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**KIBABII UNIVERSITY**

**UNIVERSITY EXAMINATIONS  
2022/2023 ACADEMIC YEAR**

**FOUR YEAR FIRST SEMESTER**

**FOR THE DEGREE OF BED (SCIENCE)**

**COURSE CODE: SCH 413**

**COURSE TITLE: POLYMER CHEMISTRY**

**DURATION: 2 HOURS**

**DATE: 17/04/2023**

**TIME: 9:00-11:00AM**

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**INSTRUCTIONS TO CANDIDATES**

- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

This paper consists of **3** printed pages. Please Turn Over



### QUESTION ONE (30 Marks)

- 1). a). Explain the process of vulcanization in polymerization. (2marks)
- b). Write the equations for the synthesis of the following polymer (4marks)
- (i) Teflon
- (ii) PVC
- c) What is the role of potassium hydroxide in preparation of Nylon 6,10 by interfacial polymerization? (2marks)
- c). Distinguish between the following terms as used in polymer chemistry
- i. Polymer and monomer (2marks)
- ii). Functionality of polymer and Polydispersity index (3marks)
- iii). State two types of polymerization (2marks)
- d) State any four methods used in determining the molecular weight of a polymer (4marks)
- e). Giving examples state five types natural polymer (5marks)
- f) What is meant by degree of polymerization (4marks)
- g) Explain what is meant by glass transition temperature. (2marks)

### QUESTION TWO (20 Marks)

- 2 a) Name the following polymers according to the common nomenclature and then identify their monomers in respect to their polymers (6marks)
- i.  $(-\text{CH}_2-\text{CH}_2-)_n$
- ii. 
$$\left[ \text{NH}-(\text{CH}_2)_6-\text{NHC}(\text{O})-(\text{CH}_2)_8-\text{C}(\text{O}) \right]_n$$
- iii. 
$$\left( \text{CH}_2-\underset{\text{Cl}}{\text{CH}} \right)_n$$

b). State three polymer properties and characterization as used in polymer chemistry. (3marks)

c) i. State two types of polythene (2marks)

ii. Giving examples in each case, explain the difference between addition and condensation polymerization. (9 marks)

### QUESTION THREE (20 Marks)

a). Explain the monomer arrangement in the co-polymer. (10marks)

b). While giving the properties and application, explain how Nylon 6,6 is produced through condensation polymerization. (10 marks)

### QUESTION FOUR (20Marks)

a). Giving examples explain what is meant by polymer tacticity (5marks)

b) Write down the expressions for  $M_n$  and  $M_m$  and explain the conditions under which  $M_n = M_m$ .  
(10 marks)

c). A polymer consists of 40% by mass of macromolecules of molecular mass 10000 and 60% by weight of macromolecules of molecular mass 75000. Calculate the number-average and mass-average molecular mass of the polymer.  
(10marks)

### **QUESTION FIVE (20Marks)**

a). While giving the advantages, disadvantages and application, Explain Bulk polymerization. (6marks)

b) Explain the free radical mechanism for the polymerization of ethene. (6marks)

c) List four ways of describing a polymer (2 marks)

d). Differentiate thermoplastics and thermosetting plastics (6marks)