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Reg. No. :

Code No. : 20323 E Sub. Code : CMCH 52

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

Fifth Semester

Chemistry — Core

PHYSICAL CHEMISTRY II

(For those who joined in July 2021 and 2022 only)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The change in enthalpy is represented as

- (a) ΔS (b) ΔE
(c) ΔH (d) ΔG

2. Inversion temperature T_i is

- (a) $\frac{2a}{Rb}$ (b) $\frac{2b}{Ra}$
(c) $\frac{2R}{ab}$ (d) $\frac{2ab}{R}$

3. Gibb's free energy equation

- (a) $\Delta G = \Delta H$ (b) $\Delta G = T\Delta H$
(c) $\Delta G = \Delta H - T\Delta S$ (d) None of the above

4. For a reversible process

- (a) $\Delta G > 0$ (b) $\Delta G = 0$
(c) $\Delta G < 0$ (d) $\Delta G > \Delta H$

5. The mathematical form of phase rule is

- (a) $F + P = C + 2$ (b) $F + P = C - 2$
(c) $F - P = C + 2$ (d) $F - P = C - 2$

6. Lewis acid

- (a) NH_3 (b) BF_3
(c) F^- (d) H_2O

7. The unit of cell constant is

- (a) cm^2 (b) cm^3
(c) cm^{-2} (d) cm^{-1}

8. Kohlrausch's law is

- (a) $\lambda = \frac{\lambda}{\lambda^\circ}$ (b) $t_+ \lambda^\circ = \lambda_+$
(c) $\lambda_+ = \lambda^\circ - \lambda_-$ (d) None of these

9. CO_2 is a _____ molecule.

- (a) Linear (b) Spherical
(c) Symmetric top (d) Asymmetric

10. The number of vibrational modes in a nonlinear triatomic molecule is

- (a) 2 (b) 3
(c) 4 (d) 5

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Explain Joule-Thomson effect and its significance.

Or

- (b) Explain Inversion temperature.

12. (a) Derive Gibb's-Helmholtz equation.

Or

- (b) Derive Gibb's Duhem Equation and write its application.

13. (a) What is common ion effect? Write any two of its applications.

Or

- (b) What is a buffer solution? Explain the buffer action of a basic buffer solution.

14. (a) Describe the method for the determination of Transport number.

Or

- (b) State Wein's effect and explain.

15. (a) Write the differences between IR and Raman Spectra.

Or

- (b) What is Raman effect? Explain.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Derive the relationship between C_p and C_v .

Or

- (b) Derive $G_{J,T} = \frac{1}{C_p} \left[\frac{2a}{R_T} - b \right]$.

17. (a) Derive Clausius – Clapeyron equation, and write its application.

Or

- (b) Explain chemical potential and write its significance.

18. (a) Explain KI- H_2O system.

Or

- (b) Explain solubility product and write any two applications of it.

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19. (a) Discuss any two types of conductometric titrations with suitable graphs.

Or

- (b) Explain Debye-Huckel theory of strong electrolytes.

20. (a) Describe the principles and applications of IR spectroscopy.

Or

- (b) Explain Frank Condon principle.
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