

 INDIAN SCHOOL AL WADI AL KABIR 		
CLASS: XI	DEPARTMENT: SCIENCE (2026-27) SUBJECT: CHEMISTRY	DATE: 10/10/2026
WORKSHEET NO: 5 WITH ANSWERS	TOPIC: REDOX REACTIONS	NOTE: A4 FILE FORMAT
CLASS & SEC:	NAME OF THE STUDENT:	ROLL NO.

Objective Type Questions

- Identify the disproportionation reaction
 - $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$
 - $\text{CH}_4 + 4\text{Cl}_2 \rightarrow \text{CCl}_4 + 4\text{HCl}$
 - $2\text{F}_2 + 2\text{OH}^- \rightarrow 2\text{F}^- + \text{OF}_2 + \text{H}_2\text{O}$
 - $2\text{NO}_2 + 2\text{OH}^- \rightarrow \text{NO}_2^- + \text{NO}_3^- + \text{H}_2\text{O}$
- Which of the following is not an example of a redox reaction?
 - $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$
 - $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$
 - $2\text{K} + \text{F}_2 \rightarrow 2\text{KF}$
 - $\text{BaCl}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + 2\text{HCl}$
- Which of the following is not true about oxidation?
 - It involves the gain of electrons
 - It can involve the addition of oxygen
 - It may involve the loss of hydrogen
 - It is always associated with reduction
- The more positive the value of E° , the greater is the tendency of the species to get reduced.
Using the standard electrode potential of redox couples given below to find out which of the following is the strongest oxidising agent?
 E° Values: $\text{Fe}^{3+}/\text{Fe}^{2+} = +0.77$; $\text{I}_2(\text{s})/\text{I}^- = +0.54$; $\text{Cu}^{2+}/\text{Cu} = +0.34$; $\text{Ag}^+/\text{Ag} = +0.80\text{V}$
 - Fe^{3+}
 - $\text{I}_2(\text{s})$
 - Cu^{2+}
 - Ag^+
- In which of the following compounds does 'Mn' exhibit the highest oxidation state?
 - KMnO_4
 - K_2MnO_4
 - MnO_2
 - MnO
- The oxidation number of Xe in Ba_2XeO_6 is
 - +8
 - +6
 - +4
 - +10
- Identify the correct statement in relation to the following reaction:
 $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$

- (a) Zn is acting as an oxidant
 (b) Chlorine is acting as a reductant
 (c) Hydrogen ion is acting as a reductant
 (d) Zn is acting as a reductant
8. Values of standard electrode potentials of three metals X, Y and Z are -1.2 V, +0.5V and -3.0 V respectively. The reducing power of these metals will be in the order
 (a) $X > Y > Z$
 (b) $Y > Z > X$
 (c) $Y > X > Z$
 (d) $Z > X > Y$
9. Oxidation numbers of P in PO_4^{3-} , of S in SO_4^{2-} , and of Cr in $\text{Cr}_2\text{O}_7^{2-}$ are respectively:
 (a) +3, +6 and +5
 (b) +5, +3 and +6
 (c) +3, +6 and +6
 (d) +5, +6 and +6
10. The oxidation states of Sulphur in S_8 , S_2F_2 , H_2S , respectively, are
 (a) 0, +1 and -2
 (b) +2, +1 and -2
 (c) +7, +1 and -2
 (d) 0, +1 and +2

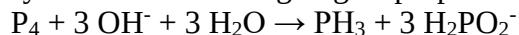
Assertion Reason type questions

- a) Both *Assertion* and *Reason* are correct and *Reason* is the correct explanation of *Assertion*.
 b) Both *Assertion* and *Reason* are correct but *Reason* is not the correct explanation of *Assertion*.
 c) *Assertion* is correct and *Reason* is wrong.
 d) *Assertion* is wrong and *Reason* is correct.
11. Assertion (A): The decomposition of hydrogen peroxide to form water and oxygen is an example of a disproportionation reaction.
 Reason (R): The oxygen of peroxide is in -1 oxidation state, and it is converted to zero oxidation state in O_2 and -2 oxidation state in H_2O .
12. Assertion (A): In the reaction between potassium permanganate and potassium iodide, permanganate ions act as an oxidising agent.
 Reason (R): The oxidation state of manganese changes from +2 to +7 during the reaction.

2-Marks questions

13. (a) Both HCl and NaH contain H, but the oxidation states of H in them are different. What is the oxidation state of H in each compound?
 (b) What is the oxidation state of 'S' in SO_4^{2-} ?
14. Write the formulae for the following compounds:
 (a) Mercury (II)chloride
 (b) Nickel (II)sulphate
 (c) Tin (IV)oxide
 (d) Thallium(I)sulphate
15. (a) Using stock notation, represent the following compounds: FeO and MnO_2 .
 (b) Redox reactions are those reactions in which oxidation and reduction take place simultaneously. Write any two redox reactions.
16. (a) Calculate the oxidation number of Cr in Cr_2O_3 and S in H_2SO_4 .

(b) In a disproportionation reaction, an element in one oxidation state is simultaneously oxidised and reduced. Identify the element undergoing disproportionation in the following reaction:



17. The compound AgF_2 is unstable. However, if formed, the compound acts as a very strong oxidising agent. Why?
18. Balance the following redox reactions in acidic medium.
- (a) $Cr_2O_7^{2-} + Sn^{2+} \rightarrow Cr^{3+} + Sn^{4+}$
- (b) $MnO_4^{2-} + S^{2-} \rightarrow Mn^{2+} + S$
19. (a) Define a redox couple.
- (b) $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$ is not a redox reaction. Why?
20. Why does ClO_4^- not show a disproportionation reaction, whereas ClO^- , ClO_2^- , and ClO_3^- do?
21. Given the standard electrode potentials, $K^+/K = -2.93V$, $Ag^+/Ag = 0.80V$, $Ni^{2+}/Ni = -0.25V$, $Ca^{2+}/Ca = -2.87V$, $Al^{3+}/Al = -1.66V$. Arrange these metals in increasing order of reducing power.

3 Marks Questions

22. (a) Balance the following redox reaction in acidic medium.
- $$NO_2^- + MnO_4^- \longrightarrow Mn^{2+} + NO_3^-$$
- (b) Using Stock notation, represent the following compounds:
- i. Fe_2O_3
- ii. FeO
23. The Mn^{3+} ion is unstable in solution and undergoes disproportionation to give Mn^{2+} , MnO_2 and H^+ ion. Write a balanced ionic equation for the reaction.
24. (a) What is the electrode potential of a standard hydrogen electrode?
- (b) Set up an electrochemical cell for the redox reaction
- $$Ni^{2+}(aq) + Fe(s) \rightarrow Ni(s) + Fe^{2+}(aq)$$
25. Write the following redox reactions in the oxidation and reduction half-reaction reactions in the oxidation and reduction half-reactions.
- $$2K(s) + Cl_2(g) \rightarrow 2KCl(s)$$
26. (a) Give two important functions of a salt bridge.
- (b) Balance the following equation by the oxidation number method:
- $$Fe^{2+} + Cr_2O_7^{2-} + H^+ \rightarrow Fe^{3+} + Cr^{3+} + H_2O$$

Case study-based Questions (4 marks)

27. Redox reactions are those reactions in which oxidation and reduction occur simultaneously. A redox reaction is made up of two half-reactions. In the first half-reaction, oxidation takes place, and in the second half-reaction, reduction occurs. Oxidation is a process in which a substance loses electrons, and in reduction, a substance gains electrons. The substance which gains electrons is reduced and acts as an oxidising agent. On the other hand, a substance which loses electrons is oxidised and acts as a reducing agent. The oxidation number of an atom increases during oxidation and reduces during reduction. The redox reactions may include combination of atoms or molecules, displacement of metals or non-metals and disproportionation reactions.

- (a) What is the oxidation number of oxygen in O_2F_2 ?
- (b) What is the value of n in the following ionic half-equation?
- $$ClO_3^-(aq) + 6H^+(aq) + ne^- \rightarrow Cl^-(aq) + 3H_2O(l)$$
- (c) Write the formula for Tin(IV) oxide.
- (d) In which of the following compounds does oxygen show a positive oxidation state?
- $NaClO$ or OF_2

5-Marks Questions

28. Consider the elements: Cs, Ne, I, F, and Fe
- (a) Identify the element that exhibits only a negative oxidation state.

- (b) Identify the element that exhibits only a positive oxidation state.
 (c) Identify the element that exhibits both positive and negative oxidation states.
 (d) Identify the element which exhibits neither a negative nor a positive oxidation state.
 (e) Identify the element that exhibits which shows +2 and +3 oxidation states.

ANSWER KEY

1.	(d) $2\text{NO}_2 + 2\text{OH}^- \rightarrow \text{NO}_2^- + \text{NO}_3^- + \text{H}_2\text{O}$
2.	(d) $\text{BaCl}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + 2\text{HCl}$
3.	(a) It involves the gain of electrons
4.	(d) Ag^+
5.	(a) KMnO_4
6.	(a) +8
7.	(d) Zn is acting as a reductant
8.	(d) $Z > X > Y$
9.	(d) +5, +6 and +6
10.	(a) 0, +1 and -2
11	(a) Both <i>Assertion</i> and <i>Reason</i> are correct, and <i>Reason</i> is the correct explanation of <i>Assertion</i> .
12	(c) <i>Assertion</i> is correct, and <i>Reason</i> is wrong
13	(a) Hydrogen in $\text{HCl} = +1$; hydrogen in $\text{NaH} = -1$. (b) Oxidation state of S in $\text{SO}_4^{2-} = +6$
14	(a) HgCl_2 (b) NiSO_4 (c) SnO_2 (d) Ti_2SO_4
15	(a) Stock notation: FeO – Iron(II) oxide MnO ₂ – Manganese(IV) oxide (b) Any two redox reactions. $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$ $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$
16	(a) Cr in $\text{Cr}_2\text{O}_3 = +3$ S in $\text{H}_2\text{SO}_4 = +6$ (b) The element undergoing disproportionation is phosphorus (P). In the reaction, phosphorus in P_4 (oxidation state 0) is both oxidised to +1 in H_2PO_2^- and reduced to -3 in PH_3 .
17	In AgF_2 , the oxidation state of Ag is +2, which is very unstable. Therefore, it quickly accepts an electron to form the more stable +1 oxidation state. $\text{Ag}^{2+} + \text{e}^- \rightarrow \text{Ag}^+$ Therefore, AgF_2 , if formed, will act as a strong oxidising agent.
18	(a) $\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + 3\text{Sn}^{2+} \rightarrow 2\text{Cr}^{3+} + 7\text{H}_2\text{O} + 3\text{Sn}^{4+}$ (b) $2\text{MnO}_4^- + 5\text{S}^{2-} + 16\text{H}^+ \rightarrow 2\text{Mn}^{2+} + 5\text{S} + 8\text{H}_2\text{O}$
19	(a) A redox couple consists of the oxidised and reduced forms of the same species, such as $\text{Fe}^{3+}/\text{Fe}^{2+}$. (b) There is no change in the oxidation states of the elements. It is an acid–base neutralisation reaction.
20	ClO_4^- does not show a disproportionation reaction because, in this compound, chlorine is present in its highest oxidation state, which is +7. However, in the case of ClO^- , ClO_2^- and ClO_3^- , chlorine

	exists in + 1, +3 and +5 oxidation states, respectively.
21	$\text{Ag} < \text{Ni} < \text{Al} < \text{Ca} < \text{K}$
22	(a) $2\text{MnO}_4^- + 5\text{NO}_2^- + 6\text{H}^+ \rightarrow 2\text{Mn}^{2+} + 5\text{NO}_3^- + 3\text{H}_2\text{O}$ (b) i) Iron(III)oxide ii) Iron(II)oxide
23	$2\text{Mn}^{3+}(\text{aq}) + 2\text{H}_2\text{O}(\text{l}) \rightarrow \text{MnO}_2(\text{s}) + \text{Mn}^{2+}(\text{aq}) + 4\text{H}^+(\text{aq})$
24	(a) 0 V (b) $\text{Fe}(\text{s}) / \text{Fe}^{2+}(\text{aq}) // \text{Ni}^{2+}(\text{aq}) / \text{Ni}(\text{s})$
25	Oxidation half reaction $2\text{K}(\text{s}) \rightarrow 2\text{K}^+ + 2\text{e}^-$ Reduction half-reaction $\text{Cl}_2(\text{g}) + 2\text{e}^- \rightarrow 2\text{Cl}^-$
26	(a) (i) It completes the internal circuit. (ii) It maintains electrical neutrality. (b) $6\text{Fe}^{2+} + \text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ \rightarrow 6\text{Fe}^{3+} + 2\text{Cr}^{3+} + 7\text{H}_2\text{O}$
27	(a) +1 (b) 6 (c) SnO_2 (d) OF_2
28	(a) F (b) Cs (c) I (d) Ne (e) Fe

Prepared by:
Ms Athira C C

Checked by:
HOD Science