ORGANIC CHEMISTRY.

(PART 1.)

(1) The percentage figures, 40, 6.6, and 53.4, divided by their atomic weights give $\frac{40}{12} = 3.3$, $\frac{6.6}{1} = 6.6$, and $\frac{53.4}{16} = 3.3$. If this ratio, 3.3 : 6.6 : 3.3, is expressed in its lowest term, it becomes 1 : 2 : 1, and the empirical formula of the compound is CH_2O. See Art. **59.**

(2) See Art. **49.**

(3) See Art. **77.**

(4) $C_{10}H_6\begin{cases}CH_2\\ |\\ CH_2\end{cases}$.

(5) (*a*) $11m + 5.5n + 7.8p$.

(*b*) See Art. **38.**

(6) Equal volumes of different solutions, at the same temperature and osmotic pressure, contain equal numbers of molecules of dissolved substances. See also Art. **51.**

(7) See Art. **76.**

(8) See Art. **26.**

(9) See Art. **96.**

(10) See Art. **70.**

(11) See Art. **68.**

(12) See Art. **41.**

(13) $x = 499 \times \frac{273 + 9.87}{273 + 29.49} = 466.615$ mm. pressure of mercury at 9.87°. See also Art. **51.**

(14) See Art. **59.**

(15) C_nH_{2n-12}.

(16) See Art. **79.**

(17) See Art. **64.**

(18) See Art. **13.**

(19) See Art. **47.**

(20) $x = 536 \times \frac{273 + 16.25}{273 + 30} = 511.666$ mm. pressure at 16.25°. See Art. **51** for explanations.

(21) See Art. **61.**

(22) Butine belongs to the acetylene series of hydrocarbons.

(23) See Art. **51.** Solutions which, under equal conditions, exert the same osmotic pressure, are said to be isotonic.

(24) See Art. **71.**

(25) See Art. **62.**

(26) See Art. **4.**

(27) See Art. **33.**

(28) See Art. **68** of this paper and Art. **104,** *Inorganic Chemistry,* Part 2.

(29) The percentage figures, 56, 12, 32, divided by their atomic weights give $\frac{56}{12} = 4.66$, $\frac{12}{1} = 12$, and $\frac{32}{16} = 2$, or 2.33 : 6 : 1. In order to obtain fractionless figures, we multiply by 3, and obtain 7 : 18 : 3, from which we take the empirical formula of the compound to be $C_7H_{18}O_3$.

(30) The mineral product known as petroleum, rock oil, or naphtha.

(31) Hydrocarbons are composed of carbon and hydrogen atoms in various groupings.

(32) See Art. **51.**

(33) See Art. **38.**

(34) See Art. **8.**

(35) $CH_3 \cdot C : CH$.

(36) See Art. **53.**

(37) Pentane C_5H_{12}, boiling point 36°.
Octane C_8H_{18}, boiling point 125°.
Hexadecane $C_{16}H_{34}$, boiling point 287°.

(38) C_nH_{2n+2}, or $H_3C \cdot C_nH_{2n} \cdot CH_3$.

(39) See Art. **46.**

(40) See Arts. **21** and **23.**

(41) See Art. **58.**

(42) See Art. **88.**

(43) Hexane, $CH_3 \cdot CH_2 \cdot CH_2 \cdot CH_2 \cdot CH_2 \cdot CH_3$.
Nonane, $CH_3 \cdot CH_2 \cdot CH_2 \cdot CH_2 \cdot CH_2 \cdot CH_2 \cdot CH_2 \cdot CH_2 \cdot CH_3$.
Butane, $CH_3 \cdot CH_2 \cdot CH_2 \cdot CH_3$.

(44) Alcohols are compounds of C, O, and H. The alcohol molecule is constructed upon the model of the water molecule, in which half the H is replaced by a compound radical, which generally consists of C and H.

(45) Using the formula given in Art. **49,**

$$M = \frac{rp \times 100}{dg},$$

and substituting the known values, we obtain

$$M = \frac{18.9 \times 4 \times 100}{1.148 \times 111} = 59.33,$$

a number sufficiently close to confirm the otherwise obtained molecular weight (60) of urea.

(46) See Art. **37.**

(47) See Arts. **11** and **12.**

(48) C_nH_{2n-6} (n must not be smaller than 6).

(49) See Art. **64.**

(50) See Arts. **71** and **72.**

(51) See Art. **40.**

(52) See Art. **18.**

(53) See Art. **102.**

(54) .3059 gr. gave .6 gr. CO_2 and .3040 gr. H_2O. Since 44 gr. CO_2 contain 12 gr. of C, $\frac{12}{44}$ of .6, or .1636 gr., is the weight of C found; and, since 18 gr. H_2O contain 2 gr. of H, $\frac{2}{18}$ of .3040 gr., or .0338, is the weight of H. The amount of O is the difference between the original weight .3059 and the sum of the weights of H and C. $.1636 + .0338 = .1974$; namely, .1085 gr. of O. Then the original compound contained .1636 gr., or 53.48% of C; .0338 gr., or 11.05% of H; .1085 gr., or 35.47% of O.

(55) See Art. **22.**

(56) See Art. **91.**

(57) See Art. **71.**

(58) $CH_3 \cdot CH : CH_2$.

(59) Carbohydrates are compounds which contain 6, or some multiple of 6, atoms of C, together with some multiple of the group H_2O.

(60) See Art. **70.**

(61) Using the formula given in Art. **49,**

$$M = \frac{rp \times 100}{dg},$$

and substituting the proper values, we obtain

$$M = \frac{18.9 \times 3 \times 100}{0.639 \times 106} = 83.71,$$

which is close enough to confirm the opinion that the molecular weight of lactic acid is 90, and that its formula is $C_3H_6O_3$.

(62) See Art. **20.**

(63) (1) $C_2H_5 \cdot H$; (2) $H_3C \cdot OH$; (3) $CH_3 \cdot CH_2I$.

(64) See Art. **73.**

(65) C_nH_{2n-2}.

(66) See Art. **10.**

(67) $CH_3 \cdot CH_2 \cdot CH_3$. For the graphical representation see Fig. 18.

(68) See Arts. **107, 108, 109,** and **110,** *Inorganic Chemistry*, Part 2, and Art. **81** of this Instruction Paper.

(69) See Fig. 16, Art. **68.**

(70) See Arts. **102, 103,** and **104,** *Inorganic Chemistry*, Part 2, and Art. **73.**

(71) C_nH_{2n}.

(72) $H_2C \cdot CH_3$.

(73) Three; namely, normal pentane, secondary pentane or isopentane, and tertiary pentane or tetramethylmethane.

(74) See Art. **5.**

(75) See Art. **54.**