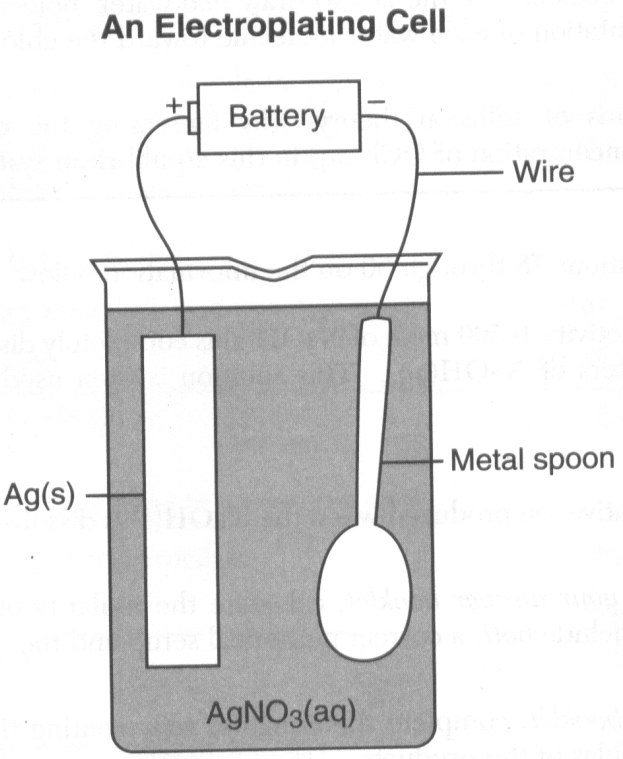
Name:_____ Period:_____ Date:_____

Ms. Randall Unit 10 Redox Constructed repsonse practice 2013-2014

1. Base your answer to the following question on the information below.

Electroplating is an electrolytic process used to coat metal objects with a more expensive and less reactive metal. The diagram below shows an electroplating cell that includes a battery connected to a silver bar and a metal spoon. The bar and spoon are submerged in $AgNO_3(aq)$.



Explain the purpose of the battery in this cell.

Period:_____

2. Base your answer to the following question on the information below

The unbalanced equation below represents the decomposition of potassium chlorate.

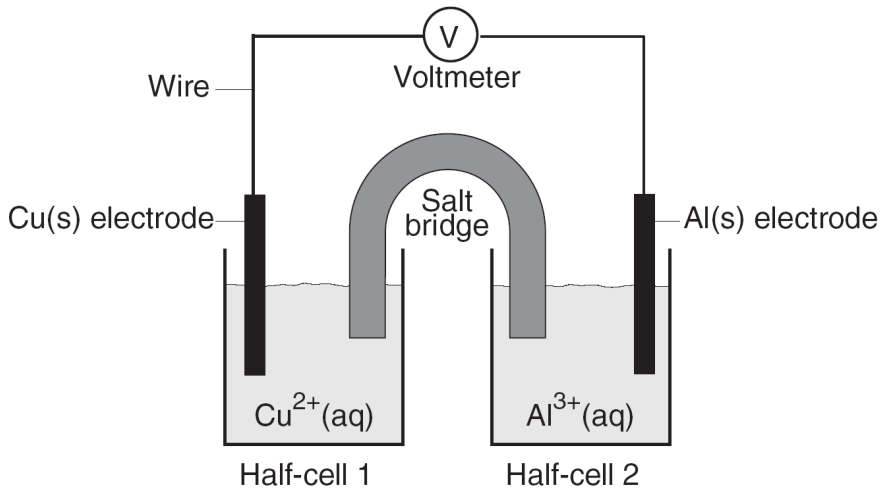
$KClO_3(s) \rightarrow KCl(s) + O_2(g)$

Determine the oxidation number of chlorine in the reactant.

Base your answers to questions **3** and **4** on the diagram below.

The diagram shows a voltaic cell with copper and aluminum electrodes immediately after the external circuit is completed.

Voltaic Cell



3. Explain the function of the salt bridge.

4. As this voltaic cell operates, the mass of the Al(s) electrode decreases. Explain, in terms of particles, why this decrease in mass occurs.

Period:_____

5. Base your answer to the following question on the information below.

   During a laboratory activity, a student reacted a piece of zinc with 0.1 M HCl(aq).

   Based on Reference Table *J*, identify *one* metal that does *not* react spontaneously with HCl(aq).

Base your answers to questions **6** and **7** on the unbalanced redox reaction below.

$$Cu(s) + AgNO_3(aq) \rightarrow Cu(NO_3)_2(aq) + Ag(s)$$

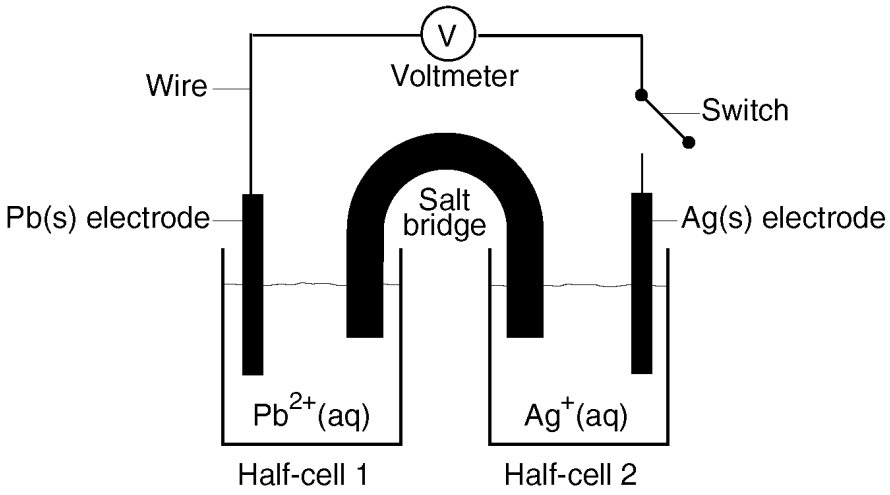
6. Balance the redox equation using the smallest whole-number coefficients.

7. Write the reduction half-reaction.

Period:_____

Base your answers to questions **8** and **9** on the diagram of the voltaic cell below.

Voltaic Cell



$$2\ Ag^{+}(aq) + Pb(s) \longrightarrow Pb^{2+}(aq) + 2\ Ag(s)$$

8. *Based on the given equation,* write the balanced half-reaction that occurs in half-cell 1.

9. When the switch is closed, state the direction that electrons will flow through the wire.

10. Given the reaction: $Cl_2 + 2\ HBr \rightarrow Br_2 + 2\ HCl$
Write a correctly balanced reduction half-reaction for this equation.

Period:_____

11. Given the reaction:

$4\ Al(s) + 3\ O_2(g) \rightarrow (g)\ 2\ Al_2O$

a Write the balanced oxidation half-reaction for this oxidation-reduction reaction.

b What is the oxidation number of oxygen in Al_2O_3?

Base your answers to questions **12** through **14** on the following redox reaction, which occurs spontaneously.

$$Zn + Cr^{3+} \rightarrow Zn^{2+} + Cr$$

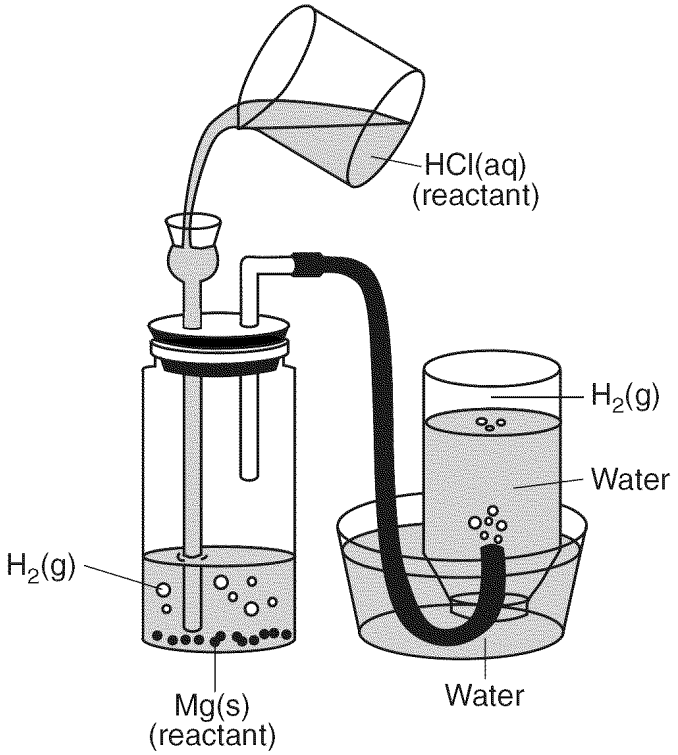
12. Write the half-reaction for the reduction that occurs.

13. Write the half-reaction for the oxidation that occurs.

14. Which half-reaction occurs at the cathode?

Base your answers to questions **15** through **17** on the information below.

A student places a 2.50-gram sample of magnesium metal in a bottle and fits the bottle with a 2-hole stopper as shown in the diagram. Hydrochloric acid is added to the bottle, causing a reaction. As the reaction proceeds, hydrogen gas travels through the tubing to an inverted bottle filled with water, displacing some of the water in the bottle.



15. Based on Reference Table *J*, explain why Ag(s) will *not* react with HCl (aq) to generate H_2(g).

16. Identify the type of chemical reaction that occurs when magnesium reacts with hydrochloric acid.

17. Show a correct numerical setup for calculating the number of moles of magnesium used in the experiment.

Answer Key
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1. *Examples:* – The battery provides the electrical energy necessary for the reaction to occur.
2. +5
3. *Examples:* —It allows migration of ions. — maintains neutrality —prevents polarization
4. —Aluminum atoms are losing electrons and becoming aluminum ions that are entering the solution.
5. *Examples:* –Cu –Ag –gold
6. $Cu(s) + 2\ AgNO_3(aq) \rightarrow Cu(NO_3)_2(aq) + 2\ Ag(s)$
7. Acceptable responses: $Ag^+ + e^- \rightarrow Ag$; $2\ Ag^+ + 2e^- \rightarrow 2\ Ag$
8. Allow credit for **$Pb(s) \rightarrow Pb^{2+}(aq) + 2e^-$ even if the labels (s) and (aq) are not included.**
9. Acceptable responses: from Pb electrode to Ag electrode, left to right, cell 1 → cell 2, Do not allow credit for a response that indicates that electrons flow through the salt bridge.
10. Examples: $–Cl_2 + 2e^- \rightarrow 2\ Cl^-$ or, $–Cl_2 \rightarrow 2\ Cl^- – 2e^-$
    $–C1 + e^- \rightarrow Cl^-$
11. *a* Examples:
    $Al \rightarrow Al^{3+} + 3e^-$
    $4\ Al \rightarrow 4\ Al^{3+} + 12e^-$
    $Al – 3e^- \rightarrow Al^{3+}$
    $4\ Al – 12e^- \rightarrow 4\ Al^{3+}$

    b –2
12. examples:
    $Cr^{3+} + 3e^- \rightarrow Cr$
    $2\ Cr^{3+} + 6e^- \rightarrow 2\ Cr$
13. examples:
    $Zn \rightarrow Zn^{2+} + 2e^-$
    $3\ Zn \rightarrow 3\ Zn^{2+} + 6e^-$
    $Zn – 2e^- \rightarrow Zn^{2+}$
    $3\ Zn – 6e^- \rightarrow 3\ Zn^{2+}$
14. $6e^- + 2\ Cr^{3+} \rightarrow 2\ Cr$ or reduction or chromium half-reaction or $Cr^{3+} + 3e^- \rightarrow Cr$.
15. Examples: – Ag is below H_2 in the activity series. – Ag is more difficult to oxidize.
16. Examples: – The reaction is single replacement. – single displacement -redox
17. Examples: 2.50g × 1 mol/24.3 g *or* 2.50/24