

M.SC. CHEMISTRY
SECOND SEMESTER
PHYSICAL CHEMISTRY-II
MSC - 203

**SET
B**

[USE OMR FOR OBJECTIVE PART]

Duration: 1:30 hrs.

Full Marks: 35

Time: 15 mins.

(Objective)

Marks: 10

Choose the correct answer from the following:

$1 \times 10 = 10$

1. 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 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
2. Which type of polymers cannot be recycled
a. Thermoplasts b. Thermosets
c. Elastomers d. All polymers
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 statement is not true
a. Polymers are never completely crystalline b. Polymers contains crystalline regions with amorphous regions together.
c. Some polymers may be completely amorphous. d. Some polymers are 100% crystalline in nature
5. Which of the following phenomenon is the fastest one?
a. Fluorescence b. Phosphorescence
c. Intersystem Crossing d. None of the above

5. The correct form of Carothers Equation is

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

a. functionality, p is extent of reaction

$$\text{and } \bar{X}_n = \frac{N_o}{N}$$

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

c. functionality, p is extent of reaction

$$\text{and } \bar{X}_n = \frac{N_o}{N}$$

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

b. functionality, f is extent of reaction

$$\text{and } \bar{X}_n = \frac{N}{N_o}$$

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

d. functionality, f is extent of reaction

$$\text{and } \bar{X}_n = \frac{N}{N_o}$$

7. The ground state multiplicity of C is -

a. Singlet

b. Doublet

c. Triplet

d. Quartet

8. Which of the following is a radiative process?

a. Fluorescence

b. Internal Conversion

c. Intersystem Crossing

d. None of the above

9. Fluorescence involves which of the following transitions?

a. S_0-S_1

b. S_0-T_1

c. T_0-S_1

d. S_1-S_0

10. Which of the following transition is forbidden?

a. Singlet-triplet

b. Singlet-singlet

c. Triplet-triplet

d. Quintet-quintet

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(Descriptive)

Time : 1 hr. 15 mins.

Marks : 25

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

1. a. State the law of photochemical equivalence. 2+2+1
b. What is Polydispersity Index of a polymer sample? Which information can be obtained from the polydispersity index value?
c. How Mark Houwink equation is related to intrinsic viscosity of a polymer.

2. a. Draw the Jablonski Diagram and state the difference between internal conversion and intersystem crossing. 3+2+2+3
=10
b. Why phosphorescence is considered as forbidden process?
c. What is delayed fluorescence?
d. Explain Chemiluminescence. How is it different from Bioluminescence?

3. a. What do you mean by quenching? What are its types? 4+2+2+2
=10
b. What do you mean by multiplicity? State the ground state multiplicity of O₂ molecule.
c. How photodynamic therapy can be employed for cancer treatment?
d. Explain Beer-Lambert's law.

4. a. Differentiate between rubbers and plastics on the basis of intermolecular forces. 1+1+3+2
+2+1=10
b. Low density polythene and high density polythene, both are polymers of ethene but there is marked difference in their properties. Explain.

- c. 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. Calculate the polydispersity index for the polymer mixture described above.
- d. Write the importance of the end group analysis technique of a polymer? What are techniques used to determine the end group analysis of a polymer?
- e. What is Ziegler-Natta catalyst? Explain its applications.
- f. Write the mechanism of cationic polymerisation process?
5. a. What is an initiator used in polymerization reaction and write its importance? 1+3+2+3
+1=10
- b. Write the mechanism of Free radical polymerization process?
- c. Write the Carothers Equation and its importance.
- d. Under which condition, the copolymerization is said to be an ideal, alternating and block copolymer. Explain with the help of copolymer equation.
- e. Write a short-note on Biodegradable polymers.

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