

# INORGANIC CHEMISTRY.

(PART 1.)

(1) See Art. **125**.

(2) See Art. **4**.

(3) 1 kilogram = 1,000 grams; 50 kilograms = 50,000 grams. See Art. **5**. 1 gram of burning hydrogen raises 34,462 grams of water from 0° to 1°. Then,  $50,000 \div 34,462 = 1.45$  grams of hydrogen are needed to raise 50,000 grams from 0° to 1°, and  $1.45 \times 10$ , or 14.5, grams will be required to raise the same quantity of water to 10°. Ans.

(4) See Art. **11**. Oxygen is an extremely active supporter of combustion, while air, being composed of oxygen and nitrogen, the latter of which is not a supporter of combustion, is a less active supporter.

(5) See Art. **100**.

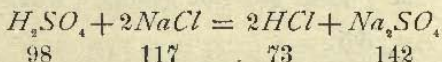
(6) See Art. **61**.

(7)  $2NaBr + Cl_2 = 2NaCl + Br_2$ .

(8) See Art. **36**.

(9) All acids, all hydrates, organic compounds, such as alcohol, petroleum, etc. See Art. **2**.

(10) Hydrochloric-acid gas is prepared according to the equation



Then,

$$(a) \quad 73 : 98 = 36.5 : 49 \text{ grams } H_2SO_4;$$

$$73 : 117 = 36.5 : 58.5 \text{ grams } NaCl.$$

$$(b) \quad 73 : 98 = 1 : 1.3424 \text{ kilograms } H_2SO_4;$$

$$73 : 117 = 1 : 1.6027 \text{ kilograms } NaCl. \quad \text{Ans.}$$

(11) See Art. 71.

(12) See Art. 44.

(13) See Art. 115.

(14) See Art. 99.

(15) See Art. 85.

(16) (a) See Art. 3 and Art. 31, Experiment 22.

(b) A molecule of water contains 2 parts of hydrogen and 16 parts of oxygen, or 1 gram of water contains  $\frac{2}{18}$  or  $\frac{1}{9}$  part of its weight of hydrogen:

$$250 \div 9 = 27.777 + \text{grams of } H. \quad \text{Ans.}$$

(17) See Arts. 30 and 31.

(18) See Art. 98.

(19) See Fig. 13 and Art. 22.

(20) See Arts. 4 and 5.

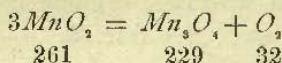
(21) See Art. 40.

(22) (a) No.

(b) See Art. 75.

(23) See Art. 28.

(24) See Art. 10. Oxygen is prepared according to the equation



Then,

$$261 : 32 = 261 : 32 \text{ grams.} \quad \text{Ans.}$$

(25) See Art. 55.

(26)  $H_2SO_4 + Zn = ZnSO_4 + H_2$ . See Art. 3.

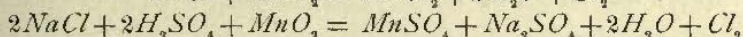
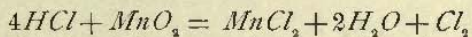
(27) See Art. 10.

(28) (a) See Art. 39.

(b) See Art. 41.

(29) (a) See Art. 45.

(b) See Figs. 23 and 24.



(30) A desiccating agent is a compound that possesses a strong affinity for water or moisture; as, for instance, sulphuric acid, calcium chloride, etc. See also Art. 5.

(31) (a) See Art. 116.

(b) See Art. 117.

(32)  $H_2SeO_4$ . See Art. 139.

(33) See Art. 5.

(34) Nascent hydrogen is distinguished by its increased chemical activity. See Art. 108, *Theoretical Chemistry*.

(35) Silver has an atomic weight of 108; chlorine has an atomic weight of 35.5. Molecular weight of  $AgCl = 143.5$ . Using formula 1, *Theoretical Chemistry*,

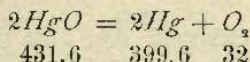
$$x = \frac{100an}{m},$$

and substituting the given values, we obtain

$$x = \frac{100 \times 108 \times 1}{143.5} = 75.261\% \text{ of silver,}$$

$$x = \frac{100 \times 35.5 \times 1}{143.5} = 24.739\% \text{ of chlorine. Ans.}$$

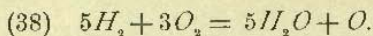
(36) See Art. 10. The production of oxygen from mercuric oxide is expressed by the equation



Then,

$$431.6 : 32 = 20 : 1.48 \text{ grams of oxygen. Ans.}$$

(37)  $2Na + 2H_2O = 2NaHO + H_2$ . See Art. 3.



(39) Two molecules of water and 1 molecule of potassium yield 2 molecules of potassium hydrate and 1 molecule of hydrogen.

(40) See Art. **61**.

(41) See Art. **76**.

(42) 114.7 grams.

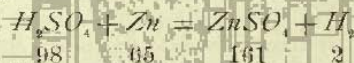
(43) See Art. **5**.

(44) See Art. **97**.

(45)  $H_2S_2O_7$ .

(46) See Art. **56**.

(47) Hydrogen is obtained according to the equation



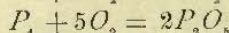
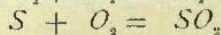
10 liters of hydrogen weigh .896 gram; then,

$$2 : 65 = .896 : 29.120 \text{ grams of zinc,}$$

$$2 : 98 = .896 : 43.904 \text{ grams of sulphuric acid. Ans.}$$

(48) Chlorine, bromine, iodine, and fluorine. See Art. **73**.

(49) (a) Water, sulphur dioxide, phosphorus pentoxide.



(50) Bromine colors a solution of starch yellow, while iodine gives a blue color to the solution. See also Arts. **77** and **80**.

(51) Potassium chlorate has the formula  $KClO_3$ ; its molecular weight is 122.5. Using formula **1**, *Theoretical Chemistry*,

$$x = \frac{100 a n}{m},$$

and substituting the known values, we obtain

$$x = \frac{100 \times 39 \times 1}{122.5} = 31.84\% K,$$

$$x = \frac{100 \times 35.5 \times 1}{122.5} = 28.98\% Cl,$$

$$x = \frac{100 \times 16 \times 3}{122.5} = 39.18\% O. \quad \text{Ans.}$$

(52) 3.17 grams occupy the volume of 1 liter. 1 gram occupies, then, the volume of .31545 liter, and 32 grams will occupy 10.094 liters. Ans.

(53) One molecule of zinc and 1 molecule of sulphuric acid yield 1 molecule of zinc sulphate and 1 molecule of hydrogen.

(54)

Hyposulphurous oxide	$S''O$	Hyposulphurous acid	$H_2S''O_2$
Sulphurous oxide	$S^vO_2$	Sulphurous acid	$H_2S^vO_3$
Sulphuric oxide	$S^viO_3$	Sulphuric acid	$H_2S^viO_4$

(55) See Art. 10.

(56) See Art. 88.

(57) Hydrogen sulphide has the formula  $H_2S$ ; its molecular weight is 34. Using formula 10, *Theoretical Chemistry*,

$$w = \frac{Wm}{M}$$

and substituting the known values, we obtain

$$w = \frac{100 \times 32}{34} = 94.117 \text{ grams.} \quad \text{Ans.}$$

(58) 1 liter of  $H_2S$  weighs 1.52 grams, 100 liters weigh 152 grams.

(59) (a) and (b) See Art. 90.

(60) 16 parts, by weight, of oxygen,  
2 parts, by weight, of hydrogen.

For the determination of the composition of water by weight, see Art. 34.

(61) See Art. **99**.

(62) See Art. **48**.

(63) See Art. **10**, Experiment 7, and Figs. 6 and 7.

(64) See Art. **108**.

(65) Hydrofluoric acid has the formula  $HF$  and a molecular weight of 20. Using formula **1**, *Theoretical Chemistry*,

$$x = \frac{100an}{m},$$

and substituting the known values, we obtain:

$$x = \frac{100 \times 1 \times 1}{20} = 5\% \text{ of } H,$$

$$x = \frac{100 \times 19 \times 1}{20} = 95\% \text{ of } F. \quad \text{Ans.}$$

(66) See Art. **145**.

(67) See Art. **113**.

(68) (a)  $2NaI + MnO_2 + 2H_2SO_4$   
 $= Na_2SO_4 + MnSO_4 + 2H_2O + I_2$

Two molecules of sodium iodide and 1 molecule of manganese dioxide and 2 molecules of sulphuric acid yield 1 molecule of sodium sulphate, 1 molecule of manganese sulphate, 2 molecules of water, and 1 molecule of iodine. See Art. **79**.

(69) See Art. **134**.

(70) (a) A unit of heat is the amount of heat required to raise 1 gram of water from  $0^\circ$  to  $1^\circ$ .

(b) 34,462 units of heat. See Art. **5**.

(71) See Art. **99**.

(72) A reducing agent is a substance that removes oxygen, or elements similar to it, from its compounds, or decreases the valence of a substance, changing it from a higher to a lower state of oxidation.

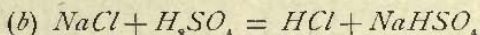
(73) (a) See Art. **122**.

(b)  $SO_2$ .

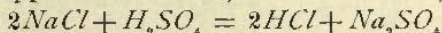
(74) (a) and (b) See Art. **16**.

(75) The antiseptic or antizymotic property of a substance is that property which prevents or destroys putrefaction.

(76) (a) See Art. **54**, and Fig. 28.



or with the application of heat,



(77) (a) See Art. **123**.

(b) See Art. **129**.

(78) See Art. **47**.

(79) See Art. **11**.

(80) A suitable freezing mixture is prepared by mixing 2 parts of ice with 1 part of ordinary salt.

(81) See Art. **105**.

(82) See Art. **14**, Experiment 17.

(83) (a) See Art. **77**.

(b) See Arts. **76** and **77**.

(84) See Art. **126**.

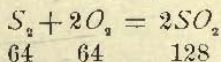
(85) See Art. **128**.

(86) See Art. **109**.

(87) See ozone, Arts. **13** and **16**.

(88) See Art. **127**.

(89)  $\text{SO}_2$  is obtained according to the equation



Using formula **10**, *Theoretical Chemistry*,

$$w = \frac{Wm}{M},$$

and substituting the known values, we obtain

$$w = \frac{10 \times 128}{64} = 20 \text{ grams of } \text{SO}_2. \quad \text{Ans.}$$