

**Spontaneity**

# Half Reactions

- Determine the half reactions and net equation for the reaction between silver chloride and solid copper



# Spontaneous Reactions

- Spontaneous reaction will occur with no input of energy!



**“Chemical reactions, Bob, combined with the heat of a locker room produce spontaneous combustion. So now you know. Never wear the same pair of socks 10 days in a row.”**

# Experimental Evidence

- place 2 substances in contact and see if they react.
- if a reaction occurs, 1 substance is oxidized (loses electrons) and 1 is reduced (gains electrons)



# So What?!

- Spontaneous redox reactions are used in batteries as well as biochemical reactions like cellular respiration!

# SOA above SRA

- for a reaction to be spontaneous, the oxidizing agent must be higher on the chart than the reducing agent
- think it requires no energy to roll downhill!



# Example 1

- 4 unknown substances are being analyzed in oxidation-reduction studies. Each substance has a form that acts as an oxidizing agent (cations usually) and a reducing agent (solid metals usually). All reactions involve only 1 electron. The following table was constructed with a \* indicating a reaction was observed.

	A(s)	B(s)	C(s)	D(s)
A+(aq)				
B+(aq)	*		*	*
C+(aq)	*			
D+(aq)	*		*	

- The oxidizing agent with the most reactions is the strongest oxidizing agent, and the strength goes down from there!

## Example 2

- In a children's chemistry set, a common experiment involves placing iron shavings in a solution of copper(II)sulfate. Predict whether or not this reaction would be spontaneous!



# Redox Tables

- By testing the reactions of different oxidizing (and reducing) agents a redox table can be constructed.
- See p.9 in blue booklet

- Strongest oxidizing agent at the top (gets reduced [*gains electrons*] easiest)
- Strongest reducing agent at the bottom (loses electrons easiest)
- Label it on your table