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CLASS 12

Chemistry

Sample Paper 3 - Questions

33 questions | 70 marks | 2026-27

Time: 3 hours. Answer all questions and subparts unless a choice is stated. Marks are shown on the right. Write answers on separate sheets. Independently prepared practice paper.

Section A - Objective questions

1. Which statement correctly describes Nucleophilic substitution? **1**

(A) A multidentate ligand binds through more than one donor atom to form rings.

(B) An element has an incomplete d subshell in its atom or a common ion under the definition.

(C) An OH group is directly attached to an aromatic ring.

(D) A nucleophile replaces a leaving group in a suitable substrate.

2. Which statement correctly describes Lanthanide contraction? **1**

(A) Atomic and ionic sizes generally decrease across the lanthanide series.

(B) A component's amount divided by total amount describes composition.

(C) A multidentate ligand binds through more than one donor atom to form rings.

(D) An element has an incomplete d subshell in its atom or a common ion under the definition.

3. Identify the term described by this statement: A multidentate ligand binds through more than one donor atom to form rings. **1**

(A) Colligative property

(B) Chelation

(C) Phenol

(D) Amine

4. Identify the term described by this statement: An OH group is directly attached to an aromatic ring. **1**

(A) Electrode potential
(B) First-order kinetics
(C) Peptide bond
(D) Phenol

5. Identify the term described by this statement: An element has an incomplete d subshell in its atom or a common ion under the definition. **1**

(A) Nucleophilic substitution
(B) Colligative property
(C) Transition element
(D) Aldehyde

6. Which statement correctly describes Electrode potential? **1**

(A) An organic nitrogen base can be related to ammonia by replacement of hydrogen with carbon groups.
(B) Rate is proportional to the first power of one reactant concentration in the simple law.
(C) An amide linkage joins amino-acid residues in a peptide.
(D) An electrode's reduction tendency is described relative to a reference.

7. Which statement correctly describes Coordination number? **1**

(A) An element has an incomplete d subshell in its atom or a common ion under the definition.
(B) The number of donor atoms directly attached to a central metal is counted.
(C) Rate is proportional to the first power of one reactant concentration in the simple law.
(D) Atomic and ionic sizes generally decrease across the lanthanide series.

8. Identify the term described by this statement: The effect depends on the number of dissolved particles under the stated model. **1**

(A) Chelation
(B) Colligative property
(C) Gibbs energy and emf
(D) Lanthanide contraction

9. Which statement correctly describes First-order kinetics? **1**

(A) The effect depends on the number of dissolved particles under the stated model.

(B) Rate is proportional to the first power of one reactant concentration in the simple law.

(C) A component's amount divided by total amount describes composition.

(D) A volatile component's partial pressure follows its mole fraction times pure-component vapour pressure in an ideal solution.

10. Which statement correctly describes Amine? **1**

(A) The effect depends on the number of dissolved particles under the stated model.

(B) An element has an incomplete d subshell in its atom or a common ion under the definition.

(C) An organic nitrogen base can be related to ammonia by replacement of hydrogen with carbon groups.

(D) An amide linkage joins amino-acid residues in a peptide.

11. Which statement correctly describes Peptide bond? **1**

(A) An electrode's reduction tendency is described relative to a reference.

(B) A terminal carbonyl group bears at least one hydrogen.

(C) The number of donor atoms directly attached to a central metal is counted.

(D) An amide linkage joins amino-acid residues in a peptide.

12. Identify the term described by this statement: A volatile component's partial pressure follows its mole fraction times pure-component vapour pressure in an ideal solution. **1**

(A) Raoult's law

(B) Gibbs energy and emf

(C) Aldehyde

(D) First-order kinetics

13. Which statement correctly describes Mole fraction? **1**

(A) A component's amount divided by total amount describes composition.

(B) Rate is proportional to the first power of one reactant concentration in the simple law.

(C) A volatile component's partial pressure follows its mole fraction times pure-component vapour pressure in an ideal solution.

(D) The number of donor atoms directly attached to a central metal is counted.

14. Which statement correctly describes Aldehyde? **1**

(A) An organic nitrogen base can be related to ammonia by replacement of hydrogen with carbon groups.

(B) A terminal carbonyl group bears at least one hydrogen.

(C) Atomic and ionic sizes generally decrease across the lanthanide series.

(D) An element has an incomplete d subshell in its atom or a common ion under the definition.

15. Identify the term described by this statement: A rate-related barrier separates reactants from a suitable activated configuration. **1**

(A) Amine

(B) Activation energy

(C) Colligative property

(D) Mole fraction

16. Which statement correctly describes Gibbs energy and emf? **1**

(A) For a reversible electrochemical cell, Gibbs energy change equals negative charge transfer times emf.

(B) A volatile component's partial pressure follows its mole fraction times pure-component vapour pressure in an ideal solution.

(C) An amide linkage joins amino-acid residues in a peptide.

(D) Atomic and ionic sizes generally decrease across the lanthanide series.

Section B - Short responses

17. A first-order reaction has half-life 1800 s. How long is required for 75 percent completion? **2**

18. Compare Chelation and Aldehyde. Give the meaning and an appropriate application of each. 2

19. A non-electrolyte solution has molality 2.4 mol/kg. If Kf = 2 K kg/mol and i = 1, calculate freezing-point depression. 2

20. Explain how the following example illustrates Raoult's law: Dilution changes a solvent's partial vapour pressure. 2

21. The cathode reduction potential is 0.80 V and anode reduction potential is -2.5 V. Calculate cell emf. 2

Section C - Short responses

22. Compare First-order kinetics and Activation energy. Give the meaning and an appropriate application of each. 3

23. 432 g glucose (180 g/mol) dissolves in 1 kg water. Calculate molality. 3

24. Compare Nucleophilic substitution and Activation energy. Give the meaning and an appropriate application of each. 3

25. In $[Co(NH_3)_6]Cl_3$, determine the oxidation number of cobalt. 3

26. Compare Activation energy and First-order kinetics. Give the meaning and an appropriate application of each. 3

27. A first-order reaction has half-life 2400 s. How long is required for 75 percent completion? 3

28. Compare Phenol and Coordination number. Give the meaning and an appropriate application of each. 3

Section D - Case and application questions

29. Consider this situation: Variable oxidation states can arise from accessible d and s electron energies.

(a) Name the concept demonstrated in the case. **1**

(b) Explain the connection between the situation and that concept. **1**

(c) Distinguish that concept from Lanthanide contraction, giving an appropriate feature of each. **2**

30. Consider this situation: Standard reduction potentials help predict standard cell emf.

(a) Name the concept demonstrated in the case. **1**

(b) Explain the connection between the situation and that concept. **1**

(c) Distinguish that concept from Gibbs energy and emf, giving an appropriate feature of each. **2**

Section E - Extended responses

31. (a) Explain Colligative property and analyse this application: Dissolving a nonvolatile solute can lower the freezing point. **5**
(b) Explain Mole fraction and show how this second application fits it: Component mole fractions sum to one.

32. (a) Explain Amine and analyse this application: An amine reacts with a suitable acid to form an ammonium salt. **5**
(b) Explain Activation energy and show how this second application fits it: Temperature changes the fraction able to react under the model.

33. (a) Explain Lanthanide contraction and analyse this application: Poor shielding contributes to increasing effective nuclear attraction. **5**
(b) Explain Transition element and show how this second application fits it: Variable oxidation states can arise from accessible d and s electron energies.

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