



Chemistry

1. Explain the following statements in one or two sentences only
 - (a) The ionization potential of beryllium is much larger than boron, though boron slightly larger in size than beryllium.
 - (b) The aqueous solution of sodium carbonate is alkaline to litmus and the ideal indicator is phenolphthalein but not methyl orange for titrations with sodium carbonate.
 - (c) Zinc sulphide is precipitated by H_2S from a solution of zinc acetate but not from a solution of zinc chloride.
 - (d) 0.5 mole of carbon contains the same number of carbon atoms as that of sodium atoms present in 0.5 mole of sodium.
 - (e) Hydrogen is being replaced by helium (though costlier than hydrogen) in airships and balloons.
2. Complete the following equations and finally balance each one of the following equations:
 - (a) $CaC_2 + N_2 \rightarrow \dots + C$
 - (b) $P_4 + 3 NaOH + H_2O \rightarrow NaH_2PO_2 + \dots$
 - (c) $Al_4C_3 + H_2O \rightarrow Al_2O_3 + \dots$
 - (d) $KClO_3 + HCl \rightarrow KCl + H_2O + Cl_2 + \dots$
 - (e) $Sn + HNO_3(Conc) \rightarrow \dots + 4 NO_2 + H_2O$
3. (a) Choose the wrong statement among the following list and rewrite the wrong ones in the correct form.
 - (i) Aluminium metal is extracted from its bauxite ore by simply heating it with coke
 - (ii) Bronze is an alloy of aluminium and zinc
 - (iii) Lead sheets can be used in the construction of chamber in the manufacture of sulphuric acid.
 - (iv) Ethyl ether but not acetone on treatment with alkali and iodine at $80^\circ C$ furnishes the yellow precipitate of iodoform (CHI_3)(b) Describe a good laboratory chemical test to distinguish between the following pairs of compounds :
 - (i) ethylene from ethane
 - (ii) Barium sulphate from barium sulphide
 - (iii) Carbon monoxide from carbon dioxide(c) Explain in two or three sentences the following observations.
 - (i) lead chloride in volumetric analysis appears both in 1st group as a white precipitate of lead chloride and also as a black precipitate of lead sulphide in the 2nd group.
 - (ii) Magnesium is not precipitated as magnesium carbonate in 5th group along with Ca, Sr and Ba, though $MgCO_3$ is also insoluble in water.
4. (a) Indicate the structure of organic product expected when 1, 2 dibromopropane ($CH_3CHBrCH_2Br$) is treated with zinc dust.



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- (b) Indicate the structure of the final organic product expected when ethyl chloride in dry ether is treated with metallic magnesium followed by solid carbon dioxide and finally decomposed with water.
- (c) Indicate the organic structure of product expected, when acetylene is passed into warm acetic acid in presence of mercuric ions as catalyst.
- (d) Indicate the structure of the organic product expected when diethyl ether is heated with anhydrous HI in excess.
- (e) Indicate the structure of the organic product expected when acetaldehyde is treated with a few drops of concentrated sulphuric acid (Note : This is used in medicine as a hypnotic).
5. 0.33g of an organic dibasic acid completely neutralised 55 ml. of 0.1N NaOH solution. Calculate the molecular weight of the organic acid.
6. A sample of dolomite contained 54% CaCO_3 and 42% MgCO_3 and 4% of clay. Calculate volume of CO_2 expected to be liberated at NTP, when 5 gm the sample is treated with enough dilute HCl.
7. Potassium chromate contains 26.78% of chromium and is isomorphous with potassium sulphate. What is the atomic weight of chromium?
8. Find the weight of copper deposited from a solution of copper sulphate by current of 0.25 ampere flowing for one hour. (At. Wt. of copper =63.5, 1 Faraday = 96,500 coulombs).
9. 1.575 of $(\text{COOH})_2 \cdot x\text{H}_2\text{O}$ are dissolved in water and the volume made upto 250 ml. On titration with 16.68 ml of this solution are required for exact neutralization of 25 ml of N/15 NaOH solution. Calculate the value of 'x' (i.e. number of water molecules associated with acid).
10. 3.6 g of mixture of sodium and potassium chloride on treatment with excess of silver nitrate solution gave 7.74 g of silver chloride. What was the percentage of each salt in the mixture?