The Open University of Sri Lanka

Faculty of Natural Sciences

Diploma in Food Science

055

Department	**: Chemistry**
Level	**: 3**
Name of the Examination	**: Final Examination**
Course Title and Code	**: Fundamentals of Chemistry & Biology for Food Science (CYD3310)**
Academic Year	**: 2022-2023**
Date	**: 24th June 2023**
Time	**: 9.30 a.m. – 11.30 a.m.**
Duration	**: 2 hr**

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of (4) essay questions in (4) pages.
3. **Answer all (4) questions. All questions carry a total of 300 marks.**
4. Use a blue or black pen not a pencil. Use the given book to write down answers for (4) essay questions.
5. **Answer for each question should commence from a new page.**
6. Draw fully labelled diagrams where necessary.
7. The use of a non-programmable electronic calculator is permitted.
8. The use of non-programable electronic calculator is permitted.
9. Involvement in any activity that is considered as an exam offense **will lead to punishment.**

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01. (a) (i) Write down the names of four **(04) basic** physical quantities. For each of the quantity state the **symbol** and the **SI unit**.

(ii) Write down the equation which define-each of the following derived physical quantities. Give the symbol, SI unit of each quantity.

Density and Concentration (24 marks)

(b) (i) Write the **name** of each of the following ionic compounds.

Mg_3N_2, $BeCl_2$, $Al_2(SO_4)_3$, Cr_2O_3

(ii) Write the **chemical formula** of the following compounds.

Nitrous acid, Carbon tetrachloride, Barium hydroxide, Aluminium phosphate

(32 marks)

(c) (i) State **three (03)** factors which affect the rate of a reaction and explain how each of the factors affect the rate of a reaction.

(ii) Write down the mathematical expression for Arrhenius equation and define **all** the terms.

(22 marks)

02. (a) (i) Illustrate the Hess's law by giving a suitable example.

(ii) State the "Law of Conservation of Energy".

(iii) The following standard enthalpy changes are given for one mole of each substance at 298K.

Enthalpy of combustion of 1-butanol, $CH_3CH_2CH_2CH_2OH_{(l)}$ = -2677 kJ
Enthalpy of formation of carbon dioxide, $CO_{2\,(g)}$ = -393 kJ
Enthalpy of formation of water, $H_2O_{(l)}$ = -285 kJ

(A) Write the **balanced** chemical equation to represent the enthalpy of combustion of 1-butanol$_{(l)}$.

(B) Calculate the enthalpy of formation of 1-butanol$_{(l)}$.

(35 marks)

(b) 25.0 cm^3 of oxalic acid($H_2C_2O_4$) solution is added to a 25.0 cm^3 of Potassium permanganate ($KMnO_4$) solution in **acidic** medium.

(i)Write **balanced** Oxidation/Reduction equations for the reactions taking place in this solution.

(ii)Write the balanced chemical equation for the total reaction.

(16 marks)

(c) (i) Calculate the mass of $AgNO_3$ (Molar mass is 170 g mol^{-1}) present in 100 cm^3 of its 0.25 M solution.

(ii) 300 cm^3 of 3.0 M NaCl is added to 200 cm^3 of 4.0 M $BaCl_2$ solution.

Calculate the concentration of Chloride ions (Cl^-) in the resulting solution in **mol dm^{-3}**.

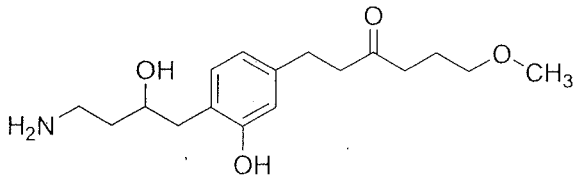
(16 marks)

03. **(a)** The molecular formula of an alkene is C_5H_{10}.

(i) Draw structures of **all** possible straight chain alkenes for this molecular formula.

(ii) Draw **three branched** chain structures for the same molecular formula. (25 marks)

(b) Copy the structure of the molecule given below on your answer script.



(i) Circle all the functional groups in it.

(ii) Write the functional group name besides each circle.

(30 marks)

04. **(a)** (i) Identify **six(06)** properties of life.

(ii) Define the term "homeostasis".

(iii) Use a flow diagram to represent the levels of organization among living things from an atom to the entire Earth.

(22 Marks)

(b) (i) Define the term "ion".

(ii) Name **four(04)** types of bonds/ interactions that exist in molecules.

(iii) Illustrate the sodium (Na) and Chlorine (Cl) **atoms** using diagrams and explain how they formed an **ionic bond** between them. (Atomic number of Na is 11 and Cl is 17)

(iv) Water molecules consists of polar covalent bond between its atoms. Explain this statement.

(34 Marks)

(c) (i) Name the functional group/s present in the following organic molecules.
Ethanol, Fatty acids, Amino acids

(ii) Briefly explain the nature of starch in terms of composition and storage.

(iii) Name the monomeric form of DNA and RNA. What are the **three(03)** components that made up the monomeric form?

(20 Marks)

(d) (i) Briefly explain the two pathways of

(A) Glycolysis

(B) Kreb's Cycle or Citric acid cycle

In terms of **where does it takes place**, what is its **main goal** during the above pathways?

(ii) Describe the overall result in terms of molecules produced by breakdown of glucose during glycolysis.

(ii) Describe the **two (02)** phases through which the Photosynthesis takes place.

(24 Marks)
