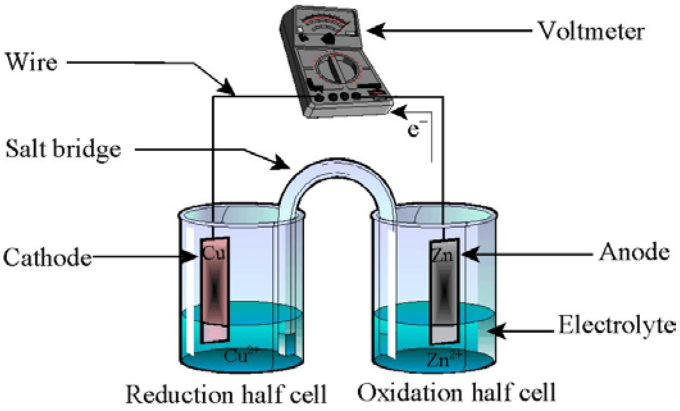
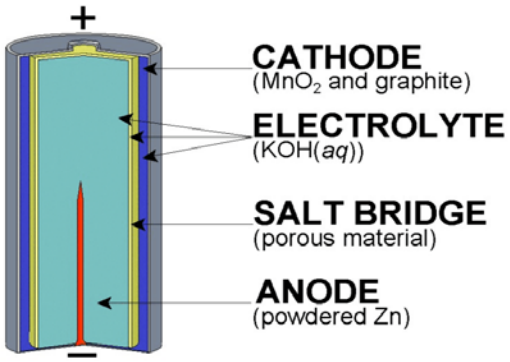
A Salt and Battery

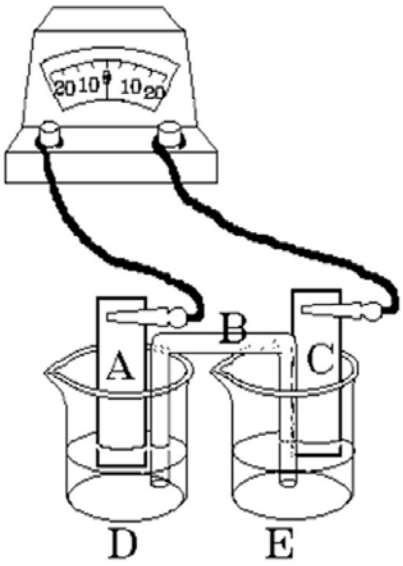
Portable electronic devices run on batteries. The electricity generated by a battery comes from a chemical reaction known as an oxidation-reduction reaction. During an a single replacement, a type of oxidation-reduction reaction, more active metals transfer electrons to less active metals. As a result, the more active metal is oxidized, and the less active metal is reduced. If the oxidation and reduction half reactions are physically separated and attached by a wire, electrons will flow through the wire during the reaction and can be used to power our portable electronics. This is done by putting electrolytes, usually aqueous acids, bases, or salts, into separate containers. The separate containers are called half cells because the half reactions are isolated in them. They are connected by a salt bridge which lets ions travel between half cells. Electrodes are immersed into the electrolytes. The electrodes are merely metals with differing activity. Completing the circuit by connecting the electrodes enables electrons to flow from the more active metal to the less active metal, reducing it. The electrode where reduction occurs is called the **cathode**. The electrode where oxidation occurs is called the **anode**. The device that produces electric current from a chemical reaction is called a **voltaic cell**. Several voltaic cells attached together form a battery of cells. A **battery**, produces a higher voltage than a single cell.





Answer the questions below based on your reading above and on your knowledge of chemistry.

*Answer questions1-4 by referring to the diagram to the right showing an electrochemical cell. The metal at electrode **A** is silver. The metal at electrode **C** is lead. The electrolytes at locations **B**, **D**, and **E** are potassium nitrate, silver nitrate, and lead nitrate respectively.*



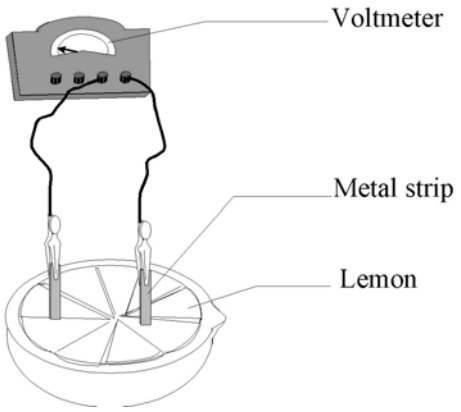
1. In what direction do electrons flow in the electrochemical cell pictured to the right (A to C *or* C to A)? _____
2. What type of chemical change is taking place in the half-cell contained in the beaker at location ***E***? _____
3. At which location are electrons being gained? _____
4. Which metal is being replaced during the reaction in this electrochemical cell? _____

Continue ☞

Answer questions 5-16 by referring to Table J. For each of the electrode pairs, which would be the anode in an electrochemical cell?

5. Cu/Zn . . . . . _____
6. Pb/Sn . . . . . _____
7. K/Al . . . . . _____
8. Ba/Li . . . . . _____
9. Au/Pb . . . . . _____
10. Mn/Zn . . . . . _____
11. Fe/Zn . . . . . _____
12. Co/Ca . . . . . _____
13. Co/Ni . . . . . _____
14. H_2/Ag . . . . . _____
15. Cu/Mg . . . . . _____
16. Zn/Al . . . . . _____

Answer questions17-19 by referring to t he setup shown to the right using a lemon and metal strips. It actually produces measurable electricity.



17. Explain how the lemon battery works? _____

_____

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_____

_____

_____

18. What parts of a typical voltaic cell are missing in the lemon battery? What effect does this have on how well it functions? Explain. _____

_____

_____

19. If the metal strip on the right is iron and the metal strip on the left is aluminum, in what direction will electricity flow?

_____

20. What happens at the anode of an electrochemical cell? _____

_____

21. There are two voltaic cells pictured on the previous page. The one on the left is called a wet cell, while the one at the left is called a dry cell. The one at the right is also called an alkaline cell. What is the difference between these cells that accounts for the difference in the way they are named? _____

_____

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