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Chemistry Grade 9 — Chapter 7

Electrochemistry

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Practice MCQs extracted from the supplied Class 9 Chemistry chapter tests (Section A). Total: 30 questions.

A. Important / Main Topics

1. In the reaction \(2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}\), magnesium is:

(A) Oxidized
(B) Reduced
(C) Neither oxidized nor reduced
(D) Acting as an oxidizing agent

Correct Answer: A

Explanation: Magnesium gains oxygen to form MgO, so it is oxidized. Oxidation can be defined as the gain of oxygen.

2. Which of the following is the correct definition of reduction in terms of electrons?

(A) Loss of electrons
(B) Gain of electrons
(C) Gain of oxygen
(D) Loss of hydrogen

Correct Answer: B

Explanation: Reduction is the gain of electrons. This is remembered by the mnemonic "OIL RIG" (Oxidation Is Loss, Reduction Is Gain).

3. What is the oxidation state of sulfur in \(\text{H}_2\text{SO}_4\)?

(A) +2
(B) +4
(C) +6
(D) -2

Correct Answer: C

Explanation: H is +1 (×2 = +2), O is −2 (×4 = −8). Sum must be zero: +2 + x − 8 = 0 → x = +6.

4. Which of the following is a common **oxidizing agent?**

(A) Hydrogen gas (H□)
(B) Carbon monoxide (CO)
(C) Zinc (Zn)
(D) Potassium permanganate (KMnO□)

Correct Answer: D

Explanation: KMnO□ is a strong oxidizing agent (electron acceptor). H□, CO, and Zn are common reducing agents.

5. In a redox reaction, the substance that is oxidized:

(A) Loses electrons and is the reducing agent
(B) Gains electrons and is the reducing agent
(C) Loses electrons and is the oxidizing agent
(D) Gains electrons and is the oxidizing agent

Correct Answer: A

Explanation: The substance that is oxidized loses electrons. It causes the other substance to be reduced, so it is the reducing agent.

6. The oxidation state of any uncombined (free) element is always:

(A) +1
(B) 0

(C) -1
(D) +2

Correct Answer: B

Explanation: Rule 1 for assigning oxidation states: the oxidation state of any free element (e.g., Zn, Na, H□, O□) is zero.

7. Which of the following is the correct formula for the ionic compound formed between \(\text{Al}^{3+}\) and \(\text{O}^{2-}\)?

(A) AlO
(B) Al□O□
(C) Al□O□
(D) AlO□

Correct Answer: C

Explanation: To balance the charges (+3 and −2), use 2 Al^{3}□ ions (+6) and 3 O^{2}□ ions (−6). The formula is Al□O□.

8. Corrosion of iron is an example of a:

(A) Physical change
(B) Neutralization reaction
(C) Precipitation reaction
(D) Redox reaction

Correct Answer: D

Explanation: Corrosion involves oxidation of iron (Fe → Fe^{2}□ + 2e□) and reduction of oxygen (O□ + 2H□O + 4e□ → 4OH□). It is an electrochemical redox process.

9. Which method of corrosion prevention involves connecting iron to a more active metal like magnesium?

(A) Cathodic protection
(B) Galvanizing
(C) Tinning
(D) Electroplating

Correct Answer: A

Explanation: Cathodic protection (sacrificial protection) makes the iron the cathode and connects it to a more active metal (Mg or Al) that acts as the anode and corrodes instead.

10. In the reaction \(2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}\), which substance is the oxidizing agent?

(A) Na
(B) Cl□
(C) NaCl
(D) Both Na and Cl□

Correct Answer: B

Explanation: Cl□ is reduced (gains electrons to form Cl□), so it is the oxidizing agent. Na is oxidized (loses electrons) and is the reducing agent.

11. In the reaction \(\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}\), which species is oxidized?

(A) Cu^{2}□
(B) SO^{2}□□
(C) Zn
(D) Cu

Correct Answer: C

Explanation: Zinc goes from oxidation state 0 to +2, losing electrons. Thus, Zn is oxidized (and acts as the reducing agent).

12. Which of the following is the correct oxidation state of nitrogen in \(\text{HNO}_3\)?

(A) +1

(B) +3
(C) −3
(D) +5

Correct Answer: D

Explanation: H is +1, O is −2 (×3 = −6). Sum must be zero: \(+1 + x - 6 = 0 \Rightarrow x = +5\).

13. In the reaction \(2\text{FeCl}_2 + \text{Cl}_2 \rightarrow 2\text{FeCl}_3\), chlorine gas (\(\text{Cl}_2\)) acts as:

(A) An oxidizing agent
(B) A reducing agent
(C) A spectator
(D) A catalyst

Correct Answer: A

Explanation: \(\text{Cl}_2\) is reduced (from 0 to −1) and causes Fe^{2}□ to oxidize to Fe^{3}□. It is the oxidizing agent.

14. Which of the following changes represents **reduction?**

(A) \(\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + e^-\)
(B) \(\text{Cl}_2 + 2e^- \rightarrow 2\text{Cl}^-\)
(C) \(\text{Zn} \rightarrow \text{Zn}^{2+} + 2e^-\)
(D) \(\text{Cu} \rightarrow \text{Cu}^{2+} + 2e^-\)

Correct Answer: B

Explanation: Reduction is the gain of electrons. \(\text{Cl}_2\) gains electrons to form \(\text{Cl}^-\), so it is reduced.

15. What is the oxidation number of Mn in \(\text{KMnO}_4\)?

(A) +2
(B) +4
(C) +7
(D) +6

Correct Answer: C

Explanation: +7 — this correctly answers the question.

B. Less Important / Secondary Topics

16. Which of the following is **not a reducing agent?**

(A) \(\text{KMnO}_4\)
(B) \(\text{H}_2\)
(C) \(\text{CO}\)
(D) \(\text{Zn}\)

Correct Answer: A

Explanation: \(\text{KMnO}_4\) is a strong oxidizing agent. \(\text{H}_2\), CO, and Zn are common reducing agents.

17. In the reaction \(2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}\), sodium acts as:

(A) An oxidizing agent
(B) A reducing agent
(C) A catalyst
(D) A spectator ion

Correct Answer: B

Explanation: Sodium loses electrons (is oxidized), so it causes chlorine to be reduced. Therefore, Na is the reducing agent.

18. Which of the following processes involves a **decrease in oxidation state?**

(A) \(\text{Fe} \rightarrow \text{Fe}^{2+} + 2e^-\)
(B) \(\text{H}_2 \rightarrow 2\text{H}^+ + 2e^-\)
(C) \(\text{Cl}_2 + 2e^- \rightarrow 2\text{Cl}^-\)
(D) \(\text{S} \rightarrow \text{S}^{2-} \text{ (as in oxidation)}\) *(Note: Option D is structurally incorrect as written; better to frame as a species gaining electrons.)*

Correct Answer: C

Explanation: Reduction involves a decrease in oxidation state. Chlorine goes from 0 in Cl_2 to −1 in Cl^-, a decrease.

19. The formula of the ionic compound formed from Ca^{2+} and PO_4^{3-} is:

(A) CaPO_4
(B) $\text{Ca}_2(\text{PO}_4)_3$
(C) $\text{Ca}(\text{PO}_4)_2$
(D) $\text{Ca}_3(\text{PO}_4)_2$

Correct Answer: D

Explanation: The formula of the ionic compound formed from Ca^{2+} and PO_4^{3-} is $\text{Ca}_3(\text{PO}_4)_2$.

20. Galvanizing protects iron from rusting by:

(A) Coating iron with zinc (which is more active and corrodes first)
(B) Making iron the anode
(C) Removing oxygen from the environment
(D) Forming an alloy with iron

Correct Answer: A

Explanation: Galvanizing coats iron with zinc. Zinc is more active than iron and oxidizes preferentially, protecting the iron.

21. In the reaction $\text{MnO}_4^- + 8\text{H}^+ + 5\text{Fe}^{2+} \rightarrow \text{Mn}^{2+} + 5\text{Fe}^{3+} + 4\text{H}_2\text{O}$, which statement is correct?

(A) MnO_4^- is oxidized and Fe^{2+} is reduced
(B) MnO_4^- is reduced and Fe^{2+} is oxidized
(C) MnO_4^- acts as a reducing agent
(D) Fe^{2+} acts as an oxidizing agent

Correct Answer: B

Explanation: Mn in MnO_4^- goes from +7 to +2 (reduced). Fe goes from +2 to +3 (oxidized). MnO_4^- is the oxidizing agent, and Fe^{2+} is the reducing agent.

22. In the reaction $\text{Cl}_2 + 2\text{KI} \rightarrow 2\text{KCl} + \text{I}_2$, which statement is correct?

(A) Cl_2 is oxidized and acts as a reducing agent
(B) I^- is reduced and acts as an oxidizing agent
(C) Cl_2 is reduced and acts as an oxidizing agent
(D) I^- is oxidized and acts as an oxidizing agent

Correct Answer: C

Explanation: Cl_2 (0) gains electrons to form Cl^- (−1), so it is reduced and is the oxidizing agent. I^- (−1) loses electrons to form I_2 (0), so it is oxidized and is the reducing agent.

23. The oxidation state of nitrogen in NH_4^+ is:

(A) +1
(B) +5
(C) −1
(D) −3

Correct Answer: D

Explanation: H is +1 (×4 = +4). The sum must equal the ion's charge (+1): $x + 4 = +1 \Rightarrow x = -3$.

24. Consider the reaction $\text{Cu} + 2\text{AgNO}_3 \rightarrow \text{Cu(NO}_3)_2 + 2\text{Ag}$. Which species is the reducing agent?

(A) Cu
(B) Ag^+
(C) NO_3^-
(D) Ag

Correct Answer: A

Explanation: Cu (0) loses electrons to form Cu^{2+}, so it is oxidized. The species that is oxidized is the reducing agent. Therefore, Cu is the reducing agent.

25. In the reaction $\text{H}_2\text{O}_2 + 2\text{KI} + \text{H}_2\text{SO}_4 \rightarrow \text{I}_2 + \text{K}_2\text{SO}_4 + 2\text{H}_2\text{O}$, hydrogen peroxide ($\text{H}_2\text{O}_2$) acts as:

(A) A reducing agent
(B) An oxidizing agent
(C) A catalyst
(D) A spectator

Correct Answer: B

Explanation: I□ (−1) is oxidized to I_2 (0). H_2O_2 is reduced (oxygen changes from −1 in peroxide to −2 in water). Since it is reduced and causes I□ to oxidize, it is the oxidizing agent.

26. Which of the following changes represents a **reduction in terms of oxidation state?**

(A) $\text{Cr}^{3+} \rightarrow \text{Cr}_2\text{O}_7^{2-}$
(B) $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+}$
(C) $\text{MnO}_4^- \rightarrow \text{Mn}^{2+}$
(D) $\text{NO}_3^- \rightarrow \text{NO}$

Correct Answer: C

Explanation: In MnO_4^-, Mn is +7; in Mn^{2+}, Mn is +2. The oxidation state decreases, so it is a reduction. The other options involve increases (oxidation).

27. A compound contains chromium with an oxidation state of +6. Which of the following could be the formula?

(A) CrCl_3
(B) Cr_2O_3
(C) CrO
(D) CrO_3

Correct Answer: D

Explanation: In CrO_3, O is −2 (×3 = −6), so Cr must be +6 for the compound to be neutral. In the other options, Cr is +3 or +2.

28. In the reaction $2\text{Al} + \text{Fe}_2\text{O}_3 \rightarrow 2\text{Fe} + \text{Al}_2\text{O}_3$ (thermite reaction), which statement is correct?

(A) Al is oxidized and Fe_2O_3 is reduced
(B) Al is reduced and Fe_2O_3 is oxidized
(C) Al is the oxidizing agent
(D) Fe_2O_3 is the reducing agent

Correct Answer: A

Explanation: Al (0) → Al^{3+} (+3) is oxidized. Fe (+3 in Fe_2O_3) → Fe (0) is reduced. Al is the reducing agent; Fe_2O_3 is the oxidizing agent.

29. Galvanized iron is protected from rusting because:

(A) Zinc is less reactive than iron
(B) Zinc is more reactive than iron and corrodes first
(C) Zinc prevents oxygen from reaching the iron
(D) Zinc reacts with iron to form an alloy

Correct Answer: B

Explanation: Zinc is more active than iron. It acts as the anode and oxidizes preferentially (sacrificial protection), protecting the iron (cathode) from corrosion.

30. A solution of sodium chloride conducts electricity, but solid sodium chloride does not. This is because:

(A) In the solid state, there are no ions; in solution, ions form
(B) In the solid state, sodium chloride is covalent; in solution, it is ionic

(C) In the solid state, the ions are fixed in the lattice; in solution, the ions are free to move

(D) In the solid state, electrons are free; in solution, they are not

Correct Answer: C

Explanation: In solid NaCl, ions are locked in a rigid lattice and cannot move, so it does not conduct. When dissolved in water, the ions become free to move and carry electric current.