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REPORT OF THE INTERNATIONAL COMMITTEE ON ATOMIC WEIGHTS. 1908.

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Since the preparation of our report for 1907, several important determinations of atomic weights have been published. They are, briefly, as follows:

Nitrogen.—Richards and Forbes[1] have redetermined the ratio between Ag and NO_3, as shown in the composition of silver nitrate. The ratio found, with all corrections applied, is Ag: NO_3 = 100: 57.479. Hence, if Ag = 107.930, N = 14.037; and if N = 14.008, Ag = 107.880. In short, the higher atomic weight hitherto assigned to silver is inconsistent with the lower value for nitrogen as found in several recent investigations.

Sulphur.—Richards and Jones[2] have measured the ratio between Ag_2SO_4 and AgCl. From the data obtained, if Ag = 107.930, S = 32.113, a value much higher than that commonly accepted. If Ag = 107.880, then S = 32.069, which is near the figure given in our former tables. Additional evidence relative to this constant is much to be desired, for it influences the determination of many other atomic weights, especially those of the rare-earth metals.

Potassium.—From the ratios Ag: KCl and AgCl: KCl, Richards and Staehler[3] find K = 39.114, when Ag = 107.930 and Cl = 35.473. From the corresponding bromide ratios, with Br = 79.953, Richards and Mueller[4] find K = 39.1143 and 39.1135. The final result of both researches is K = 39.114, a distinct lowering of the constant in question.

Manganese.—Atomic weight redetermined by Baxter and Hines,[5] from

[1] This Journal, **29**, 808; and Z. anorg. Chem., **55**, 34.
[2] This Journal, **29**, 826; and Z. anorg. Chem., **55**, 72.
[3] This Journal, **29**, 623; and Ber., **39**, 3611.
[4] This Journal, **29**, 639; and Z. anorg. Chem., **53**, 423.
[5] This Journal, **28**, 1560; and Z. anorg. Chem., **51**, 202.

analyses of the chloride and bromide. The mean of their very concordant determinations is Mn = 54.957, when Ag = 107.930.

Cobalt.—From new analyses of the chloride, Baxter and Coffin[1] find Co = 58.997, or 59 in round numbers. This confirms the earlier determinations by Richards and Baxter.

Indium.—Mathers,[2] from analyses of indium chloride, found In = 114.88. From the bromide, In = 114.86. The author recommends the adoption of the rounded-off value, 114.9, when Ag = 107.93, Cl = 35.473, and Br = 79.953.

Tellurium.—Norris,[3] by twelve concordant reductions of the basic nitrate, $2TeO_2.HNO_3$ to TeO_2, found the atomic weight of tellurium to be 127.48, when N = 14.01. With N = 14.04, Te = 127.64, which is in better agreement with other recent determinations. The true cause of the difference is not clear.

Neodymium.—Holmberg[4] has redetermined the atomic weight of this element by synthesis of the sulphate from the oxide. In mean, when S = 32.06, Nd = 144.08. This is higher by 0.48 than the value given in our table.

Dysprosium.—In two series of determinations, based upon the ignition to oxide of the octohydrated sulphate, Urbain and Demenitroux[5] find for the atomic weight of dysprosium, values ranging between 162.29 and 162.75. In mean, Dy = 162.53.

Radium.—Madame Curie,[6] in a series of three new determinations, has found a more precise value for the atomic weight of radium. Working with material more abundant and pure than that formerly analyzed, she found Ra = 226.18 when Ag = 107.8 and Cl = 35.4. With Ag = 107.93 and Cl = 35.45, Ra = 226.45. This number is higher than her earlier determination by more than a unit.

From the data here given, and from those cited in previous reports, it is evident that the entire table of atomic weights is in need of revision. The values assigned to K and Na are too high; those given to Cl and S are too low; and these constants affect the determinations of many others. They depend, however, upon the atomic weight of silver, which is probably, but not certainly, as low as 107.88. It is well known that work upon these fundamental constants is now nearing completion in several laboratories, notably under T. W. Richards, W. A. Noyes, and probably other investigators also. Within a few months it should be possible to

[1] This Journal, **28,** 1580; and Z. anorg. Chem., **51,** 171.

[2] This Journal, **29,** 485; and Ber., **40,** 1220.

[3] This Journal, **28,** 1675.

[4] Z. anorg. Chem., **53,** 83.

[5] Compt. rend., **143,** 598.

[6] Ibid., **145,** 422. The atomic weight of radium is also under investigation by Thorpe.

enter upon a satisfactory revision of the table, a task which would be unsatisfactory, if undertaken now. It is true, as Brauner has suggested,[1] that the present table contains inconsistencies, but they are small in amount, and are due to inconsistencies in the original data from which the values are derived. In our next report we hope to recompute the entire table; but meanwhile, awaiting the completion of the researches which we know to be in progress, we prefer to leave the table practically

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Aluminum	Al	27.1	Molybdenum	Mo	96.0
Antimony	Sb	120.2	Neodymium	Nd	143.6
Argon	A	39.9	Neon	Ne	20.
Arsenic	As	75.0	Nickel	Ni	58.7
Barium	Ba	137.4	Nitrogen	N	14.01
Bismuth	Bi	208.0	Osmium	Os	191.0
Boron	B	11.0	Oxygen	O	16.00
Bromine	Br	79.96	Palladium	Pd	106.5
Cadmium	Cd	112.4	Phosphorus	P	31.0
Caesium	Cs	132.9	Platinum	Pt	194.8
Calcium	Ca	40.1	Potassium	K	39.15
Carbon	C	12.00	Praseodymium	Pr	140.5
Cerium	Ce	140.25	Radium	Ra	225.
Chlorine	Cl	35.45	Rhodium	Rh	103.0
Chromium	Cr	52.1	Rubidium	Rb	85.5
Cobalt	Co	59.0	Ruthenium	Ru	101.7
Columbium	Cb	94.	Samarium	Sa	150.3
Copper	Cu	63.6	Scandium	Sc	44.1
Dysprosium	Dy	162.5	Selenium	Se	79.2
Erbium	Er	166.	Silicon	Si	28.4
Europium	Eu	152.	Silver	Ag	107.93
Fluorine	F	19.0	Sodium	Na	23.05
Gadolinium	Gd	156.	Strontium	Sr	87.6
Gallium	Ga	70.0	Sulphur	S	32.06
Germanium	Ge	72.5	Tantalum	Ta	181.
Glucinum	Gl	9.1	Tellurium	Te	127.6
Gold	Au	197.2	Terbium	Tb	159.2
Helium	He	4.0	Thallium	Tl	204.1
Hydrogen	H	1.008	Thorium	Th	232.5
Indium	In	115.	Thulium	Tm	171.
Iodine	I	126.97	Tin	Sn	119.0
Iridium	Ir	193.0	Titanium	Ti	48.1
Iron	Fe	55.9	Tungsten	W	184.0
Krypton	Kr	81.8	Uranium	U	238.5
Lanthanum	La	138.9	Vanadium	V	51.2
Lead	Pb	206.9	Xenon	Xe	128.
Lithium	Li	7.03	Ytterbium	Yb	173.0
Magnesium	Mg	24.36	Yttrium	Y	89.0
Manganese	Mn	55.0	Zinc	Zn	65.4
Mercury	Hg	200.0	Zirconium	Zr	90.6

[1] Chem.-Ztg., May 11, 1907.

unchanged. A conservative policy seems to be safer than one of haste, and the delay of another year will do no harm. One exception to the rule may, however, be made. Dysprosium, with the atomic weight 162.5, may now be properly added to the list of the chemical elements, and we recommend its insertion in the table.

It is with the deepest regret that we record the loss, by death, in February last, of our distinguished colleague, Professor Moissan. The Chemical Society of Paris has designated Monsieur G. Urbain as his successor upon this Commission.

(Signed)

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THE CHOICE OF THE MOST PROBABLE VALUE FOR AN ATOMIC WEIGHT: THE ATOMIC WEIGHT OF HYDROGEN.[1]

BY WILLIAM A. NOYES.

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A large amount of material has been accumulated from which the atomic wieghts of the more important elements can be calculated. A very superficial examination of this material reveals the fact that the experimental results on which our knowledge of these constants is based, vary very greatly in their value and that many of the older determinations have been rendered practically worthless by recent work, which has been more careful and accurate.

As some of these new determinations affect the values for elements of such fundamental importance that a recalculation of the whole table of atomic weights will be necessary in the near future, it seems desirable to formulate some general principles to aid in the elimination of results which have little or no value and in the combination of the results which remain. Such principles, if they meet with general acceptance, will be of value, not only for the purpose stated but also as setting a certain standard which must be attained by future workers in this field, if their work is to be of permanent value.

The most important general principle which has been proposed for the combination of the results of different observers, is the one based on the mathematical discussion of accidental errors of observation. In accordance with the theory of probabilities, these results, if subject only to accidental errors, should be weighted in inverse proportion to their

[1] Presented in abstract at the N. Y. Meeting of the American Chemical Society, Dec. 28, 1906.