Name _____ Date _____

Electrochemistry

Section 20.1 Voltaic Cells

energy _____

chemical potential energy _____

spontaneous process _____

_____

oxidation _____

reduction _____

half-reaction _____

_____

_____

_____

New Vocabulary *Use your text to define each term.*

salt bridge _____

electrochemical cell _____

_____

voltaic cell _____

_____

half-cell _____

_____

anode _____

cathode _____

reduction potential _____

standard hydrogen electrode _____

_____

Name _____ Date _____

Section 20.1 Voltaic Cells (continued)

Main Idea — **Details**

Redox in Electrochemistry

Use with pages 708–709.

Explain *the branch of chemistry called electrochemistry.*

_____

_____

Write *the half-reactions of copper and zinc.*

_____ (reduction half-reaction: electrons _____)

_____ (oxidation half-reaction: electrons ____)

Explain *how an electrochemical cell uses a redox reaction.*

_____

_____

Chemistry of Voltaic Cells

Use with page 710.

Complete *each of the following statements.*

1. The electrode where oxidation takes place is called the _____.
2. The electrode where reduction takes place is called the _____.
3. An object's potential energy is _____.
4. In electrochemistry, _____ is a measure of the amount of _____ that can be generated from a _____ to do work.

Sequence *the steps of the electrochemical process that occur in a zinc-copper voltaic cell. The first one has been done for you.*

____ To complete the circuit, both positive and negative ions move through the salt bridge. The two half-reactions can be summed to show the overall cell reaction.

____ The electrons flow from the zinc strip and pass through the external circuit to the copper strip.

__1__ Electrons are produced in the oxidation half-cell according to this half-reaction: $Zn(s) \rightarrow Zn^{2+}(aq) + 2e^-$.

____ Electrons enter the reduction half-cell where the following half-reaction occurs: $Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$.

Name _____ Date _____

Section 20.1 Voltaic Cells (continued)

Main Idea — **Details**

Calculating Electrochemical Cell Potential

Use with pages 711–712.

Describe *reduction potential in relation to an electrode.*

Analyze *Table 20.1. Some of the E^0 (V)s are positive, some are negative. Explain the difference.*

Write *the abbreviated E^0 and half-reaction for each of the following:*

Element	Half-Reaction	E^0 (V)
Li		
Au		
$PbSO_4$		
Na		

Calculate a Cell Potential

Use with Example Problem 20.1, page 715.

Summarize *Fill the blanks to help you take notes while you read Example Problem 20.1.*

Problem

Calculate the overall cell reaction and the standard potential for the half-cells of a voltaic cell.

$I_2(s) + 2e^- \rightarrow 2I^-(aq)$

$Fe^{2+}(aq) + 2e^- \rightarrow Fe\ (s)$

1. **Analyze the Problem.**
   List the known and the unknown.
   Known: Standard reduction potentials for the half-cells
   Unknown: _____

Section 20.1 Voltaic Cells (continued)

Main Idea — **Details**

2. Solve for the unknown.

Find the standard reduction potentials for half-reactions.

$E^0_{I_2|I^-}$ = _____

$E^0_{Fe^{2+}|Fe}$ = _____

Rewrite the half–reactions in the correct direction.

reduction half–cell reaction: _____

oxidation half–cell reaction: _____

overall cell reaction: _____ $I_2(s) + Fe(s) \rightarrow Fe^{2+}(aq) + 2I^-(aq)$

Balance the reaction if necessary:

_____

Calculate cell standard potential:

$E^0_{cell} = E^0_{reduction} - E^0_{oxidation}$

$E^0_{cell} = +0.536\ V -$ _____

$E^0_{cell} = +$ _____

Write the reaction using cell notation:

_____

3. Evaluate the answer.

The answer seems reasonable given the _____ of the _____ that comprise it.

Using Standard Reduction Potentials

Use with page 716.

Write ***the steps for the process of predicting whether any proposed redox reaction will occur spontaneously.***

1. _____
2. _____
3. _____

_____

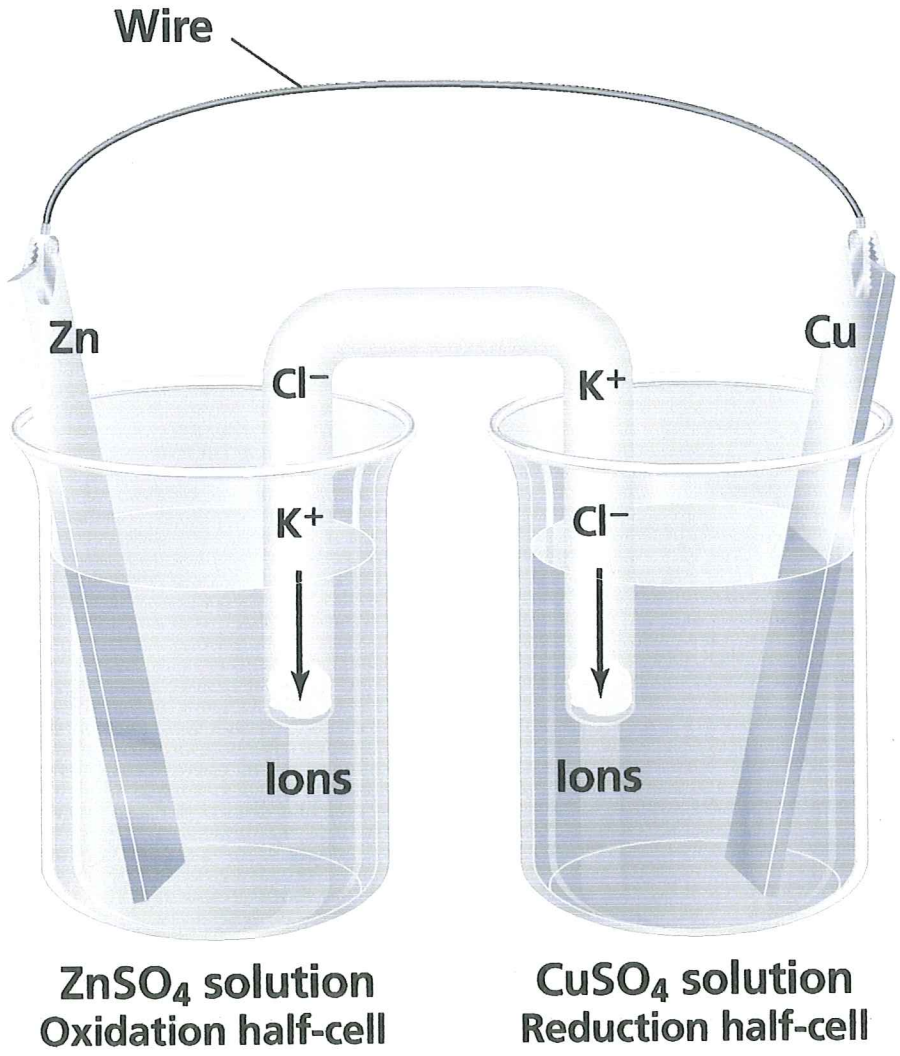
4. _____
5. _____

Name _____ Date _____ Class _____

TEACHING TRANSPARENCY MASTER 60

Electrochemical Cell

Use with Chapter 20, Section 20.1



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Name _____ Date _____ Class _____

TEACHING TRANSPARENCY WORKSHEET 60

Electrochemical Cell

Use with Chapter 20, Section 20.1

1. What half-cell reaction takes place in each beaker?

   Left beaker _____

   Right beaker _____

2. What type of reaction (oxidation or reduction) takes place in each beaker?

   Left beaker _____ Right beaker _____

3. Which electrode is the anode and which is the cathode?

   Anode _____ Cathode _____

4. What atomic particles move through the wire, and in which direction do they move?

   _____

5. Which ions flow from the salt bridge into each beaker?

   Left beaker _____ Right beaker _____

6. Write the overall cell reaction.

   _____

7. Represent the cell symbolically, using vertical lines to separate the components.

   _____

8. Use the following standard reduction potentials to calculate the standard cell potential, E^0_{cell}.

   $Zn^{2+} + 2e^- \rightarrow Zn$ $\quad$ $Cu^{2+} + 2e^- \rightarrow Cu$

   $E^0_{Zn} = -0.7618\ V$ $\quad$ $E^0_{Cu} = +0.3419\ V$

   _____

9. How is an electrochemical cell useful?

   _____

   _____

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