

Redox Reactions — CBSE Pattern Test 1

Class 11 Chemistry · 90 minutes · 40 marks · Sections A–D with answer key · Narayan Gurukul Academy

Test 1 — CBSE Pattern (90 minutes, 40 marks)

Class 11 Chemistry · Redox Reactions · Narayan Gurukul Academy (ClassApna)

General Instructions: (1) This paper has four sections — Section A (1×10), Section B (2×4), Section C (3×4) and Section D (5×2) — total 40 marks. Time allowed: 90 minutes.

(2) All questions are compulsory. No overall choice is given; internal choice, where allowed, is clearly marked.

(3) For MCQ questions choose the single correct option; for VSA answers write a single line.

(4) Take $g = 10 \text{ m/s}^2$. All symbols carry their usual meaning. Use of a calculator is not permitted.

Section A — MCQ & VSA ($10 \times 1 = 10$ marks)

- Oxidation, in terms of electrons, is
 - loss of electrons
 - gain of electrons
 - gain of protons
 - loss of neutrons
- Reduction is
 - gain of electrons
 - loss of electrons
 - gain of oxygen
 - loss of hydrogen
- The oxidation number of an element in its free state is
 - zero
 - +1
 - 1
 - +2
- The oxidation number of Mn in KMnO_4 is
 - +7
 - +4
 - +6
 - +2
- In the ion-electron method, a redox reaction is split into
 - two half-reactions
 - three half-reactions
 - one reaction
 - four half-reactions
- The reaction $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$ is an example of
 - combination
 - decomposition
 - displacement
 - disproportionation
- In an electrochemical cell, oxidation occurs at the
 - anode

- (B) cathode
- (C) salt bridge
- (D) voltmeter

8. The relation between standard Gibbs energy and standard cell potential is

- (A) $\Delta G^\circ = -nFE^\circ$
- (B) $\Delta G^\circ = nFE^\circ$
- (C) $\Delta G^\circ = -E^\circ/nF$
- (D) $\Delta G^\circ = nF/E^\circ$

9. Define oxidation in terms of electrons.

10. Write the Nernst equation for an electrode.

Section B — Short Answer I (4 × 2 = 8 marks)

- 11. What is the oxidation number of oxygen in peroxides?
- 12. What is the role of the salt bridge in an electrochemical cell?
- 13. What is a disproportionation reaction?
- 14. What is the value of the cell potential at equilibrium?

Section C — Short Answer II (4 × 3 = 12 marks)

- 15. Define oxidation and reduction in terms of electrons and identify the oxidising and reducing agents in $\text{Zn} + \text{Cu}^{2+} \rightarrow \text{Zn}^{2+} + \text{Cu}$.
- 16. State the rules for assigning oxidation numbers and use them to calculate the oxidation number of Cr in $\text{K}_2\text{Cr}_2\text{O}_7$.
- 17. Describe the ion-electron method and balance $\text{MnO}_4^- + \text{Fe}^{2+} \rightarrow \text{Mn}^{2+} + \text{Fe}^{3+}$ in acidic medium.
- 18. Describe the construction and working of a Daniell cell and explain the function of the salt bridge.

Section D — Long Answers (2 × 5 = 10 marks)

- 19. State the rules for assigning oxidation numbers. Balance the redox reaction $\text{Cu} + \text{HNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + \text{NO} + \text{H}_2\text{O}$ by the oxidation-number method and explain each step.
- 20. Write the Nernst equation and derive the relation between the standard Gibbs energy and the standard cell potential. Calculate ΔG° for a cell with $n = 2$ and $E^\circ = 1.10 \text{ V}$. ($F = 96500 \text{ C mol}^{-1}$)

Answer Key (Marking Scheme)

- Q1 — (A) loss of electrons. Q2 — (A) gain of electrons. Q3 — (A) zero. Q4 — (A) +7.
- Q5 — (A) two half-reactions. Q6 — (A) combination. Q7 — (A) anode. Q8 — (A) $\Delta G^\circ = -nFE^\circ$.
- Q9 — Loss of electrons.
- Q10 — $E = E^\circ - (0.059/n)\log Q$.
- Q11 — -1.
- Q12 — Maintains electrical neutrality and completes the circuit.
- Q13 — A reaction in which the same element is both oxidised and reduced.
- Q14 — Zero.
- Q15 — Oxidation/reduction definitions; Cu^{2+} oxidising agent, Zn reducing agent.
- Q16 — Rules as in notes; Cr = +6.

Q17 — $\text{MnO}_4^- + 5\text{Fe}^{2+} + 8\text{H}^+ \rightarrow \text{Mn}^{2+} + 5\text{Fe}^{3+} + 4\text{H}_2\text{O}$.

Q18 — Daniell cell description and salt bridge function as in notes.

Q19 — $3\text{Cu} + 8\text{HNO}_3 \rightarrow 3\text{Cu}(\text{NO}_3)_2 + 2\text{NO} + 4\text{H}_2\text{O}$.

Q20 — $\Delta G^\circ = -nFE^\circ = -2.123 \times 10^5 \text{ J}$.