson [with W. A. Felsing] (*J. Amer. Chem. Soc.*, 1942, **64**, 1478—1480).—E.m.f. measurements have been made at 25° on cells H_2 (1 atm.)|HCl (M. in 10 and 20% aq. EtOH)|AgCl–Ag. The v.p. and ρ of the solvent have been determined at 0°, 10°, 20°, 25°, 30°, and 40°. The molal electrode potentials of the Ag–AgCl electrode have been calc. for these temp. W. R. A.

Potential of the ytterbic–ytterbous ion electrode. H. A. Laitinen (*J. Amer. Chem. Soc.*, 1942, **64**, 1133—1135).—The potential of the $Yb^{\cdot\cdot\cdot}$–$Yb^{\cdot\cdot}$ ion electrode is probably identical with the val. of the half-wave potential obtained with a Yb amalgam dropping into a Yb^{III} salt solution, viz., −1·15 v. W. R. A.

Dropping mercury electrode in acetic acid. I. Discontinuous current–voltage curves. G. B. Bachman and M. J. Astle (*J. Amer. Chem. Soc.*, 1942, **64**, 1303—1309).—The dropping Hg electrode has been applied to determinations of electro-reducible substances in anhyd. AcOH. Such substances with half-wave reduction potentials between ~−0·3 and −1·4 v. can be determined normally, whilst other substances give discontinuous curves or are interfered with by the $H^{\cdot}$ ion curve and cannot be determined polarographically. Dissolved O_2 markedly affects current–voltage curves in AcOH. W. R. A.

Validity of the Ilkovič equation in polarographic analysis of alkali metals and the characteristics of alkali waves in various media. I. Zlotowksi and I. M. Kolthoff (*J. Amer. Chem. Soc.*, 1942, **64**, 1297—1301).—The diffusion currents of the alkali metals determined experimentally and the vals. calc. by the Ilkovič equation agree provided that the initial drop time of the capillary is ≮3 sec. The equation of the alkali metal waves corresponds with the reversible reduction of a univalent ion. Half-wave potentials of K, Na, and Li in H_2O–EtOH mixtures are const. within the concn. range investigated. W. R. A.

VIII.—REACTIONS.

Mechanism of combustion of mixtures of oxygen and hydrogen at low pressures in presence of carbon monoxide. M. Prettre (*Compt. rend.*, 1941, **213**, 29—31).—Mixtures of H_2, O_2, and CO react according to a chain mechanism with a velocity given by $V = k[CO][H_2]/(1 + 0{\cdot}48[H_2])$. The $[O_2]$ may be regarded as const. as it is always taken in considerable excess over $[H_2]$. The occurrence of $[H_2]$ in this equation is similar to that observed for many other reactions of order between zero and unity. The occurrence of a heterogeneous reaction in the present case agrees with experimental evidence. The mechanism is: (1) H_2 (gas) = 2H (adsorbed); (2) $H + O_2 = HO_2$; (3) $HO_2 + CO = CO_2 + OH$; (4) $OH + CO = CO_2 + H$, etc. Theory gives an expression for the velocity similar to that given above. A. J. M.

Experimental criteria for recognition of chain-thermal explosions. F. S. Dainton (*Trans. Faraday Soc.*, 1942, **38**, 227—238).—The characteristics of gaseous reactions in which the liberated heat is, and is not, a contributory cause of explosion are described, and nine experimental tests, which may be used to identify a reaction as belonging to the former (chain-thermal) or the latter (chain-isothermal) group, are based on the differences. Examples are given to illustrate the application of the tests. F. L. U.

Kinetics of gaseous reactions by means of the mass spectrometer. Thermal decomposition of dimethyl ether and acetaldehyde. E. Leifer and H. C. Urey (*J. Amer. Chem. Soc.*, 1942, **64**, 994—1001).—The thermal decomp. of Me_2O and MeCHO at 504° has been studied by a mass spectral method which has advantages over existing

methods but the possible error of which is ±5%. MeCHO decomposes to CH_4 and CO, with small amounts of C_2H_2 and H_2O. In the decomp. of Me_2O CH_2O is a stable intermediate. Thus the main products are CH_4, CO, and H_2, but C_2H_6 (0·8%) is also formed. There is no evidence of polymerisation of CH_2O or Me_2O. The effects of (i) packing the reaction vessel to various extents with Pyrex, (ii) initial pressure of Me_2O, and (iii) added gases (N_2, CH_2O, He, H_2, and D_2) are discussed. The exchange reaction between Me_2O and D_2 has been investigated. Production of C_2H_6 in the decomp. of Me_2O postulates a chain mechanism with a chain length of 100. Advantages and limitations of the method are discussed. W. R. A.

Kinetics of the degradation of chain molecules. II. Mol. wt. distribution which appears during the degradation of materials with chain molecules. G. V. Schulz (*Z. physikal. Chem.*, 1942, **B**, **51**, 127—143).—Kuhn's equation (A., 1930, 1025) for the mol. wt. distribution of the fragments produced by degradation of long-chain compounds holds when the mol. wt. distribution before the degradation is also in accord with this equation and also holds for all cases when the mean mol. wt. is decreased considerably during the degradation. Corrections are calc. for the case where mols. of uniform chain length are slightly degraded. Relationships between the mean degree of polymerisation and the viscosimetrically determined degree of polymerisation and between the heterogeneity of the product and its degree of degradation are derived. J. W. S.

Exchange reaction between simple alkyl iodides and iodide ion. H. Seelig and D. E. Hull (*J. Amer. Chem. Soc.*, 1942, **64**, 940—948).—The rate of exchange of I between EtI, $Pr^{\alpha}I$, and $Pr^{\beta}I$ and NaI in EtOH has been studied using ^{128}I as indicator at temp. between 50° and 70° by pptg. radioactive samples as AgI. Activation energies and collision diameters have been calc. The activation energies are $Pr^{\beta} > Pr^{\alpha} \approx Et$ and tentative explanations are advanced. W. R. A.

Hydrolysis of acid amides in concentrated hydrochloric acid solutions. B. S. Rabinovitch and C. A. Winkler (*Canad. J. Res.*, 1942, **20**, **B**, 73—81).—The hydrolysis of $HCO{\cdot}NH_2$, NH_2Ac, $EtCO{\cdot}NH_2$, and NH_2Bz in 1—10N-HCl has been investigated and the consts. of the Arrhenius equation have been evaluated. There is approx. correspondence between activation energy and reaction rate for the series. Activation energy increases with increasing acid concn. for all the amides. A max. rate of hydrolysis occurs at higher acid concns., and can be accounted for by the variation of the Arrhenius consts. with acid concn. A. J. M.

Reaction-rate formulæ for heterogeneous reactions at phase boundaries of solids. I. Development of mathematical method and derivation of surface reaction formulæ. K. L. Mampel (*Z. physikal. Chem.*, 1940, **A**, **187**, 43—57).—Formulæ for the kinetics of a pure surface reaction proceeding by formation of reaction nuclei at a const. rate per unit unreacted surface area, followed by radial spreading of the reaction from such nuclei, are derived. L. J. J.

Reaction-rate formulæ for heterogeneous reactions at the phase boundaries of solids. II. Time-conversion formula for a powder of spherical particles. K. L. Mampel (*Z. physikal. Chem.*, 1940, **A**, **187**, 235—249; cf. preceding abstract).—Mathematical. O. D. S.

Corrosion investigations on thallium. E. Plank and A. Urmánczy (*Korros. u. Metallschutz*, 1940, **16**, 33—38).—The velocity of corrosion of Tl in aq. HCl or H_2SO_4 in presence of air increases with increasing acid concn. to a max. and then decreases with further increase in concn. This behaviour is correlated with the rate of diffusion of $Tl^{\cdot}$ and acid ions in the diffusion film on the metal surface, the max. being explained by the formation of a deposit of the sparingly sol. Tl salt. With HNO_3 the rate of dissolution is much greater and no max. velocity is attained in the concn. range 0·01—0·5N-HNO_3. In H_2O the velocity of corrosion of Tl ∝ the amount of dissolved O_2. Tl is unattacked in O_2-free H_2O saturated with H_2. J. W. S.

Rate of oxidation of typical non-ferrous metals as determined by interference colours of oxide films.—See B., 1942, I, 354.

Gaseous hydrogenation and polymerisation reactions. H. D. Burnham and R. N. Pease (*J. Amer. Chem. Soc.*, 1942, **64**, 1404—1410).—The polymerisation of C_2H_4 and C_2H_2 and the hydrogenation of C_2H_4 are inhibited by small initial additions of NO. The results suggest a chain mechanism for these reactions and that the NO acts by combining with the free radicals or atoms and effectively prevents their further participation in the chain reaction. Small additions of NO do not inhibit the polymerisation and hydrogenation of C_3H_6 but cause a slight acceleration. The catalytic effect of NO does not support or deny the possibility of a chain mechanism in the C_2H_6 reactions. W. R. A.

Non-peroxide catalysts for the reaction between sulphur dioxide and olefines. C. S. Marvel, L. F. Audrieth, and W. H. Sharkey (*J. Amer. Chem. Soc.*, 1942, **64**, 1229—1230).—NMe_3O and $NPhMe_2O$ catalyse the addition of SO_2 to Δ^{α}-pentene, -hexene, and -heptene, Δ^{β}-butene, and Δ^{α}-pentinene. Halogen salts of NMe_3O increase the catalytic activity. NH_2OH,HCl, o-$C_6H_4(CO)_2NH$, and $NMe_4Cl(Br)$ showed some activity but NR_4I showed none. W. R. A.

Effect of catalysis on oxidation products of hydroxylamine. T. H. James (*J. Amer. Chem. Soc.*, 1942, **64**, 731—734).—Under proper conditions $Hg_2(NO_3)_2$ oxidises NH_2OH without an induction period and produces chiefly N_2O. A progressive increase in the yield of N_2 is produced by the addition of colloidal Hg or Ag catalyst. The product of the catalysed reaction is principally N_2. The product of the oxidation of NH_2OH by Ag salts in strongly alkaline solution varies considerably with the nature of the salt and reaction conditions. At p_H 12·7 N_2 yields ranging from 5 to 90% were obtained. Kinetic data on the initial uncatalysed reaction of $Ag_2S_2O_3$ complex were obtained. The catalysed reduction involves adsorption of NH_2OH to Ag, but not adsorption of $Ag^{\cdot}$ ions or complex. The metal-catalysed oxidation of NH_2OH by Hg^{I} and Ag salts yields almost entirely N_2 whilst the uncatalysed reaction yields chiefly N_2O. W. R. A.

Effect of inorganic salts on ketone decomposition of oxaloacetic acid. H. A. Krebs (*Biochem. J.*, 1942, **36**, 303—305).—Unlike amines, which catalyse the decomp. of all β-keto-acids and of some α-keto-acids, multivalent cations, *e.g.*, $Al^{\cdot\cdot\cdot}$, $Cu^{\cdot\cdot}$, $Fe^{\cdot\cdot}$, $Fe^{\cdot\cdot\cdot}$, etc., react only with β-keto-dicarboxylic acids, *e.g.*, oxaloacetic and acetonedicarboxylic acids. The optimum p_H is ~4, little decomp. occurring at p_H 1 or 13 even at 40°. P. G. M.

Mutarotation of α-*d*-glucose in dioxan–water mixtures at 25°. H. H. Rowley and W. N. Hubbard (*J. Amer. Chem. Soc.*, 1942, **64**, 1010—1011).—In dioxan–H_2O mixtures the catalytic effect of dioxan on the mutarotation of α-*d*-glucose is small. W. R. A.

Methyl methacrylate polymerisation. Peroxide catalysis and oxidation of quinol inhibitor.—See B., 1942, II, 293.

Adsorption of nitrogen and the mechanism of ammonia decomposition over iron catalysts. S. Brunauer, (Miss) K. S. Love, and R. G. Keenan (*J. Amer. Chem. Soc.*, 1942, **64**, 751—758).—Equations have been derived for the rates of adsorption and desorption and for the adsorption isotherm when (i) the surface is heterogeneous and the heat of adsorption and energies of adsorption and desorption vary linearly between the max. and min. vals., and (ii) when there are forces of attraction or repulsion between the adsorbed particles and the heat of adsorption and energies of adsorption and desorption vary linearly with the fraction of the surface covered. Adsorption isotherms of N_2 on Fe and an equation for the rate of decomp. of NH_3 on doubly-promoted Fe catalyst 931 have been obtained from data on rates of adsorption and agree well with experimental vals. W. R. A.

Effect of alkali promoter concentration on the decomposition of ammonia over doubly promoted iron catalysts. (Miss) K. S. Love and S. Brunauer (*J. Amer. Chem. Soc.*, 1942, **64**, 745—751).—Doubly promoted catalysts were prepared by treating an Al_2O_3-promoted Fe catalyst with KOH solutions of various concns. By means of adsorption measurements the total surface areas and surface concns. of the promoters have been determined for each catalyst and the effects of temp. and gas composition on the kinetics of decomp. of NH_3 have been studied. When ~30% of the catalyst surface is covered by KOH the catalyst is most active towards NH_3 decomp. W. R. A.

Mechanism of catalytic synthesis of ammonia.—See B., 1942, I, 340.

Analysis of process of reduction of ammonia catalysts.—See B., 1942, I, 340.

Effect of poisons on rate of hydrogenation of adsorbed nitrogen.—See B., 1942, I, 340.

Thermal decomposition of nitrous oxide. (Mlle.) A. Cheutin (*Compt. rend.*, 1941, **213**, 26—29).—Pt, not previously heated in N_2O, has only very weak catalytic effect on the decomp. of the gas, but the effect increases with use, as shown by the fall in the reaction temp. $CaCO_3$ has considerable catalytic effect on the thermal decomp. of N_2O, if lowering of temp. of decomp. is taken as the criterion. A. J. M.

Catalytic polymerisation of olefines in presence of phosphoric acid. A. Farkas and L. Farkas (*Ind. Eng. Chem.*, 1942, **34**, 716—721).—A D_3PO_4 catalyst was used, forming polymers containing D, with exchange of H atoms between olefine and catalyst. Under similar conditions polymerisation and exchange of n-C_4H_8 are slower than the reactions of *iso*-C_4H_8; those of C_3H_6 and C_2H_4 are still slower. No exchange of *iso*-C_4H_8 was observed, whilst di*iso*butene polymeride may undergo further exchange in contact with the D_3PO_4. A modified form of Ipatiev mechanism for the polymerisation is suggested, in which the catalyst and olefine mol. can combine to two different forms, one resulting from the transfer of one H atom from the catalyst to the olefine and the other by the reverse transfer, the polymeride being formed by the interaction of these two forms. D. F. R.

New methods of preparative organic chemistry. XV. Hydrogenation with copper–chromium oxide catalysts. C. Grundmann (*Angew. Chem.*, 1941, **54**, 469—474). D. F. R.

Regeneration of Raney catalyst for organic synthesis.—See B., 1942, II, 273.

Catalytic hydrogenation of coal.—See B., 1942, I, 329.

Anomalous electro-reduction of water at the dropping mercury electrode in relatively concentrated salt solutions. E. F. Orlemann and I. M. Kolthoff (*J. Amer. Chem. Soc.*, 1942, **64**, 833—838).—In salt solutions (>0·5M.) passage of a current causes electro-reduction of H_2O at the dropping Hg electrode and the H_2O current ∝ total current flowing. This H_2O current is suppressed by 0·01% gelatin. The effects of other strongly adsorbed substances are discussed and interpreted and a quant. interpretation of the conditions necessary for the H_2O current is given. W. R. A.

Reduction of iodate and bromate in acid medium at the dropping mercury electrode. E. F. Orlemann and I. M. Kolthoff (*J. Amer. Chem. Soc.*, 1942, **64**, 1044—1052).—The reduction has been studied in buffered solutions of various p_H. In dil. solutions of strong acids two waves are obtained with IO_3' and BrO_3' when $[H^+]$ is $<2[IO_3']$ or $<2{\cdot}3[BrO_3']$. Half-wave potentials of IO_3' and BrO_3' vary with change in drop time but are independent of $[I(Br)O_3']$. Mechanisms for the irreversible reduction of both ions in buffered solutions have been advanced. W. R. A.

Mixed electrolysis of nitrate with *n*-valerate and *iso*butylacetate.—See A., 1942, II, 277.

Polarographic investigation of rhenium compounds. I. Reduction of perrhenate ion at the dropping mercury electrode. J. J. Lingane (*J. Amer. Chem. Soc.*, 1942, **64**, 1001—1007).—In HCl or $HClO_4$ (2—4N.) as supporting electrolyte ReO_4' is reduced to Re^{+4} at the dropping electrode. In 4N-$HClO_4$ the diffusion current is well-defined and ∝ $[ReO_4']$. In neutral unbuffered solutions of KCl a double wave is obtained; the first part of the wave is due to the reduction $ReO_4' \rightarrow Re'$ and the second part of the wave to the catalytic discharge of H_2. Data concerning the catalytic wave of ReO_4' in buffered solution are also given. W. R. A.

Cathodic deposition of metal powders. M. Passer (*Kolloid-Z.*, 1941, **97**, 272—280).—Published work is summarised. Experiments on the cathodic deposition of Zn from zincate solutions show that factors which hinder the growth of nuclei or of crystallites favour the production of powder whilst mechanical disturbances due to gas bubbles or turbulent motion of the electrolyte near the cathode tend to produce a coherent deposit, this effect probably being due to diminution of the concn. polarisation and to the resulting decrease of potential gradient at the cathode. F. L. U.

Preparation of metallic phosphides by igneous electrolysis. M. Chene (*Ann. Chim.*, 1941, [xi], **15**, 187—282).—By electrolysis of solutions of metallic oxides in fused $NaPO_3$ or $Na_4P_2O_7$ the following new *phosphides* have been obtained: Ni_3P (ρ 7·6), Ni_6P_5, CoP_2, Mo_3P, V_2P (ρ 4·5), and VP (ρ 4·0). Cryst. specimens of the following known phosphides may be obtained in this way: Fe_3P, Fe_2P, FeP, FeP_2, Ni_5P_2, Ni_2P, Co_2P, CoP, MoP, W_2P, WP, Mn_2P, MnP (ρ 5·6), CrP. F. J. G.

Factors determining electrical properties of the lead accumulator.—See B., 1942, I, 323.

Preparation of fluorine.—See B., 1942, I, 341.

Oxidation of ammonium sulphite to ammonium sulphate by electrolytic oxygen.—See B., 1942, I, 341.

Electrolytic behaviour of ferrous and non-ferrous metals in soil-corrosion circuits.—See B., 1942, I, 351.

Chemical action of electric discharges. XXVIII. Action of the high- and low-frequency electric arc on the systems nitrogen–water vapour and air–water vapour. E. Briner and H. Hoefer (*Helv. Chim. Acta*, 1942, **25**, 530—538).—High-frequency arcs are more favourable than low for N_2 fixation from N_2–H_2O mixtures, yields equiv. to 20 g. of HNO_3 per kw.-hr. being attainable. Addition of H_2O to air has only a slight effect on N_2 fixation. C. R. H.

Decomposition of methane in glow discharge at liquid-air temperature. L. M. Yeddanapalli (*J. Chem. Physics*, 1942, **10**, 249—260).—The reaction products are invariably H_2, $(CH_2)_n$, C_2H_6, C_2H_4, and C_2H_2. Presence of H_2 favours C_2H_4 and C_2H_2 formation at the expense of C_2H_6. In the negative glow the reaction rate is ∝ the current, and the electron efficiency is ~10 mols. CH_4 decomposed per electronic charge for a.c. or d.c. In the positive column the rate increases with pressure and field strength and is ∝ the current for const. pressure and field strength; the electron efficiency is ~0·2 for a.c. and ~0·6 for d.c. L. J. J.

Photolysis of persulphate. L. J. Heidt (*J. Chem. Physics*, 1942, **10**, 297—302).—0·1—1M-$K_2S_2O_8$ solutions in H_2O, irradiated with λ 254 mμ. at 10—21°, decompose by the reaction $S_2O_8'' + H_2O + h\nu = 2HSO_4' + 0{\cdot}5O_2$, with a quantum yield of 0·58±0·02 in neutral and alkaline solution and 1·0 in dil. AcOH solution. The val. is lowered by non-oxidisable ions, and is <0·01 in acidified solutions. It is concluded that $(S_2O_8 + h\nu)$ is stabilised by association with H^+, since absorption spectra and conductivity vals. give no indication of formation of a weak acid. The main reaction is not decomp. of SO_4'. No H_2O_2 is formed. L. J. J.

Zinc-photosensitised reactions of ethylene. H. Habeeb, D. J. LeRoy, and E. W. R. Steacie (*J. Chem. Physics*, 1942, **10**, 261—267).—Rapid polymerisation of C_2H_4 is produced by λ 2139 A. in presence of Zn, the products being C_3H_6, C_4H_8, and traces of higher hydrocarbons. The rate of polymerisation increases rapidly with $[C_2H_4]$. The initial step $Zn\ (4^1P_1) + C_2H_4 = ZnH + C_2H_3$ is suggested. With λ 3076 A. the reaction is very slow. H_2 markedly accelerates the reaction with λ 3076 A. L. J. J.

Photolysis of the aliphatic aldehydes. X. Acetaldehyde and iodine mixtures. F. E. Blacet and J. D. Heldman. **XI. Acetaldehyde and iodine mixtures.** F. E. Blacet and D. E. Loeffler (*J. Amer. Chem. Soc.*, 1942, **64**, 889—893, 893—896).—X. The photolysis of MeCHO with and without I at 3130 A. has been investigated from 60° to 170°. MeCHO (10^{-2} mol. per l.) gives a quantum yield (Φ) of 0·34 at 60° for CO, increasing to 2·29 at 135°. When I vapour is added Φ_{CO} at 60° decreases with [I] (1—3 mm.) to a const. val. of 0·21, whilst increase in I from 0 to 1 mm. causes Φ_{CH_4} to decrease from 0·32 to 0·013, and Φ_{MeI} to increase from zero to 0·20. With a sufficiently high [I] Φ_{CO} and Φ_{MeI} remain approx. const. from 60° to 170°. No AcI is formed, only traces of H_2, and considerable quantities of HI. Formation of free Me and CHO groups is the predominant primary dissociation process and they react readily with I, thus stopping secondary processes. I does not react readily with activated MeCHO mols. nor do Me and CHO radicals recombine. The primary dissociation quantum yield is 0·20 and collisional deactivation accounts for a large part of the total absorbed radiant energy.

XI. In the absence of I at 2654 A. Φ_{CO} is 0·78 at 60° and 5·85 at 150°. In presence of I (1·0—2·5 mm.) the vals. of Φ_{CO}, Φ_{MeI}, and Φ_{CH_4} from 200 mm. MeCHO at 60° and different $\lambda\lambda$ are given (*e.g.*, at 3130A. 0·21, 0·20, 0·013). With sufficient I to suppress secondary reactions $\Phi_{CO} \approx \Phi_{MeI} + \Phi_{CH_4}$. In the absence of I the photolysis chain process requires an activation energy of 9·6 kg.-cal., chiefly for the reaction $MeCO + M = Me + CO + M$. The dissociation into Me and CHO radicals at 3130 A. becomes less important at shorter $\lambda\lambda$ and the dissociation into CH_4 and CO becomes increasingly important and attains equal probability at 2380 A. W. R. A.

Ultra-violet absorption and photochemical decomposition of aqueous solutions of ascorbic acid in the ultra-violet. (Miss) S. Guinand and B. Vodar (*Compt. rend.*, 1941, **213**, 526—528).—Beer's law was verified over a wide concn. range. The most rapid photochemical decomp. was obtained by the far ultra-violet radiation from the spark spectra of Zn or Cd. N. M. B.

Importance in radiobiology of the activation of oxygen. J. Loiseleur, R. Latarjet, and (Mlle.) T. Caillot (*Compt. rend.*, 1941, **213**, 730—732).—The formation of H_2O_2 in the *X*-irradiation of H_2O at p_H 2·2—9 is facilitated by the presence of dissolved O_2. J. L. E.

IX.—METHODS OF PREPARATION.

Chemical processes in which solids participate. III. Processes of metal ceramics and oxide ceramics. Sintering processes in powders consisting of a single component. G. F. Hüttig (*Kolloid-Z.*, 1941, **97**, 281—300).—A review of the literature and a discussion of the thermodynamics of sintering. F. L. U.

Magnetochemical study of the amidosulphonates and imidodisulphonates and basic salts of copper. L. Lecuir (*Ann. Chim.*, 1941, [xi], **15**, 33—96).—The following *compounds* are described: $Ag_5H(N{\cdot}SO_3Na)_3,4H_2O$; $Ag_3NSO_3,3NH_3,3H_2O$; $Cu(NH_2{\cdot}SO_3)_2,4NH_3,H_2O$ (**I**); $CuBa_2[N(SO_3)_2]_2,6H_2O$ (**II**); $Cu_2NaN(SO_3)_2,4NH_3,2{\cdot}5H_2O$ (**III**). Vals. of χ for (**I**), (**II**), and (**III**), and for other Cu derivatives of amido- and imidodi-sulphonic acid, and for a large no. of basic Cu salts and basic Cu double salts, are recorded and discussed. F. J. G.

Calcium complexes of sodium hexameta- and tripoly-phosphate. H. Rudy, H. Schloesser, and R. Watzel (*Angew. Chem.*, 1940, **53**, 525—531).—Recent investigations on H_2O-softening problems are discussed and new experiments are described. Ca complexes are more readily formed by $Na_6P_6O_{18}$ than by $Na_5P_3O_{10}$. Complex formation by $Na_6P_6O_{18}$ is much less influenced by p_H than in the case of $Na_5P_3O_{10}$, the ratio of % complex formation being ~80 : 50 at p_H 8—13. At p_H 4—5 complex formation is at a min., the ratio being ~70 : 5. At p_H 3 complex formation increases and is 100% in the case of $Na_6P_6O_{18}$. Complex formation is almost independent of [Ca]. The dissolution of Ca soaps is greatly dependent on temp. At room temp. $Na_5P_3O_{10}$ is less effective in this connexion than $Na_6P_6O_{18}$, but at ~80° they are equally effective. The complexes formed by these two salts at room temp. and in the p_H range 8—9

appear to be $Ca(Na_4P_3O_{10})_2$ and $Na_4CaP_6O_{18}$ respectively. So-called tetrapolyphosphate is probably a mixture, the properties of which lie between those of $Na_5P_3O_{10}$ and $Na_6P_6O_{18}$. $Na_4P_2O_7$ does not tend to form complexes, its action depending on the formation of sparingly sol. $Ca_2P_2O_7$ and $Na_2CaP_2O_7$. C. R. H.

Calcium complexes of sodium hexameta- and tripoly-phosphate. II. H. Rudy (*Angew. Chem.*, 1941, **54**, 447—449; cf. preceding abstract).—The dissolution of Ca oleate in the presence of $Na_6P_6O_{18}$ (**I**) and $Na_5P_3O_{10}$ (**II**) was studied at 60—95° and in p_H ranges 9·2—9·5, 10·9—11·2, and 12·3—12·7. The effect of (**I**) is least influenced by temp. and p_H; (**II**) has a relatively small optimum temp. range, especially at the lowest p_H. D. F. R.

Structure of the compounds InP, InAs, and InSb. A. Iandelli (*Gazzetta*, 1941, **71**, 58—62).—In with P, As, and Sb at 700° slowly gives *InP*, *InAs*, and *InSb*. These have face-centred cubic structure (ZnS type); a = 5·861, 6·036, and 6·461 A., respectively. E. W. W.

Zirconium compounds with transition elements. H. J. Wallbaum (*Naturwiss.*, 1942, **30**, 149).—Zr (at. radius 1·60 A.) would be expected to form intermetallic compounds with other transition elements with a radius ratio r_{Zr}/r_X ~1·23. Debye–Scherrer diagrams of sintered mixtures of Zr with powdered Re, V, Os, Ru, Cr, and Ir indicate the existence of such *compounds* of the $MgZn_2$ type. The lattice consts. of these compounds are given. The existence of Mo_2Zr is also indicated. A. J. M.

Purification of thorium chloride octahydrate. C. B. Kremer (*J. Amer. Chem. Soc.*, 1942, **64**, 1009—1010).—$ThCl_4,8H_2O$ has been purified by dissolving it in 6M-HCl, filtering through asbestos, extracting with Et_2O and evaporating to small vol. SiO_2, which separates, is filtered off. The filtrate, cooled to 0°, is saturated with dry HCl and an equal vol. of Et_2O added, homogeneity being obtained by agitation with HCl. Pure $ThCl_4,8H_2O$ separates. W. R. A.

Radio-halogen exchanges in the phosphorus halides. W. Koskoski and R. D. Fowler (*J. Amer. Chem. Soc.*, 1942, **64**, 850—852).—Since exchange between Br^* and PBr_3, Cl^* and PCl_3, and Cl^* and PCl_5 in CCl_4 is complete in 3 min., it is concluded that all five halide atoms in PCl_5 and PBr_5 are equally reactive. W. R. A.

Preparation of *N*-substituted derivatives of the phenyl esters of amido- and diamido-phosphoric acids.—See A., 1942, II, 281.

Vanadates. H. Guiter (*Ann. Chim.*, 1941, [xi], **15**, 5—32).—The following *vanadates are* described: $K_2O,3V_2O_5,3H_2O$; $K_2O,5V_2O_5,7H_2O$; $2Na_2O,V_2O_5,6H_2O$; $Na_2O,V_2O_5,3{\cdot}5H_2O$; $3Na_2O,4V_2O_5,16H_2O$; $Na_2O,2V_2O_5,8H_2O$; $Na_2O,2V_2O_5,4H_2O$; $3Na_2O,7V_2O_5,35H_2O$; $2Na_2O,5V_2O_5,25H_2O$; $Na_2O,3V_2O_5,6H_2O$; $Na_2O,5V_2O_5,9H_2O$; $6BaO,7V_2O_5,9H_2O$; $10SrO,3V_2O_5$; $6SrO,7V_2O_5$; $2SrO,3V_2O_5$; $CaO,4V_2O_5$; Hg_2VO_4; $3Hg_2O,V_2O_5$; $Ag_2O,2V_2O_5$; $5MgO,V_2O_5$; $7ZnO,2V_2O_5$; $4CdO,V_2O_5$; $Cd_2V_2O_7$; $5MnO,2V_2O_5$; $3CoO,V_2O_5$; $5NiO,2V_2O_5$; $5CuO,2V_2O_5$; $5HgO,V_2O_5$; $2Fe_2O_3,3V_2O_5$; Fe_2O_3,V_2O_5; $Fe_2O_3,3V_2O_5$. The conditions of p_H under which these and other known vanadates are formed are recorded. F. J. G.

Bismuthates. R. Scholder and H. Stobbe (*Z. anorg. Chem.*, 1941, **247**, 392—414).—The oxidation of Bi^{III} [Bi_2O_3 or $Bi(NO_3)_3,5H_2O$] in aq. NaOH solutions has been investigated and the effect of the oxidising agent, temp., and [NaOH] has been studied. In 25—50% NaOH at temp. >100° using large excess of NaOCl or Br a brown oxidation product with 92—97% of the total Bi as Bi^V was obtained; with more dil. NaOH (5—22%) the oxidation product was dark green to black, depending on the NaOH concn., the amount of Bi^V being 30—90%. Washing the brown product with H_2O or cold MeOH left crude yellow Na metabismuthate (92—97%), from which pure $NaBiO_3$ (99—100%) was prepared by boiling with 50% NaOH and washing with much H_2O, both anhyd. and in the form of hydrates. Pure $KBiO_3,0{\cdot}33H_2O$ was prepared by oxidation of Bi in dil. KOH, black oxidation products of varying composition being obtained. Orange-coloured Ca and Ba metabismuthates and black $AgBiO_3$ were prepared by double decomp. of alkali metabismuthates with solutions of the corresponding metal salts. Decomp. of $NaBiO_3$ or $KBiO_3$ with acids yielded products the composition, colour, chemical behaviour, and *X*-ray diagram of which showed them to be higher oxides of Bi. J. L. E.

Reactions involving oxygen, amalgams, and hydrogen peroxide. H. A. Liebhafsky (*J. Amer. Chem. Soc.*, 1942, **64**, 852—856).—Reaction systems composed of O_2, amalgams, and H_2O_2 have been investigated to ascertain if they reach a steady state in which O_2 and base metal are used up whilst [H_2O_2] remains const. Such a steady state was attained only with Zn–Hg but there is evidence that other base metal amalgams behave similarly. The reduction of H_2O_2 by Zn, Tl, Cd, and Pb amalgams has been investigated. O_2 is not necessarily reduced to H_2O_2 (as an isolable intermediate) by the baser metals and is more likely reduced to H_2O. With Cu amalgam O_2 is stoicheiometrically reduced to H_2O_2. W. R. A.

Formation of complexes of tartaric and metatungstic acids. (Mlle.) M. Murgier and (Mlle.) M. Cordier (*Compt. rend.*, 1941, **213**, 729—730).—The (1 : 1) complexes produced by the action of $H_2W_4O_{13},8H_2O$ on $[CH(OH){\cdot}CO_2H]_2$ are described. J. L. E.

Reactions of bromine with carbon tetrachloride and tetrachloroethylene following neutron capture and isomeric nuclear transition. E. G. Bohlman and J. E. Willard (*J. Amer. Chem. Soc.*, 1942, **64**, 1342—1346).—The nuclear n, γ process whereby Br^* is produced causes reaction between Br and CCl_4 in solution but practically no reaction in the gas phase. The isomeric transition and neutron capture reactions of Br with CCl_4 give an appreciable fraction of compounds containing org. bound Br^*, having b.p. > that of CCl_3Br, indicating that the mechanism of reaction involves a disruption of the CCl_4 mol. more serious than the removal of a single Cl. Br reacts with liquid C_2Cl_4 following neutron capture and isomeric transition with probabilities of ~37% and ~85% respectively. It will react in the gas phase following isomeric transition but not following neutron capture. The different probabilities of reaction following the two types of activation are discussed and support the Franck and Rabinowitsch "cage" hypothesis (A., 1933, 1255). W. R. A.

Products obtained by the reducing action of metals on salts in liquid ammonia solution. VII. Reduction of complex nickel cyanides. Univalent nickel. J. W. Eastes and W. M. Burgess (*J. Amer. Chem. Soc.*, 1942, **64**, 1187—1189).—Alkali metal cyanonickelates (**I**) are reduced by alkali metals in anhyd. liquid NH_3 to products in which Ni has a valency of <2. When there is excess of alkali metal the product has the empirical formula $M^I_4Ni(CN)_4$ but when (**I**) is in excess a product, isolable from anhyd. NH_3 and from H_2O, is a *cyanonickelite*, $M^I_2Ni(CN)_3$. On exposure to air the red colour of $M_2Ni(CN)_3$ becomes paler and finally yellow; in aq. solution it is deep red but the colour fades with time, and $Ni(OH)_2$ is pptd. Aq. $K_2Ni(CN)_3$ instantly reduces $AgNO_3$ or $AuCl_3$ to Ag or Au. W. R. A.

Formation of double hydroxides between bi- and ter-valent metals. W. Feitknecht (*Helv. Chim. Acta*, 1942, **25**, 555—569).—Of 19 double hydroxides of Ni, Mg, Co^{II}, Zn, Mn^{II}, Cd, or Ca with Al, Co^{III}, Fe^{III}, Mn^{III}, Cr^{III}, or La, 17 have a double layer lattice, the exceptions being Mg Cr^{III} and Cd Fe^{III} hydroxides. Lattice consts. for 16 hydroxides are recorded. Structural differences are discussed. C. R. H.

Metal carbonyls. XXXVI. Carbon monoxide compounds of iridium halides. W. Hieber, H. Lagally, and A. Mayr (*Z. anorg. Chem.*, 1941, **246**, 138—148).—The *compounds* $IrX_2(CO)_2$ and $IrX(CO)_3$ (X = Cl, Br, or I) have been obtained by interaction of CO with the corresponding halides at atm. pressure and 150°. Their formation indicates that the formation of $\{Ir(CO)_3\}_x$ from the halides does not occur through the metal. The crystal structure of $\{Ir(CO)_3\}_x$ is discussed. J. W. S.

X.—ANALYSIS.

Progress in microchemistry. IV. Radiochemistry. Separation of elements in unweighable quantity. O. Erbacher (*Angew. Chem.*, 1941, **54**, 485—491).—A lecture. O. D. S.

Potentiometric titration of dibasic acids in dioxan–water mixtures. R. H. Gale and C. C. Lynch (*J. Amer. Chem. Soc.*, 1942, **64**, 1153—1157).—The Auerbach–Smolczyk treatment of acid–base titration for weak dibasic acids has been extended to include the influence of ion-association of salts in low dielectric media and an equation for these effects has been developed. Potentiometric titrations of $H_2C_2O_4$, $CH_2(CO_2H)_2$, $(CH_2{\cdot}CO_2H)_2$, and glutaric acid in H_2O–dioxan have been made with a quinhydrone–Hg_2SO_4 electrode chain with high [$LiSO_4$] and the data have been used in support of the extended theory. W. R. A.

Determination of small amounts of iodide in photographic developers.—See B., 1942, II, 304.

Determination of oxygen in gas mixtures by physical methods. F. Klauer, E. Turowski, and T. von Wolff (*Angew. Chem.*, 1941, **54**, 494—496).—The determination is based on an effect due to the high paramagnetic susceptibility of O_2. A hot wire in a gas containing O_2 loses heat more rapidly in a magnetic field since the heated gas near the wire has susceptibility < that of the body of the gas and moves to regions of lower flux density, producing a gas stream over the wire. The effect opposes and under these conditions is > the Senftleben effect (A., 1938, I, 22). O_2 from 0 to 100% in gas mixtures is determined to ~1%, or from 0 to 20% to ~0·2%. O. D. S.

Detection and determination of selenium and tellurium in copper.—See B., 1942, I, 351.

Determination of nitrites [in water].—See B., 1942, III, 192.

Colorimetric determination of phosphorus in iron ore.—See B., 1942, I, 348.

Rapid spectrographic determination of minute amounts of arsenic, lead, and copper and other heavy metals in foodstuff colours and medicinals.—See B., 1942, III, 187.

Spectrochemical determination of boron in synthetic mixtures of soil materials. R. Q. Parks (*J. Opt. Soc. Amer.*, 1942, **32**, 233—237).—The sample (0·05 g.) was mixed with about twice its wt. of $CaCO_3$ as buffer and 1 c.c. of 0·03% $SnCl_2$ or SnI_2 as internal standard. Exposures with a 2200-v. a.c. arc were compared with those with three standards of known B content plotted against the ratio of intensities of the 2497·7 A. B and the 2429·5 A. Sn lines. Results were accurate to 3—10%. N. M. B.

Determination of K_2O in commercial fertilisers using 95 and 80% alcohol and acid-alcohol.—See B., 1942, III, 178.

Determination of strontium in presence of calcium. P. B. Stewart and K. A. Kobe (*Ind. Eng. Chem.* [*Anal.*], 1942, **14**, 298—299).—The $COMe_2$ extraction method (A., 1939, I, 337) is unsatisfactory when the ratio Ca : Sr is >3 : 1. The method now described uses a standardised procedure, and a calibration curve for correction of the actual data obtained. L. S. T.

Critical study of qualitative reagents for cations. IV. Reagents for zinc cations. P. Wenger and R. Duckert [with D. Rieth] (*Helv. Chim. Acta*, 1942, **25**, 406—415).—A no. of reagents which have been suggested for the detection of $Zn^{\cdot\cdot}$ have been tested and data on their sensitivity and specificity are tabulated. Fuller details are given for operation with 15 reagents which are recommended for use. J. W. S.

Examination of zinc oxide.—See B., 1942, I, 341.

Determination of lead in silicate rocks. I. T. Rosenqvist (*Amer. J. Sci.*, 1942, **240**, 356—362).—Enrichment of Pb is effected by co-pptn. with $SrSO_4$; this method is superior to that in which Pb is pptd. as PbS in presence of $Ag^{\cdot}$. The Pb is determined finally as PbO_2 by electrolysis. The Pb content of the Norwegian granite, gneiss-granite, augengneiss, and Nordmarkite porphyry examined is approx. const. at 10—20 g. per ton. L. S. T.

Photometric determination of copper and iron in distilled liquors.—See B., 1942, III, 184.

Determination of copper and nickel in steels.—See B., 1942, I, 350.

Separation of ytterbium and accompanying rare earths by means of its amalgam. H. N. McCoy and R. P. Hammond (*J. Amer. Chem. Soc.*, 1942, **64**, 1009).—An extension of previous work (A., 1942, I, 178) with spectroscopic examination of the rare-earth metals from the electrolysed amalgams indicates that Yb can be separated from other rare earths by its amalgam. W. R. A.

Precipitation of aluminium chloride from ether-aqueous hydrochloric acid and its importance in separation operations. W. Fischer and W. Seidel (*Z. anorg. Chem.*, 1941, **247**, 333—366).—The solubility of $AlCl_3,6H_2O$ in mixtures of H_2O and Et_2O saturated with HCl has been determined and the effect of stirring, temp., and the EtO : H_2O ratio has been investigated; at 0° with equal parts of H_2O and Et_2O containing 39% of HCl the solubility was 0·3 mg. Al_2O_3 per 100 ml. of mixture; it decreased as the % Et_2O was increased—at 15° in a 7 : 3 mixture of Et_2O and 6N-aq. HCl the solubility was 0·2. The solubilities of $Na^{\cdot}$, $K^{\cdot}$, $NH_4^{\cdot}$, $Be^{\cdot\cdot}$, $Mg^{\cdot\cdot}$, $Ca^{\cdot\cdot}$, $Ti^{\cdot\cdot\cdot\cdot}$, $V^{\cdot\cdot\cdot\cdot}$, $Cr^{\cdot\cdot\cdot}$, $Mn^{\cdot\cdot}$, $Fe^{\cdot\cdot\cdot}$, $Co^{\cdot\cdot}$, $Ni^{\cdot\cdot}$, $Cu^{\cdot\cdot}$, and $Zn^{\cdot\cdot}$ at 0° in 1 : 1 Et_2O–H_2O mixtures saturated with HCl (~39%) have also been determined and the solubilities, which were all ≫ that of $Al^{\cdot\cdot\cdot}$, and colours of the solutions are given. The wt. of impurity carried down when 100 mg. of Al was pptd. from 100 ml. of Et_2O–H_2O–HCl in presence of 1000, 100, 10, and 1 mg. of other mixed substances was determined and in most cases was extremely small (<1%); the method has been extended to the separation of Ni from Fe and Co. The results of the method are compared with the results obtained by pptn. with aq. NH_3, and its importance in quant. analysis is discussed. J. L. E.

Qualitative reagents for cations. V. Reagents for rhenium cations and perrhenic anions. P. Wenger and R. Duckert (*Helv. Chim. Acta*, 1942, **25**, 599—604).—Reagents for $Re^{\cdot\cdot\cdot}$ and ReO_4' are classified. C. R. H.

Quantitative control tests for ferric iron added to flour.—See B., 1942, III, 184.

Oxidimetric determination of niobium alone and in the presence of iron, vanadium, and titanium. W. D. Treadwell and R. Nieriker (*Helv. Chim. Acta*, 1942, **25**, 474—488).—Using an improved form of electrolytic reduction vessel it has been shown that Nb^{V} in M-H_2SO_4 can be reduced quantitatively to Nb^{III} at an amalgamated Pb cathode using a c.d. of ~5 amp. per sq. dm. In this solution the Nb^{III} can be titrated electrometrically with $KMnO_4$ or $FeCl_3$, or, with less accuracy, with $K_2Cr_2O_7$, even in presence of $Fe^{\cdot\cdot}$, $Ti^{\cdot\cdot\cdot}$, of $V^{\cdot\cdot}$. In M-H_3PO_4 Nb^{V} is not reduced at a Cd cathode, whereas Ti^{IV}, V^{V}, and Fe^{III} are all reduced under these conditions. This method permits the determination of these metals in presence of Nb. J. W. S.

XI.—APPARATUS ETC.

Methods of photographic stellar photometry. M. de Saussure (*Ann. Guébhard-Séverine*, 1940—41, 259—274).—Multiple images of known intensity ratio are formed on the photographic plate by means of two half-aluminised glass plates at a small angle. O. D. S.

Logarithm-of-wave-length scale for use in absorption spectrophotometry. W. A. Shurcliff (*J. Opt. Soc. Amer.*, 1942, **32**, 229—233).—Advantages are indicated, and a system providing 100 units per spectral octave is described. N. M. B.

Interference spectroscopy. (A) II. (B) Errata. K. W. Meissner (*J. Opt. Soc. Amer.*, 1942, **32**, 185—210, 211; cf. A., 1942, I, 27).—(A) A description of the principles of the compound interferometer, multiplex interference spectroscope, and reflexion echelon diffraction grating and of their applications to absorption spectra, half widths, and intensity distributions.
(B) Corrections to I. N. M. B.

Streaming double refraction in absorbing and [optically] active solutions. I. Methods of measurement. Y. Björnståhl (*Kolloid-Z.*, 1941, **97**, 46—53).—Mathematical. A method is given for obtaining the consts. that characterise the emergent light after traversing a streaming doubly refracting solution of an optically active substance. F. L. U.

Mercury sensitisation and the optical and *X*-ray latent images. A. May (*J. Opt. Soc. Amer.*, 1942, **32**, 219—223).—Results of a study of the speed factors of films sensitised before and after exposure are plotted and discussed. N. M. B.

Use of Elkonite for cyclotron ion sources. B. R. Curtis and R. S. Bender (*Rev. Sci. Instr.*, 1942, **13**, 266).—Elkonite (W–Cu; 10W3 grade), when used instead of Cu for the arc capillary, prolongs the life of the capillary ≮3-fold. A. A. E.

Complete proportional counter arrangement for cosmic-ray measurements. P. Weisz and W. E. Ramsey (*Rev. Sci. Instr.*, 1942, **13**, 258—264).—Apparatus is described and figured, and certain general principles of proportional counter mechanism are discussed. A. A. E.

Operating characteristics of the Wilson cloud chamber. W. E. Hazen (*Rev. Sci. Instr.*, 1942, **13**, 247—257).—$p_{min.}$ and the initial pressure rise after completion of expansion $\propto t^{\frac{1}{2}}$ (t = expansion time); the ion threshold expansion ratio and the surface area of a drop increase linearly with t. The sensitive time increases with expansion ratio, is max. when the general background becomes appreciable, and approaches zero for higher expansion ratios. A. A. E.

Electrical method for the instantaneous determination of traces of gases in air. E. Huguenard (*Compt. rend.*, 1941, **213**, 21—23).—The method depends on variation of resistance of a Pt wire heated in pure and in impure air. It is possible to determine the proportions of two impurities. The EtOH content of a liquid can be found by aspirating some of the atm. from above the liquid, and analysing it by the above method. A. J. M.

Hot-stage hypermicroscopy with the electron microscope. M. von Ardenne (*Kolliod-Z.*, 1941, **97**, 257—272).—The construction and use of heating stages for use with the author's electron microscope (cf. A., 1940, I, 376) are described; the stages are calibrated by a micro-pyrometer. By using different metals, temp. up to 3000° can be reached. The effect of heat was thus investigated on (*a*) Zn foil, (*b*) an Al splinter, (*c*) a metal powder of high m.p., (*d*) an uncrystallisable powder of high m.p., and (*e*) spores of *B. vulgatus*. The possible applications of this new technique are discussed. N. G.

Distillation. W. Kuhn (*Helv. Chim. Acta*, 1942, **25**, 252—295).—Mathematical. The effects of various factors on the efficiency of a simple reflux fractionating column are evaluated and the optimum conditions for the operation of such a column are deduced. J. W. S.

Sealing quartz windows on Pyrex tubes. S. W. Benson (*Rev. Sci. Instr.*, 1942, **13**, 267—269).—Procedure whereby the bevelled end of a Pyrex tube is platinised and then sealed to a quartz window by means of fused AgCl is described. A. A. E.

Sealing mica to glass or metal to form a vacuum-tight joint. J. S. Donal, jun. (*Rev. Sci. Instr.*, 1942, **13**, 266—267).—Powdered Pb borosilicate glass of low m.p., mixed with H_2O, is painted on the surfaces to be sealed, and the parts are heated in an oven at ~600°. A. A. E.

Black-enamelled basins. A. G. Arend (*Paint Tech.*, 1942, **7**, 41).—The use of black surfaces enhances the visibility of ppts. E. F. P.

Alignment chart for computation of ultracentrifugation results.—See A., 1942, III, 656.

Determination of viscosity with the turboviscosimeter.—See B., 1942, I, 323.

XIII.—GEOCHEMISTRY.

Calcium content of some East Australian waters.—See A., 1942, III, 695.

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SEPTEMBER, 1942.

ERRATUM.

Page	Line	
287	33*	*For* "**Sodium hydroxide**" *read* "**Sodium hydride.**"

* From bottom.

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