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Reg. No. :

Code No. : 20374 E Sub. Code : EMCH 53

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2025.

Fifth Semester

Chemistry — Core

PHYSICAL CHEMISTRY – I

(For those who joined in July 2023 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.:

- Using the equation $\Delta G = \Delta H - T\Delta S$, say when will be a reaction spontaneous?
 - when $\Delta H - T\Delta S$
 - when T is very high
 - when ΔH is positive and $T\Delta S$ is negative
 - when T is very low

- Chemical potential is
 - Extensive property
 - Intensive property
 - Colligative property
 - All of these
- Unit of first order reaction is
 - mol sec^{-1}
 - $\text{mol}^{-1} \text{sec}^{-1}$
 - sec^{-1}
 - mol sec
- On which factors the rate constant of a reaction does not depend upon _____.
 - temperature
 - activation energy
 - catalyst
 - concentration of reactants and products
- In the Haber process for the manufacture of ammonia, the following catalyst is used.
 - Pt
 - Fe/Mo
 - Cu_2O_2
 - Al_2O_3

6. The phenomenon of concentration of molecules of a gas (or) liquid at a solid surface is called _____.
- (a) Absorption (b) Adsorption
(c) Sorption (d) None of these
7. The phenomenon of changing colloidal state to a suspended state is known as _____ of colloidal solution.
- (a) Zeta potential (b) coagulation
(c) dialysis (d) suspension
8. _____ are colloidal systems in which dispersed phase as well as dispersion medium are normally liquids.
- (a) Sol (b) Aerosol
(c) Emulsion (d) Gel
9. The dissociation of hydrogen molecule in presence of mercury vapour is an example for _____ reaction.
- (a) Fluorescence
(b) Phosphorescence
(c) Photosensitized
(d) Thermal

10. Which of the following is an example of photochemical reaction _____.
- (a) Formation of NaOH
(b) Decomposition of HCl
(c) Photosynthesis
(d) Decomposition of ammonia

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Derive an expression for variation of free energy change with temperature and pressure.
- Or
- (b) Discuss the various conditions of equilibrium and spontaneity.
12. (a) What are the characteristics of second order reactions?
- Or
- (b) Write short notes on the failure of collision theory.

13. (a) Differentiate between physical adsorption and chemical adsorption.

Or

(b) What is heterogeneous catalysis? Explain with examples.

14. (a) Summarize about the term associated colloids.

Or

(b) Differentiate between electro-osmosis and electrophoresis.

15. (a) Discuss the absorption of light by photochemical reactions.

Or

(b) State the laws of photochemistry.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Derive Gibbs-Helmholtz equation (i) At constant pressure and (ii) At constant volume and state its uses.

Or

(b) Derive an expression for the variation of chemical potential in terms of pressure and temperature.

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17. (a) Describe the Arrhenius equation. Give its merits.

Or

(b) Derive expressions for the rate constant and half-life period of a third order reaction of the type $3A \rightarrow P$.

18. (a) Describe the kinetics of enzyme catalysis.

Or

(b) Discuss in detail about Freundlich adsorption isotherm.

19. (a) Give an account on the application of colloids.

Or

(b) Summarize about the types of colloids.

20. (a) Discuss the $H_2 - Cl_2$ kinetics of photochemical reaction.

Or

(b) Write short notes on :

(i) Chemiluminescence and

(ii) Fluorescence.

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