2025

(FYUGP)

(4th Semester)

CHEMISTRY

(MINOR)

Paper : CHEM.M–4 (T)

(Physical Chemistry—II : Phase Equilibria and Chemical Kinetics)

Full Marks : 75 *Pass Marks* : 40%

Time : 3 hours

(PART : B—DESCRIPTIVE)

(*Marks* : 50)

The figures in the margin indicate full marks for the questions

1. *(a)* What is a phase diagram? Define the term 'component'. 2+1=3

(b) Write the desilverization of argentiferous lead. 3½

(c) Discuss the phase diagram of sulphur system. 3½

OR

2. *(a)* Derive Gibbs' phase rule from thermodynamics consideration. 4

(b) Discuss the phase diagram of ferric chloride-water system. 4

(c) Write a note on metastable equilibrium. 2

3. *(a)* Derive an expression for rate constant of a first-order reaction. 3

(b) What is meant by half-life period of a reaction? Prove that half-life of a first-order reaction does not depend on the initial concentration of reactant. 1+3=4

(c) Derive the integrated rate law for first-order reaction. 3

OR

4. *(a)* Discuss the limitations of collision theory. 3

(b) What do you understand by pseudo-order reaction? Discuss with suitable example. 1+2=3

(c) Write short notes on the following : 2×2=4

(i) Transition state theory on reaction rate

(ii) Parallel reaction

5. *(a)* Explain hydrogenation of ethene (ethylene) in presence of nickel. 2

(b) What is acid-base catalysis? Give example. 2

(c) Write some characteristics of enzyme catalysis. 3

(d) What are the functions of catalytic promoter and inhibitor in chemical reactions? 3

OR

6. *(a)* Define catalyst. Explain the types of catalyst with suitable example. 1+3=4

(b) Write a note on the poisoning of catalyst. Give example. 2

(c) Discuss the theories of catalysis. 3

(d) Define negative catalysis. 1

7. *(a)* What are colloids? Discuss the difference between lyophilic sols and lyophobic sols. 1+3=4

(b) Discuss the preparation of sols by Bredig's arc method. 2

(c) Discuss in detail the application of adsorption. 2

(d) Write some characteristic features of adsorption of gases by solid. 2

OR

8. (a) Derive Freundlich adsorption isotherm. 3

(b) Write an application on adsorption. 3

(c) Discuss on Langmuir's adsorption isotherm. 4

9. (a) Define rate constant of a reaction. Calculate the unit of rate constant for zero-, first- and second-order reactions. 1+3=4

(b) Explain the effect of the particles size and efficiency of nanoparticles as catalyst. 3

(c) Determine the order of reaction using half-life period. 3

OR

10. (a) Discuss the collision theory of bimolecular reaction. What are the limitations of this theory? 2+2=4

(b) Explain the phase diagram of water system. 3

(c) Write a note on acid-base catalysis. 3

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Subject Code : Bs/CHEM.M–4 (T)

Booklet No. A 90

Date Stamp .....

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To be filled in by the Candidate

BA / BSc / BCom / BBA / BCA 4th Semester End Term Examination, **2025 (FYUGP)**

Subject .....

Paper .....

INSTRUCTIONS TO CANDIDATES

1. **The Booklet No. of this script should be quoted in the answer script meant for descriptive type questions and vice versa.**
2. **This paper should be ANSWERED FIRST and submitted within 1 (one) Hour of the commencement of the Examination.**
3. **While answering the questions of this booklet, any cutting, erasing, over-writing or furnishing more than one answer is prohibited. Any rough work, if required, should be done only on the main Answer Book. Instructions given in each question should be followed for answering that question only.**

To be filled in by the Candidate

BA / BSc / BCom / BBA / BCA 4th Semester End Term Examination, **2025 (FYUGP)**

Roll No. .....

Regn. No. .....

Subject .....

Paper .....

DESCRIPTIVE TYPE

Booklet No. B .....

Signature of Scrutiniser(s)

Signature of Examiner(s)

Signature of Invigilator(s)

/425

2025

(FYUGP)

(4th Semester)

CHEMISTRY

(Minor)

Paper : CHEM.M–4 (T)

(Physical Chemistry—II : Phase Equilibria and Chemical Kinetics)

(PART : A—OBJECTIVE)

(*Marks* : 25)

The figures in the margin indicate full marks for the questions

Put a Tick (✓) mark against the correct answer in the brackets provided : 1×12=12

1. A system containing liquid water and water vapour has the number of phases equal to

(a) 0 ( )

(b) 1 ( )

(c) 2 ( )

(d) 3 ( )

2. At a triple point, the number of phases in equilibrium is

(a) 0 ( )

(b) 1 ( )

(c) 2 ( )

(d) 3 ( )

3. For one-phase and one-component system, the degree of freedom is equal to

(a) 1 ( )

(b) 2 ( )

(c) 3 ( )

(d) 4 ( )

4. Which three factors affect the rate of a chemical reaction?

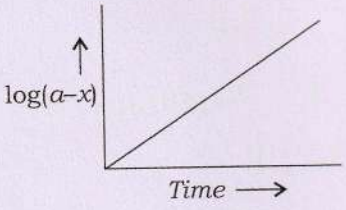
(a) Temperature, pressure and humidity ( )

(b) Temperature, reactant concentration and catalyst ( )

(c) Temperature, reactant concentration and pressure ( )

(d) Temperature, product concentration and container volume ( )

5. The nature of plot of first-order reaction is

(a) 

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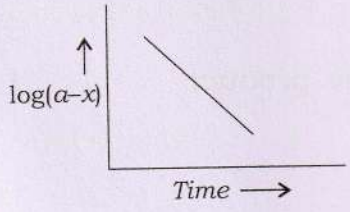
(b) 

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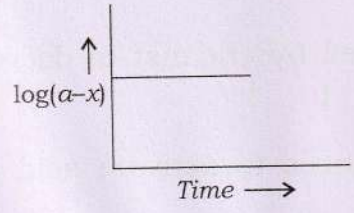
(c) 

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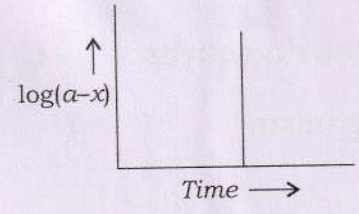
(d) 

( )

6. As temperature increases, the reaction rate

(a) decreases then increase ( )

(b) decreases ( )

(c) increases ( )

(d) stays the same ( )

7. A catalyst will affect the rate of the forward reaction by changing the

(a) activation energy ( )

(b) heat of reaction ( )

(c) heat of formation ( )

(d) potential energy of the product ( )

8. Enzymes are

(a) substances synthesized by chemist to decrease the reaction rate ( )

(b) highly porous substances to activate acid and bases ( )

(c) extremely poor in catalytic activity ( )

(d) catalysts found in organism ( )

9. The type of reaction in which one of the products itself acts as a catalyst is known as

(a) negative catalysis ( )

(b) enzyme catalysis ( )

(c) positive catalysis ( )

(d) auto-catalysis ( )

10. _____ does not show Tyndall effect.

(a) True solution ( )

(b) Colloidal solution ( )

(c) Suspension ( )

(d) None of the above ( )

11. Fog is an example of colloidal system of

(a) liquid dispersed in a liquid ( )

(b) solid dispersed in a solid ( )

(c) gas dispersed in a liquid ( )

(d) liquid dispersed in a gas ( )

12. Freundlich isotherm is not applicable at

(a) high pressure ( )

(b) low pressure ( )

(c) 273 K ( )

(d) room temperature ( )

Fill in the blanks of the following : 1×3=3

13. Chemisorption generally ..... with temperature.

14. For one-component system, at triple point the number of degrees of freedom is

..... .

15. In lyophobic sols, the dispersed phase has no

..... for the medium or solvent.

Answer the following questions in short : 2×5=10

1. Define molecularity of a reaction. Give example.

2. Define degrees of freedom.

3. What is promoter? Give example.

4. Differentiate between chemical adsorption and physical adsorption.

5. Write a note on electrophoresis.

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