

**B.SC. CHEMISTRY [HONOURS]
SEVENTH SEMESTER
PHYSICAL CHEMISTRY V
BSC – 704
[USE OMR FOR OBJECTIVE PART]**

2025/12

**SET
A**

Duration: 1:30 hrs.

Full Marks: 35

Time: 15 mins.

Marks: 10

(Objective)

Choose the correct answer from the following:

1×10=10

- The correct option representing a Freundlich adsorption isotherm is
 - $\frac{x}{m} = k p^{0.3}$
 - $\frac{x}{m} = k p^{2.5}$
 - $\frac{x}{m} = k p^{0.5}$
 - $\frac{x}{m} = k p^{-1}$
- Freundlich adsorption isotherm is given by the expression $x/m = kp^{1/n}$, which of the following conclusions can be drawn from this expression
 - When $1/n = 1$, the adsorption is directly proportional to pressure
 - When $1/n = 1$, the adsorption is independent of pressure
 - When $n = 0$, plot of x/m vs p is a curve
 - None of the above
- Micelle formations is accompanied by the
 - Decrease in overall entropy due to ordering
 - Increase in overall entropy mostly due to increase in solvent entropy
 - Increase in overall entropy mostly due to increase in solute entropy
 - Increase in overall entropy mostly and decrease in enthalpy
- Which of the following options are correct?
 - Micelle formation by soap in aqueous solution is possible at all temperatures.
 - Micelle formation by soap in aqueous solution occurs above a particular concentration.
 - On dilution of soap solution micelles may revert to individual ions.
 - Soap solution behaves as a normal strong electrolyte at all concentrations.
 - (i) and (ii) are Correct option
 - (ii) and (iii) are Correct option
 - (i), (ii) and (iii) are Correct option
 - All are correct
- Which isotherm is applicable for multilayer adsorption process
 - Freundlich adsorption isotherm
 - Langmuir adsorption isotherm
 - BET isotherm
 - All of the above
- The rate constant according to collision theory is directly proportional to:
 - Temperature
 - Collision frequency
 - Collision diameter
 - Activation energy

7. The main limitation of collision theory is
- a. It ignores molecular orientation
 - b. It assumes all collisions are effective
 - c. It applies only to gases
 - d. All of these
8. In Michaelis-Menten kinetics, the rate is proportional to
- a. $[E]$
 - b. $[S]$
 - c. Both $[E]$ and $[S]$ at low substrate concentrations
 - d. Independent of $[S]$
9. The flow method for fast reactions relies on
- a. Mixing reactants rapidly
 - b. Applying high temperature
 - c. Flash irradiation
 - d. Pressure relaxation
10. Flash photolysis is based on
- a. Thermal excitation
 - b. Electric discharge
 - c. Short intense light pulse
 - d. Mechanical impact

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(Descriptive)

Time : 1 hr. 15 mins.

Marks : 25

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

1. a. Write about the micelle, critical micelle concentration and Kraft temperature? 3+2=5
b. Write the Arrhenius equation and explain the meaning of each term.

2. a. Write the equation for multilayer adsorption process. 1+2+2+2
b. Write the Limitations of Freundlich adsorption isotherm. +2+1=10
c. Write the Freundlich Adsorption Isotherm equation for adsorption from solution.
d. What is Capillary action? Why it occurs?
e. Write the Young-Laplace equation and its importance?
f. Why the shape of liquid drop is spherical?

3. a. What are surfactants? Write about Zwitterionic surfactants and their applications. 2+2+2+2
b. Soap contains which type of surfactant? Explain their structure and properties. +2=10
c. What is reverse micelle? Write the applications of reverse micelle?
d. A gas is known to satisfy Langmuir isotherm when adsorbed on a certain metal surface. If the fractional coverage of the gas is 0.5 when the gas pressure is 1.0 Pa, then, calculate the fractional coverage at 3.0 Pa.
e. Name two devices or instruments which are mainly used for measuring surface tension.

4. a. Derive the Eyring equation from transition state theory. 3+3+3+1
b. Discuss the principle and applications of flash photolysis in studying fast reactions. =10

c. For a 1st order homogeneous gaseous reaction $A \rightarrow 2B + C$, the initial pressure was P_i while the total pressure after time 't' was P_t . Write the expression for rate constant.

d. Write the unit of rate for a 2nd order reaction.

5. a. The rate constant of a reaction doubles when temperature increases from 298 K to 308 K. Calculate the activation energy.
b. Derive the Michaelis-Menten equation for enzyme catalysis and plot the graph between r vs. $[S]$.
c. Write the postulates of Collision Theory.

3+5+2
=10

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