CHEMISTRY (CODE - 043)

CHAPTER TEST - QUESTION PAPER

Class XI (2026-27) | Chapter 7: Redox Reactions

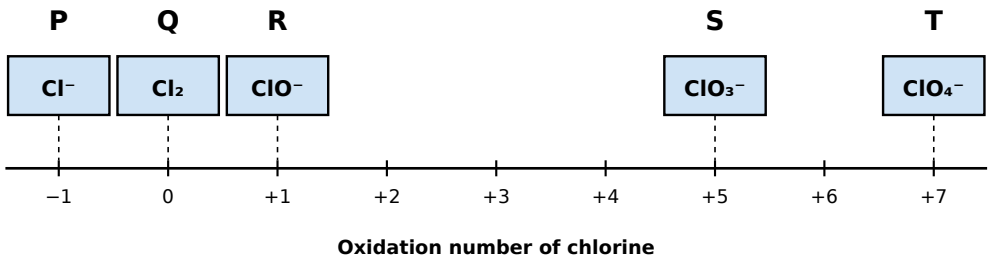
Time: 1 hour 30 minutes | Max. Marks: 35

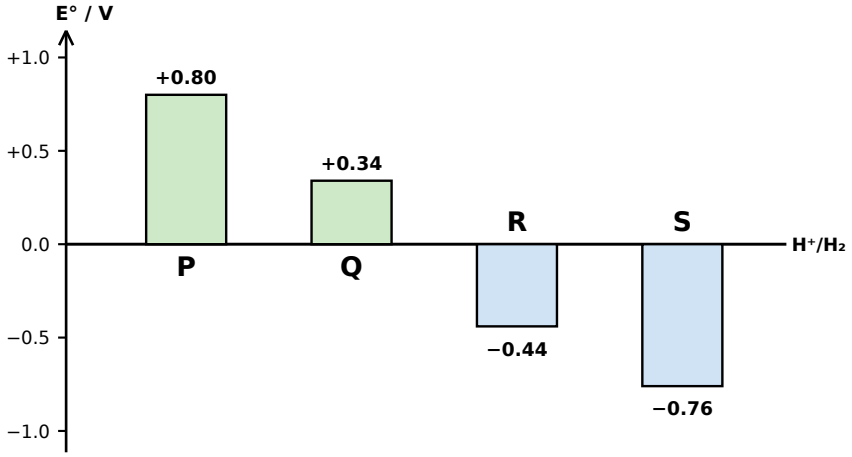
GENERAL INSTRUCTIONS:

1. Read the following instructions carefully.
2. There are 20 questions in this question paper with internal choice.
3. SECTION A consists of 12 questions carrying 1 mark each (Q. 1 to 9 are multiple-choice questions and Q. 10 to 12 are Assertion–Reason questions).
4. SECTION B consists of 4 very short answer questions carrying 2 marks each.
5. SECTION C consists of 2 short answer questions carrying 3 marks each.
6. SECTION D consists of 1 case-based question carrying 4 marks.
7. SECTION E consists of 1 long answer question carrying 5 marks.
8. All questions are compulsory. Internal choice is provided in Q. 16 (Section B) and Q. 20 (Section E).
9. Use of log tables and calculators is not allowed.
10. The standard electrode potential data required for the questions are given in the questions.

SECTION A

Questions 1 to 9 are multiple-choice questions. Only one of the choices is correct. Questions 10 to 12 are Assertion–Reason questions.

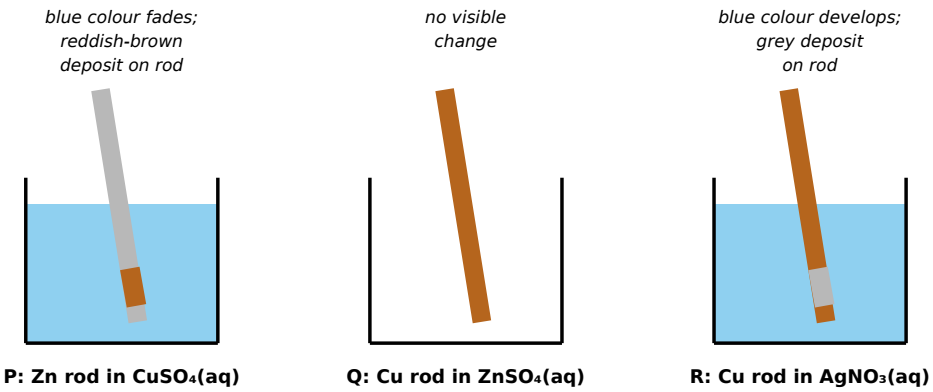
1	The oxidation number of phosphorus in pyrophosphoric acid, $H_4P_2O_7$, is: A. +3 B. +5 C. +4 D. +7	1
2	The figure shows five chlorine-containing species P, Q, R, S and T placed according to the oxidation number of chlorine.  Which species can act **only** as an oxidising agent? A. P B. R C. S D. T	1
3	Which one of the following is **not** a redox reaction? A. $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$ B. $2KClO_3(s) \rightarrow 2KCl(s) + 3O_2(g)$ C. $2NaH(s) \rightarrow 2Na(s) + H_2(g)$ D. $Zn(s) + CuSO_4(aq) \rightarrow Cu(s) + ZnSO_4(aq)$	1

4	The figure shows the standard electrode potentials (E°) of four metal ion/metal couples P, Q, R and S, measured against the standard hydrogen electrode (H^+/H_2).  Which two metals will liberate hydrogen gas from dilute hydrochloric acid? A. P and Q B. Q and R C. R and S D. P and S	1
5	The oxidation number of each oxygen atom in potassium superoxide, KO_2, is: A. −2 B. −1 C. +½ D. −½	1
6	Which of the following metals does **not** liberate hydrogen from dilute hydrochloric acid? A. Zn B. Fe C. Cu D. Mg	1
7	The average oxidation number of sulphur in the tetrathionate ion, $S_4O_6^{2-}$, is: A. +2.5 B. +5 C. 0 D. +6	1
8	Which of the following reactions is a disproportionation reaction? A. $Cl_2(g) + 2OH^-(aq) \rightarrow ClO^-(aq) + Cl^-(aq) + H_2O(l)$ B. $N_2(g) + O_2(g) \rightarrow 2NO(g)$ C. $Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$ D. $2KClO_3(s) \rightarrow 2KCl(s) + 3O_2(g)$	1
9	Which of the following acts as a self indicator in redox titrations? A. $Na_2S_2O_3$ B. $KMnO_4$ C. $K_2Cr_2O_7$ D. KI	1
10	Questions 10 to 12 are Assertion (A) and Reason (R) type questions. Select the correct option. **Assertion (A):** Oxidation and reduction always occur simultaneously. **Reason (R):** The electrons lost by one species in a reaction are gained by another species. A. Both A and R are true, and R is the correct explanation of A. B. Both A and R are true, and R is not the correct explanation of A. C. A is true but R is false. D. A is false but R is true.	1

11	**Assertion (A):** The oxidation number of oxygen in oxygen difluoride (OF_2) is −2. **Reason (R):** Fluorine is the most electronegative element. A. Both A and R are true, and R is the correct explanation of A. B. Both A and R are true, and R is not the correct explanation of A. C. A is true but R is false. D. A is false but R is true.	1
12	**Assertion (A):** Fluorine does not show a disproportionation tendency. **Reason (R):** Fluorine is the strongest oxidising agent among the halogens. A. Both A and R are true, and R is the correct explanation of A. B. Both A and R are true, and R is not the correct explanation of A. C. A is true but R is false. D. A is false but R is true.	1

SECTION B

Questions 13 to 16 are very short answer questions carrying 2 marks each.

13	Three students set up the experiments shown below. In each beaker a metal rod is dipped in the aqueous solution of a salt of another metal and the observations are noted after some time.  **P: Zn rod in $CuSO_4$(aq)** **Q: Cu rod in $ZnSO_4$(aq)** **R: Cu rod in $AgNO_3$(aq)** (i) Write the ionic equation for the reaction in beaker P and name the species oxidised and the species reduced. [1] (ii) Arrange Zn, Cu and Ag in the decreasing order of their reducing power and explain why no change is observed in beaker Q. [1]	2
14	The standard electrode potentials of some halogen/halide ion couples at 298 K are given below. **Couple (oxidised form + ne^- → reduced form)** / **E° / V** $F_2 + 2e^- \rightarrow 2F^-$: +2.87 $Cl_2 + 2e^- \rightarrow 2Cl^-$: +1.36 $Br_2 + 2e^- \rightarrow 2Br^-$: +1.09 $I_2 + 2e^- \rightarrow 2I^-$: +0.54 (i) Identify the strongest oxidising agent and the strongest reducing agent among the species given in the table. [1] (ii) Predict, with a reason, whether Cl_2 can oxidise Br^- ions and whether I_2 can oxidise Br^- ions. [1]	2

15	Calculate the oxidation number of the underlined element in each of the following species: (i) $H_2\underline{S}_2O_7$ (ii) $Na\underline{B}H_4$ (iii) $Ca\underline{O}_2$ (iv) $K_2\underline{Mn}O_4$ [½ each]	2
16	Classify each of the following redox reactions as a combination, decomposition, displacement or disproportionation reaction. [½ each] (a) $3Mg(s) + N_2(g) \rightarrow Mg_3N_2(s)$ (b) $2KClO_3(s) \rightarrow 2KCl(s) + 3O_2(g)$ (c) $Cl_2(g) + 2KBr(aq) \rightarrow 2KCl(aq) + Br_2(l)$ (d) $2NO_2(g) + 2OH^-(aq) \rightarrow NO_2^-(aq) + NO_3^-(aq) + H_2O(l)$ **OR** Why does nitric acid act only as an oxidising agent, whereas sulphur dioxide can act both as an oxidising and as a reducing agent? (Oxidation numbers of sulphur range from −2 to +6.) [1 + 1]	2

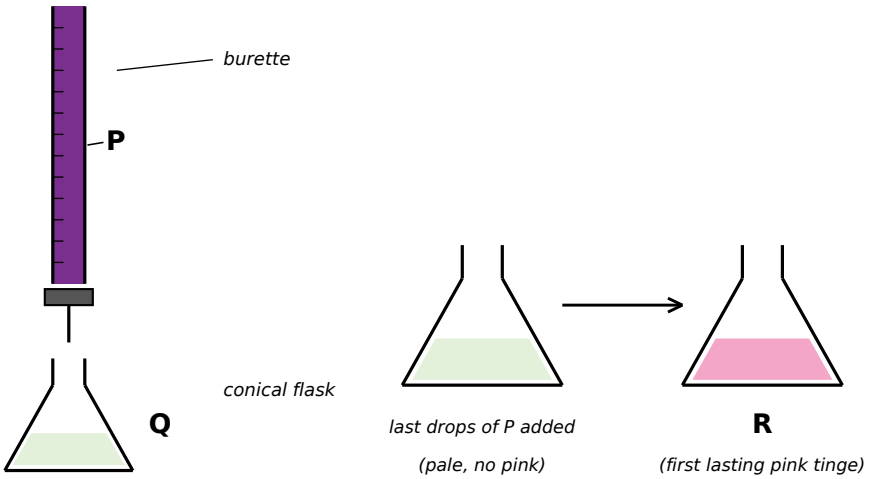
SECTION C

Questions 17 and 18 are short answer questions carrying 3 marks each.

17	Permanganate ion oxidises ferrous ion in acidic medium: $MnO_4^-(aq) + Fe^{2+}(aq) \rightarrow Mn^{2+}(aq) + Fe^{3+}(aq)$. Balance the equation by the half-reaction method using the following table. **Half-reaction** | **Oxidation number change** | **Balanced half-reaction** Oxidation | ? | ? Reduction | ? | ? (i) Complete the oxidation number change column. [1] (ii) Balance each half-reaction in acidic medium with H^+, H_2O and electrons, and equalise the electrons lost and gained. [1] (iii) Add the half-reactions to write the balanced net ionic equation. [1]	3
18	Chlorine reacts with cold dilute sodium hydroxide solution to form a household bleaching agent: $Cl_2(g) + 2OH^-(aq) \rightarrow ClO^-(aq) + Cl^-(aq) + H_2O(l)$ (i) Assign the oxidation number to chlorine on each side and show that this is a disproportionation reaction. [1] (ii) Write the oxidation half-reaction and the reduction half-reaction, and show that they add up to give the above equation (multiply to equalise electrons). [1] (iii) Why does fluorine not show a disproportionation reaction of this type? [1]	3

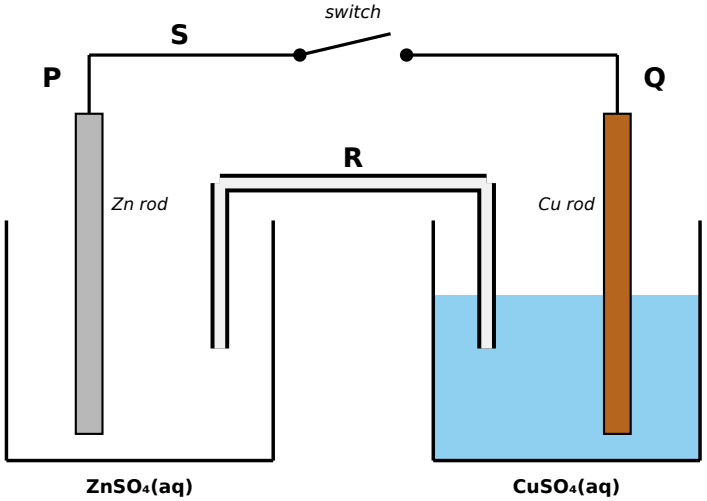
SECTION D

Question 19 is a case-based question carrying 4 marks.

19	**Redox titration** In a redox titration the strength of a reductant (or oxidant) is found by titrating it against a standard solution of an oxidant (or reductant). Permanganate ion is intensely coloured, so it acts as a self indicator: the end point is reached after the last of the reductant is oxidised and the first lasting tinge of pink appears. 25.0 mL of an Fe^{2+} solution, acidified with dilute H_2SO_4, is taken in a conical flask and titrated with 0.02 M $KMnO_4$ solution from a burette. 20.0 mL of the permanganate solution is required to reach the end point. The reaction is: $MnO_4^-(aq) + 8H^+(aq) + 5Fe^{2+}(aq) \rightarrow Mn^{2+}(aq) + 5Fe^{3+}(aq) + 4H_2O(l)$  (i) Identify the solution in P and Q. What does the pink colour in R indicate? [1] (ii) Write the change in oxidation number of manganese and of iron. Name the oxidising agent and the reducing agent. [1] (iii) Calculate the number of moles of MnO_4^- used and the molarity of the Fe^{2+} solution. [2]	4

SECTION E

Question 20 is a long answer question carrying 5 marks.

20	The figure shows a Daniell cell in which a zinc rod dips in zinc sulphate solution and a copper rod dips in copper sulphate solution. The two solutions are connected by a salt bridge and the rods are connected by a metallic wire with a switch.  (i) Name part R. Which of the rods P and Q is the anode and which is the cathode? [1] (ii) The switch is closed. Give the direction of electron flow and of current flow in the wire S. What carries the current inside the cell? [1] (iii) Write the half-reaction at each electrode and the overall cell reaction. [1½] (iv) State the function of the salt bridge. [1] (v) Define the standard electrode potential. What is the value of the standard electrode potential of the hydrogen electrode? [½] **OR** Pb_3O_4 reacts differently with hydrochloric acid and with nitric acid: $Pb_3O_4 + 8HCl \rightarrow 3PbCl_2 + Cl_2 + 4H_2O$ and $Pb_3O_4 + 4HNO_3 \rightarrow 2Pb(NO_3)_2 + PbO_2 + 2H_2O$ (i) Pb_3O_4 behaves as a mixture of two oxides. Name them and give the oxidation number of lead in each. [1] (ii) Why is chlorine liberated with HCl but not with HNO_3? Name the reaction type in each case. [2] (iii) Balance the equation $Cr_2O_7^{2-}(aq) + SO_2(g) \rightarrow Cr^{3+}(aq) + SO_4^{2-}(aq)$ in acidic solution by the ion-electron method. [2]	5

***** END OF QUESTION PAPER *****