

Activity - Electrons and Redox Processes

Introduction:

In some reactions, oxidation and reduction may occur to different elements. Sometimes, these processes are better understood with a visual representation. Some elements are oxidized easily. For example, magnesium easily loses two electrons to become an ion:



For bookkeeping purposes, an atom of Mg could be depicted this way:

Mg: the symbol for the element with two dots attached to it

Each dot represents one easily removable electron. The symbol Mg represents the remaining parts of the atom. This expression is called a dot structure, and can be represented this way:



Questions:

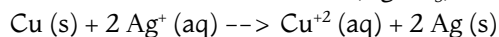
1) Construct a similar electron dot structure for each of the following events:

a) An atom of zinc, Zn, was converted to a Zn^{+2} ion (Hint: Zn has two easily removable electrons)

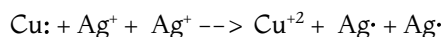
b) A silver ion, Ag^{+} , is converted to a metallic silver atom, Ag.

2) For each of the reactions in question 1, label them as oxidation or reduction.

When copper metal (Cu) is immersed in a solution of silver nitrate (AgNO_3), this is the reaction that occurs:



Using dot structures, the reaction could be represented as:



3a) Which reactant in the reaction above is oxidized?

b) Which reactant in the reaction above is reduced?

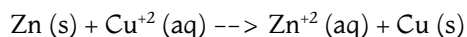
4) Why are two Ag^{+} ions needed for each Cu (s) atom that reacts?

Each copper atom involved in this reaction loses two electrons, and that the silver ions gain these electrons. So, Ag^{+} is the agent that causes the removal of electrons from Cu (resulting in the oxidation of Cu). The species involved in removing electrons from the reactant is called the oxidizing agent.

5a) Given the definition and explanation of an oxidizing agent in the previous paragraph, what must be the reducing agent in the reaction of copper and silver ions?

b) Define reducing agent.

Now consider another reaction:



6) Draw an electron dot representation of this reaction.

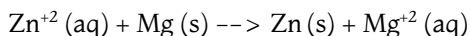
7a) Which reactant is oxidized?

b) Which reactant is reduced?

8) Identify the oxidizing agent and the reducing agent in the reaction.

9) What general features of an oxidation-reduction would allow you to answer questions 7 and 8 without drawing electron dot representations?

10) Test your answer to question 9 by identifying the reactant oxidized, reactant reduced, the oxidizing agent and the reducing agent in the reaction below:



11) For each of the following reactions, identify the element being oxidized and the element being reduced. Remember, when an element is by itself, it has a neutral charge.

