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(FOR THE CANDIDATES ADMITTED DURING THE ACADEMIC YEAR 2023 ONLY)

SUB CODE 23PCY103

REG.NO. :

N.G.M.COLLEGE (AUTONOMOUS): POLLACHI

END-OF-SEMESTER EXAMINATION: NOVEMBER 2023

M.sc CHEMISTRY **MAXIMUM MARKS:75**

SEMESTER: I **TIME: 3 HOURS**

PHYSICAL CHEMISTRY-I-GROUP THEORY AND CHEMICAL KINETICS

SECTION – A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS. (K1)

1. Which of the following is a proper rotation axis of symmetry?

A) C2 B) σh C) i D) σv.

2. Which point group does the molecule NH_3 belong to?

A) C_{2V} B) C_{3V} C) Td D) D_{3h}

3. What is the term used to refer to the number of collisions per unit volume of the reaction mixture?

A) Collision force B) Collision frequency C) Collision energy D) Collision time period

4. In the reaction $2A + B \rightarrow A_2B$, if the concentration of A is doubled and that of B is halved, then the rate of the reaction will

A) Increase 2 times B) Increase 4 times C) Decrease 2 times D) Remain the same

5. Which among the following is an example of adsorption process.

A) Silica gel in contact with water vapours B) Misty windows C) Painting D) All of the above

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES (K2)

6. Define a group

7. Why are vibrational modes in NH_3 and H_2O molecules IR active?

8. Write the basic concept of Arrhenius theory?

9. Define fast reactions

10. Why do physisorption and chemisorption behave differently with rise in temperature?

SECTION – B (5 X 5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K3)

11. a) Describe the symmetry elements and symmetry operations with suitable examples.

(OR)

b) What is a point group, and how are point groups of simple molecules identified?

12. a) Illustrate reducible and irreducible representations with example.

(OR)

b) Construct the C_{2v} point group.

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13. a) Differentiate the classical and modified collision theory.

(OR)

b) Explain the types of salt effects and its signification.

14. a) Analyze the H_2-Br_2 thermal reaction**.**

(OR)

b) Discuss the pulse radiolysis technique.

15. a) Distinguish between the physisorption and chemisorption.

(OR)

b) How do you derive B.E.T. equation of multilayer adsorption?

SECTION – C (5 X 8 = 40 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.

(K4 (Or) K5)

16. a) Define a group and discuss its properties.

(OR)

b) Construct the character table of C_{3V} point group with example.

17. a) Explain the following (i) Hullal approximation (ii) Secular determinat.

(OR)

b) Illustrate the selection rule for IR and Raman spectra.

18. a) How will derive the rate of the equation by statistical mechanics?

(OR)

b) Elaborate the Lindeman's theory of unimolecular reactions.

19. a) Explain (i)Grunwald-Winstein equation (ii)H_2–Br_2thermal reaction.

(OR)

b) Discuss the experimental methods of fast reactions.

20. a) Describe ARRT of surface reactions

(OR)

b) Examine Gibbs adsorption isotherm.

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ETHICAL PAPER