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Reg. No. :

Code No. : 20065 E Sub. Code : CMCH 63

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

Sixth Semester

Chemistry — Core

PHYSICAL CHEMISTRY – III

(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. Voltaic cell is also known as _____.
- (a) Galvanic cell
 - (b) Daniel cell
 - (c) Fuel cell
 - (d) $H_2 - O_2$ cell

2. The site of reduction in an electrochemical cell is _____.

- (a) anode
- (b) cathode
- (c) electrolyte solution
- (d) salt bridge

3. Which of the following can change the value of equilibrium constant for a given reaction?

- (a) Changing the concentration of the reactant
- (b) Adding catalyst
- (c) Removing the products as they are formed
- (d) Changing the solvent

4. Chemisorption generally _____ with temperature.

- (a) decreases
- (b) increases
- (c) remains constant
- (d) reversed

5. The unit for first order rate constant is _____.
- (a) s (b) M
(c) s^{-1} (d) K
6. Species that are formed in one step of the reaction mechanism and used up in another step are called _____.
- (a) catalysts
(b) intermediates
(c) inhibitors
(d) activated complexes
7. Ammonia molecule belongs to _____ point group.
- (a) C_2 (b) C_{2v}
(c) C_{3v} (d) C_{2h}
8. The angle of rotation for C_3 axis of symmetry is _____.
- (a) 180° (b) 120°
(c) 90° (d) 60°

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9. How many types of protons are present in acetone molecule?
- (a) 6 (b) 3
(c) 1 (d) 10
10. The ESR spectrum of hydrogen radical contains _____ peaks.
- (a) 1 (b) 2
(c) 3 (d) 4

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) What are amperometric titrations? Explain their applications.
- Or
- (b) What are reversible and irreversible cell? Give examples.
12. (a) Write Hammett equation. Give its significance.
- Or
- (b) Explain the characteristics of physical and chemical adsorption.

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13. (a) What is Arrhenius equation? Give its significance.

Or

- (b) Tabulate the factors affecting the rate of a chemical reaction.

14. (a) What is plane of symmetry? Explain different types of planes in a molecule with suitable example.

Or

- (b) Write matrix representation for following symmetry elements: E , C_2 and i .

15. (a) Discuss the applications of NQR spectroscopy.

Or

- (b) Analyze the factors affecting the value of chemical shift in the proton NMR spectroscopy.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Discuss any two applications of EMF measurements.

Or

- (b) What are fuel cell? Write the principle and working of hydrogen-oxygen fuel cell.

17. (a) Apply Le Chatelier's principle to explain the formation of ammonia.

Or

- (b) Write BET adsorption isotherm equation. Apply BET equation to determine the surface area of an adsorbent.

18. (a) What is second order reaction? Give an example. Write the rate equation and characteristics of second order reaction.

Or

- (b) Explain any two method for the determination of order of reaction.

19. (a) Discuss the classification of molecules based on point groups.

Or

(b) Construct the group multiplication table for C_{2v} point group.

20. (a) Draw and explain the ESR spectrum of methyl and benzene radicals.

Or

(b) Explain the principle and applications of proton NMR spectroscopy.
