STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI-86
(For candidates admitted during the academic year 2019-20 and thereafter)

M. Sc. DEGREE EXAMINATION, APRIL 2021
BRANCH IV- CHEMISTRY
SECOND SEMESTER

COURSE: MAJOR ELECTIVE
PAPER: POLYMER MATERIALS AND APPLICATIONS
TIME: 90 MINUTES   MAX MARKS: 50

SECTION A

Answer all the questions   (11 X 1 = 11marks)
I   Fill in the blanks

1   The ratio of material relaxation time to the time of experimental observation is called _____.

2   The property exhibited by liquid crystals which is similar to solids is_____ _____

3   Consider samples of Polypropylene A, B and C with degree of polymerisation 300, 980 and 2000 respectively. Among the three polymers the one with high melt viscosity is_____.

II   Match the following

4	Nitrobenzene	A	Anionic Polymerisation
5	Living polymer	B	Coordination Polymerisation
6	FTIR Spectroscopy	C	Inhibitor
7	Dynamic Mechanical Analysis	D	Degradation of polymer
8	Diethyl Aluminium Chloride	E	Polymer softening
		F	Phase Changes

III   Answer in a sentence or two
9   What is the polydispersity index of starch obtained from a plant source?

10   What is Auto acceleration in a polymerisation process?

11   Of the polymers - Isotactic and Atactic polypropylene, which is more crystalline and why?

SECTION – B

Answer any three questions   **(3 x 8 =24 marks)**

12. With the help of a graph, explain   (5+3)

    (a) Stress Strain relationship in a viscoelastic system

    (b) Creep and stress relaxation

13. Distinguish between Isotactic, Syndiotactic and Atactic (8) Polymethylmethacrylate using a proton NMR technique.

14. Explain the use of the following in determination of molecular weight of a (4+4) polymer (a) Chromatography   (b) Viscosity

15. Give reasons for the following   (8)
    (a) Polymers made from bulk polymerisation method can be directly used in moulds.
    (b) Viscous polymers are provided with a working zone in the extrusion machine.
    (c) The glass transition temperature of polybutadiene is greater than polyethylene.
    (d) Ortho phthalates when added to polyvinylchloride reduces its crystallinity

SECTION – C

Answer any one question   **(15 x 1 =15 marks)**

16. (a) Show that for a free radical polymerisation reaction, the rate of (7) polymerisation is directly proportional to the concentration of monomer.

    (b) (i) Give any two significant properties of hydrogels.   (4)

        (ii) Explain Biodegradability of a polymer   (4)

17. (a) Suggest additives to be added to a polymer to incorporate the following (8) properties. Give an example and explain their function.
    (i) To improve heat resistance of a polymer
    (ii) To prevent the degradation of polymers during storage
    (iii) To increase electrical conductivity of a polymer
    (iv) To protect the polymer from fire.

    (b) (i) Estimate the solubility parameter for polyisobutylene at 25 ^{o}C. Given (5) density = 0.924 g/cm^{3}. The group molar attraction constant of -CH$_2$ – and -C(CH$_3$)$_3$ are 280 and 840 (cal.cm^{3}/mol)$^{1/2}$ respectively.

        (ii) The solubility of amorphous polymer only can be understood using the (2) Hildebrand solubility parameter. Explain.

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