

## Redox Reactions — CBSE Pattern Test 2

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

### Test 2 — 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 ( $1 \times 10$ ), Section B ( $2 \times 4$ ), Section C ( $3 \times 4$ ) and Section D ( $5 \times 2$ ) — 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)

1. An oxidising agent is a substance that
  - (A) accepts electrons
  - (B) donates electrons
  - (C) accepts protons
  - (D) donates protons
2. The oxidation number of hydrogen in most of its compounds is
  - (A) +1
  - (B) –1
  - (C) 0
  - (D) +2
3. The first step in the oxidation-number method is to
  - (A) identify the elements whose oxidation numbers change
  - (B) balance oxygen
  - (C) balance hydrogen
  - (D) add water
4. In an acidic medium, the half-reactions are balanced using
  - (A)  $\text{H}^+$  and  $\text{H}_2\text{O}$
  - (B)  $\text{OH}^-$  and  $\text{H}_2\text{O}$
  - (C) only  $\text{H}_2\text{O}$
  - (D) only  $\text{O}_2$
5. A reaction in which the same element is both oxidised and reduced is called
  - (A) disproportionation
  - (B) combination
  - (C) displacement
  - (D) decomposition
6. The standard electrode potential of the standard hydrogen electrode is
  - (A) 0 V
  - (B) 1 V
  - (C) –1 V
  - (D) 0.5 V
7. The Nernst equation gives the dependence of the electrode potential on
  - (A) concentration

(B) temperature only

(C) pressure only

(D) volume

8. At equilibrium, the cell potential is

(A) zero

(B) maximum

(C) infinite

(D) negative

9. Define reduction in terms of electrons.

10. Write the relation between  $\Delta G^\circ$  and  $E^\circ$ .

### Section B — Short Answer I ( $4 \times 2 = 8$ marks)

11. Calculate the oxidation number of Mn in  $\text{KMnO}_4$ .

12. Give one example of a metal displacement reaction.

13. How are oxygen atoms balanced in an acidic medium in the ion-electron method?

14. Write the relation between the standard cell potential and the equilibrium constant.

### Section C — Short Answer II ( $4 \times 3 = 12$ marks)

15. Define oxidation and reduction in terms of electrons and identify the oxidising and reducing agents in a given reaction.

16. State the rules for assigning oxidation numbers and calculate the oxidation number of Fe in  $\text{Fe}_3\text{O}_4$ .

17. Explain the different types of redox reactions with one example of each.

18. Describe the construction and working of an electrochemical cell and define the standard electrode potential.

### Section D — Long Answers ( $2 \times 5 = 10$ marks)

19. Explain the ion-electron method of balancing redox equations. Balance  $\text{Cr}_2\text{O}_7^{2-} + \text{Fe}^{2+} + \text{H}^+ \rightarrow \text{Cr}^{3+} + \text{Fe}^{3+} + \text{H}_2\text{O}$  and explain each step.

20. Write the Nernst equation and derive the relation between  $\Delta G^\circ$  and  $E^\circ$ . Derive the relation between the equilibrium constant and  $E^\circ$ , and calculate K for a cell with  $E^\circ = 1.10$  V and  $n = 2$  at 298 K.

### Answer Key (Marking Scheme)

Q1 — (A) accepts electrons. Q2 — (A) +1. Q3 — (A) identify the elements whose oxidation numbers change. Q4 — (A)  $\text{H}^+$  and  $\text{H}_2\text{O}$ .

Q5 — (A) disproportionation. Q6 — (A) 0 V. Q7 — (A) concentration. Q8 — (A) zero.

Q9 — Gain of electrons.

Q10 —  $\Delta G^\circ = -nFE^\circ$ .

Q11 — +7.

Q12 —  $\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$ .

Q13 — By adding  $\text{H}_2\text{O}$  to the side deficient in oxygen and  $\text{H}^+$  to the other side.

Q14 —  $E^\circ = (0.059/n)\log K$ .

Q15 — Oxidation/reduction definitions and agent identification.

Q16 — Rules as in notes; Fe in  $\text{Fe}_3\text{O}_4 = +8/3$ .

Q17 — Types with examples as in notes.

Q18 — Cell description and definition as in notes.

Q19 —  $\text{Cr}_2\text{O}_7^{2-} + 6\text{Fe}^{2+} + 14\text{H}^+ \rightarrow 2\text{Cr}^{3+} + 6\text{Fe}^{3+} + 7\text{H}_2\text{O}$ .

Q20 — Relations as in notes;  $\log K = 37.3$ ,  $K \approx 2 \times 10^{37}$ .