Assigning Oxidation Numbers Worksheet

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Part 1: Foundational Knowledge

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

Hint: Consider the state of the element.

- ◯ +1
- ◯ 0
- ◯ -1
- ◯ +2

Which of the following statements are true about oxidation numbers?

Hint: Think about the common oxidation states of elements.

- ☐ The oxidation number of oxygen is always -2.
- ☐ The oxidation number of hydrogen is +1 when bonded with non-metals.
- ☐ The oxidation number of fluorine is always -1.
- ☐ The oxidation number of alkali metals is +2.

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

Hint: Consider the bonding and structure of peroxides.

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

Hint: Think about the common compounds these elements form.

1. Sodium (Na)

2. Chlorine (Cl)

3. Calcium (Ca)

Part 2: Understanding and Interpretation

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

Hint: Consider the compounds where hydrogen is bonded to metals.

- ◯ H_2O
- ◯ NaH
- ◯ HCl
- ◯ NH_3

Which of the following rules apply when assigning oxidation numbers?

Hint: Think about the general principles of oxidation states.

- ☐ The sum of oxidation numbers in a neutral compound is zero.
- ☐ The oxidation number of a monatomic ion is equal to its charge.
- ☐ The sum of oxidation numbers in a polyatomic ion is zero.
- ☐ Fluorine always has an oxidation number of +1.

Describe how you would determine the oxidation number of sulfur in the compound H_2SO_4.

Hint: Consider the known oxidation states of hydrogen and oxygen.

Part 3: Applying Knowledge and Analyzing Relationships

What is the oxidation number of chromium in the dichromate ion (Cr2O7^2-)?

Hint: Consider the overall charge of the ion and the oxidation states of oxygen.

- ◯ +3
- ◯ +6
- ◯ +7
- ◯ +4

In the reaction between hydrogen peroxide (H2O2) and potassium permanganate (KMnO4), which of the following elements undergo a change in oxidation state?

Hint: Think about the oxidation states of the elements in the reactants and products.

- ☐ Oxygen
- ☐ manganese
- ☐ Potassium
- ☐ Hydrogen

Calculate the oxidation number of nitrogen in the compound NH4+.

Hint: Consider the known oxidation states of hydrogen.

In the reaction $2H_2 + O_2 \rightarrow 2H_2O$, which element is reduced?

Hint: Think about the changes in oxidation states of the elements.

- ◯ Hydrogen
- ◯ Oxygen
- ◯ Both hydrogen and oxygen
- ◯ Neither hydrogen nor oxygen

Which of the following statements correctly describe the redox process?

Hint: Consider the definitions of oxidation and reduction.

- ☐ Oxidation involves the gain of electrons.
- ☐ Reduction involves the loss of electrons.
- ☐ The substance that is oxidized loses electrons.
- ☐ The substance that is reduced gains electrons.

Analyze the following reaction and identify the oxidizing and reducing agents: $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$.

Hint: Consider the changes in oxidation states of zinc and copper.

Part 4: Synthesis and Reflection

Which of the following reactions is a redox reaction?

Hint: Think about the transfer of electrons in the reactions.

- ◯ $NaCl + AgNO_3 \rightarrow NaNO_3 + AgCl$
- ◯ $2Mg + O_2 \rightarrow 2MgO$
- ◯ $HCl + NaOH \rightarrow NaCl + H_2O$
- ◯ $CaCO_3 \rightarrow CaO + CO_2$

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

Hint: Consider the definitions and characteristics of redox reactions.

- [ ] In a redox reaction, one substance is oxidized and another is reduced.
- [ ] Redox reactions involve the transfer of protons.
- [ ] Redox reactions are essential for cellular respiration.
- [ ] All combustion reactions are redox reactions.

Create a balanced redox equation for the reaction between iron (Fe) and chlorine gas (Cl_2) to form iron(III) chloride ($FeCl_3$). Include the oxidation states of each element in your answer.

Hint: Consider the oxidation states of iron and chlorine in the reactants and products.