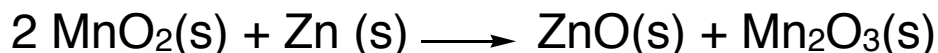
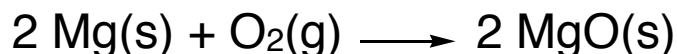
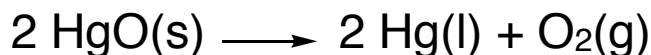


Batteries: Where are those electrons going?

Model 1: adding and removing oxygen atoms



atoms are oxidized by adding oxygen atoms

Critical Thinking Questions

1. According to Model 1, is the Hg in the HgO being oxidized or reduced? How about the Mg?

		metal		oxygen	
		charge as reactant	charge as product	charge as reactant	charge as product
1	$2 \text{HgO(s)} \longrightarrow 2 \text{Hg(l)} + \text{O}_2\text{(g)}$				
2	$2 \text{Mg(s)} + \text{O}_2\text{(g)} \longrightarrow 2 \text{MgO (s)}$				

2. When a metal is oxidized, it gains or loses electrons?

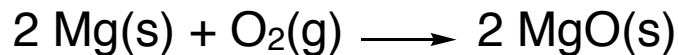
3. When a metal is reduced, it gains or loses electrons?

4. a. The mercury (Hg) atom (in reaction 1 above) is gaining how many electrons?

b. Since a reduction reaction is always accompanied by an oxidation reaction what element is being oxidized in reaction 1?

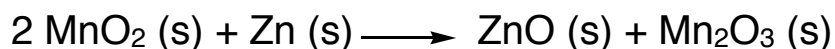
c. Is the oxygen atom gaining or losing electrons? How many?

d. Describe in your own words what is happening with the electrons. In other words, how many electrons are moved, and where were they at the beginning of the reaction, and where are they at the end?



5. a. The magnesium (Mg) atom (in reaction 2 above) is gaining or losing how many electrons?
- b. Since an oxidation reaction is always accompanied by a reduction reaction what element is being oxidized in reaction 2?
- c. Is the oxygen atom gaining or losing electrons? How many?
- d. Describe in your own words what is happening with the electrons. In other words, how many electrons are moved, and where were they at the beginning of the reaction, and where are they at the end?

6. Fill out the table for the following reaction.



charge on Mn		charge on Zn		charge on O	
as reactant	as product	as reactant	as product	as reactant	as product

7. a. Which element(s) are being oxidized and which are being reduced?
- b. Describe in your own words what is happening with the electrons. In other words, how many electrons are moved, and where were they at the beginning of the reaction, and where are they at the end?

8. A schematic diagram of an alkaline battery is drawn below. One notable feature is that the zinc and the manganese(IV) oxide (MnO_2) are kept apart. Consider that (1) a graphite rod is a good conductor of electricity, (2) batteries are used as a source of electricity (flowing electrons), and (3) to make an electrical appliance work it must be connected to a battery at two spots and describe how the electrons get from their starting position to their finishing position.

