Name _____

Practice: Oxidation and Reduction

Multiple Choice

_____ 1. In the reaction $2K + Br_2 \rightarrow 2K^+ + 2Br^-$, which species is reduced?

a. K only
b. Br_2 only
c. Both K and Br_2
d. Neither K nor Br_2

_____ 2. In the half-reaction $Ag^{2+} + 2e^- \rightarrow Ag(s)$, the silver ion changes into solid silver because it is

a. oxidized.
b. reduced.
c. ionized.
d. disintegrated.

_____ 3. In the oxidation-reduction reaction

$H_2O + 2MnO_2 + Zn \rightarrow Mn_2O_3 + Zn(OH)_2$,

the balanced half-reaction involving zinc is

a. $Zn(OH)_2 \rightarrow Zn + 2e^-$.
b. $Zn(OH)_2 \rightarrow Zn + 2OH^-$.
c. $Zn + 2OH^- \rightarrow Zn(OH)_2 + 2e^-$.
d. $Zn + 2OH^- + 2e^- \rightarrow Zn(OH)_2$.

_____ 4. Consider the two half-reactions below.

I. $Pb + HSO_4^- \rightarrow PbSO_4$

II. $PbO_2 + HSO_4^- \rightarrow PbSO_4 + 2H_2O$

The reactant lead, Pb, is
a. oxidized in both.
b. reduced in both.
c. reduced in I and oxidized in II.
d. oxidized in I and reduced in II.

_____ 5. In the reaction $Zn + CuSO_4 \rightarrow Cu + ZnSO_4$,

a. Cu is oxidized and Zn^{2+} is reduced.
b. Cu is reduced and Zn^{2+} is oxidized.
c. Cu^{2+} is oxidized and Zn is reduced.
d. Cu^{2+} is reduced and Zn is oxidized.

6.) Determine which of the following are redox reactions. For those that are, identify the element oxidized, the element reduced, the oxidizing agent (reactant), and the reducing agent (reactant). If the reaction is not a redox reaction, place a check ✓on the "none of the above" line.

a.) $SiCl_4(l) + Mg \rightarrow MgCl_2(s) + Si(s)$

_____ is oxidized _____ is the oxidizing agent

_____ is reduced _____ is the reducing agent

_____ none of the above, this is not a redox reaction!

b.) $HCl(g) + NH_3(g) \rightarrow NH_4Cl(s)$

_____ is oxidized _____ is the oxidizing agent

_____ is reduced _____ is the reducing agent

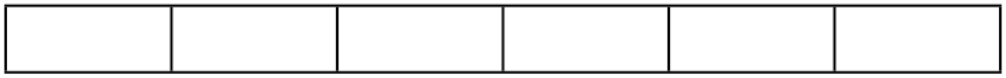
_____ none of the above, this is not a redox reaction!

7.) From the data below, determine the activity series of the following six elements:

A, B, C, H, Sr, and Hg.

Reactants	Observations
$C(s) + H_2SO_4(aq)$	No Reaction
$A(s) + HNO_3(aq)$	Bubbles form
$B(s) + ASO_4(aq)$	Dark substance begins to form on the B metal
$C(s) + HgCl_2(aq)$	Liquid metal begins to appear within the solution
$B(s) + H_2SO_4(aq)$	Bubbles form
$B(s) + SrCl_2(aq)$	No Reaction

Activity Series (place element symbols inside of boxes):



Most Active ----------> Least Active

8. Use the half-reaction method to balance the redox reaction shown below that takes place in <u>acidic</u> solution:

$$MnO_4^-(aq) + Cr_2O_4^{2-}(aq) \rightarrow Mn^{2+}(aq) + CrO_2(s)$$

Oxidation half-reaction:

Reduction half-reaction:

Complete redox reaction:

9.) The three reactions below could all be used to prepare plumbous sulfate:

Reaction I : $PbCl_2 + Ag_2SO_4 \rightarrow PbSO_4 + 2AgCl$

Reaction II : $PbF_2 + H_2SO_4 \rightarrow PbSO_4 + 2\ HF$

Reaction III : $Pb(SO_4)_2 + SO_2 + 2H_2O \rightarrow PbSO_4 + 2H_2SO_4$

Which of the following best summarized what is happening to <u>lead</u> in each of these reactions?

	<u>Reaction I</u>	<u>Reaction II</u>	<u>Reaction III</u>
A.	reduction	no change	no change
B.	no change	no change	reduction
C.	no change	reduction	oxidation
D.	reduction	reduction	oxidation

10.) Assign oxidation numbers (states) to each of the atoms below:

a.) K_2SO_3 b.) $Ca(ClO_4)_2$ b.) $H_2PO_4^-$

11.) Determine which of the following are oxidation-reduction reactions. For those that are, identify the element that is being oxidized, the element that is being reduced, the oxidizing agent, and the reducing agent. If the reaction is not an oxidation-reduction reaction, indicate this by leaving the lines blank.

a.) $Cu + 2\,Ag^{+} \rightarrow 2\,Ag + Cu^{2+}$

_____ is oxidized _____ is the oxidizing agent

_____ is reduced _____ is the reducing agent

b.) $SiCl_4 + 2\,H_2O \rightarrow 4\,HCl + SiO_2$

_____ is oxidized _____ is the oxidizing agent

_____ is reduced _____ is the reducing agent

c.) $Cr_2O_7^{2-}(aq) + Cl^{-}(aq) \rightarrow Cr^{2+}(s) + Cl_2(g)$

_____ is oxidized _____ is the oxidizing agent

_____ is reduced _____ is the reducing agent

12.) Complete the table below by listing the relative oxidizing and reducing strengths of the elements and ions associated with the following redox reactions:

$Al(s) + CaCl_2(aq) \rightarrow$ No Rxn

$Al(s) + ZnCl_2(aq) \rightarrow AlCl_3(aq) + Zn(s)$

$Ag(s) + CuCl_2(aq) \rightarrow$ No Rxn

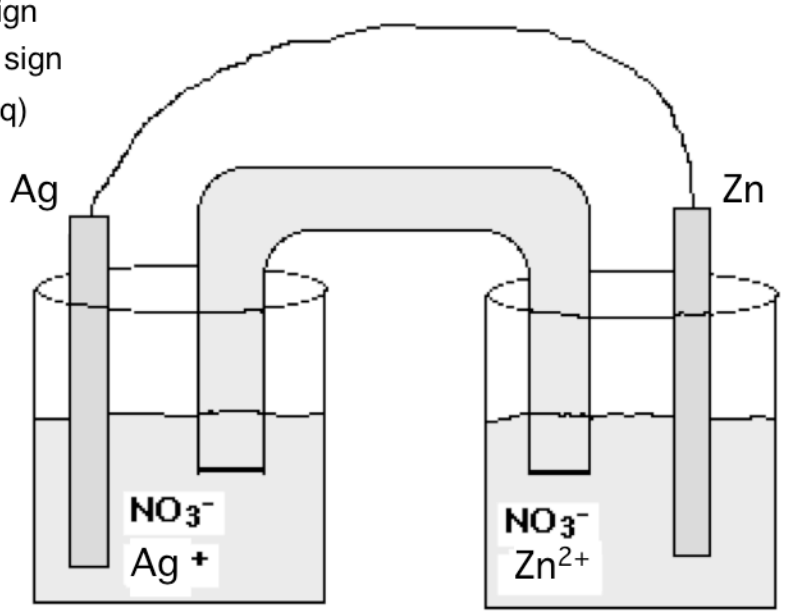
$Zn(s) + CuCl_2(aq) \rightarrow ZnCl_2(aq) + Cu(s)$

Reducing Agents <----------Increasing Strength ----------				
Oxidizing Agents ----------Increasing Strength ---------->				

13. Voltaic Cell (Check your activity series handout!)

i. On the diagram below, label the following:

The electrode that is the anode and its +/- sign
The electrode that is the cathode and its +/- sign
Movement of ions in the salt bridge, NaCl(aq)



ii. Write the half-reactions taking place at each electrode:

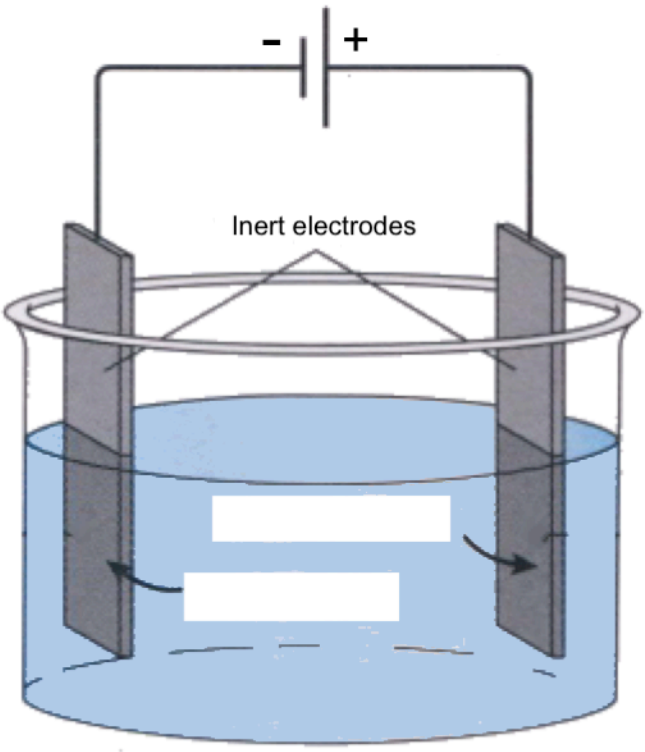
Anode:_____

Cathode: _____

14. Electrolytic Cell: $CrI_3(l)$ (molten chromium(III) iodide)

i. On the diagram, label the following:

The direction of the electron flow ($e^- \rightarrow$)
The electrode that is the anode and its +/- sign
The electrode that is the cathode and its +/- sign
The ion attracted to the anode
The ion attracted to the cathode



ii. Write the half-reaction taking place at each electrode:

Anode:_____

Cathode: _____