***Chemistry***

**17: Electrochemistry**

**17.5: Batteries and Fuel Cells**

35. List some things that are typically considered when selecting a battery for a new application.

Solution

Considerations include: cost of the materials used in the battery, toxicity of the various components (what constitutes proper disposal), should it be a primary or secondary battery, energy requirements (the “size” of the battery/how long should it last), will a particular battery leak when the new device is used according to directions, and its mass (the total mass of the new device).

37. Consider a battery with the overall reaction: .

(a) What is the reaction at the anode and cathode?

(b) A battery is “dead” when it has no cell potential. What is the value of *Q* when this battery is dead?

(c) If a particular dead battery was found to have [Cu2+] = 0.11 *M*, what was the concentration of silver ion?

Solution

(a)



(b) Using the Nernst equation with *n* = 2:



; (c) Using the value of *Q* just calculated:

.

39. Why do batteries go dead, but fuel cells do not?

Solution

Batteries are self-contained and have a limited supply of reagents to expend before going dead. Alternatively, battery reaction byproducts accumulate and interfere with the reaction. Because a fuel cell is constantly resupplied with reactants and products are expelled, it can continue to function as long as reagents are supplied.

41. Using the information thus far in this chapter, explain why battery-powered electronics perform poorly in low temperatures.

Solution

*E*cell, as described in the Nernst equation, has a term that is directly proportional to temperature. At low temperatures, this term is decreased, resulting in a lower cell voltage provided by the battery to the device—the same effect as a battery running dead.

This resource file is copyright 2015, Rice University. All Rights Reserved.