MANIPAL ACADEMY of HIGHER EDUCATION (Deemed to be University under Section 3 of the UGC Act, 1956)

Question Paper - Report

19-Mar-2025 23:58:01
KENNETH FRANCIS RODRIGUES .
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Question Paper

MANIPAL ACADEMY OF HIGHER EDUCATION

II Sem B.Tech. Mid Sem Examination

APPLIED CHEMISTRY FOR ENGINEERS [CHM 1072-CHM]

Marks: 30 **Duration: 90 mins.**

MCQ

Answer all the questions. Section Duration: 20 mins

1) HOOC CH_2 CH (COOH) CH_2 OH polymer can form (0.5)

Linear polymer | Branched polymer | Addition polymer | No Polymerization

2) Intrinsic viscosity of polyisobutene is 180 cm^3 /g and the Mark-Houwink constants K is 3.60 $\times 10^{-2}$, α is 0.64. The Molecular weight is (0.5)

7.95×10^5 g/mol | 5.9×10^5 g/mol | 6.9×10^5 g/mol | 4.9×10^5 g/mol

3) Which of the following best describes the glass transition temperature (Tg)? (0.5)

The temperature at which a crystalline polymer melts. | The temperature at which a polymer undergoes a significant change in its mechanical properties, transitioning from a glassy to a rubbery state. | The temperature at which a polymer completely decomposes. | The temperature at which a polymer becomes completely liquid.

4) Which of the following polymers contain only −C−C− linkages ? (0.5)

condensation polymers | copolymers | addition polymers | none of the mentioned

5) Polymer having high bonding strength to a variety of substrates including metals, ceramics, glass, and plastics. (0.5)

polyester | polyamide. | polyepoxies. | polyaniline.

6) Reaction of adipic acid and hexamethylenediamine produces (0.5)

Nylon 6 | dacron | polycarbonate | Nylon 66

7) Pick out the **WRONG** statement regarding the solubility characteristics of high polymers

Greater the degree of cross-linking in the polymer, lesser is its solubility

Polymers having more aliphatic character are more soluble in aliphatic solvents, while those polymers having more aromatic character are more soluble in aromatic solvents

Swelling tendency or solubility of polymers in a particular solvent decreases with increase in molecular weight of the solvent

High molecular weight polymers on dissolving gives solution of very low viscosity

(0.5)

8) Choose the INCORRECT statement regarding conducting polymers

Polymers having conjugated double bonds in the backbone possess their conductivity due to π electrons.

They have high electron affinities

The electrical conductivity does not take place without thermal or photolytic activation of the electrons

They have high ionization potential

(0.5)

9) Sodium naphthalide is involved in __ of conducting polymers

p-doping and oxidation

n-doping and oxidation

n-doping and reduction

p-doping and reduction

(0.5)

10) During the working of Photo-responsive polymer

Polymer expands and contract.

Polymer expands at lower temperatures and contracts at higher temperatures.

Switching between the cis and trans configuration occurs

Polymer swells and shrinks upon application of electrical energy

(0.5)

DESCRIPTIVE

Answer all the questions.

11) a) Describe how the following properties of polymers are related to their structure
Elasticity
Crystallinity
b) A polymer sample contains the following composition:
If the number-average molecular mass (Mn) is 15,360 g/mol, calculate the weight-average molecular weight (Mw).

(4)

D.P.	300	500	700
Composition	0.30	0.5	0.2

12) i)Why is the critical water management of conducting membrane essential in Proton exchange membrane fuel cell ?

ii) List the various ways of End-of-Life management of battery

(3)

13) Describe the construction and working of the Li-ion battery.

(3)

14) i) Explain any 3 factors affecting glass transition temperature of a polymer. (3)

ii) Justify the statement ; Polythiophene is a smart polymer.

15) With suitable examples explain doping in conducting polymers. (3)

16) Differentiate between the following; (Any 2 points) (3)

a. Energy density and Power density

b. Lithium ion and Lithium sulfur batteries

c. fuel cell and galvanic cell

17) Give reasons for the following; (2)

i. Polylactic acid requires industrial composting facilities for degradation.

ii. Polystyrene has lesser slipping power than PVC

18) Give reason for the following (2)

i. The cell potential of Nickel metal hydride battery is invariant whereas that of lead acid battery drops with usage.

ii. Maintenance free lead acid batteries do not need top up

19) Calculate E.M.F. of the zinc – silver cell at 25 ˚C when $[Zn^{2+}]$ = 1.0 M and $[Ag^{+}]$ = 10 M (2)

Write the cell representation and cell reaction.

[Given: E^0Zn^{2+}/Zn= - 0.76 V and E^0Ag^{+}/Ag is 0.80 V at 25˚C]

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