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

Code No. : 10011 E **Sub. Code : SMCH 63**

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023.

Sixth Semester

Chemistry – Core

PHYSICAL CHEMISTRY – IV

(For those who joined in July 2017 – 2019 only)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. NMR spectra is studied in
   (a) UV region
   (b) Visible region
   (c) Radio frequency region
   (d) Microwave region

2. ESR spectrum is observed in the following region
   (a) Microwave (b) X-ray
   (c) IR (d) Raman region

3. Rate constant increases as temperature
   (a) Constant
   (b) Decreases
   (c) Increases
   (d) Increases or decreases

4. For first order reaction, $t_{1/2}$ = 69.3 sec. The value of rate constant is
   (a) 10^{-2} sec^{-1} (b) 10^{-4} sec^{-1}
   (c) 10 sec^{-1} (d) 10^{2} sec^{-1}

5. Ostwald's dilution law is applicable to
   (a) Strong electrolytes only
   (b) Weak electrolytes only
   (c) Strong and weak electrolytes
   (d) None of the mentioned

6. Among the given pairs given below which solution pair is a buffer solution?
   (a) KNO_3/K_2SO_4 (b) NH_4OH/HNO_3
   (c) $H_2SO_4/BaSO_4$ (d) NH_4Cl/NH_4OH

7. Phase rule is
   (a) F = C – P + 2 (b) F = C + P – 2
   (c) F = C – P + 1 (d) F = C + P + 2

8. In water phase diagram Triple point is the point where the number of degree of freedom is
   (a) 1 (b) 2
   (c) 3 (d) 0

9. Which one of the following statements is not true?
   (a) Gold at the nanoscale is red
   (b) Copper at the nanoscale is transparent
   (c) Silicon at the nanoscale is an insulator
   (d) Aluminium at the nanoscale is highly combustible

10. One nanometre is _____ metre.
    (a) 10^{-9} (b) 10^{-8}
    (c) 10^{-7} (d) 10^{-6}

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Explain the ESR spectrum of methyl radical.

    Or

    (b) What are the two factors affecting chemical shift?

12. (a) What is activation energy? Explain its significance.

    Or

    (b) Discuss the collision theory of reaction rates. Mention its defects.

13. (a) What is buffer solution? Explain the buffer action of an acidic buffer.

    Or

    (b) Explain the common ion effect.

14. (a) Explain the Phase diagram of Pb-Ag system.

    Or

    (b) Explain the Phase diagram of KI-H_2O system.

15. (a) What are quantum dots? Explain.

    Or

    (b) Explain the sol-gel method for the synthesis of nano particles.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) (i) Discuss the Principle involved in Raman spectroscopy.

    (ii) Discuss the Principles of ESR spectroscopy. How does it differ from NMR spectroscopy?

    Or

(b) (i) Sketch the low and high resolution NMR spectrum of ethanol.

(ii) ^{12}C does not give NMR spectra but ^{13}C NMR gives. Why?

17. (a) Deduce the rate expression for second order reaction where both the concentration terms are same. Derive the expression for half life period of this reaction.

Or

(b) Explain Lindemann hypothesis for unimolecular reactions.

18. (a) Write notes on :

(i) Ostwald's dilution law

(ii) Lewis acid-base concept.

Or

(b) Describe various indicators used in acid base titrations.

19. (a) (i) Derive the Phase rule thermodynamically.

(ii) Derive the distribution law thermodynamically.

Or

(b) (i) State the distribution law.

(ii) What are the applications of distribution law?

20. (a) (i) Explain about carbon nanotubes.

(ii) Explain the electrical properties of nanosized compounds.

Or

(b) (i) Applications of nanoscience.

(ii) Magnetic properties of nanosized compounds.

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