S6 CHEMISTRY HOLIDAY WORK
Attempt ALL questions in both sections A and B

SECTION A

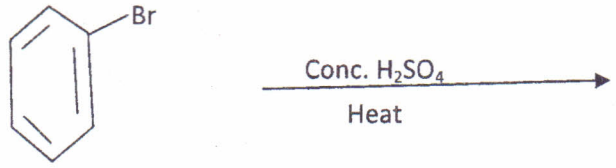
1. Carbon, silicon, tin and lead are elements of group(IV) of the periodic Table.
   (a) Write the general outer most electronic configuration of the elements (01 mark)
   (b) Describe the reactions of;
      (i) Silicon and lead with water (05 marks)
      (ii) The oxides of carbon and tin with sodium hydroxide solution (05 marks)
      (iii) The tetrachlorides of the elements with water (03 marks)
   (c) Sodium hypochlorite (sodium chlorate(I)) was added to lead(II) ethanoate solution and the mixture warmed.
      (i) State what was observed (01 mark)
      (ii) Write equation for the reaction that took place ($1\frac{1}{2}$ marks)
   (d) When an aqueous solution of tin(II) sulphate was added to an aqueous solution of potassium manganate(VII) solution, the purple solution turned colourless. Explain this observation. ($3\frac{1}{2}$ marks)

2. (a) Explain what is meant by
      (i) Strong electrolyte (2 marks)
      (ii) Weak electrolyte (2 marks)
   (b) State two factors that affect conductivity of an electrolyte. (2 marks)
   (c) Explain how the factors you have stated in (b) above affect the conductivity of an electrolyte. (6 marks)
   (d) A solution containing $0.095gl^{-1}$ of magnesium chloride has an electrolytic conductivity of $2.58\ X10^{-4}\ \Omega^{-1}\ cm^{-1}$. If the molar ionic conductivity of magnesium ions is $106\Omega^{-1}cm^2mol^{-1}$, determine the molar ionic conductivity of chloride ions. (3 marks)
   (e) State three factors which affect degree of ionization of a weak acid. ($\frac{1}{2}$ marks)
   (f) The molar conductivity at infinite dilution of ammonium ethanoate, magnesium chloride and magnesium ethanoate are $115.2, 258$ and $188\Omega^{-1}cm^2mol^{-1}$.($3\frac{1}{2}$ marks)

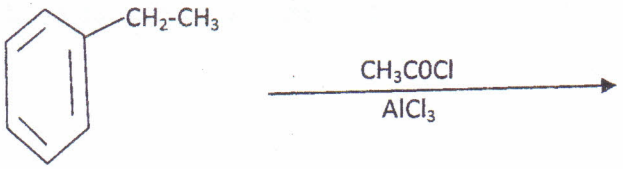
   Calculate the molar conductivity at infinite dilution of ammonium chloride.

3. Complete the following equations and in each case outline the mechanism for the reaction.

   (a)

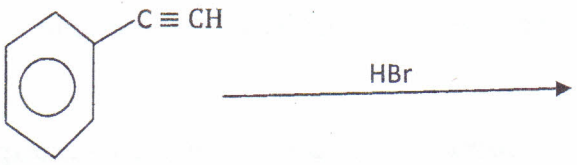


(5 marks)

(b) 

(5 marks)

(c) $CH_3CH_2CH_2CH_2OH \xrightarrow[180^0C]{Conc.\ H_2SO_4}$ (5 marks)

(d) 

(5 marks)

4. (a) State Raoult's law. (2marks)

(b) The vapour pressure of n – heptane and n-hexane at 50^0C are $20KNm^{-2}$ and $50KNm^{-2}$ respectively. If the mixture contains 20g of n-heptane and 30g of n-hexane at 50^0C, calculate the;

(i) vapour pressure above the liquid mixture at 50^0C. (4marks)

(ii) mole fraction of each in the vapour. (3marks)

(c) Nitric acid (boiling point 86^0C) and water form an azeotropic mixture which boils at 120^0C and contains 68% of nitric acid.

(i) Draw a labeled temperature – composition diagram of a nitric acid-water mixture. (4marks)

(ii) Explain the shape of the curve (4marks)

(iii) Using the diagram describe what will happen when a mixture containing 30% of nitric acid is distilled. (3marks)

SECTION B

5. (a) write equations for the following reactions.

(i) Calcium oxide reacts with carbon to give calcium carbide which reacts with water to give ethyne. (3 marks)

(ii) Aluminium combines directly with carbon at 1600^0C to give aluminium carbide and hydrolysis the carbide gives an inflammable gas. (3 marks)

(iii) The carbide of magnesium gives prop-1-yne on hydrolysis. (3 marks)

(b) What do you understand by the term first electron affinity? (1 mark)

(c) The table below shows the first electron affinities of the elements of Period 2 of the Periodic Table.

Element	Li	Be	B	C	N	O	F
First electron affinity	-59.8	+66	-29.0	-120	-3.0	-142	-348

(i) Write an equation for the first electron affinity of nitrogen. (1 mark)

(ii) State and explain the trend of first electron affinities of the elements. (06 marks)

6. The elements fluorine, chlorine, bromine and iodine belong to group VII of the Periodic table.

(a) Write the general outermost electronic configuration of the elements. ($\frac{1}{2}$ marks)

(b) Fluorine shows only one oxidation state of -1 but the others show -1 and higher oxidation states. Explain (3 marks)

(c) Explain the following observations:

(i) Chlorine is much more soluble in sodium hydroxide than it is in water (3 marks)

(ii) Iodine is only sparingly soluble in water but dissolves readily in aqueous potassium iodide. (3 marks)

(iii) Unlike the other halogens, fluorine liberates oxygen from cold water. (3 marks)

(d) When iodine is added to aqueous sodium hydroxide, the initial product disproportionate. Explain the meaning of this term and write ionic equation(s) for the changes that take place. (3 marks)

(e) The elements of group (vii) form oxoacids except fluorine.

(i) Define the term oxoacid. (1 mark)

(ii) Give reasons why fluorine doesnot form oxoacids. ($1\frac{1}{2}$ marks)

(iii) Write the formulae of the oxoacids formed by chlorine. (2 marks)

7. Write equations to show how the following compounds can be synthesized.

(a) 2,2-dichloropropane from propan-1-ol (5 marks)

(b) 1,3,5-tribromobenze from benzene (5 marks)

(c) pent-2-yne from 1,1-dibromopropane (5 marks)

(d) ethanol from 2-chlorobutane (5 marks)

8. (a) What is meant by a buffer solution. (2 marks)

(b) Explain how the following act as buffers.

(i) A solution of ethanoic acid and sodiumethanoate (04 marks)

(ii)A solution of ammonium chloride and ammonia solution (04 marks)

(c) A solution is made by dissolving $7.2g$ of ethanoic acid and $12.0g$ of sodiumethanoate to make $1dm^3$.To this solution was added $14cm^3$ of $1M$ hydrochloric acid. Calculate the pH of the solution. State any assumptions made. ($Ka = 1.8X10^{-5}\ moldm^{-3}$) (04 marks)

(d) Calculate the pH

(i) Of a solution made by mixing $40cm^3$ of $0.1M$ aminoethane and $16cm^3$ of $0.1M$ hydrochloric acid.

(ii) Change when of $6cm^3$ of $0.1M$ potassium hydroxide is added to the solution in d(i) above. ($Kb = 1.8X10^{-5}\ moldm^{-3}$) (03 marks)

END