UGANDA MATYRS UNIVERSITY
END OF SEMESTER I EXAMINATIONS 2022/2023
DIPLOMA IN EDUCATION (PRIMARY) YEAR 2
MODULE ONE (3)
INTEGRATED SCIENCE
PAPER 2: STRUCTURE, AND BONDING, ELECTROCHEMISTRY AND THERMOCHEMISTRY; AND WAVES, SOUND AND OPTICS

Date: 11.1.2023 **Time: 2:00pm- 5:00pm** **3HRS**

Instructions

Answer only four questions in the booklets provided by attempting one question from each section.

SECTION A
WAVES, SOUNDS AND OPTICS

Answer one question from this section.

(1) Sound is a form of longitudinal wave.

(a) What is meant by the term longitudinal wave? (02marks)

(b) How is sound produced? (02marks)

(c) State the major difference between sound waves and other forms of waves(light and electromagnetic waves) (02marks)

(d) (i). How are echoes produced? (03marks)

(ii) Discuss any three applications of echoes in our daily lives. (09marks)

(e) Describe an experiment to measure velocity of sound by echo method. (07marks)

Total = 25 marks

2. Light is a form of wave, just like any other form of wave, it can be reflected.

(a) State one two laws of reflection of light. (04marks)

(b) The relationship between object distance, u, and image distance,v and focal length, f given expressed in the mirror formula as given below.

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

A convex mirror of focal length 18cm produces an image on its axis 25 cm away from the mirror. Determine the position of the object.

(c) Describe one use of:

(i) Parabolic (curved) mirrors. (02marks)

(ii) Prisms (02marks)

(iii) Lenses (02marks)

(d) (i) Define one term critical angle (02marks)

(ii) State the conditions for total internal reflection. (02marks)

(iii) State any two example of total internal reflection. (02marks)

(i) Name any three optical instruments. (03marks)

(e) State any two defects of lenses. (02marks)

Total = 25 marks.

SECTION B
STRUCTURE AND BONDING.

Answer one question from this section.

3 (a) Explain the following terms associated to bonding with examples.

(i) Ionic bonding (03marks)

(ii) Covalent bonding (03marks)

(iii) Dative bonding (03marks)

(b)State:

(i) Any three differences between ionic and covalent compounds. (06 marks)

(ii) Major difference between covalent bonding and dative bonding. (02marks)

(iv) Similarity between dative bonding and covalent bonding (02marks)

(c) Draw and name the shapes adopted by the following molecules.

(i) Water, H_2O (02marks)

(ii) Boron chloride, BCl_3 (02marks)

(iii) Methane, CH_4 (02marks)

Total = 25 marks.

4 (a). With examples, explain the following

(i) Metallic bonding (03marks)

(ii) Hydrogen bonding (03marks)

(iii) Vander Waal's forces of attraction. (03marks)

(b) (i) Discuss any four influences of hydrogen bonding on the molecules that have them. (04marks)

(ii) State any two properties of metals. (04marks)

(c) Draw the shapes adopted by the following molecules. (04marks)

(i) Ammonia, NH_3

(ii) Carbon dioxide, CO_2

(iii) Hydrogen Sulphide, H_2S

(iv) Phosphorus (V) chloride, PCl_5

Total = 25 marks.

SECTION C
ELECTROCHEMISTRY

Answer one question from this section.

5 (a) Define the following terms (08marks)

(i) Oxidation

(ii) Reduction

(iii) Reducing agent

(iv) Oxidizing agent

(b) Acidified potassium manganate (vii) was reacted with iron (ii) sulphate solution.

(i) Write the half-equations for the reactions taking place. (04marks)

(ii) Hence write the overall equation for the reaction. (02marks)

(c) (i) Define the term standard electrode potential. (02marks)

(ii) Describe the standard hydrogen electrode. (04marks)

(d) (i) The half cells for some reactions are given below

$Mg^{2+}_{(aq)} + 2e \longrightarrow Mg_{(s)}$ $E\emptyset = -2.37V$

$Cu^{2+}(aq) + 2e \longrightarrow Cu_{(s)}$ $E\emptyset = +0.34V$

Calculate the e.m.f of the cell. (03marks)

(ii) State any two application of standard electrode potential measurement (02marks)

Total = 25marks

6. Define the term electrolysis. (02marks)

(ii) Discuss factors that favour selective discharge of ions at the electrodes from solution. (09marks)

(b) Discuss any three applications electrolysis by giving examples where necessary. (09marks)

(c) State Faraday's laws of electrolysis. (04marks)

Total = 25 marks

SECTION D
THERMOCHEMSISTRY AND RATES OF REACTIONS

Answer one question from this section.

7 (a) Explain the following terms (10marks)

(i) Exothermic reaction

(ii) Endothermic reaction

(iv) Enthalpy of formation

(v) Enthalpy of combustion

(vi) Enthalpy of neutralization.

(b) Calculate enthalpy of formation of carbon monoxide from the following thermo chemical data. (04marks)

(i) $C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)}$ $\Delta H_1 = -393.4\ Kjmol^{-1}$

(ii) $CO_{(g)} + \frac{1}{2} O_{2(g)} \longrightarrow CO_{2(g)}$ $\Delta H_2 = -218.6\ Kjmol^{-1}$

(c) State Hess law of constant heat summation. (03marks)

(d) Calculate the enthalpy of hydrogenation of ethyne to ethane from the following data. (05marks)

(i) $C_2H_{2(s)} + 2^1/_2O_{2(g)} \longrightarrow 2CO_{2(g)} + H_2O$ $\Delta H_1 = -1312.6Kjmol^{-1}$

(ii) $H_{2(g)} + \frac{1}{2} O_{2(g)} \longrightarrow H_2O_{(i)}$ $\Delta H_2 = -286\ Kjmol^{-1}$

(iii) $C_2H_{6(g)} + 3^1/_2 O_{2(g)} \longrightarrow 2CO_{2(g)} + 3H_2O_{(i)}$ $\Delta H_3 = -1562.5Kmol^{-1}$

(f) State one importance of heat of combustion measurements. (03marks)

Total = 25 marks.

8. (a) Explain any five factors that determine rate of chemical reactions (15marks)

(b) How does collision theory of a occurs for chemical reactions.(02marks)

(c) Equal volume of dilute acid of a various concentrations was placed in five beakers. 0.26g of Zinc were added to each beaker. The times taken for the reaction to go to completion were noted as below

Acid concentration (M)	1.0	1.4	2.0	1.6	3.0
Time (seconds)	500	250	100	40	20

(i) Plot a graph of concentration of acid against time. (04marks)

(ii) Using the graph you have plotted, explain how concentration of the acid affects rate of reaction. (04marks)

Total = 25 marks.

The end