CHIN 432: POLYMER TECHNOLOGY

INSTRUCTIONS

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS.

QUESTION ONE (30 MARKS)

(a) Using a suitable example and illustrations differentiate between a monomer, a polymer and degree of polymerization

(3 marks)

b) Compare Copolymerization and homopolymerization giving appropriate examples (3marks)

(c) The table below shows distribution of polymer molecules in a sample. Use it to answer questions that follow.

polymer	Number of units(n)	Weight of each polymer unit (g)	Total weight of polymer entity (g)
POLYMER 1	2	10	20
POLYMER 2	4	20	80
POLYMER 3	6	100	600
POLYMER 4	3	250	750
TOTAL	15	XXXXXXXXX	1450

(i) Calculate the number average molecular weight, weight average molecular weight and the poly-dispersity index of the polymer. (6 marks)

d) Using appropriate diagrams differentiate crosslinked polymer and branched polymers (4 marks)

e) Differentiate between the following terms (6marks)
   i) Monofunctional and bifunctional
   ii) Propagation and initiation
   iii) Fibres and elastomers

f) Differentiate random and alternating co- polymerization using appropriate diagrams (2marks)

(g) Briefly discuss the effect of molecular weight on properties of polymers

(4 marks)

h) Name some common additives in polymers (2 marks)

QUESTION TWO (20 MARKS)

a) Write short notes on
i) Step-Growth polymerization (6 marks)
ii) Ring Opening polymerization

b) Match the polymer processing techniques with products

(4 marks)
Calendering
Rotational blow molding
Injection molding
Compression molding
Dipping

c) Discuss the merits and demerits of emulsion polymerization when compared to other polymerization processes

(6 marks)

d) Explain the meaning of glass transition temperature (3 marks)

QUESTION THREE (20 MARKS)

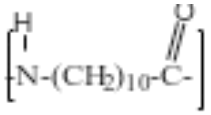
a) Differentiate between the following terms (6 marks)

i) Thermoplastic and thermosetting
ii) Bulk polymerization and solution polymerization
Iii) Suspension polymerization and emulsion polymerization

b) Explain briefly the making of low density polyethene (3 marks)

c) a) What are the applications of ebulliometry and cryoscopy in polymer technology (3 marks)

b) Nylon has the following structure



If its polydispersity is 1.2, determine the number average molecular weight given the other molecular weight= 120,000, (N= 14 C=12 O=16).
(4 marks)

d) Describe what stereo specific polymers are and how they are formed. (4 marks)

QUESTION FOUR (20 MARKS)

(a) Indicate with reasons why high density poly ethene is more suitable for water tanks while PolyVinyl Chloride is more appropriate for electrical conduits coating (4mks)

(b) Discuss the following polymer characterization techniques (8 marks)
(i) Molecular mass
(ii) Chemical composition
(iii) Mechanical properties
(iv) Thermogravimetric analysis
(c)Highlight the major raw materials and some applications of the following polymers (8marks)
(i) Viscose rayon
(ii)Phenol formaldehyde
(iii)Stylene butadiene rubber
(iv) Nylon 66