CHIN 432: POLYMER TECHNOLOGY

INSTRUCTIONS

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS.

QUESTION ONE (30 MARKS)

(a) Using a suitable example differentiate between a monomer and a polymer (3 marks)

(b) Define the following terms briefly (5marks)

i)Degree of Polymerization

ii) Linear polymers

iii) CoPolymers

(iv) Homopolymer

(v) Block polymerization

(c)(i) Define the molecular weight of a polymer (1mark)

ii) What is the molecular weight of polypropylene with a degree of polymerization of 1200.The formula for the limiting unit is [-CH_2-$CH(CH_3)$-] C=12 H=1 (3 marks)

d) Using appropriate digrams 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 with appropriate digrams (4marks)

g) Differentiate chain transfer reaction and ionic polymerization mechanisms (2 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)

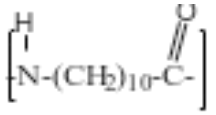
i) Thermoplastic and thermosetting

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) Differentiate between number-average molecular weight and the weight-average molecular weight
(2 marks)

b) Nylon has the following structure



If the number-average degree of polymerization X_n for nylon is 100 and molecular weight= 120,000, what is its polydispersity (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 HDPE is more suitable for water tanks while PVC 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