P525/2
Chemistry
Paper 2
July/August 2024
2 ½ hours

KAYUNGA SECONDARY SCHOOLS EXAMINATIONS COMMITTEE (KASSEC)

JOINT MOCK EXAMINATIONS 2024

Uganda Advanced Certificate of Education

CHEMISTRY

Paper 2

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

- *Answer **5** questions including **3** questions from section **A** and **2** questions from section **B**.*
- *Begin each question on a fresh page.*

Turn over

SECTION A

(Answer 2 questions only)

1. The elements Beryllium, Magnesium, Calcium, Strontium and Barium belong to to group II of the periodic table

   (a) Explain how the following properties vary within the group:
   - (i) electropositivity ***(4marks)***
   - (ii) melting points ***(3marks)***

   (b) Describe the reactions of the elements with
   - (i) Water ***(4marks)***
   - (ii) Sulphuric acid ***(4marks)***

   (c)
   - (i) Write equations for the reaction between aqueous sodium hydroxide and beryllium. ***(1mark)***
   - (ii) State two other properties in which beryllium differs from other group(II) elements. ***(2marks)***
   - (iii) Give two reasons why beryllium differs from other group(ii) elements. ***(2 marks)***

2. Write equations an outline the mechanisms for the reactions that take place between the following.

   (a) Bromethane is heated with a solution of sodium ethoxide in ethanol. ***(2marks)***

   (b) 2 –bromo-z-methylbutane is heated with a solution of potassium hydroxide in ethanol. ***(3 ½ marks)***

   (d) Benzene is heated with bromine in the presence of iron. ***(4marks)***

   (e) Saturated sodium hydrogen sulphite is added to propane. ***(3marks)***

   (f) Acidified solution of hydroxylamine is added to propanal. ***(4 ½ marks)***

3. (a) Define ;-

   (i) ***Solubility product*** ***(1mark)***

   (ii) ***Common ion effect*** ***(1 mark)***

   (b) Describe an experiment that you would carry out to determine the solubility of silver chromate. ***(7marks)***

(c) The solubility of silver product of silver chromate at 25^{o}c is 3.62 x 10^{-12}mol^{3}dm$^{-9.}$

(i) Calculate its solubility in water at this temperature. ***(3marks)***

(ii) Calculate the solubility of silver chromate in 0.02M silver nitrate solution.

(3marks)

(d) Explain how the solubility of silver chromate is affected if the following solution are separately added to a saturated solution of silver chromate.

(i) Ammonia solution

(ii) Potassium chromate solution.

(f) State two applications of solubility product. ***(1marks)***

4. Explain the following observations. Write equations for the reactions where necessary.

(a) When ammonia solution is added to a solution of magnesium sulphate a white precipitate is formed. However, when it is added to the same solution in the presence of ammonium chloride solution no precipitate is formed. ***(5marks)***

(b) When choloroethane is head ted with sodium hydroxide solution, the product acidified with dilute nitric acid followed by silver nitrate, a white precipitate is formed. When chlorobenzene is treated the same way, there is no observable change. ***(5marks)***

(c) The bond angle in a water molecule is 105^{o} whereas that in a molecule of ammonia is 107^{o}. ***(4marks)***

(d) Tetracholoromethane is non polar molecule whereas trichloromethane is polar.

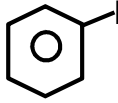
(3 ½ marks)

(e) When a concentrated solution of sodium hydrogen carbonate is added to aqueous solution of iron (iii) sulphate, a brown precipitate is formed with effervescence. ***(4marks)***

SECTION B

Answer 2 questions only

5. Write equations to show how the following compounds can be synthesized .Indicate reagents and conditions.

(a) Benzene to ethlyphenylamine  $NHCN_2CH_3$ ***(3marks)***

(b) Ethanol to methoxyxthane $CH_3CH_2OCH_3$ ***(1 ½ marks)***

(c) Propan-2-01 to 1-aminopropane ***(3marks)***

(d) Bromoethane to $CH_3CH_2CH_2NHCH_3$ ***(3marks)***

(e) Propan-1-01 to ethylamine ***(3marks)***

(f) Phenol to benzaldehyde- ***(3marks)***

(g) $CH_3C \equiv CH$ to $CH_3CH_2CH_2OH$ ***(4 ½ marks)***

6. (a) Define ***an azeotropic mixture*** ***(1mark)***

(b) Hydrogen fluoride had a boiling point of 19.4^{o}C at 101.3 Kpa. It forms an azeotropic mixture with water that contains 46.5% hydrogen fluoride and has a boiling point of 126^o.

(i) Draw a labeled boiling point-composition diagram of the mixture of hydrogen fluoride and water. ***(4marks)***

(ii) Explain the shape of the diagram ***(3 ½ marks)***

(c) Using the diagram describe what happens when the liquid mixture containing 60% of water is distilled.

(d) The vapour pressure of water at 50oc is 92mmHg. A solution containing 18.1g of a non-volatile solute x in 100g of water has a vapour pressure of 87mmHg at the same temperature.

(i) Calculate the relative molecular mass x ***(2 ½ marks)***

(ii) Explain how the concentration of the solute affects the boiling point of water. ***(4marks)***

7. (a) (i) Define ***a transition element*** ***(1 mark)***

(ii) Explain why iron had different oxidation states. ***(3marks)***

(b) Describe the reaction of iron with

(i) ***Water*** ***(2marks)***

(ii) ***sulphuric acid*** ***(4marks)***

(c) Explain what is observed when

(i) a solution of iron (III) sulphate is heated with zinc powder and aqueous hydroxide is added to the resulting solution and left to stand for some time. ***(6marks)***

(ii) Potassium thiocyanate solution was added to the solution of iron(III) sulphate . ***(4marks)***

8. (a) Define the terms;-

(i) ***Conductivity*** ***(1mark)***

(ii) ***Molar conductivity*** ***(1 mark)***

(b) Draw a sketch graph to show how molar conductivity varies with concentration for the following solutions. In each case explain the shape of the graph.

(i) Sodium fluoride ***(4 ½ marks)***

(ii) hydrofluoric acid ***(3marks)***

In each case explain the shape of the curve.

(c) The molar conductivities of some ion at infinite dilution are given below.

Ion	H^+	Na^+	Cl^-	OH^-
$\Omega^{-1}cm^3mol^{-1}$	350	50	76	200

(i) Calculate the conductivity of 0.01M hydrochloric acid ***(2marks)***

(ii) Calculate the conductivity of a solution formed when $50cm^3$ of 0.1M hydrochloric acid is reacted with $50cm^3$ of 0.1M sodium hydroxide.

(d) (i) Draw a sketch graph to show the change in conductivity with volume of ammonia solution when $25cm^3$ of 0.1M hydrochloric acid is titrated with 0.1M ammonia solution.

(ii) Explain the shape of the curve. ***(3 ½ marks)***

END