

## Assigning Oxidation Numbers Worksheet Answer Key PDF

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### Part 1: Foundational Knowledge

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**What is the oxidation number of any element in its pure elemental form?**

undefined. +1

**undefined. 0 ✓**

undefined. -1

undefined. +2

The oxidation number of any element in its pure elemental form is 0.

**Which of the following statements are true about oxidation numbers?**

**undefined. The oxidation number of oxygen is always -2. ✓**

**undefined. The oxidation number of hydrogen is +1 when bonded with non-metals. ✓**

**undefined. The oxidation number of fluorine is always -1. ✓**

undefined. The oxidation number of alkali metals is +2.

The true statements include the oxidation number of oxygen being -2, hydrogen being +1 with non-metals, and fluorine being -1.

**Explain why the oxidation number of oxygen is different in peroxides compared to other compounds.**

**In peroxides, the oxidation number of oxygen is -1, unlike the usual -2 in most compounds due to the presence of an O-O bond.**

**List the oxidation numbers for the following elements in their most common compounds:**

1. Sodium (Na)

**+1**

2. Chlorine (Cl)

-1

3. Calcium (Ca)

+2

Sodium typically has an oxidation number of +1, chlorine -1, and calcium +2.

## Part 2: Understanding and Interpretation

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**In which of the following compounds does hydrogen have an oxidation number of -1?**

undefined. H<sub>2</sub>O

**undefined. NaH ✓**

undefined. HCl

undefined. NH<sub>3</sub>

Hydrogen has an oxidation number of -1 in sodium hydride (NaH).

**Which of the following rules apply when assigning oxidation numbers?**

**undefined. The sum of oxidation numbers in a neutral compound is zero. ✓**

**undefined. The oxidation number of a monatomic ion is equal to its charge. ✓**

undefined. The sum of oxidation numbers in a polyatomic ion is zero.

undefined. Fluorine always has an oxidation number of +1.

The correct rules include that the sum of oxidation numbers in a neutral compound is zero and that the oxidation number of a monatomic ion equals its charge.

**Describe how you would determine the oxidation number of sulfur in the compound H<sub>2</sub>SO<sub>4</sub>.**

**To determine the oxidation number of sulfur in H<sub>2</sub>SO<sub>4</sub>, you would set up an equation based on the known oxidation states of hydrogen (+1) and oxygen (-2) and solve for sulfur.**

## Part 3: Applying Knowledge and Analyzing Relationships

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**What is the oxidation number of chromium in the dichromate ion ( $\text{Cr}_2\text{O}_7^{2-}$ )?**

undefined. +3

**undefined. +6 ✓**

undefined. +7

undefined. +4

The oxidation number of chromium in the dichromate ion is +6.

**In the reaction between hydrogen peroxide ( $\text{H}_2\text{O}_2$ ) and potassium permanganate ( $\text{KMnO}_4$ ), which of the following elements undergo a change in oxidation state?**

**undefined. Oxygen ✓**

**undefined. manganese ✓**

undefined. Potassium

undefined. Hydrogen

In this reaction, both oxygen and manganese undergo a change in oxidation state.

**Calculate the oxidation number of nitrogen in the compound  $\text{NH}_4^+$ .**

**The oxidation number of nitrogen in  $\text{NH}_4^+$  is -3.**

**In the reaction  $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$ , which element is reduced?**

undefined. Hydrogen

**undefined. Oxygen ✓**

undefined. Both hydrogen and oxygen

undefined. Neither hydrogen nor oxygen

In this reaction, oxygen is reduced as its oxidation state decreases.

**Which of the following statements correctly describe the redox process?**

undefined. Oxidation involves the gain of electrons.

undefined. Reduction involves the loss of electrons.

**undefined. The substance that is oxidized loses electrons. ✓**

**undefined. The substance that is reduced gains electrons. ✓**

The correct statements are that oxidation involves the loss of electrons and the substance that is oxidized loses electrons.

**Analyze the following reaction and identify the oxidizing and reducing agents:  $\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$ .**

**In this reaction, zinc is the reducing agent and copper(II) sulfate is the oxidizing agent.**

## Part 4: Synthesis and Reflection

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**Which of the following reactions is a redox reaction?**

undefined.  $\text{NaCl} + \text{AgNO}_3 \rightarrow \text{NaNO}_3 + \text{AgCl}$

**undefined.  $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$  ✓**

undefined.  $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$

undefined.  $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$

The reaction  $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$  is a redox reaction as magnesium is oxidized and oxygen is reduced.

**Evaluate the following statements about redox reactions and select those that are correct:**

**undefined. In a redox reaction, one substance is oxidized and another is reduced. ✓**

undefined. Redox reactions involve the transfer of protons.

**undefined. Redox reactions are essential for cellular respiration. ✓**

**undefined. All combustion reactions are redox reactions. ✓**

The correct statements are that in a redox reaction, one substance is oxidized and another is reduced, and that redox reactions are essential for cellular respiration.

**Create a balanced redox equation for the reaction between iron (Fe) and chlorine gas ( $\text{Cl}_2$ ) to form iron(III) chloride ( $\text{FeCl}_3$ ). Include the oxidation states of each element in your answer.**

**The balanced equation is  $2\text{Fe} + 3\text{Cl}_2 \rightarrow 2\text{FeCl}_3$ , with iron going from 0 to +3 and chlorine from 0 to -1.**