

(6 pages)

Reg. No. : _____

Code No. : 20324 E Sub. Code : AMCH 62

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2023.

Sixth Semester

Chemistry — Core

PHYSICAL CHEMISTRY – III

(For those who joined in July 2020 only)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

- The number of vibrational modes in a nonlinear triatomic molecule is
(a) 2 (b) 3
(c) 4 (d) 5
- Selection rule for rotational spectra
(a) $\Delta J = \pm 1$ (b) $\Delta J = \pm 1$
(c) $\Delta J = 0$ (d) $\Delta J = 0$

8. Arrhenius equation is

- (a) $K = A e^{-E_a/RT}$ (b) $K = A e^{E_a}$
(c) $K = A e^{E_a/RT}$ (d) $K = A e^{1/RT}$

9. Freundlich adsorption isotherm is

- (a) $x/m = p^n$ (b) $x/m = p^{1/n}$
(c) $x/m = kp^h$ (d) $x/m = kp^{1/n}$

10. Addition of a small amount of sodium chloride to the phenol-water system

- (a) Increases the CST
(b) decreases the CST
(c) Does not alter the CST
(d) Increases the freezing point of the mixture

PART B — (5 × 5 = 25 marks)

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

11. (a) Write and explain Born-Oppenheimer approximation.

Or

(b) Explain the types of molecular vibrations.

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3. What is the name of the lines obtained when the Raman frequency value is negative.

- (a) Antistokes lines (b) Stokes lines
(c) Polarization lines (d) Polarization bands

4. ESR spectra is observed in

- (a) Radio frequency region
(b) Microwave region
(c) (a) and (b)
(d) None of the above

5. Point group of H_2O is

- (a) C_{2v} (b) S_2
(c) C_{3v} (d) C_2

6. Point group of BF_3 molecule is

- (a) D_{3h} (b) C_{2v}
(c) T_d (d) O_h

7. The unit of first order reaction rate constant is

- (a) $lit\ mol^{-1}$ (b) sec^{-1}
(c) $(mol\ lit)^{-1} time^{-1}$ (d) $mol\ lit^{-1}$

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12. (a) Write the Differences between Raman spectra and IR spectra.

Or

(b) What is chemical shift in NMR? Describe the factors influencing chemical shift.

13. (a) Explain symmetry elements and symmetry operations.

Or

(b) Explain the character table for C_{2v} point Group.

14. (a) Differentiate order of a chemical reaction from molecularity.

Or

(b) Explain graphical method for the determination of order of a reaction in case of a first order and second order reactions.

15. (a) Write the differences between physisorption and chemisorption.

Or

(b) Explain Azeotropic Distillation.

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[P.T.O.]

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Explain Rotational spectra.
Or
(b) What are the factors affecting vibrational frequency?
17. (a) (i) Explain Hyperfine splitting in ESR with example.
(ii) Write the applications of NMR.
Or
(b) Explain the principle and applications of IR spectroscopy.
18. (a) Explain plane of symmetry with example.
Or
(b) Explain the Improper rotational axis.
19. (a) Describe the Lindemann theory of unimolecular reaction.
Or
(b) How will you determine the order of reactions by Half life method?

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20. (a) Write the applications of Adsorption.

Or

- (b) What is CST? Discuss about phenol water system.

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