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(63) SEAT No._____

No. of Printed pages: 2

SARDAR PATEL UNIVERSITY

M.Sc. 2nd Semester (Surface Coating Technology) (CBCS) Examination

Monday, 18th March 2019

Time: 10:00 am to 01:00 pm

Course No.: PS02CSCT21

***Subject:* Polymer Physics & Properties of Polymer**

Total Marks: 70

N.B. *(1) Marks allotted to the question are on its RHS*
(2) Illustrate your answers wherever necessary with the help of neat sketches & chemical equations

Q.1. Choose the *Correct Answer* from the followings:

1.1 Identify the correct T_g order for the given below polymers. **1**

a) methyl acrylate > ethyl acrylate > butyl acrylate

b) methyl acrylate < ethyl acrylate < butyl acrylate

c) ethyl acrylate > butyl acrylate > methyl acrylate

d) ethyl acrylate < butyl acrylate < methyl acrylate

1.2 The force due to presence of electron cloud in hydrocarbon is ____. **1**

a) London dispersion b) Dipole c) H-bonding d) Covalent bond

1.3 In elastomers, which type of cross-linking is observed? **1**

a) Labile b) Light c) High d) None

1.4 Which of the Brownian movement is/are activated above Tg in case of polymer? **1**

a) EBM b) IBM c) Both d) None

1.5 Identify the correct thermal stability order. **1**

a) Polyethylene <Polystyrene < Poly-α-methylstyrene

b) Polystyrene > Poly-α-methylstyrene > Polyethylene

c) Polystyrene < Poly-α-methylstyrene < Polyethylene

d) Polyethylene > Polystyrene > Poly-α-methylstyrene

1.6 Only T_m can be observed in _____ polymer. **1**

a) Amorphous b) Crystalline c) Partly crystalline d) None

1.7 The process of dissolution becomes spontaneous when ΔH is ____. **1**

a) ΔH = -Ve b) ΔH = +Ve c) ΔH = 0 d) None

1.8 Which of the following is more thermally stable? **1**

a) Polyethylene b) Teflon c) Polypropylene d) polyisobutylene

Q.2. Answer the following short questions (any seven) **14**

a) Define T_g & T_f for polymers.

b) Describe the syndiotactic and isotactic representation of polyvinyl chloride.

c) Define: Crystallites & spherulites.

d) Which of polyethylene and nylon-6 will be more crystalline? Explain.

(P.T.O.)

e) Which of natural rubber and Gutta-Percha will be more crystalline?

f) Define heat distortion temperature.

g) What is plasticizer and how it affects T_g of polymer.

h) How labile cross-linking differs from light cross-linking.

i) Which of polyethylene and polyvinyl alcohol have higher Tg? Explain.

Q.3 a Discuss microstructure of polymer based on chemical structure. **6**

b Describe the following polymers in isotactic and syndiotactic forms. **6**

i) polystyrene ii) PMMA iii) polyacrylic acid

And also describe cis, trans and vinyl structure for polybutadiene

OR

Q.3 a Write a note on state of phases of polymer. **6**

b Explain importance of glass transition temperature and discuss dilatometry technique. **6**

Q.4 a Describe the factors affecting glass transition temperature. **6**

b Describe the schematic representation of Brownian movement taking place at various transitions in case of low molecular and high molecular weight compounds. **6**

OR

Q.4 a Describe the factors affecting crystallinity. **6**

b Describe the transition curves for crystalline, amorphous and partly crystalline polymers. **6**

Q.5 a i) Write a note on thermodynamics of polymer dissolution. **6**

ii) Differentiate between unzipping and random degradation.

b What is solubility parameter and derive the equation for heat of mixing for polymer dissolution. **6**

OR

Q.5 a Write a note on degradation of polyvinylchloride. **6**

b i) Discuss the degradation mechanism of styrene. **6**

ii) Write a note on oxidative degradation.

Q.6 a What is labile and light cross-linking? Explain how light cross-linking affect different properties of a polymer. **6**

b i) Describe the factors affecting thermal stability of a polymer **6**

ii) List out the different types of intermolecular forces and explain in brief.

OR

Q.6 a Explain how polarity affects various properties of polymers. **6**

b Discuss the effects of heavy cross-linking on the properties of polymers. **6**