

P525/1

CHEMISTRY

Paper 1

Jul/Aug 2017

2 ¾ Hours

RESOURCEFUL MOCK 2017
Uganda Advanced Certificate of Education
CHEMISTRY
Paper 1
Time: 2 Hours 45 Minutes

INSTRUCTIONS TO CANDIDATES

- Answer **all** questions in section **A** and **six** questions from section **B**.
- All answers **MUST** be written in the spaces provided.
- Illustrate your answers with equations where applicable.
- Molar gas constant, $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$
- Molar volume of gas at s.t.p is 22.4 litres

For Examiner's use only																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total

SECTION A

1. The standard electrode potentials of two half cells are given in the table below;

Half-cell	E° cell (V)
$\text{HCl}_{(\text{aq})} / \text{H}_{2(\text{g})}$	0.00
$\text{CuSO}_{4(\text{aq})} / \text{Cu}_{(\text{s})}$	+0.34

a) Write the cell notation for the cell formed by combining the two half cells. **(1 ½ marks)**

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b) Write the ionic equation for the reaction at the;

(i) positive electrode **(01mark)**

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(ii) negative electrode. **(01mark)**

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c) Write equation for the overall cell reaction. **(01 mark)**

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d) Calculate the e.m.f of the cell. **(1½ marks)**

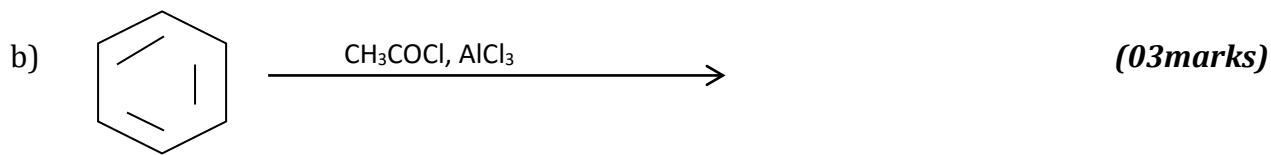
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2. To an aqueous solution of Cobalt (II) Sulphate was added concentrated hydrochloric acid dropwise until in excess.

a) Name the cobalt species present in solution

(i) before hydrochloric acid was added. **(01mark)**

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4. Compound W contains 22.5% phosphorous, the rest being chlorine. (W = 137.5, P=31, Cl = 35.5).

a) Determine the molecular formula of W . **(03marks)**

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b) Draw the structure and name the shape of a molecule of W . **(1 ½ marks)**

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5. Name the reagent that can be used to distinguish between the following pairs of compounds and state what would be observed in each case if member of the pair is separately treated with the reagent you have named.



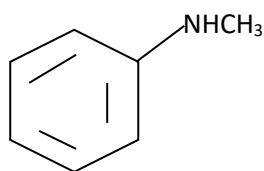
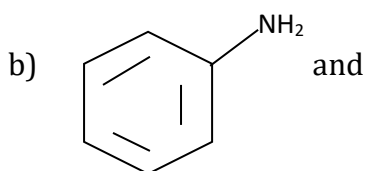
(03marks)

Reagent:

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Observations

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(03marks)

Reagent:

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6. Compound Z is a green solid. Z dissolved in water to give a green solution. The solution of Z formed a red precipitate with butanedionedioxime solution. When Z was heated with concentrated sulphuric acid ethanedioic acid was formed.

a) Identify Z.

(½ mark)

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b) Write equation for the reaction that took place when Z was heated with concentrated sulphuric acid.

(1 ½ marks)

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c) Write the equation(s) for the reaction(s) that would take place when excess ammonia solution is added to a solution Z.

(02marks)

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7. Ethylamine ionizes when dissolved in water.

a) Write;

(i) equation for the ionization of ethylamine.

(1 ½ marks)

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(ii) the expression for the ionization constant

(½ mark)

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b) If the ionization constant of ethylamine is $1.78 \times 10^{-4} \text{ mol dm}^{-3}$ at 25°C .

(i) Calculate the pH of a 0.01M solution of ethylamine.

(03marks)

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(ii) State any assumptions you made in your calculation.

(01mark)

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8. The molecular formula of a compound Q, is C_3H_8O . Compound Q burns with a sooty flame and forms a yellow precipitate with Brady's reagent.

a) Write the structural formulae and names of all the possible isomers of Q. **(02marks)**

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b) Q reacted with iodine in aqueous Sodium hydroxide to form a yellow precipitate.

(i) Identify Q **(½ mark)**

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(ii) Write equation(s) to show how Q can be synthesized from an alkene. **(1 ½ marks)**

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9. The first ionization energies of some group (II) metals of the periodic table and the melting points of their chlorides are given in the table below.

Metal	Mg	Ca	Sr	Ba
1 st I.E ($KJmol^{-1}$)	738	590	549	505
M.pt of chlorine ($^{\circ}C$)	708	772	873	967

Explain;

a) the trend in the first ionization energies. **(2 ½ marks)**

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b) the trend in the melting points of the chlorides.

(1 ½ marks)

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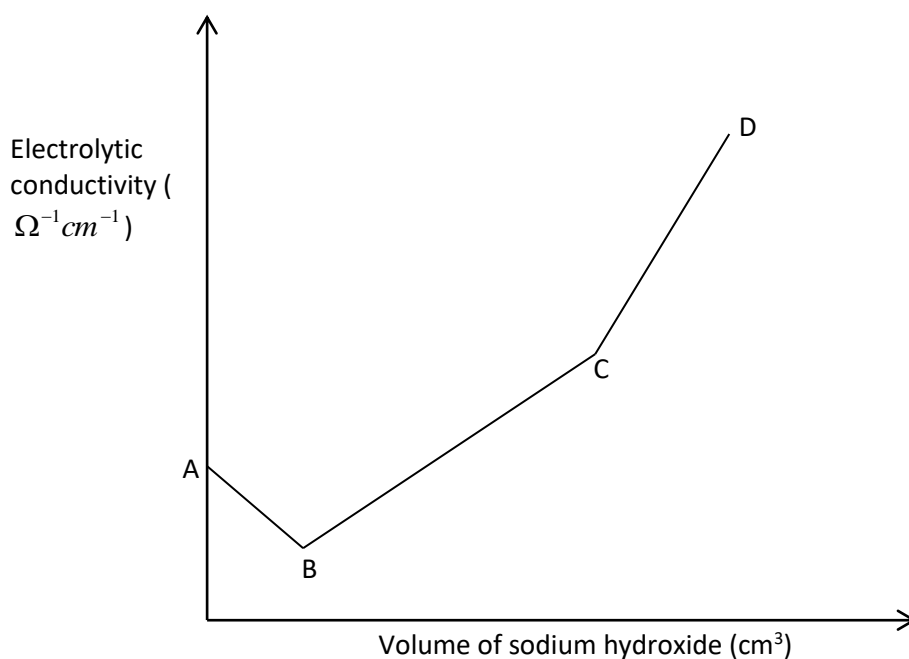
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SECTION B (54 MARKS)

Attempt only *six* questions

10. a) The conductimetric curve for the titration of ethanoic acid with sodium hydroxide is given below.



Explain the shape of the curve ABCD

(04marks)

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b) The molar conductivity of silver nitrate, potassium nitrate and potassium chloride are 134.0, 143.2, and 140.8 $\Omega^{-1}cm^{-1}$ respectively at infinite dilution at 25°C. Calculate the;

(i) molar conductivity of silver chloride at infinite dilution at 25°C. **(1 ½ marks)**

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(ii) The solubility product of silver chloride at 25°C.

(The electrolytic conductivity of water and a saturated solution of silver chloride are 5.5×10^{-8} and $1.9 \times 10^{-6} \Omega^{-1}cm^{-1}$ respectively) **(3 ½ marks)**

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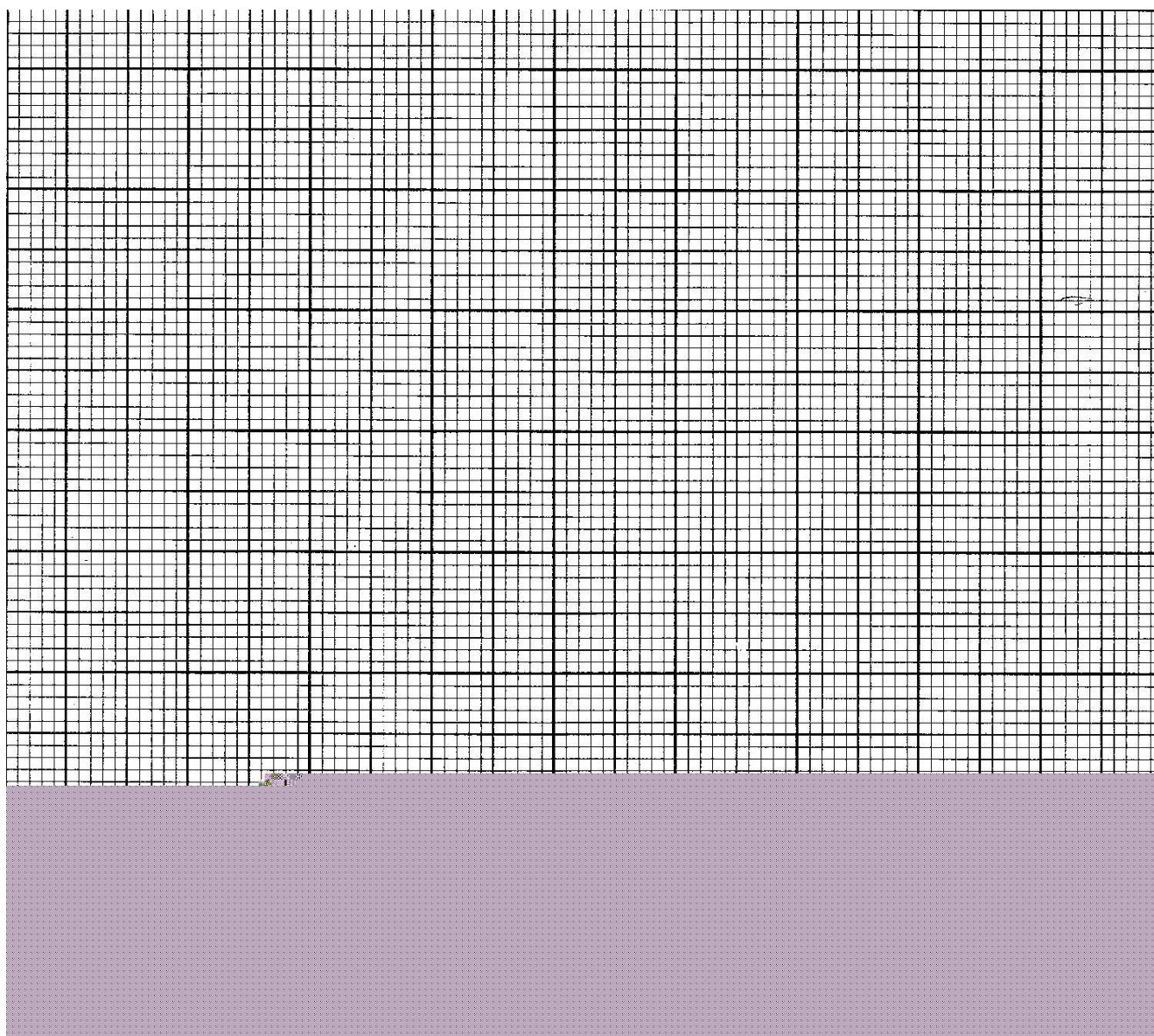
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11. The Kinetics data for the reaction between Y and sodium hydroxide is shown in the table below.

$\text{Log}_{10} [Y]$	0.05	-0.04	-0.13	-0.30	-0.41	-0.65	-0.76	-1.00
Time (min)	0	4	8	15	20	30	35	45

a) Plot a graph of $\text{Log}_{10} [Y]$ against time

(03marks)



b) From the graph, determine the order of reaction. Give a reason for your answer.

(02marks)

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c) Determine;

(i) the rate constant for the reaction.

(02marks)

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(ii) the half-life of the reaction

(02marks)

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12. State what would be observed and write equation for the reaction that would take place when

a) Tin (II) chloride is added to acidified potassium manganate (VII) solution. **(2 ½ marks)**

Observation

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Equation

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b) Hydrogen sulphide is bubbled through a solution of Iron (III) chloride. **(02marks)**

Observation

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Equation

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c) Acidified hydrogen peroxide is added to a solution of potassium chromate (VI) **(2 ½ marks)**

Observation

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Equation

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d) 2-3 drops of 2,4 - dinitrophenyl hydrazine is added to an aqueous solution of propanone.

(02marks)

Observation

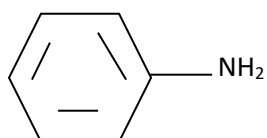
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Equation

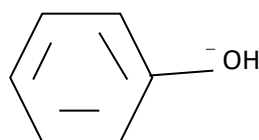
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13. Write equations to how the following compounds can be synthesized and in each case, indicate the conditions for the reaction.

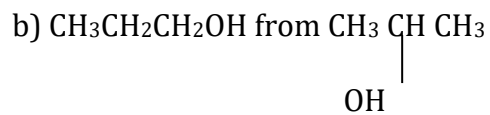
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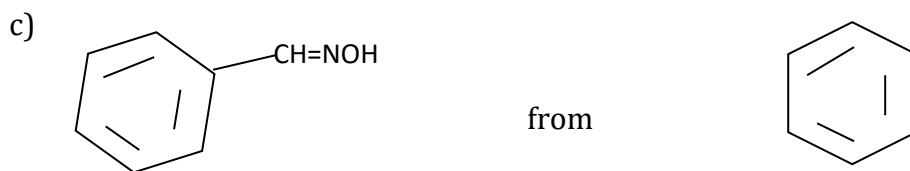
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14. a) State

(i) what is meant by “steam distillation.”

(01mark)

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(ii) the principle of steam distillation.

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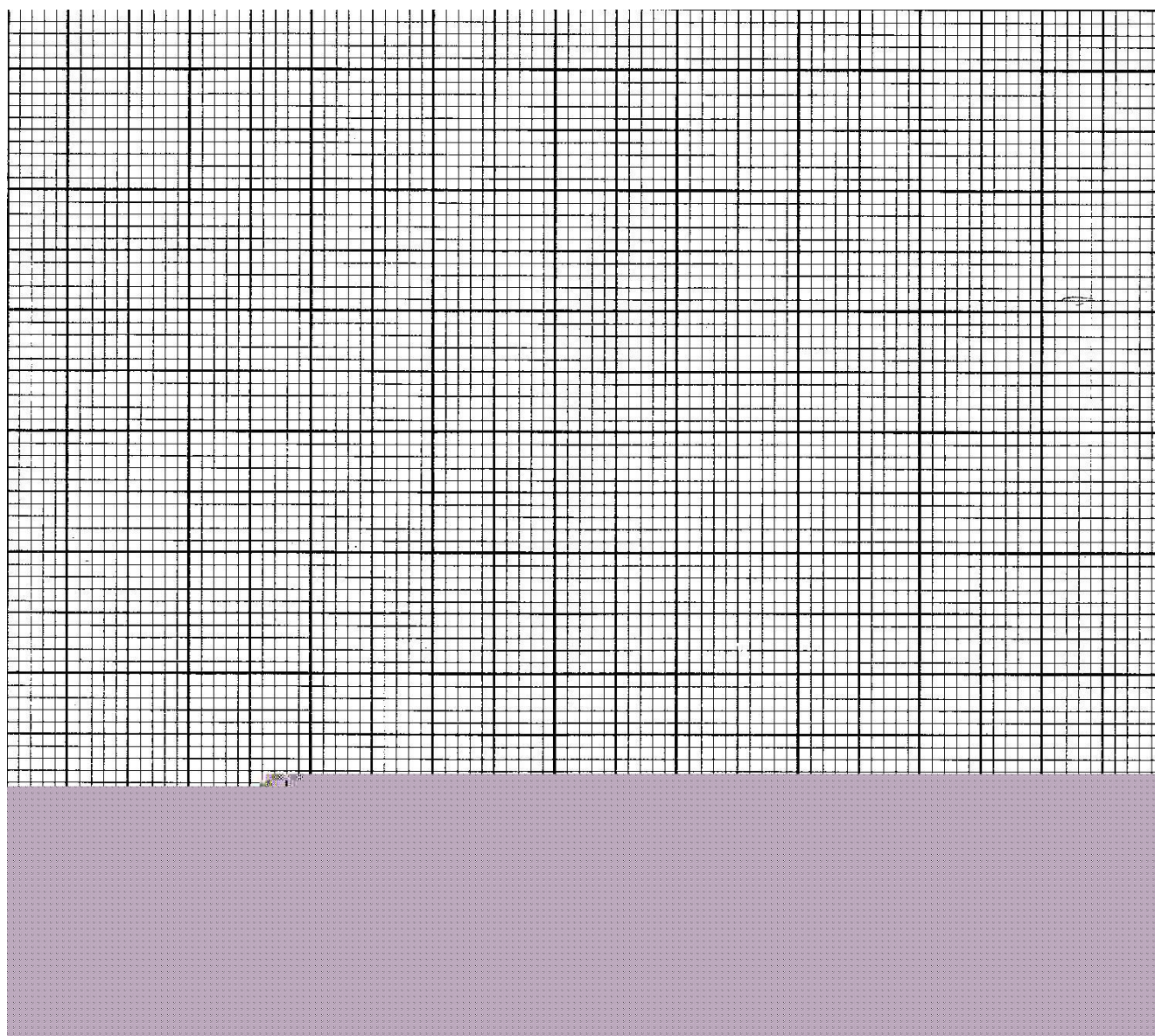
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b) Aminobenzene and water are immiscible liquids. The saturated vapour pressure of pure water at various temperatures are given in the table below.

Temperature / °C	85	90	95	100	105
Vapour pressure, kPa (Aminobenzene)	3.0	4.0	5.0	6.0	7.3
Vapour pressure / kPa (water)	58	70	84.6	101.3	120.7
Total vapour pressure (kPa)	61	74	89.6	107.3	128

(i) Plot on the same axes, graphs of vapour pressure of aminobenzene, water and the mixture against temperature.

(03marks)



(ii) Using the graphs, determine the boiling point of the mixture of aminobenzene and water.

(atmospheric pressure = 101.3kPa)

(½ mark)

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(iii) Calculate the percentage by mass of aminobenzene in the distillate if the mixture was steam distilled.

(03marks)

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c) State one advantage of steam distillation over fractional distillation.

(½ mark)

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15. In the extraction of copper from its ores, the ores are first concentrated and then roasted in air. The roasted material is then mixed with silica and heated by hot air in a blast furnace producing copper.

a) Write the formula of one ore from which copper can be extracted.

(½ mark)

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b) Describe the process by which the ore named in (a) can be concentrated. **(04marks)**

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c) Write an equation for the reaction that takes place when the ore is roasted in air.
(1 ½ marks)

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d) Write equations for the reactions that lead to the formation of copper in the blast furnace.
(03marks)

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16. a) Distinguish between addition polymerization and condensation polymerization.

(03marks)

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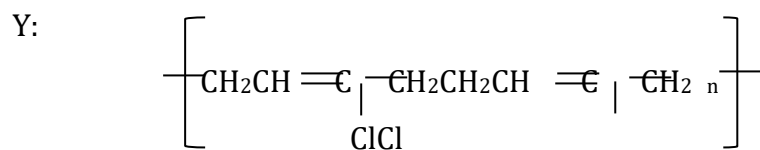
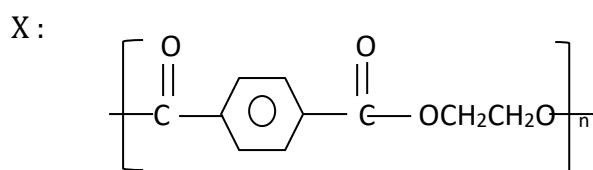
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b) The structural formulae of polymers X and Y are shown



In the table below, write structural formula(e) and name(s) for the monomer(s) and in each case name the type of polymerization. **(5 ½ marks)**

	Structural formula(e)	Name of monomer	Type of polymerization
X			
Y			

c) Give one use of X and one use of Y.

(01mark)

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17. Write equation(s) to show how chlorine and iodine react with;

a) potassium iodide solution.

(i) chlorine

(1 ½ marks)

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(ii) iodine

(1 ½ marks)

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b) Sodium thiosulphate solution

(i) chlorine

(1 ½ marks)

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(ii) iodine

(1 ½ marks)

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c) Hot concentrated potassium hydroxide solution

(i) chlorine

(1 ½ marks)

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(ii) iodine

(1 ½ marks)

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END