

THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

FIRST SEMESTER EXAMINATIONS – 2022

CH 223 -- ADVANCE ORGANIC CHEMISTRY

WEDNESDAY NOVEMBER 2022 – 8:20 AM

TIME ALLOWED: 2 HOURS

**INFORMATION FOR CANDIDATES: -**

1. You will have 10 minutes to read the question paper. You **MUST NOT** begin writing in the answer book during this time.
2. **ANSWER ALL QUESTIONS.**
3. All answers **MUST** be written on the answer book provided
4. Calculators are permitted in the examination room. Lecture notes, notebooks plain papers and textbooks are **NOT** allowed.
5. Mobile phones are not allowed. **SWITCH OFF THE MOBILE PHONES.**
6. Show all workings and calculations in the answer book.
7. **DRAW** the **STRUCTURES** clear and visible.
8. **DO NOT** over write.
9. Write your name and student **ID number** clearly on the front page of the answer book. **DO IT NOW.**

**MARKING SCHEME: TOTAL 100 MARKS**

1. (a) Lipids are amphipathic molecules. Explain what this means. [2 marks]
- (b) (i) List four biological molecules that are classified as lipids. [2 marks]  
(ii) Explain the chemical and physical characteristics of lipids. [3 marks]
- (c) (i) Draw the structure of 2-methyl-1,3-butadiene and indicate the head/tail arrangement of the molecule. [2 marks]  
(ii) Structurally, what is the main difference of alpha carotene from the rest of the other terpenes? [2 marks]
- (d) Lecithins and cephalins are phospholipids. Contrast the two groups of molecules. [4 marks]

**(Total = 15 Marks)**

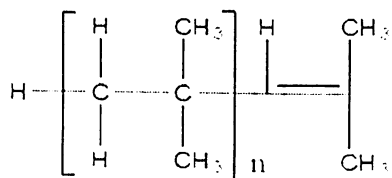
2. (a) (i) As related to amino acids, define Zwitterions. [2 marks]  
(ii) Explain the two common features of amino acids. [2 marks]
- (b) (i) Calculate the isoelectric point of alanine if the acidity constant  $pK_{a1}$  for the cationic form is 2.3 and  $pK_{a2}$  for the dipolar ionic form of alanine is 9.7. [2 marks]  
(ii) Show the reaction equation for the synthesis of amino acids from potassium phthalimide. [4 marks]
- (c) (i) What are the factors that determine the rate of migration of amino acids on paper electrophoresis? [2 marks]  
(ii) Electrophoresis of a mixture of lysine ( $pI = 9.47$ ), histidine ( $pI = 7.64$ ) and cysteine ( $pI = 5.02$ ) is carried out at pH 7.64. Describe the migratory behavior of each amino acid. [3 marks]

**(Total = 15 Marks)**

3. (a) Define the following terms.  
(i) Stereochemistry.  
(ii) Chirality.  
(iii) Polarized light.  
(iv) Racemic mixture. [4 marks]
- (b) (i) Draw the two metameric isomers of  $C_4H_{11}N$ . [2 marks]  
(ii) Draw the two functional isomers of  $C_3H_6O$ . [2 marks]  
(iii) Draw two stereoisomers of any chiral molecule. [2 marks]

**(Total = 10 marks)**

4. (a) Based on reaction mechanism, polymers are classified into chain growth polymers and step growth polymers. Give brief explanation of these two types of reactions. [2 marks]
- (b) With the support of chemical equations, explain the two types of reactions that take place to terminate polymerization reactions. [4 marks]
- (c) Given below is a structure of a polymer product.



- (i) Name the polymer. [1 mark]
- (ii) Name the specific type of polymerization reaction that give rise to the polymer. [1 mark]
- (iii) Explain why this type of polymerization reaction occurs. [2 marks]

**(Total = 10 Marks)**