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## SARDAR PATEL UNIVERSITY

M.Sc. 2<sup>nd</sup> Semester (Surface Coating Technology) (CBCS) ExaminationMonday, 04<sup>th</sup> April 2016

Time: 10:30 am to 1:30 pm

Course No.: PS02CSCT01

Subject: Polymer Physics &amp; 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:
- Q.1.1 If in the polymer molecule the functional group (R) located alternate above and below of the plane of the carbon-carbon chain than the polymer is said to be \_\_\_\_\_ 1  
 (a) Heterotactic (b) Isotactic (c) Syndiotactic (d) None of these.
- Q.1.2 During Polymerization, if all the repeat units take trans configuration, the resultant polymers is a 100% trans and due to that the molecules assumes \_\_\_\_\_ structures. 1  
 (a) Spring (b) Rod-like (c) Spherical (d) Coil.
- Q.1.3 If a Polymer chain grown with the anionic initiator butyl lithium and can be terminated with ethylene oxide and hydrolyzed with dilute hydrochloric acid, the polymer having \_\_\_\_\_ group at the chain end can be formed. 1  
 (a) Carboxyl (b) Hydroxyl (c) Isocyanate (d) Amine.
- Q.1.4 A crystalline polymer is made to exist in a glassy state by rapidly cooling its melt to a very low temperature without allowing enough time to orient and form crystallites called as \_\_\_\_\_ 1  
 (a) Quarreling (b) Quenching (c) Rubbery state (d) Viscoelastic state.
- Q.1.5 The presence or absence of a long range order makes different solids behave differently when exposed to \_\_\_\_\_ giving sharp and well defined pattern in crystalline polymer. 1  
 (a) UV Radiation (b) X Ray (c) Electron Beam radiation (d) Infrared rays.
- Q.1.6 Gutta-percha exhibits a straightening out of the successive isoprene units giving a \_\_\_\_\_ like structure to the molecule and therefore more \_\_\_\_\_. 1  
 (a) rod, crystalline (b) elastic, crystalline (c) rod, amorphous (d) elastic, amorphous
- Q.1.7 Many polymers are protected against oxidative degradation by incorporating chemical compounds called \_\_\_\_\_. 1  
 (a) Stabilizer (b) Antioxidants (c) Driers (d) None of these.
- Q.1.8 The function of photostabilizer is to absorb the \_\_\_\_\_ and dissipate the energy thus absorbed to the environment in some harmless form. 1  
 (a) UV Radiation (b) X-Ray (c) Electron Beam radiation (d) Infrared rays.
- Q.2 Attempt any Seven Questions: 14
1. Explain Viscoelastic Deformation.
  2. Define Configuration and Conformation.
  3. Two Polystyrene samples can have the same chemical structure and almost similar molecular weight distribution but may have different properties.
  4. Justify the statement "As the polymer crystallinity increases the permeability decreases".
  5. Give Classification of Adhesives by polarity giving suitable examples.

6. Justify the statement "All substituent's do not always reduce the thermal stability of the polymeric system".
7. A polymer shows all features of a Glassy brittle material or elastic rubber or viscous liquid depending on temperature scale measurements.
8. The polymer solution is highly viscous as compare to low molecular weight solution.
9. Epoxidised oil is used as stabilizers for PVC? Why?

Q.3 a Classify and explain the polymers on the basis of Chemical and Geometrical structures. 6

Q.3 b What are Stereo-regular polymers? Draw structural formula indicating the stereo regular chain configuration in 6

- (1) Atactic Polystyrene
- (2) Isotactic Polystyrene
- (3) Cis, 1-4 Polyisoprene
- (4) Trans, 1-4 Polybutadiene.

**Or**

Q.3 b State various intermolecular forces and outline the effects of permanent dipoles on properties of polymers. 6

Q.4 a What are the factors affecting Glass transition temperature of a Polymer? Discuss in brief about co-polymerization. 6

Q.4 b What is the importance of T<sub>g</sub> on polymers? Calculate T<sub>g</sub> of a copolymer with 25% Styrene, 25% MMA and 50 % of Butyl Acrylate? 6  
(T<sub>g</sub> of Styrene = 100°C, MMA= 105°C and BA= -54°C)

**Or**

Q.4 b Give the importance of T<sub>g</sub> on polymers and explain the concept of various transition states associated with low molecular weight compounds and polymeric materials. 6

Q.5 a Discuss in details about the factors affecting Crystallinity in Polymers. 6

Q.5 b Explain the process of polymer dissolution in detail. 6

**Or**

Q.5 b Write a note on Polymer Solubility parameter. 6

Q.6 a Write a note on Thermal degradation of polymers. 6

Q.6 b What is Polymer Degradation? Discuss in detail about Chain end and random degradation? 6

**Or**

Q.6 b Explain Newtonian and Non Newtonian flow. Give classification of Viscometer on the basis of their Rheological State 6