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ANNUAL REPORT OF THE INTERNATIONAL COMMITTEE ON ATOMIC WEIGHTS, 1914.

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At the Eighth International Congress of Applied Chemistry, held in New York in September, 1912, a resolution was passed favoring less frequent changes in the official table of atomic weights. Such changes are sometimes embarrassing to technical chemists, and the resolution adopted expressed a desire that the table for 1913 should remain, for legal and commercial use, the official table until the next Congress convenes, in 1915. With this wish the Committee can easily comply; at least in its essential features, for changes which affect the industrial chemist are not likely to be important, and the text of each annual report will give all the refinements of data which may be needed in theoretical discussions. Only such changes in the table as seem to be absolutely necessary need be made during the next two years, and that they should seriously affect the values in common use is highly improbable.

Since the annual report for 1913 was prepared, a number of important memoirs on atomic weights have appeared, which may be summarized as follows:

Nitrogen.—Scheuer,[1] from analyses of nitrogen trioxide and tetroxide, and from measurements of ratios connecting the oxides of nitrogen, finds N = 14.008 as the mean of five series of determinations. He also redetermined the densities of ammonia and of sulfur dioxide, obtaining results in accordance with earlier investigations. The value assigned to N varies from the rounded-off figure given in the table by only one part in 7000.

Chlorine.—By the synthesis of NOCl, by the direct union of nitric oxide

[1] *Auzeiger Wien Akad.*, **49**, 36 (1912).

and chlorine, Wourtzel[1] finds Cl = 35.4596, when N = 14.008. He also[2] determined the density of nitrosyl chloride, and found the weight of the normal liter to be 2.9919 grams. From this he deduced a molecular weight of 65.456, which is probably too low. From the ratio between ammonia and hydrochloric acid, remeasured by Baume and Perrot,[3] the authors found Cl = 35.463; an unusually high value. None of these new determinations warrants any change in the accepted figure for chlorine.

Bromine.—By the direct synthesis of hydrobromic acid from weighed quantities of hydrogen and bromine, Weber[4] finds Br = 79.3066 when H = 1. With O = 16, the value for bromine becomes 79.924. The accepted value differs from this by only one part in 20,000.

Phosphorus.—Baxter and Moore,[5] from analyses of phosphorus trichloride, find P = 31.018, in good agreement with previous determinations. This is slightly lower than the value given in the table.

Iron.—By the reduction of ferric oxide in hydrogen, Baxter and Hoover[6] find Fe = 55.847.

Cadmium.—The electrochemical equivalent of cadmium has been determined by Laird and Hulett,[7] who precipitated cadmium and silver simultaneously in an electric current. From the data given the atomic weight of cadmium is 112.31, a low value, but one in accord with the previous work of Hulett and Perdue on cadmium sulfate. The investigation is to be continued with the chloride.

Tellurium.—The supposed complexity of tellurium has been reinvestigated by Dudley and Bowers,[8] with negative results. They attempted to determin the atomic weight by the basic nitrate method, which they found to be unsatisfactory. A series of syntheses of the tetrabromide gave Te = 127.479.

Uranium.—From calcinations of uranyl nitrate to uranium dioxide, Lebeau[9] found U = 238.54. Oechsner de Coninck,[10] by calcination of uranic oxalate obtained variable results, in mean, U = 238.44.

Scandium.—Atomic weight redetermined by Meyer and Goldenberg,[11] who employed the sulfate method. In mean, Sc = 44.14, in agreement with the accepted value. The higher figure given by Meyer and Winter was due to the presence of thoria in the material employed.

[1] *Compt. rend.*, **155**, 345.
[2] *Ibid.*, **155**, 152.
[3] *Ibid.*, **155**, 461.
[4] THIS JOURNAL, **34**, 1294.
[5] *Ibid.*, **34**, 1644.
[6] *Ibid.*, **34**, 1657.
[7] *Trans. Amer. Electrochem. Soc.*, **22**, 385.
[8] THIS JOURNAL, **35**, 875.
[9] *Compt. rend.*, **155**, 161.
[10] *Ibid.*, **155**, 1511.
[11] *Chem. News*, **106**, 12.

INTERNATIONAL ATOMIC WEIGHTS, 1914.

	Symbol.	Atomic weight.		Symbol.	Atomic weight.
Aluminum	Al	27.1	Molybdenum	Mo	96.0
Antimony	Sb	120.2	Neodymium	Nd	144.3
Argon	A	39.88	Neon	Ne	20.2
Arsenic	As	74.96	Nickel	Ni	58.68
Barium	Ba	137.37	Niton (radium emanation)	Nt	222.4
Bismuth	Bi	208.0	Nitrogen	N	14.01
Boron	B	11.0	Osmium	Os	190.9
Bromine	Br	79.92	Oxygen	O	16.00
Cadmium	Cd	112.40	Palladium	Pd	106.7
Caesium	Cs	132.81	Phosphorus	P	31.04
Calcium	Ca	40.07	Platinum	Pt	195.2
Carbon	C	12.00	Potassium	K	39.10
Cerium	Ce	140.25	Praseodymium	Pr	140.6
Chlorine	Cl	35.46	Radium	Ra	226.4
Chromium	Cr	52.0	Rhodium	Rh	102.9
Cobalt	Co	58.97	Rubidium	Rb	85.45
Columbium	Cb	93.5	Ruthenium	Ru	101.7
Copper	Cu	63.57	Samarium	Sa	150.4
Dysprosium	Dy	162.5	Scandium	Sc	44.1
Erbium	Er	167.7	Selenium	Se	79.2
Europium	Eu	152.0	Silicon	Si	28.3
Fluorine	F	19.0	Silver	Ag	107.88
Gadolinium	Gd	157.3	Sodium	Na	23.00
Gallium	Ga	69.9	Strontium	Sr	87.63
Germanium	Ge	72.5	Sulfur	S	32.07
Glucinum	Gl	9.1	Tantalum	Ta	181.5
Gold	Au	197.2	Tellurium	Te	127.5
Helium	He	3.99	Terbium	Tb	159.2
Holmium	Ho	163.5	Thallium	Tl	204.0
Hydrogen	H	1.008	Thorium	Th	232.4
Indium	In	114.8	Thulium	Tm	168.5
Iodine	I	126.92	Tin	Sn	119.0
Iridium	Ir	193.1	Titanium	Ti	48.1
Iron	Fe	55.84	Tungsten	W	184.0
Krypton	Kr	82.92	Uranium	U	238.5
Lanthanum	La	139.0	Vanadium	V	51.0
Lead	Pb	207.10	Xenon	Xe	130.2
Lithium	Li	6.94	Ytterbium (Neoytterbium)	Yb	172.0
Lutecium	Lu	174.0	Yttrium	Yt	89.0
Magnesium	Mg	24.32	Zinc	Zn	65.37
Manganese	Mn	54.93	Zirconium	Zr	90.6
Mercury	Hg	200.6			

Yttrium.—Two determinations of the atomic weight by Meyer and Wuorinen[1] gave Yt = 88.6. The sulfate method was used. Egan and Balke,[2] in a preliminary study of the ratio between yttrium chloride and

[1] *Z. anorg. Chem.*, **80**, 7.

[2] THIS JOURNAL, **35**, 365.

yttria, found Yt = 90.12. As their research is to be continued, it would be unwise to use either of these investigations as a basis for changing the table. The lower of the two values appears to be the more probable.

Ruthenium.—Vogt,[1] from reductions of ruthenium dioxide finds Ru = 101.63.

Palladium.—Determinations of atomic weight by analysis of palladiammonium chloride have been made by Shinn.[2] The mean value obtained was Pd = 106.709, but the individual determinations varied more than is satisfactory. Shinn supposes that the chloride is less definit than it has been assumed to be.

Radium.—From analyses of radium bromide, Hönigschmid[3] finds Ra = 225.97, in confirmation of his former analyses of the chloride. The discordance between this value and the higher value obtained by others is unexplained. The presumption is in favor of Hönigschmid's determination, but a change in the table may well be deferred until more evidence is available.

The preceding table is that of 1913, unchanged.

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THE ELECTRON CONCEPTION OF VALENCE. IV. THE CLASSIFICATION OF CHEMICAL REACTIONS.

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Definition.[4] *The valence of an element may be defined as the number of corpuscles (negative electrons) an atom of that element loses or gains to form chemical bonds.*

Assumptions Involved.—Every chemical bond formed between two atoms involves the transfer of a corpuscle from one atom to the other.

[1] *Sitzungsb. phys. med. Soz. Erlangen*, 43, 268.

[2] THIS JOURNAL, 34, 1448.

[3] *Monats. Chem.*, 34, 283.

[4] The electron conception of valence, as developed in the previous papers of this series, was applied in some detail to the structures of organic compounds and their reactions; while inorganic compounds were also included, although not discussed as thoroughly. In developing these valence views farther, and in attempting to extend them so as to include chemical reactions and relationships in general, it is necessary to state the fundamental definitions and conceptions in as clear a manner as possible. The definition of valence, and the views on oxidation and reduction which will be used as the fundamental conceptions, are, therefore, given in this paper and the classification of chemical reactions is then based upon them. It should hardly be necessary to state that the definition of valence and the consideration of oxidation and reduction as changes in the electrical state of certain definit atoms has received essentially the same treat-