Branch: AIML Session/Sem: 2022-23/I

Subject: Chemistry Code: 21CYB101J

Duration: 1hr 40 mins Max. Marks: 50 marks

Part A
Attempt all questions (1x10=10 marks)

1. Which of the following is NOT a natural polymer? (Marks: 1; BL: 1; CO: 4; PO: 1)

(a) Rayon (b) RNA (c) Cellulose (d) Starch

2. The crystal plane for which the interplanar spacing $d_{hkl} = a/\sqrt{12}$ is (Marks: 1; BL: 3; CO: 5; PO: 2)

(a) 110 (b) 111 (c) 221 (d) 222

3. The polydispersity index (PDI) of a polymer is (Marks: 1; BL: 1; CO: 4; PO: 1)

(a) $M_w = M_n$ (b) M_w/M_n (c) M_n/M_w (d) $M_w \times M_n$

4. .... type of bonding is seen in thermoset plastic polymers (Marks: 1; BL: 1; CO: 4; PO: 1)

(a) ionic (b) van der Waals (c) covalent (d) molecular

5. The X-ray diffractometers are NOT used to determine the physical properties of (Marks: 1; BL: 1; CO: 5; PO: 1)

(a) metals (b) liquids (c) polymeric materials (d) solids

6. The Bragg's equation for diffraction of X-rays is (Marks: 1; BL: 1; CO: 5; PO: 1)

(a) $n\lambda = 2d\sin\theta$ (b) $n\lambda = 2d^2\sin\theta$ (c) $n\lambda = 2d\sin^2\theta$ (d) $n\lambda = d^2\sin\theta$

7. Fibres in the form of thin filamentary single crystals are called (Marks: 1; BL: 1; CO: 5; PO: 1)

(a) Wires (b) Fibres (c) Whiskers (d) Matrix

8. Correct order for bulk modulus is (Marks: 1; BL: 2; CO: 5; PO: 1)

(a) $B_{gas} > B_{liquid} > B_{solid}$ (b) $B_{liquid} > B_{gas} > B_{solid}$ (c) $B_{solid} > B_{liquid} > B_{gas}$ (d) $B_{liquid} > B_{gas} > B_{solid}$

9. Which type of polymers is known for its high crystallinity? (Marks: 1; BL: 1; CO: 4; PO: 1)

(a) isotactic (b) syndiotactic (c) atactic (d) none of them

10. Aramid fibers are used for (Marks: 1; BL: 1; CO: 5; PO: 1)

(a) apparels (b) shoe soles (c) bullet-proof jackets (d) packing materials

Part B
Attempt all questions (10 x 4=40 marks)

11. (a) Differentiate between homopolymers and co-polymers with the help of suitable examples.
(Marks: 5; BL: 2; CO: 4; PO: 1)

(b) Discuss the synthesis and applications of teflon and polyurethane. (Marks: 5; BL: 2; CO: 4; PO: 1)

OR

12. (a) Explain about the doping in conducting polymers and its types. Marks: 5; BL: 2; CO: 4; PO: 1)

(b) Discuss the synthesis, properties and applications of PVC and nylon-6,6.
(Marks: 5; BL: 2; CO: 4; PO: 1)

13. (a) Differentiate between thermoplastics and thermosetting plastic. (Marks: 6; BL: 3,4; CO: 4; PO: 1)

(b) Equal number of polymer molecules with $M_1 = 20,000$ and $M_2 = 200,000$ are mixed. Calculate its mass average molecular mass (M_w). Take n=10
(Marks: 4; BL: 3; CO: 4; PO: 1,2)

OR

14. (a) Discuss about fibre-reinforced composites in detail and list out their applications.
(Marks: 6; BL: 2; CO: 5; PO: 1)

(b) Write short notes on the following:
(Marks: 4; BL: 3; CO: 4; PO: 1)
    (i) cross-linked polymer   (ii) polypropylene

15. (a) Define composites and discuss about their constituents. Outline the general classification of composites.
(Marks: 8; BL:1,3; CO: 5; PO: 1)

(b) Comment on the significance of matrix in composites. (Marks: 2; BL: 4; CO: 5; PO: 1)

OR

16. (a) Construct a labeled diagram exhibiting stress-strain relationship and discuss about it briefly.
(Marks: 5; BL: 3; CO: 5; PO: 1)

(b) A brass wire of length 2 m has its one end, fixed to a rigid support and from the other end a 4 kg weight is suspended. If the radius of the wire is 0.35 mm, find the extension produced in the wire. g = 9.8 m/s^2, Y = 11×10^{10} N/m^2
(Marks: 5; BL: 3; CO: 5; PO: 1,2)

17. (a) The parameters of an orthorhombic unit cell are a=50 pm, b=100 pm, c=150 pm. Determine the spacing between (123) planes.
(Marks: 3; BL: 3; CO: 5; PO: 1,2)

(b) Find out the Miller indices for plane with intercepts a= 1/2, b= 1, c= ∞ (Marks:2; BL:3; CO:5; PO: 1,2)

(c) Discuss Brag's Law (Marks: 5; BL: 3; CO: 5; PO:1)

OR

18. Discuss the principle and instrumentation with a block diagram of X-ray photoelectron spectroscopy (XPS) in detail. Mention any two applications. (Marks: 4; BL: 2,3; CO: 5; PO: 1)