



## Chemistry

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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 )  $Sn + HNO_3(\text{Conc}) \rightarrow \dots + 4 NO_2 + H_2O$
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 1<sup>st</sup> group as a white precipitate of lead chloride and also as a black precipitate of lead sulphide in the 2<sup>nd</sup> group.
  - ( ii ) Magnesium is not precipitated as magnesium carbonate in 5<sup>th</sup> 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%  $\text{CaCO}_3$  and 42%  $\text{MgCO}_3$  and 4% of clay. Calculate volume of  $\text{CO}_2$  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?