



NATIONAL OPEN UNIVERSITY OF NIGERIA
UNIVERSITY VILLAGE, PLOT 91 CADASTRAL ZONE, NNAMDI AZIKIWE
EXPRESS WAY,
JABI - ABUJA.
FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY
2025_2 EXAMINATIONS

COURSE CODE: CHM 408
COURSE TITLE: POLYMER CHEMISTRY
COURSE UNIT: 2
TIME: 2 HOURS
INSTRUCTION: *Answer question one and any other two questions.*
Question 1 score 30 marks with the other two scoring 20 marks each

Question 1

- a. Discuss Addition polymerization? (6 mark)
- b. Discuss the following terms used in describing the response of material to stress – strain
 - i. Ultimate elongation (3 marks)
 - ii. Tensile strength (3 marks)
- c. Discuss Hydrolytic degradation? (6 mark)
- d. Explain structural isomerism? (6 mark)
- e. Discuss the following;
Nuclear Magnetic Resonance Spectroscopy (NMR) (3 mark)
X-ray Diffraction (XRD) (3 mark)

Question 2

- a. Discuss Geometrical isomerism (4 mark)
- b. With the aid of a table, Show the condensed formula and a physical property for the below polymers (6 mark)
 - i. Cis-Polychloroprene
 - ii. Poly(methyl methacrylate)
 - iii. Poly(vinylacetate)
 - iv. Polyacrylonitrile
- c. Give four polymers that are gotten from anionic polymerization (2 mark).
- d. For solution process, show the defined expressions for free energy, enthalpy and entropy of mixing (3 mark)
- e. Explain how the below affect the mechanical strength of a polymer? (5 marks)
 - i. Effects of Additives
 - ii. Effect of Blending and Copolymerization

Question 3

- a. From the first and second law of thermodynamics derive the pressure-volume expansion and work relationship. (6mark)
- b. Briefly discuss cationic polymerization stating the stages of reaction (6mark)
- c. For solution process, show the defined expressions for free energy, enthalpy and entropy of mixing (3mark)
- d. Discuss the below types of copolymerization
 - i. Random copolymers (2.5mark)
 - ii. Alternating copolymers (2.5mark)

Question 4

- a. What is dynamic mechanical thermal analysis (4marks)
- b. Discuss how the below properties affect solubility of polymers.
 - i. Crystallinity (strong hydrogen bonding) (2.5mark)
 - ii. Polarity or non-polarity (2.5mark)
- c. Discuss five benefits of polyurethane (8mark)
- d. Discuss the use of IR spectroscopy to identify polymers; (3mark)

Question 5

- a. Give a brief information about polymer phase equilibrium (7mark)
- b. In a tabular form, show three applications of any two thermosetting polymers (5mark)
- c. Discuss the following complex instrumental techniques used to identify polymers
 - Glass Liquid Chromatography (GLC) (4mark)
 - Gel Permeation Chromatography (GPC): (4mark)