Chapter 1

1. What can be achieved by appropriate selection of polymer-based materials? Give five representative advantages of adopting polymer-based materials with short explanations (a few lines for each advantages).

Chapter 2

3. In emulsion polymerization, the principal place where the monomer polymerizes is
   a) monomer droplets
   b) aqueous phase
   c) swollen surfactant micelles
   d) surface of reactor

4. If a polymer chain has a molecular weight of 280,000, how many ethylene units does it contain?

17. Which of the following polymers is least likely to be optically transparent?
   a) atactic polystyrene
   b) isotactic polystyrene
   c) an ethylene/propylene random copolymer
   d) a styrene/butadiene random copolymer

20. High pressure, high temperature free-radical polymerization of ethylene produces
   a) HDPE
   b) LDPE
   c) PP
   d) LLDPE

21. Calculate the molecular weights of the repeating units of polypropylene and PVC. Determine Mw for a polypropylene of average degree of polymerisation of 18,000. (Atomic masses of H = 1, C = 12, and Cl = 35).
Answer: m(PP) = 42 g/mol; m(PVC) = 62 g/mol; w = 756x103 g/mol.

23. The molecules of a sample of polystyrene can be divided into 5 groups in terms of their molecular weight with the same number of molecules in each group. The molecular weights of the molecules in the groups are 10,000; 20,000; 30,000; 40,000; 50,000. Calculate n.
Answer: n = 30,000.

Chapter 3

1. Indicate if the viscosity of a polymer decreases with increases in (a) shear strain rate, (b) molecular weight, (c) temperature (d) pressure.

3. How are weld-lines caused in injection mouldings and how do they affect the quality of the components?

11. On a standard extruder screw, there are three sections – what are they called?

14. Indicate two important microstructural characteristics for polymers that are considered for fibre production.

19. Which of the following processing methods would you use for compounding a polymer with colorants and stabilizers

a) injection moulding
b) thermoforming
c) single-screw extrusion
d) twin-screw extrusion
e) transfer moulding.

22. Moulds for blow moulding can be made using aluminium whereas moulds for injection moulding are usually made out of tool steel, why?

24. Describe vacuum forming/thermoforming processes. What are typical thermoformed plastic products?

26. What processing method would you use to make large, hollow polyethylene playground items?

30. Describe the injection moulding process and distinguish between the injection moulding of TP and TS polymers.

34. Distinguish between electrostatic and electrophoretic coating.