DEPARTMENT OF CHEMISTRY
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA
FIRST SEMESTER EXAMINATION FOR 2021/2022 ACADEMIC SESSION

COURSE CODE: CHM553   **CREDIT UNITS: 3**

COURSE TITLE: POLYMER CHAIN PROPERTIES & POLYMERIZATION

INSTRUCTIONS: ANSWER ANY FOUR (4) QUESTIONS

TIME ALLOWED: 2 HOURS 30 MINUTES

Q1. a Explain the following concepts and give appropriate example in each case:

(i) Configuration **(2mks)**

(ii) Conformation **(2mks)**

(iii) Geometric isomers **(2mks)**

(iv) Root Mean Square Radius of Gyration **(2mks)**

b. When is a polymer molecule considered to be optically active? Illustrate your answer with any polymerization reaction capable of providing a polymer with this behaviour **(7mks)**

Q2. a Justify the following observations:

(i) Carbon tetrachloride would not as easily dissolve natural rubber as toluene **(3mks)**

(ii) Linear PE (Tm = 135°C) dissolves at temperature above 100°C but nylon dissolves at room temperature in polar solvents **(3mks)**

b. Discuss the role of each parameter in the following equation in the determination of dissolution of polymer in a given solvent: **(9mks)**

$\Delta G = \Delta H - T\Delta S$

Q3 a.Explain the term 'Solubility parameter'. Support your answers using the relevant thermodynamic relations **(6mks)**

b. Calculate the solubility parameter of polyisobutylene whose density is 0.917 g/cm³, and its respective values of group molar attraction constant are as shown in parentheses: **(9mks)**

-CH₃ (214); >C< (-93) and CH₂ (133). Take R.A.M for H = 1.00 and C = 12.00

Q4 a. Explain the conditions as well as the characteristics of an 'Ideal solution'. **(7mks)**

b. Would you consider a polymer solution to be an Ideal solution? Why? **(8mks)**

5a Outline the basic propositions of the Flory-Huggins Theory of polymer solution: **(9mks)**

b. State the behaviour of a polymer solution under the following thermodynamic states: **(6mks)**

(i) Above Theta temperature

(ii) At Flory Temperature

(iii) Below Theta temperature