

BOWEN UNIVERSITY, IWO, OSUN STATE
COLLEGE OF AGRICULTURE, ENGINEERING AND SCIENCE
INDUSTRIAL CHEMISTRY PROGRAMME
2022/2023 B.SC DEGREE FIRST SEMESTER EXAMINATION

Course Code: ICH 405 Courses Title: Polymer Technology Credit: 2
Date: /02/2023 Time Allowed: 2 hours

INSTRUCTIONS: Answer any three (3) questions
Answer each main question on a fresh page
Each question carries 25 marks

QUESTION 1

- a. As the new Polymer Chemist at Azozo Polymer industry what processing method will you recommend for the production of the following
- i. Papers
 - ii. Corrugated sheets
 - iii. Bottles **3 marks**
- b. Write short notes on any two of the process mentioned above **4 marks**
- c. Give detailed description of the working operations involved in injection moulding process **8 marks**
- d. In order to deliver high quality polymer products, a well-controlled polymer process by injection moulding is highly recommended. Define and discuss how to use the following parameter in improving polymer products.
- i. Injection pressure
 - ii. Component thickness
 - iii. Hold-on times
 - iv. Mould temperature **10 mark**

QUESTION 2

- a. Discuss the influence of following polymer architecture on polymer properties
- i. Molecular chain length
 - ii. Molecular shape

- iii. Side groups on chain backbones
- iv. Nature of bonds between polymer chains **10 marks**
- b. write note on the two major ways in which processing can affect the properties of thermoplastic polymers. **8 marks**
- c. What are some polymer defects that can be observed during polymer processing **7 marks**

QUESTION 3

- a. Write short notes on the following:
 - i. Polymerization reactions. **3 marks**
 - ii. Living polymerization. **3 marks**
 - iii. Free radical polymerization is the most important commercial process for the manufacturing of commodity polymers, justify this statement. **2 marks**
- b. Using reaction schemes only, show:
 - i. the active and dormant chain equilibrium in living radical polymerization. **2 marks**
 - ii. the equilibrium and reactions in ATRP. **3marks**
 - iii. Explain what the two schemes stand for. **2 marks**
- c. Write the full meaning of the following acronyms in polymerization processes:
 - i. NMP ii. ATRP iii. RAFT **3 marks**
- d. Why is ATRP the most versatile synthetic tool for the preparation of new polymer materials? **4 marks**
- e. What are the requirements for a good understanding of chemical systems? **3 marks**

QUESTION 4

- a. i. What is the importance of polymer characterization to their applications? **3 marks**
- ii. List the various forms of polymer characterization. **5 marks**
- b. i. Enumerate the criteria for polymer solubility. **4 marks**
- c. ii. Briefly explain why polymer solubility is vital in drug delivery. **4 marks**
- d. Define rheology and states its importance in polymer science **5 marks**
- e. Graphically depict the stress-strain curve to show the mechanical properties of polymers. **4 marks**



