M.Sc. CHEMISTRY
SECOND SEMESTER
PHYSICAL CHEMISTRY II
MSC – 203
[USE OMR FOR OBJECTIVE PART]

SET
A

Duration: 1.30 hrs.   Full Marks: 35

(**Objective**)

Time: 15 min.   Marks: 10

Choose the correct answer from the following: $1 \times 10 = 10$

1. The correct form of Carothers Equation is

   $p = \frac{f}{2}(1 - \frac{1}{\bar{X}_n})$ f is average $p = \frac{f}{2}(1 - \frac{1}{\bar{X}_n})$ p is average

   a. functionality, p is extent of reaction and   b. functionality, f is extent of reaction and
   $\bar{X}_n = \frac{N_o}{N}$ $\bar{X}_n = \frac{N}{N_o}$

   $p = \frac{2}{f}(1 - \frac{1}{\bar{X}_n})$ where, f is average $p = \frac{2}{f}(1 - \frac{1}{\bar{X}_n})$ p is average

   c. functionality, p is extent of reaction and   d. functionality, f is extent of reaction and
   $\bar{X}_n = \frac{N_o}{N}$ $\bar{X}_n = \frac{N}{N_o}$

2. A copolymer system is said to be *ideal if*

   (i) $k_{11}/k_{12} = k_{21}/k_{22}$ (ii) $r_1 = 1/r_2$

   (iii) $r_1 r_2 = 1$.   (iv) $r_1 = r_2 = 0$

   a. 1, 2 and 3 are correct option   b. 1 and 2 are correct option
   c. 1, 2 and 4 are correct option   d. All are correct

3. As the crystallinity increases, the strength and flexibility of the polymer

   a. Strength increases, flexibility decreases   b. Strength decreases but flexibility increases

   c. Strength and flexibility both are increases   d. Both are decreases

4. Which of the following are characteristics of thermosetting polymers?
   (i) Heavily branched cross linked polymers
   (ii) Linear slightly branched long chain molecules.
   (iii) Become infusible on moulding so cannot be reused.
   (iv) Soften on heating and harden on cooling, can be reused

   a. (iii) is the correct answer   b. (iv) is the correct answer
   c. (i) and (iii) are the correct answers   d. (ii) and (iii) are the correct answer

5. A polymer has the following molar mass distribution

Number of molecules	Molar mass (g/mol)
50	5000
75	6000

The calculated number average, weight average molar mass and polydispersity index are

a. 5200, 5642 and 1.
b. 5600, 5642 and 1.0075
c. 5600, 5542 and 1.0075
d. 6000, 5642 and 1

6. What are the chemicals needed to produce the glow?
   a. Luciferin and luciferase
   b. Nitrogen and monosodium glutamate
   c. Benzentricarboxylic acid and tris ester
   d. None of these

7. E-type delayed fluorescence is also known as
   a. Triplet-triplet annihilation
   b. Thermally activated delayed
   c. Prompt
   d. None of these

8. The ground state complex is formed in which of the following quenching?
   a. Dynamic
   b. Collisional
   c. Static
   d. None of the above

9. The substances which initiate a photochemical reaction but itself does not undergo any chemical change is called
   a. Catalysis
   b. Fluorescent
   c. Sensitizer
   d. None of these

10. For reverse intersystem crossing which of the following transition is correct?
    a. $S \rightarrow T$
    b. $S \rightarrow S$
    c. $T \rightarrow S$
    d. $T \rightarrow T$

-- --- --

(__Descriptive__)

Time : 1 hr. 15 mins.   Marks:25

[Answer question no.1 & any two (2) from the rest]

1. a. What is condensation polymerization? Explain with an example.   1+1+3
=5

   b. Write the advantages of natural polymer over synthetic polymer.

   c. What do you mean by radiative and nonradiative transitions?
      Write two differences between dynamic and static quenching.

2. a. What is viscosity average molecular weight? How it is related to   2+3+2+
      Mark-Houwink equation? Explain.   1+2=10

   b. A sample of polymer contains 30% molecules with molecular mass
      20,000, 40% with molecular mass 30,000 and 30% with molecular
      mass 60,000. What is the number average molecular mass of the
      polymer?

   c. What is Molecular weight distribution of polymers? Explain with
      graphs.

   d. What is polydispersity index of a polymer?

   e. What is Ziegler–Natta catalyst? Explain its applications.

3. a. Write the Carothers Equation and its importance.   2+3+1+
2+2=10

   b. Taking one example, explain the steps and mechanism involved in
      free radical polymerisation technique.

   c. Write the importance of end group analysis.

   d. Write the advantages and applications of thermosetting polymer.

   e. Write the mechanism of Anionic polymerisation process?

4. a. Explain excimer and exciplex concentration quenching giving the   3+3+4
      mechanism.   =10

   b. What do you mean by chemiluminescence? Discuss the chemistry
      of glow stick.

c. What do you mean by photosensitation? Explain it using suitable example. Discuss the photodynamic therapy of tumor. Give the mechanism.

5. a. Explain P-type delayed fluorescence.

    b. What do you mean by heterogeneous photocatalysis? Give the mechanism using suitable example.

    c. Give the Stern-Volmer equation for static quenching and combined static dynamic quenching. Define each term involve in the equations.

    d. Discuss the stimulated emission process in Einstein's quantum theory of radiation.

3+3+2+
2=10

= = *** = =