2025/05

SET A

M.Sc. CHEMISTRY
SECOND SEMESTER
PHYSICAL CHEMISTRY II
MSC – 203 [REPEAT]

[USE OMR FOR OBJECTIVE PART]

Duration: 1:30 hrs. **Full Marks: 35**

Objective

Time: 15 mins. **Marks: 10**

Choose the correct answer from the following: ***1×10=10***

1. What is exciplex?
   a. A complex formed between a molecule and its ion
   b. An excited-state complex between two different molecules
   c. A ground-state complex between two molecules
   d. A polymer formed under UV radiation

2. Which of the following is a classic example of a chemiluminescent reaction?
   a. Combustion of magnesium
   b. Dissolution of salt in water
   c. Reaction of luminol with hydrogen peroxide
   d. Electrolysis of water

3. The Stern–Volmer equation is used to study:
   a. Absorbance of solutions
   b. Thermal conductivity
   c. Fluorescence quenching
   d. Electrochemical redox reactions

4. Which of the following is the most commonly used photocatalyst?
   a. Silicon dioxide (SiO_2)
   b. Titanium dioxide (TiO_2)
   c. Calcium carbonate ($CaCO_3$)
   d. Sodium chloride (NaCl)

5. What is formed when an electron is excited in a photocatalyst?
   a. Hole-electron pair
   b. Proton-electron pair
   c. Photon pair
   d. Ion pair

6. The correct form of Carothers Equation is
   a. $p = \frac{f}{2}(1-\frac{1}{\bar{X}_n})$ f is average functionality, p is extent of reaction and $\bar{X}_n = \frac{N_o}{N}$
   b. $p = \frac{f}{2}(1-\frac{1}{\bar{X}_n})$ p is average functionality, f is extent of reaction and $\bar{X}_n = \frac{N}{N_o}$
   c. $p = \frac{2}{f}(1-\frac{1}{\bar{X}_n})$ where, f is average functionality, p is extent of reaction and $\bar{X}_n = \frac{N_o}{N}$
   d. $p = \frac{2}{f}(1-\frac{1}{\bar{X}_n})$ p is average functionality, f is extent of reaction and $\bar{X}_n = \frac{N}{N_o}$

7. For monodisperse polymer, number average and weight average molar mass is -
   a. Same
   b. Different
   c. Depends upon polymerization
   d. None of the above

8. $F_2C=CF_2$ is a monomer of

a. Nylon-6 b. PVC

c. Teflon d. PMMA

9. The polymer used in the non-stick utensils is -

a. PVC b. Bakelite

c. Novolac d. Teflon

10. 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)$r_1r_2 = 1$. (iv) $r_1= r_2= 0$

a. 1 and 2 are correct option b. 1, 2 and 3 are correct option

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

-- --- --

(Descriptive)

Time:1 hr. 15 mins. **Marks: 25**

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

1. **a.** How is chemiluminescence applied in glow stick technology? 3+2=5

   b. What is Weight average molecular weight? How it can be determined?

2. **a.** Describe the general mechanism by which photodynamic therapy destroys target cells. 4+2+2+2 =10

   b. What is photocatalysis? Give two examples of photocatalyst.

   c. Write two differences between excimer and exciplex quenching.

   d. What do you meant by spontaneous and stimulated emission?

3. **a.** What is the Stern–Volmer equation and how is it used in quenching studies? 3+4+1+2 =10

   b. What is Fluorescence Resonance Energy Transfer (FRET)?Define the Förstercritical distance (R_0) in the context of FRET.

   c. Write the Einstein relations between the A and B coefficients.

   d. Explain the mechanism of E-type (triplet-triplet annihilation) delayed fluorescence.

4. **a.** What are thermoplastic and thermosetting plastics? Give examples. What are the advantages of thermosetting plastics over thermoplastics? 3+3+2+2

   b. An equal number of protein mixture containing hemoglobin 15.5 kg/mol, Ribonuclease 13.7 kg/mol, myoglobin 17.2 kg/mol. Calculate mass average and weight average molecular weight. Also, calculate the polydispersity index value.

c. What is Molecular weight distribution? Explain the Molecular weight distribution with help of a curve?

d. What are the advantages of natural polymers over synthetic polymers? What are challenges faced by the natural polymer based composites?

5. a. What is end group analysis? Why it is important to study for the polymer? What are the techniques used to determine the end group? 3+2+ 3+2

b. Write the mechanism of anionic polymerisation reaction?

c. Derive the Carothers Equation for polymerisation reaction? What is the importance of this reaction?

d. Write the types of Copolymerization based on the copolymer equation?

= = *** = =