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Reg. No. :.....

Code No. : 20287 E **Sub. Code : JMCH 63/ SMCH 63**

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2021.

Sixth Semester

Chemistry — Core

PHYSICAL CHEMISTRY — IV

(For those who joined in July 2016 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

1. The selection rule for the rotational Raman Spectra of a linear molecule is

(a) $\Delta J = 0, \pm 1$ (b) $\Delta J = 0, \pm 2$

(c) $\Delta J = 0, \pm 1, \pm 2$ (d) $\Delta J = \pm 1$

2. How many signals will be obtained in the H-nmr of l-nitropropane?

(a) One (b) Two

(c) Four (d) Three

3. Rate constant of a reaction depends upon

(a) Speed of reaction

(b) Concentration of the reactants

(c) Pressure of the surrounding

(d) Temperature

4. The activation energy for a chemical reaction is dependent on

(a) Temperature

(b) Nature of reacting species

(c) Collision frequency

(d) Concentration of reactants

5. pH of a solution is 8.5, solution is

(a) amphoteric (b) neutral

(c) acids (d) basic

6. On dissolving sodium chloride in water pH of the solution

(a) decreases

(b) increases

(c) remains unchanged

(d) increase or decreases

7. Gibbs phase rule for general system _____.

(a) P + F = C – 1 (b) P + F = C + 1

(c) P + F = C – 2 (d) P + F = C + 2

8. The degree of freedom at triple point in unary diagram for water _____.

(a) 0 (b) 1

(c) 2 (d) 3

9. The size of nano particles is between _____ nm.

(a) 100 to 1000 (b) 0.1 to 10

(c) 1 to 100 (d) 0.01 to 1

10. Which of the following is an example of top-down approach for the preparation of nano materials?

(a) Gas phase agglomeration

(b) Molecular self-assembly

(c) Mechanical grinding

(d) Molecular beam epitaxy

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Explain Rayleigh and Raman Scattering.

Or

(b) Explain the base peak and meta stable peak.

12. (a) Explain what is meant by rate of a reaction. How is it expressed?

Or

(b) What is meant by zero order reaction? Describe giving examples.

13. (a) Calculate the pH of solution having hydrogen ion concentration $2.5 \cdot 10^{-3}$ M.

Or

(b) State and explain Ostwald dilution law.

14. (a) Explain the following terms :

(i) Phase

(ii) Degree of freedom

Or

(b) State and explain Nernst Distribution Law.

15. (a) Write a note on quantum dots and nano fibre.

Or

(b) Give the sol-gel method of preparation of nano materials.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) (i) Explain the mutual exclusion principle. (5)

(ii) What is chemical shift? (3)

Or

(b) Discuss the applications and limitations of NMR.

17. (a) Explain the Lindeman theory of unimolecular reaction.

Or

(b) Write Arrhenius equation for the effect of temperature on rate of reaction.

18. (a) The solubility of a salt of type AB_2 with mol mass 78 in water is 1.6×10^{-2} g lit^{-1} at 20° C. Calculate its solubility product.

Or

(b) Define the following with suitable example : (2 + 3 + 3)

(i) pH

(ii) Buffer solution

(iii) Common ion effect.

19. (a) Draw the labeled phase diagram of sulphur system and discuss its salient features.

Or

(b) How is distribution law modified when the solute undergoes association in one of the solvents?

20. (a) Give the preparation, properties and uses of CNT.

Or

(b) Write a note on the following :

(i) CVD method

(ii) Fullerenes.

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