

CHEMISTRY.

I.

I.—State the difference between Combining weight and Volume weight.

II.—Explain the equation :

$\text{H}_2 \text{SO}_4 + 2\text{KOH} = \text{K}_2 \text{SO}_4 + 2\text{H}_2\text{O}$,
and write out the combining numbers for each element.

The Combining weight of a substance is the least number of parts by weight which can take part in a chemical reaction, and this substance either unites with others with this number of parts by weight or some multiple of this number. The Volume weight of a substance is the weight of a given volume of that substance in the form of gas, as compared with some standard. (We use Hydrogen as the standard.)

The Combining weights and Volume weights are the same, with the exception of P, As, Cd and Hg. In the first two the Volume weight is twice that of Combining weight, and in last two, one-half of it.

The equation means that if a molecule of H_2SO_4 and two molecules of KOH be brought together, a molecule of $\text{K}_2 \text{SO}_4$ Potassic Sulphate, and two molecules H_2O will be formed. That is, the Potassium of the KOH changes places with the Hydrogen of the Sulphuric Acid.

Combining numbers are

$$\left. \begin{array}{l} \text{H} = 1 \\ \text{S} = 32 \\ \text{O} = 16 \\ \text{K} = 39 \end{array} \right\} \begin{array}{l} \text{In round} \\ \text{numbers.} \end{array}$$

II.

I.—Deduce the formula for converting degrees on Fahrenheits scale to corresponding degrees on the Centigrade scale.

II.—Convert 84°C into F.

III.—Convert 40°C into F.

IV.—Convert 39°F into C.

I.—The zero point of the Fahrenheit scale is 32° below the freezing point of water. The boiling point of water is 212° removed from the zero point. The number of degrees, therefore, on the Fahrenheit scale between the freezing and boiling point of water is 180° .

Celsius, the inventor of the Centigrade thermometer, made the freezing point of water his zero point, and the boiling point 100° above this; so that 100 spaces on Centigrade corresponds with 180 spaces on the Fahrenheit, and as 0°C corresponds to 32°F . to change degrees of C to degrees of F we must add the 32° ; and in changing from F to C we must subtract the 32° , hence

$$\frac{9}{5} \text{C} = \text{F} + 32, \text{ and}$$

$$\frac{5}{9} \text{F} - 32 = \text{C}$$

$$\text{II.} - \frac{9}{5} \text{ of } 84^\circ + 32^\circ = \frac{756^\circ}{5} + 32^\circ \text{ or } 182\frac{1}{5}^\circ \text{F.}$$

$$\text{III.} - \frac{9}{5} \text{ of } 40^\circ + 32^\circ = 72^\circ + 32^\circ = 104^\circ \text{F.}$$

$$\text{IV.} - \frac{5}{9} \text{ of } (-30^\circ - 32^\circ) = \frac{-310^\circ}{9} = -34\frac{4}{9}^\circ \text{C.}$$

III.

I.—State and explain the laws relating to the variation in the volume of a gas, for variation in temperature or pressure.

II.—100 volumes air under a barometric pressure of 740 min. become how many volumes when under a pressure of 750 min.?

III.—A quantity of air at 0°C , what will be its volume at 185°F ?

I.—For temperature—Gay-Lussac's law—for every increase of one degree C in temper-