

Name: _____ Due: **Feb 25**

Single Replacement Reactions of metals

Lithium	$\text{Li} \longrightarrow \text{Li}^+ + \text{e}^-$
Potassium	$\text{K} \longrightarrow \text{K}^+ + \text{e}^-$
Barium	$\text{Ba} \longrightarrow \text{Ba}^{2+} + 2 \text{e}^-$
Calcium	$\text{Ca} \longrightarrow \text{Ca}^{2+} + 2 \text{e}^-$
Sodium	$\text{Na} \longrightarrow \text{Na}^+ + \text{e}^-$
Magnesium	$\text{Mg} \longrightarrow \text{Mg}^{2+} + 2 \text{e}^-$
Aluminum	$\text{Al} \longrightarrow \text{Al}^{3+} + 3 \text{e}^-$
Manganese	$\text{Mn} \longrightarrow \text{Mn}^{2+} + 2 \text{e}^-$
Zinc	$\text{Zn} \longrightarrow \text{Zn}^{2+} + 2 \text{e}^-$
Chromium	$\text{Cr} \longrightarrow \text{Cr}^{3+} + 3 \text{e}^-$
Iron	$\text{Fe} \longrightarrow \text{Fe}^{2+} + 2 \text{e}^-$
Cobalt	$\text{Co} \longrightarrow \text{Co}^{2+} + 2 \text{e}^-$
Nickel	$\text{Ni} \longrightarrow \text{Ni}^{2+} + 2 \text{e}^-$
Tin	$\text{Sn} \longrightarrow \text{Sn}^{2+} + 2 \text{e}^-$
Lead	$\text{Pb} \longrightarrow \text{Pb}^{2+} + 2 \text{e}^-$
Hydrogen	$\text{H}_2 \longrightarrow 2 \text{H}^+ + 2 \text{e}^-$
Copper	$\text{Cu} \longrightarrow \text{Cu}^{2+} + 2 \text{e}^-$
Silver	$\text{Ag} \longrightarrow \text{Ag}^+ + \text{e}^-$
Mercury	$\text{Hg} \longrightarrow \text{Hg}^{2+} + 2 \text{e}^-$
Platinum	$\text{Pt} \longrightarrow \text{Pt}^{2+} + 2 \text{e}^-$
Gold	$\text{Au} \longrightarrow \text{Au}^{3+} + 3 \text{e}^-$

Oxidation and Reduction:

1. Refer to the Activity Series of Metal and write the oxidation reaction for the corrosion of iron metal. Include physical states of all the species.
2. Refer to the Activity Series of Metal and write the reduction reaction of iron (II) ion. Include physical states of all the species.
3. Refer to the Activity Series of Metal and write the reduction reaction of tin (II) ion. Include physical states of all the species.
4. Refer to the Activity Series of Metal and write the oxidation reaction of gold metal. Include physical states of all the species.

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Gold	$\text{Au} \longrightarrow \text{Au}^{3+} + 3 \text{e}^-$

Oxidation and Reduction:

5. Refer to the Activity Series of Metal and write the oxidation reaction of aluminum metal. Include physical states of all the species.

6. Refer to the Activity Series of Metal and write the reduction reaction of chromium (III) ion. Include physical states of all the species.

7. Refer to the Activity Series of Metal and write the reduction reaction of lead (II) ion. Include physical states of all the species.

8. Refer to the Activity Series of Metal and write the oxidation reaction of platinum metal. Include physical states of all the species.

9. Refer to the video and fill in the blanks in these 5 boxes and circle hydrogen on the table.

ACTIVITY SERIES OF METALS

_____ at the top of the table.

Metals at the top of the table

Each reaction in the table is a

Metals at the bottom of the table

_____ at the bottom of the table.

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Gold	$\text{Au} \longrightarrow \text{Au}^{3+} + 3 \text{e}^-$

10.(a) Write the general form of a single-replacement reaction involving metals in contact with compounds dissolved in aqueous solution.

(b) Explain the condition that must be satisfied in order for a single-replacement reaction to proceed.

Experiment: What happens if you dip Mg metal into a $\text{Zn}(\text{NO}_3)_2$ (aq) solution?

- 11.(a) Compare the positions of magnesium and zinc on the Activity Series of Metal. Which is higher on the Activity Series of Metals?

_____ is higher than _____
on the Activity Series of Metal.

- (b) According to your answers in question 10, would you predict that this reaction will proceed?

- 12.Using the general form for a single replacement reaction as a guide, what is the reaction that will occur? Make sure the reaction is balanced.



13. (a) What do you see in the zinc nitrate solution?

- (b) What is the ratio of the ions you see?

14.(a) Draw the magnesium before and after it was dipped into the zinc nitrate solution?

Before:	After:
(b) Does your before and after picture look the same?	
(c) Did a reaction occur as predicted? (If the before and after picture is NOT the same, then something happened, a reaction occurred.)	

15.(a) Write the oxidation reaction that occurred.

(b) Identify the species that is oxidized.

16. (a) Write the reduction reaction that occurred.

(b) Identify the species that is reduced.

17. Write the net ionic reaction that occurred.

18. Identify the spectator ion(s).

Experiment: What happens if you dip Cu metal into a $\text{Zn}(\text{NO}_3)_2$ (aq) solution?

19.(a) Compare the positions of copper and zinc on the Activity Series of Metal. Which is higher on the Activity Series of Metals?

_____ is higher than _____
on the Activity Series of Metal.

(b) Draw the copper before and after it was dipped into the zinc nitrate solution?

Before:	After:
(c) Does your before and after picture look the same?	
(d) Did a reaction occur as predicted? (If the before and after picture is the same, then nothing happened, no reaction occurred.)	

(e) According to your answers in question 10, would you predict that this reaction will proceed?

(f) If the answer to part (b) is yes, then,

(i) Write the balanced chemical reaction

(ii) Write the net ionic reaction

(iii) Write the oxidation reaction

(iv) Write the reduction reaction

(v) Identify the species oxidized

(vi) Identify the species reduced

(vii) Identify the spectator ion(s)

20 (a) Fill in the cells. (There is a total of 6 reactions.)

SOLID METALS	(NR = no reaction) SOLUTIONS							
	Mg(NO₃)₂ (aq)		Zn(NO₃)₂ (aq)		Cu(NO₃)₂ (aq)		AgNO₃ (aq)	
Mg (s)	NR		Is there a reaction?	Is the solid metal more active?	Is there a reaction?	Is the solid metal more active?	Is there a reaction?	Is the solid metal more active?
Cu (s)	Is there a reaction?	Is the solid metal more active?	Is there a reaction?	Is the solid metal more active?	NR		Is there a reaction?	Is the solid metal more active?
Zn (s)	Is there a reaction?	Is the solid metal more active?	NR		Is there a reaction?	Is the solid metal more active?	Is there a reaction?	Is the solid metal more active?
Ag (s)	Is there a reaction?	Is the solid metal more active?	Is there a reaction?	Is the solid metal more active?	Is there a reaction?	Is the solid metal more active?	NR	

20 (b) When a reaction occurs, do the following:

(i) Write the balanced chemical reaction

(ii) Write the net ionic reaction

(iii) Write the oxidation reaction

(iv) Write the reduction reaction

(v) Identify the species oxidized

(vi) Identify the species reduced

(vii) Identify the spectator ion(s).

(You will need more space to do this.)

21 (a)

	HCl (aq) Is there a reaction?	When a reaction occurs, rank the speed of the reaction (i.e. the rate at which the bubbles form) (1) for the fastest reaction, (2) for the 2 nd fastest reaction, etc.
Ag (s)		
Cu (s)		
Fe (s)		
Mg (s)		
Ni (s)		
Pb (s)		
Sn (s)		
Zn (s)		

Look up the solid metals on the Activity Series of metals. Arrange the **solid metals** in order of activities (From most active to least active).

21 (b) When a reaction occurs, do the following:

(i) Write the balanced chemical reaction

(ii) Write the net ionic reaction

(iii) Write the oxidation reaction

(iv) Write the reduction reaction

(v) Identify the species oxidized

(vi) Identify the species reduced

(vii) Identify the spectator ion(s).

(You will need more space to do this.)

24. (a) What happens when Al metal is dipped in a copper (II) chloride solution?
- (b) What happens when Mg metal is dipped in a copper (II) chloride solution?
- (c) What happens when Ag metal is dipped into a copper (II) chloride solution?

When a reaction occurs in (a), (b), and (c), do the following:

- (i) Write the balanced chemical reaction
- (ii) Write the net ionic reaction
- (iii) Write the oxidation reaction
- (iv) Write the reduction reaction
- (v) Identify the species oxidized
- (vi) Identify the species reduced
- (vii) Identify the spectator ion(s).

(You will need more space to do this.)