(6 pages) **Reg. No. :** .....

Code No. : 20065 E **Sub. Code : AMCH 62**

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

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 :

1. Which one of the following is true in electronic spectroscopy?

   (a) $\Delta S = 0$ (b) $\Delta l = \pm 1$

   (c) (a) and (b) (d) $\Delta l = +1$

2. The finger point region in IR spectroscopy involves

   (a) 600 – 1400 cm^{-1} (b) 500 – 1300 cm^{-1}

   (c) 400 – 1400 cm^{-1} (d) 500 – 1500 cm^{-1}

3. Raman spectroscopy calculates

   (a) absolute frequency (b) relative frequency

   (c) frequency factor (d) chemical shift

4. The decreasing in the nucleus force of attraction on valence exactors in the inner shells is known as

   (a) Shield effect (b) Screening effect

   (c) (a) and (b) (d) Coupling constant

5. Which one of the following is an action that leaves an object looking the same after it has been carried out?

   (a) identity element

   (b) cyclic group

   (c) abelian group

   (d) improper rotational axis of symmetry

6. H_2O molecule belongs to the

   (a) C_3V (b) C_2V

   (c) $C_\infty V$ (d) C_4V

7. Decomposition of N_2O_5 is belongs to

(a) 2nd order reaction

(b) First order reaction

(c) Zero order reaction

(d) Pseudo chi molecular reaction

8. Which one of the following represents the frequency of collisions between reactant molecules as a standard concentration?

(a) Activation energy

(b) Arrehnius equation

(c) Lindemann theory constant

(d) Arrehnius frequency factor

9. Dichlorofluorescein is related with

(a) Raoult's law

(b) Adsorption indicators

(c) Azeotropic mixture

(d) Binary liquid mixture

10. Benzene-toluene is an example for

(a) Ideal solution (b) Non-ideal solution

(c) BET isotherm (d) Liquid crystals

PART B — (5 × 5 = 25 marks)

Answer ALL questions by choosing (a) or (b).
Each answer should not exceed 250 words.

11. (a) What are the types of transitions in molecules?

Or

(b) Explain the determination of force constant.

12. (a) Differentiate IR spectroscopy from Raman spectroscopy.

Or

(b) Discuss on the selection rules and applications of raman spectroscopy.

13. (a) Write a note on planes of symmetry and type of planes.

Or

(b) Explain: group multiplications tables.

14. (a) Write a note on third order reactions.

Or

(b) Explain: The activation energy.

15. (a) List out the applications of adsorption.

Or

(b) Discuss on critical solution temperature

PART C — (5 × 8 = 40 marks)

Answer ALL questions by choosing (a) or (b).
Each answer should not exceed 600 words.

16. (a) Explain the following: (i) Effect of isotopic substitution (ii) Selection rules for electronic spectra.

Or

(b) (i) Describe on born oppenheimer approximation.

(ii) Define finger print region Born-Oppenheimer.

17. (a) (i) Describe on various modes of nuclear spin relaxation process.

(ii) Define chemical shift.

Or

(b) (i) Explain energy levels in ESR spectroscopy.

(ii) Write the applications of zero field splitting.

18. (a) (i) Explain Groups and their basic properties.

(ii) Define with example improper rotational axis of symmetry.

Or

(b) (i) Explain Abelian and cyclic groups.

(ii) Classification of molecules into point groups.

19. (a) (i) Differentiate order from molecularity.

(ii) What are the factors influencing the rate of a reaction?

Or

(b) Explain The theory of absolute reaction rate.

20. (a) Describe on the statement and explanation of BET isotherm.

Or

(b) Write a detailed note on liquid crystals.

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