

ChemQuest 81

Oxidation and Reduction

Name: _____

Date: _____

Hour: _____

Information: Oxygen and Oxidation

You have probably heard of antioxidants, which are substances (often vitamins) taken to prevent the oxidation of cells. When iron rusts we say that the iron has oxidized. What is oxidation?

Let's look at the chemical reaction for separating iron from iron ore:



Critical Thinking Questions

1. In Equation 1 above carbon is "oxidized" and iron ore is "reduced." Define each of the terms using the concept of gaining or losing oxygen.

Oxidizing:

Reducing:

2. In the following reaction, is magnesium oxidized or reduced? Explain.



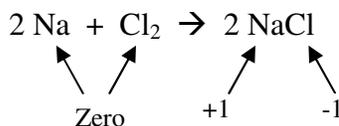
3. Which substance is reduced in the following reaction? (Note: When answering a question like this we are always talking about which reactant is reduced, not which product.)



Information: Oxidation States

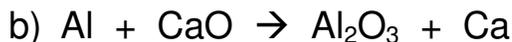
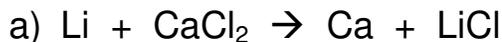
The term "oxidation state" is a fancy term for "charge." The charge, or oxidation state, of any atom by itself or in its natural state is zero. Here are some examples of substances that have an oxidation state of zero: Mg, Na, Cl₂, S, O₂, or any substance by itself or any normally diatomic substance.

When a substance is bonded we can often find its oxidation state from the periodic table:



Critical Thinking Questions

4. Assign oxidation numbers to each atom in the following chemical reactions:



5. Sometimes it is difficult to determine from the periodic table. For example, Consider SO_2 .

a) Both sulfur and oxygen are in the same column of the periodic table and we could

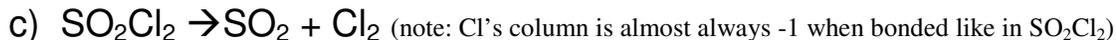
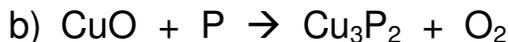
predict the same oxidation state (or charge) of _____ for each of them when they are bonded ionically.
what number? (include + or -)

b) What about in SO_2 ? They both can't have the exact same oxidation state. Here's a rule: *Oxygen almost always has a -2 oxidation state when it is bonded.* You'll have to figure out the S, by first assuming oxygen is -2. Treat S like an unknown "x": XO_2 . Verify that the oxidation state for S is +4 in SO_2 .

6. Find the oxidation state for each atom bonded to oxygen below:

a) NO b) ClO_3 c) S_2O_3 d) NO_3^{-1} (Note: the total of all charges must equal -1)

7. Assign oxidation states to each atom in the following reactions:



8. A positive ion is formed when an atom _____ electrons.
gains OR loses?

9. A negative ion is formed an atom _____ electrons.
gains OR loses?

