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(FOR THE CANDIDATES ADMITTED DURING THE ACADEMIC YEAR 2022-23 ONLY)

SUBJECT CODE 22 PCY 103

REG.NO. :

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

END-OF-SEMESTER EXAMINATION: DECEMBER – 2022

M.Sc. – CHEMISTRY **MAXIMUM MARKS: 50**

I SEMESTER **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 belongs to the C_{3v} point group?

   a) SO_3 a) BBr_3 a) NH_3 a) $AlCl_3$

2. SO_2 belongs to which point group…….

   a) C_{2V} a) C_{3V} a) C_2 a) C_{2h}

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

   a) Collision energy c) 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?

   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. What is the difference between group and abelian group?
7. How many irreducible representations are there?
8. What is the basic concept of Arrhenius theory?
9. Define fast reactions
10. Why do physisorption and chemisorption behave differently with rise in temperature?

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SECTION – B (5 X 3 = 15 MARKS)

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

11. a) Describe the symmetry elements.

(OR)

b) Explain the types of groups.

12. a) Compare reducible and irreducible representations.

(OR)

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

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

(OR)

b) Examine the salt effect.

14. a) Analyze the H_2-Br_2 thermal reaction**.** Why is a low quantum field observed?

(OR)

b) Discuss the pulse radiolysis technique in study of fast reactions.

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 5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K4 (Or) K5)

16. a) Describe symmetry operations.

(OR)

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

17. a) Analyze secular determinant.

(OR)

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

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

(OR)

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

19. a) Explain Grunwald-Winstein equation

(OR)

b) Discuss the experimental methods for study of first reactions by shock tube technique.

20. a) Describe Langmur-Ridel mechanism.

(OR)

b) Examine Gibbs adsorption isotherm.

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