INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY

THIRUVANANTHAPURAM

Quiz II – June 6, 2022

CH 121- Materials Science and Metallurgy

Second Semester

Time: 1 h **Max. Marks: 20**

1. Arrange the following polymers in increasing order of Tg and give reasons for the order

   (i) Polystyrene (ii) polypropylene (iii) nylon6,6 (iv) polyethylene (3 marks)

2. N-butyl lithium (0.05 g) was added to styrene (10 g) dissolved in 2 liters of THF (solvent) and polymerization was carried out. After complete conversion of styrene, 10 g of butadiene was added and the polymerization reaction was continued. After complete conversion of butadiene, the reaction was completed by addition of dichloromethane (CH_2Cl_2). Find out the molecular weight of the final polymer obtained.

   (molecular weights: styrene- 104 $gmol^{-1}$, butadiene- 54 $gmol^{-1}$, n-butyl lithium- 64 $gmol^{-1}$)

   (4 marks)

3. Krrish and Yash were asked to prepare poly(ethylene terephthalate) by the reaction of 0.1 mol of ethylene glycol and 0.1 mol of dimethyl terephthalate by melt-polycondensation. Krrish carried out the reaction for 2 h while Yash carried out the reaction for 4 h. Who will get higher molecular weight polymer? Justify your answer with appropriate kinetic expressions. (You may derive the relevant kinetic expressions)

   (3 marks)

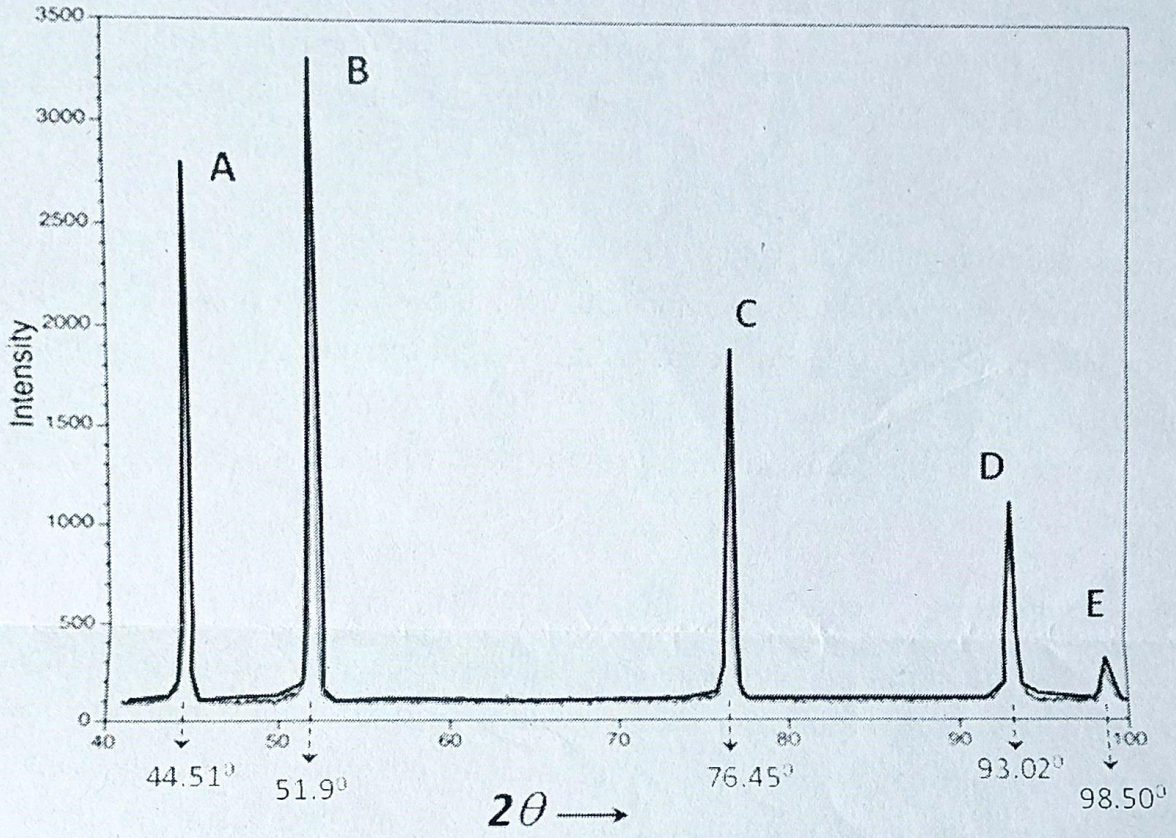
4. Kroger-Vink notation can be used for representing the defects and defect reactions in the materials. Write the Kroger-Vink notations for representing a **(i)** Schottky defect in Al_2O_3 and **(ii)**substitutional and interstitial defect reactions due to the incorporation of MgO in Al_2O_3. (3 marks)

[PTO]

5. X-ray diffraction (XRD) measurement of Nickel metal using Cu-Kα radiation (λ = 0.1542 nm) resulted in the following diffraction pattern.

(i) index the peaks A, B, C, D and E, (ii) identify the type of unit cell, (iii) calculate the unit cell parameter a_0 and (iv) which is the slip system in this material? calculate the length of Burger's vector.

Show all steps in your answer paper. (4 marks)



6. Many shaping methods are used for green ceramic production. Describe (i) isostatic pressing and (ii) Gel casting methods. Give their advantages/disadvantages.

(3 marks)