

P525/2

CHEMISTRY

Paper 2

2 ½ Hours

July/August 2022



TORORO ARCHDIOCESE EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

MOCK EXAMINATIONS 2022

CHEMISTRY

[Principal Subject]

Paper 2

2 Hours 30 Minutes

INSTRUCTIONS TO CANDIDATES

- *ANSWER FIVE questions including three questions from Section A and any two from section B.*
- *Write answers in the answer booklets provided.*
- *Begin each question on a fresh page.*
- *Mathematical tables and graph papers are provided.*
- *Non – programmable scientific electronic calculators may be used.*
- *Use equations where necessary to illustrate your answers.*

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Turn Over

SECTION A

Answer three questions from this section.

1. (a) (i) What is meant by the term colligative property (2 marks)
(ii) State any two colligative properties of a solution (1 mark)
(iii) State any two limitations of the colligative properties stated in (ii) above. (2 marks)

(b) Describe how molecular mass of cane sugar can be determined using the depression of freezing point method. (7 marks)

(c) The table below shows the freezing points of various solutions of cane sugar in solvent Y.

Mass of cane sugar (g/100 g solvent Y)	26	42	66	78	118	148	173
Freezing point/ $^{\circ}\text{C}$	5.11	4.87	4.51	4.33	3.73	3.28	2.91

Plot a graph of freezing point against mass of cane sugar and use it to determine the

- (i) Freezing point of solvent Y
(ii) Freezing point constant for solvent Y (RMM of cane sugar = 342) (5 marks)

(d) State and explain how the freezing point of the solution would be affected if cane sugar associates in solvent Y (2 marks)

(e) Explain why the method of depression of freezing point is not suitable for determination of relative molecular mass of very large molecules. (1 mark)

2. An organic hydro carbon compound R on complete combustion yielded 13.2 g of carbon dioxide and 2.7 g of water. When 9.4 g of R was vapourised at 273 K and 760 mm Hg; it occupied a volume of $2.7 \times 10^{-3} \text{ m}^3$

- (a) (i) Calculate the empirical formula of R (2 ½ marks)
(ii) Determine the molecular formula of R (3 marks)

(b) R burns with a sooty flame. Identify R (1 mark)

(c) Discuss the reactions of R with

- (i) Bromine (4 marks)
(ii) Propene (4 marks)
(iii) Ethanoyl bromide (4 marks)

(Your answer should include conditions for the reaction and mechanisms for the reactions where possible)

(d) Write equation to show how R can be synthesized from benzaldehyde (1 ½ marks)

3. (a) What is meant by the term

- (i) Complex ion (2 marks)
(ii) Oxidation state (1 mark)

(b) Explain why transition metals form complex ions (2 marks)

(c) (i) Write the electronic configuration of zinc (Atomic number of zinc = 30) (1 mark)

(ii) State two reasons why zinc is not considered a typical transition element (2 marks)

(d) Chromium and iron are transition elements. State three properties which classify them as transition elements (3 marks)

(e) (i) Write the electronic configuration of chromium and iron (Atomic numbers of Cr = 24, Fe = 26) (2 marks)

(ii) Give a reason why iron (III) compounds are more stable than iron (II) compounds

(1 mark)

(f) Describe the reactions of chromium with

- (i) water (2 marks)
- (ii) oxygen (2 marks)
- (iii) Chlorine (2 marks)

Your description should include relevant equations.

4. (a) (i) Define the term degree of dissociation (2 marks)
- (ii) State and explain any two factors which affect the degree of dissociation of an electrolyte (3 marks)
- (b) Define the term solubility product (1 mark)
- (c) The solubility product of aluminium hydroxide is $1.6 \times 10^{-33} \text{ mol}^4 \text{ dm}^{-12}$.
Calculate the solubility of aluminium hydroxide in
- (i) water (2 marks)
 - (ii) 0.01 M Sodium hydroxide solution (3 marks)
- d) Explain your results in (c) (i) and (ii) above (2 marks)
- e) (i) State two applicants of solubility product (1 mark)
- ii) Explain why zinc sulphide is precipitated by hydrogen sulphide from ammoniacal solution (2 marks)
- f) Describe an experiment to determine the solubility product of potassium iodate in water (4 marks)

SECTION B

Attempt only two questions from this section

5. (a) (i) Define the term enthalpy of neutralization (2 marks)
- (ii) Briefly explain how the enthalpy of neutralization between hydrochloric acid and sodium hydroxide solution can be determined (5 marks)
- (b) Define the term standard enthalpy of reaction (2 marks)

(c) Excess zinc was added to 25 cm³ of 1 M copper (II) sulphate solution in a plastic beaker and the temperature of the solution recorded at some time intervals. The data obtained is shown below

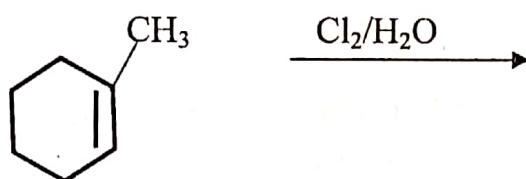
Time/minutes	0	2.5	3.0	5.0	6.0	7.0
Temperature /°C	27.2	66.0	69.5	65.0	62.0	59.5

- Plot a graph of temperature against time (4 marks)
- Use the graph to determine the molar enthalpy of the reaction. (Assume specific heat capacity of the solution is 4.2 Jg⁻¹k⁻¹) (4 marks)

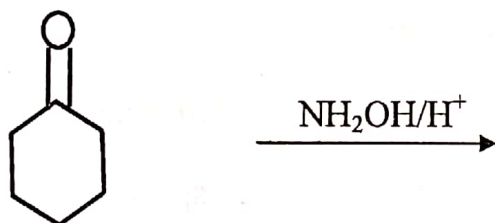
(d) Explain why hydrated copper (II) sulphate crystals dissolve endothermically whereas anhydrous copper (II) sulphate dissolves exothermically (3 marks)

6. Complete the following equations and outline the mechanism

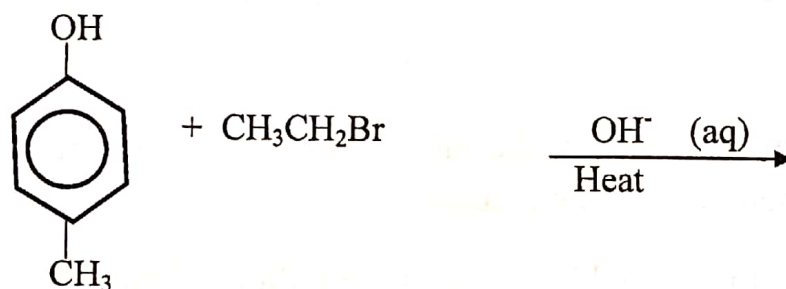
- (4 marks)



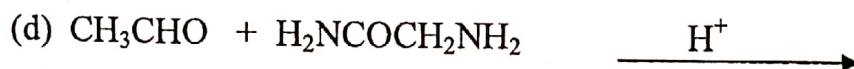
- (4 marks)

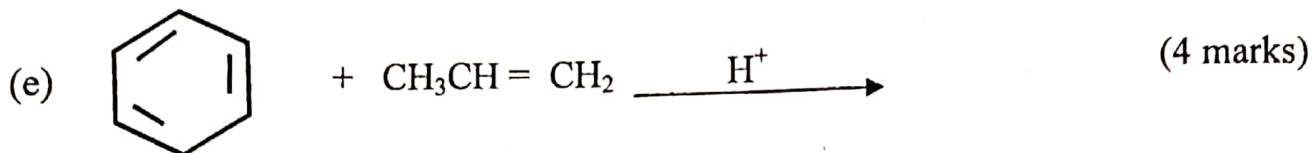


- (4 marks)



- (4 marks)





7. (a) The elements fluorine, chlorine, bromine and iodine are in group (VII) of the Periodic Table.

(i) State the physical state in which each of the above given elements exists at room temperature (2 marks)

(ii) Explain your answer in (a) (i) above (4 marks)

(b) Discuss the reactions of the elements fluorine, chlorine, bromine and iodine with

(i) water (5 marks)

(ii) Sodium hydroxide solution (7 marks)

(c) How would you distinguish between Potassium bromide and potassium iodide given chlorine water and tetra chloromethane (2 marks)

8. Explain each of the following observations

(a) An aqueous solution of iron (III) chloride is acidic to litmus (4 marks)

(b) Nitrogen is a gas at room temperature whereas phosphorus is a solid at the same temperature yet both belong to the same group in the Periodic Table

(4 marks)

(c) Benzene undergoes electrophilic substitution reaction whereas cyclohexene undergoes electrophilic addition reaction (4 marks)

(d) Iodine is much more soluble in Potassium iodide solution than in water (4 marks)

(e) The acid dissociation constant, K_a of bromoethanoic acid is greater than that of ethanoic acid at the same temperature (4 marks)

END