

S.6 CHEMISTRY HOLIDAY WORK.

- (a) Explain what is meant by the term ideal solution.
 - (b) At standard atmospheric pressure, hydrochloric acid and water form a constant boiling point mixture having a boiling point of 110°C and a composition of 20% by mass of hydrochloric acid.
 - (i) Define a constant boiling mixture
 - (ii) Sketch a labelled diagram of the boiling point – composition for hydrochloric acid and water system. [boiling point of water and hydrochloric acid are 100 and 85°C respectively]
 - (c) A constant boiling mixture of hydrochloric acid and water has a density of 1.18gcm^{-3} . Calculate the volume of the acid needed to prepare one litre of 2M hydrochloric acid solution
 - (d) The vapour pressure of ethanol at 20°C is 43.6mmHg while that of benzene at the same temperature is 75.2mmHg . The mole fraction of benzene is 0.09 for a mixture of benzene and ethanol at 20°C . Calculate
 - (i) The vapour pressure of the mixture
 - (ii) The mole fraction of benzene in the vapour phase
2. The table below shows the partial vapour pressures for two component mixtures of propanone and trichloromethane at 35°C for a range of mole fractions of trichloromethane

Mole fraction of trichloromethane	0.0	0.2	0.4	0.6	0.8	1.0
Partial pressure of trichloromethane (mmHg)	0	35	82	142	219	293
Partial pressure of propanone (mmHg)	347	270	185	102	37	0

- (i) Plot a graph to show how this system deviates from Raoult's law
- (ii) Name the type of deviation shown by the system

- (iii) State the cause of such a deviation and the characteristics of such a system showing this deviation
- (b) What are the requirements for a system to obey Raoult's law?
- (c) Methanoic acid and water are miscible in all proportions. They form a maximum boiling mixture containing 77.5% methanoic acid which boils at 108°C. The boiling point of methanoic acid is 101°C
- (i) Sketch a labelled diagram of the mixture of methanoic acid and water showing the variation of the boiling points with composition
- (ii) Describe briefly what happens when a mixture containing 40% methanoic acid is distilled
- (iii) Suggest one method by which methanoic acid may be obtained from the mixture.
3. Write the electronic configuration of copper
- (b) State two properties which show that copper is a transition element
- (c) Excess ammonia was shaken with an equal volume of trichloromethane and a 0.05M aqueous solution of copper(II) sulphate and allowed to stand. Some ammonia formed a complex with copper ($[Cu(NH_3)_n]^{2+}$). At equilibrium, the concentration of ammonia in the trichloromethane layer and aqueous layer were 0.021 mol l⁻¹ and 0.725 mol l⁻¹ respectively. (The partition ratio K_D of ammonia between water and trichloromethane is 25). Calculate
- (i) The concentration of free ammonia in the aqueous layer
- (ii) The concentration of ammonia that formed the complex with copper (iii). That value of n in the complex.