**STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 86**
**(For candidates admitted from the academic year 2006-07 & thereafter)**

**SUBJECT CODE : CH/PS/PM44**

**M.Sc. DEGREE EXAMINATION APRIL 2009**
**BRANCH IV – CHEMISTRY**
**FOURTH SEMESTER**

**REG.NO .....**

**COURSE : SPECIALISATION**
**PAPER : POLYMER MATERIALS AND APPLICATIONS**
**TIME : 30 MINS** **MAX. MARKS :20**

**SECTION – A**

**ANSWER ALL OUESTIONS:** **(20 X 1 =20)**

**I Choose the correct answer:**

1. Filter paper is nearly pure
   a) Cellulose b) Polystyrene c) PVA d) Polyacrylic acid

2. Thermally stable polymers should have
   a) low molecular weight b) Branched structure
   c) low activation energy d) High bond dissociation energy

3. The mechanical property of a polymer expressed as the ratio of stress to strain is called
   a) Strength b) Modulus c) Abberation d) None of the above

4. A thermal analytical method that is often used for the determination of Tg of polymers is
   a) TGA b) DSC c) IR spectrometer d) Dilatometer

5. Whether a given sample is polyvinylacetate(A) or polyvinylalcohol(B) can be identified from the following observations in their IR spectra.
   a) A band at ~3400 $cm^{-1}$ in A and one at ~1700 $cm^{-1}$ in B.
   b) A band at ~1700 $cm^{-1}$ in A and one at ~3400 $cm^{-1}$ in B.
   c) A band at 2200 $cm^{-1}$ in A and B.
   d) None of the above

6. Low molecular weight liquid polymers which solidify due to crosslinking are
   a) solvent based adhesives b) pressure sensitive adhesives
   c) Latex adhesives d) Reactive adhesives

7. Thermomechanical analysis is used for measuring the following changes in a polymer
   a) dielectric constant b) density
   c) refractive index d) dimensional changes

8. The high resistance of polysiloxanes to elevated temperatures is due to the presence of
   a) hydrogen bonding b) covalent bonding
   c) Si – O bond in the polymer backbone d) All of the above

..2

9. Polyphosphazenes are used as specially blood compatible implants and as surgical sutures because of their
   a) biodegradability
   b) High stability
   c) Low cost
   d) None of the above

10. In laminated composites the fibers
   a) decrease the strength
   b) increase the strength
   c) decrease the modulus
   d) None of the above

**II Fill in the blanks:**

11. Silicones are used as implant material due to their _____.
12. If the viscosity of a polymer solution is independent of the rate of shear, then it is said to exhibit _____.
13. In an elementary capillary rheometer _____, defined as the mass rate of flow of polymer through a specified capillary under controlled conditions of temperature and pressure is determined.
14. Cellophane, a transparent film, is _____ made in the form of a thin film.
15. The thermal degradation of _____ is a good example of unzipping or chain-end degradation.

**III Answer in one or two sentences:**

16. What do you mean by strain in a polymer?

17. What difference do you expect in the syndiotactic and isotactic PMMA in their $^{1}$H-NMR spectrum.

18. How does hydrogen bonding affect the properties of nylon fiber?

19. What is the important use of blowing agents in polymers?

20. Arrange the following in the order of decreasing C-C bond stability: Polypropylene, Polyisobutylene and Polyethylene.

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**TIME : 2½ HOURS** **MAX. MARKS: 80**

## SECTION – B

**ANSWER ANY FIVE QUESTIONS:** **(5 X 8 =40)**

1. How are polyamides (nylon) prepared? Write about their structure and properties.

2. Discuss briefly about the applications of polymers in membrane separation.

3. How will you determine the tensile properties of a polymers? Discuss the tensile stress vs. strain curve?
4. Discuss briefly about birefringence in polymers.

5. a) How will you determine the aberration properties of a polymer experimentally?
   b) Explain the role of plasticizers and fillers in polymer processing. Give one example for each.

6. Explain the concept of paints as surface coatings. Write the various constituents of an organic paint and explain their role (one or two lines for each constituent.

7. Illustrate with suitable examples, the effect of antioxidant on the oxidative degradation of a polymer.

## SECTION – C

**ANSWER ANY TWO QUESTIONS:** **(2 X 20=40)**

8. a) Write a short note on i) Hydrophilic polymers and (5)
      ii) Polymers with electronic and Photonic properties (5)

   b) What is dielectric strength of a polymer? Describe any one technique to determine this property with a suitable diagram. (10)

9. a) Illustrate the use of IR spectral technique for the characterization of polymer structure using suitable examples. (10)
   b) Give a brief account of the identification of polymers by chemical methods. (10)

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10. a) Draw the DSC curve of PET and explain the different transitions taking place at different temperatures. (10)
    b) Write the appropriate synthetic route for the polyphosphazenes and subsequently polyorgans phosphozenes. Write the mechanism of the reactions. (10)

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