

four atoms of Chlorine : how may this be established ?

5. What is the law of combination, in multiple proportion ? Shew that the Oxides of Nitrogen conform to the law.

6. Give a short account of the chemistry of Silicon and its principal compounds. What element do you consider it most nearly resembles ?

7. What meanings do you assign to the terms—acid, base, and salt ? Compare the substances represented by the formulæ :— H_2SO_4 , NaHSO_4 , SO_2 , N_2O_5 , HNO_3 , Al_2O_3 , KAsS_4 , Na , AlO_3 .

Second Year.

1. Give a brief account of the origin of the term Organic Chemistry.

2. How may the presence of Nitrogen, Hydrogen, and Iodine, be detected in an organic compound ?

3. The analysis of a hydrocarbon leads to the formula C_nH_{2n} . What experimental evidence would enable to assign a particular value to n in the above formula ?

4. Give the general methods of preparation and characteristic reactions of the alcohols. What class of bodies in inorganic chemistry do they most nearly resemble ?

5. A mixture of the gaseous hydrocarbon C_2H_6 with excess of Oxygen is exploded in a Eudiometer. What alteration of volume will occur ?

6. By what reactions can we distinguish between the primary, secondary, and tertiary alcohols ?

7. The reactions of organic acids are explained on the hypothesis that all acids contain the group $-\text{C} \begin{smallmatrix} \text{O} \\ \parallel \end{smallmatrix} -\text{H}$. Shew that this is probable in the case of acetic acid.

Third Year.

1. On boiling a substance with concentrated hydrochloric acid, chlorine is evolved : what compounds do you know by which this reaction may be caused ? Give equations expressing the reaction in every case.

2. Give a full account of the methods of identifying the acid and base in each of the following salts : lead chromate, aluminium fluoride, manganous phosphate.

3. By what reactions can we distinguish between hydrochloric, hydrobromic, and hydroiodic acid, and between ferrous and ferric salts.

4. Describe experiments to shew that (1) sulphuric acid contains oxygen, and (2) that hydroiodic acid contains iodine, (3) that ammonia contains nitrogen.

5. Neutral solutions of the salts of certain acids with the alkalis are precipitated by a solution of barium chloride. Give the formulæ of the substances produced.

6. The gas from a Marsh's apparatus is passed into a solution of silver nitrate : What reactions will occur if (1) hydrogen arsenide, (2) hydrogen antimonide are present ? Give a comparison of the properties of the spots deposited on porcelain in each case.

7. Iodic acid, sulphur dioxide, and free chlorine, are frequently impurities of commercial nitric acid, sulphuric acid, and hydrochloric acid respectively. Describe methods of testing for these impurities.

Third Year and M.B.

1. How would you recognize a gas to be (1) Nitrous Oxide, (2) Oxygen, (3) Nitrogen ?

2. Describe a method of preparing Nitric Acid : write equations shewing its action on (1) Tin, (2) Copper, (3) Phosphorus, (4) Ferrous Sulphate, (5) Sulphur Dioxide. How could Nitric Acid be shewn to contain hydrogen ?

3. By what reactions can you distinguish between a Chlorate, Nitrate, Nitrite, and Bromate ; and also between Ferrous and Ferric Salts ?

4. Explain, giving an instance, how the determination of the specific heat of an element may be used to ascertain the atomic weight.

5. What volume (measured at 0°C and 7.60mm Bar.) of hydrogen will be set free by the action of 20 grms of zinc on excess of