



KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR**

**FOURTH YEAR SECOND SEMESTER
RESIT EXAMINATIONS
FOR THE DEGREE OF BSC (PHYSICS)**

COURSE CODE: SPH 422

COURSE TITLE: POLYMER PHYSICS II

DURATION: 2 HOURS

DATE: 21/1/2022

TIME: 8-10AM

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 **4** printed pages. Please Turn Over



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Question One (30 marks)

- a) What is a polymer? (1 mark)
- b) Name and describe any two polymer structures. (4 marks)
- c) What is the effect of branching on polymer properties? (2 marks)
- d) What is the effect of cross-linking on polymer properties? (2 marks)
- e) What is the effect of the degree of polymerization on the batch of molecules? (2 marks)
- f) What is the molecular weight of the polymer? (1 mark)
- g) Compare crystallinity in polymers and metals. (1 mark)
- h) What is the effect of increasing crystallinity in polymers? (4 marks)
- i) Name three factors for polymer crystallization. (3 marks)
- j) What are the advantages of natural rubber? (4 marks)
- k) Explain the following types of additives;
 - I) Fillers (1 mark)
 - II) Plasticizers. (1 mark)
 - III) Colorants. (1 mark)
 - IV) Lubricants. (1 mark)
- l) Name two disadvantages of reaction injection molding. (2 marks)

Question Two (30 marks)

- a) What are the general properties of polymers? (4 marks)
- b) Name any three applications of elastomeric plastic materials. (3 marks)
- c) Name any five limitations of polymers as engineering materials. (5 marks)
- d) Explain the following methods of polymerization. Give two examples for each. (4 marks)
 - I) Step polymerization. (4 marks)
 - II) Addition polymerization. (4 marks)

Question Three (20 marks)

- a) What is an additive? (1 mark)
- b) Explain the following types of additives;
 - I) Flame retardents. (1 mark)
 - II) Antioxidants. (1 mark)
 - III) Ultraviolet light absorbers. (1 mark)
- c) What are the applications of natural rubber. (4 marks)
- d) Name any three thermoplastics commonly used in injection molding. (3 marks)
- e) What are the advantages of the reaction injection molding in polymers. (4 marks)
- f) What are the main properties of elastomers? (5 marks)

Question Four (20 marks)

- a) Differentiate between a thermoplastic polymer and elastomers. (1 mark)
- b) Name two disadvantages of natural rubber. (2 marks)
- c) Name four mechanical properties of thermoplastics. (4 marks)
- d) Name any four physical properties of thermoplastics. (4 marks)
- e) By use of diagrams explain the three polymer structures. Hence give examples. (9 marks)

Question Five (20 marks)

- a) What is a thermosetting polymer? Give two examples. (3 marks)
- b) What is curing in thermosets? (1 mark)
- c) Name five general properties of thermosets. (5 marks)
- d) Explain the three categories of cross linking in thermosets. (6 marks)
- e) What are elastomers? Give two examples. (3 marks)
- f) Name any two applications of natural rubber. (2 marks)

(10)