



UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET

COURSE CODE	: BPE 2153
COURSE	: POLYMER SYNTHESIS
SEMESTER/SESSION	: 1-2024/2025
DURATION	: 3 HOURS

Instructions:

1. This booklet contains **3** questions. Answer **ALL** questions.
2. All answers should be written in answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise your hands and ask the invigilator.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

THIS BOOKLET CONTAINS 3 PRINTED PAGES INCLUDING COVER PAGE

QUESTION 1 (40 MARKS)

Copolymers obtained by copolymerization of two monomer species are sometimes called biopolymers.

- a) Polybutadiene-styrene (PBS) is a block copolymer that is synthesized by two simultaneous polymerizations:

Styrene to polystyrene

Grafting of styrene-polybutadiene

- i. Identify the route of these two reactions to synthesize PBS. Name and illustrate the chemical structures. (20 marks)
 - ii. List four (4) applications of the styrene-polybutadiene copolymer. (4 marks)
- b) One example of a random copolymer is polypropylene (PP)-polyethylene (PE) copolymer.
- i. Write the meaning of random copolymer. (2 marks)
 - ii. Show how the PP-PE copolymer can be formed. (4 marks)
 - iii. Debate the need for synthesizing of PP-PE copolymer. (10 marks)

QUESTION 2 (20 MARKS)

Polymer degradation changes mechanical properties, color, shape, and others.

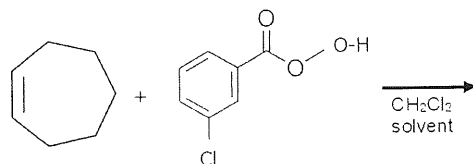
- a) Present the differences between oxidation degradation and radiation degradation. (10 marks)
- b) Examine the general mechanism of thermal degradation. (10 marks)

QUESTION 3 (40 MARKS)

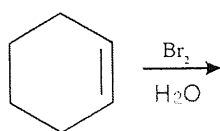
Polymers can produce a variety of materials *via* several reactions.

- a) Halogenation reaction may use the bromine gas (Br_2) as an initiator. Examine the complete mechanism of the propene reaction in the presence of bromine gas. Use hydrogen peroxide, HO-OH as initiator. (10 marks)
- b) Stereoisomerism means the different configurations or optical polymers occurred.
- i. Give three (3) types of stereoisomerism. Sketch the molecule structures. (9 marks)
- ii. 'Stereochemistry has an important effect on chain packing'. Explain the statement by using polypropylene as an example. (5 marks)
- iii. Outline four (4) different isomers of polyisoprene. (8 marks)
- c) An epoxide is a cyclic ether with a three-atom ring. Identify the product after the reaction.

- i. (4 marks)



- ii. (4 marks)



-----End of question-----

