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Reg. No. :

Code No. : 20062 E Sub. Code : CMCH 52

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 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 heat capacity at constant volume

(a) $C_v = \left(\frac{\partial E}{\partial T}\right)_v$ (b) $C_v = \left(\frac{\partial E}{\partial t}\right)_p$

(c) $C_v = \left(\frac{\partial H}{\partial T}\right)_v$ (d) $C_v = \left(\frac{\partial H}{\partial T}\right)_p$

2. For an ideal gas $\mu_{J,T}$

- (a) +ve (b) -ve
(c) 0 (d) Infinity

3. Helmholtz free energy A is

- (a) $A = E + TS$ (b) $A = E - TS$
(c) $A = H + TS$ (d) $A = H - TS$

4. Gibbs-Duhem equation is

- (a) $d\mu_1 = -\frac{n_2}{n_1} d\mu_2$ (b) $d\mu_1 = d\mu_2$
(c) $d\mu_1 = -\frac{n_2}{n_1}$ (d) None of the above

5. Freezing mixture

- (a) $\text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$ (b) $\text{FeCl}_3 + \text{H}_2\text{O}$
(c) $\text{NaCl} + \text{H}_2\text{O}$ (d) $\text{NaCl} + \text{ICl}$

6. pH scale is

- (a) 0-14 (b) 0-10
(c) 1-15 (d) 1-14

7. Conductance C is
- (a) $C = \frac{l}{a}$ (b) $C = \frac{1}{R}$
 (c) $C = k \times v$ (d) none of the above
8. The relation between k and \wedge is given by the equation
- (a) $\wedge = 1000 k$ (b) $\wedge = \frac{k \times 1000}{c}$
 (c) $\wedge = \frac{1}{k}$ (d) $\wedge = k\lambda$
9. Selection rule for rotational spectra
- (a) $\Delta J = \pm 1$ (b) $\Delta V = \pm 1$
 (c) $\Delta J = 0$ (d) $\Delta V = 0$
10. What is the name of lines obtained when the Raman frequency value is negative?
- (a) Antistokes lines
 (b) Stokes lines
 (c) Polarization lines
 (d) Polarization bands

PART B — (5 × 5 = 25 marks)

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

Answer should not exceed 250 words.

11. (a) Write the differences between reversible and irreversible processes.
- Or
- (b) Derive Kirchoff's equation.
12. (a) Write the differences between Gibb's free energy and Helmholtz free energy.
- Or
- (b) Write short notes on fugacity and its significance.
13. (a) Explain Ferric Chloride-Water system.
- Or
- (b) What are Buffer solutions? Illustrate the types of Buffer solutions.

14. (a) What is Transport number? Explain the moving boundary method for its determination.

Or

(b) Explain Debye-Falkenhagen effect.

15. (a) How will you determine bond length using rotational spectrum?

Or

(b) Explain the types of molecular vibrations.

PART C — (5 × 8 = 40 marks)

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

Answer should not exceed 600 words.

16. (a) Describe the types of systems in thermodynamics.

Or

(b) Explain Hess's law of constant heat summation.

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17. (a) Derive Clapeyron equation.

Or

(b) Explain activity.

18. (a) Explain the phase diagram of water system.

Or

(b) Derive Henderson equation for an acid buffer.

19. (a) State Kohlrausch's law and explain the applications.

Or

(b) Write notes on :

(i) Asymmetric effect

(ii) Electrophoretic effect.

20. (a) Write the differences between Raman spectra and IR spectra.

Or

(b) Explain Frank-Condon principle.

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