

Name: _____

CHEMISTRY

SINGLE REPLACEMENT REACTION WORKSHEET

REACTION CATEGORY	SINGLE REPLACEMENT																												
REACTION DESCRIPTION	<p>In these reactions, a free element reacts with a compound to form another compound and release one of the elements of the original compound in the elemental state. There are two different possibilities:</p> <ol style="list-style-type: none"> 1. One cation (+ ion) replaces another. 2. One anion (- ion) replaces another. 																												
REACTION FORMAT	<ol style="list-style-type: none"> 1. $AB + C \rightarrow CB + A$ 2. $A + BC \rightarrow BA + C$ 																												
REACTION GUIDELINES	<p>1. In a single replacement reaction atoms of one element replace the atoms of a second element in a compound. Whether one metal will replace another metal from a compound can be determined by the relative reactivities of the two metals. To help us determine this, an activity series of metals arranges metals in order of decreasing reactivity. A reactive metal will replace any metal listed below it in the activity series.</p> <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: 80%;"> <p style="text-align: center;">ACTIVITY SERIES OF METALS</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">METAL</th> <th style="text-align: left;">SYMBOL</th> </tr> </thead> <tbody> <tr><td>Lithium</td><td>Li</td></tr> <tr><td>Potassium</td><td>K</td></tr> <tr><td>Calcium</td><td>Ca</td></tr> <tr><td>Sodium</td><td>Na</td></tr> <tr><td>Magnesium</td><td>Mg</td></tr> <tr><td>Aluminum</td><td>Al</td></tr> <tr><td>Zinc</td><td>Zn</td></tr> <tr><td>Iron</td><td>Fe</td></tr> <tr><td>Lead</td><td>Pb</td></tr> <tr><td>(Hydrogen)</td><td>(H)*</td></tr> <tr><td>Copper</td><td>Cu</td></tr> <tr><td>Mercury</td><td>Hg</td></tr> <tr><td>Silver</td><td>Ag</td></tr> </tbody> </table> <p>*Metals from Li to Na will replace H from acids and water; from Mg to Pb they will replace H from acids only.</p> </div> <p>2. A nonmetal can also replace another nonmetal from a compound. This replacement is usually limited to the halogens (F₂, Cl₂, Br₂, and I₂). The activity of the halogens decreases as you go down the Group (17) of the periodic table.</p>	METAL	SYMBOL	Lithium	Li	Potassium	K	Calcium	Ca	Sodium	Na	Magnesium	Mg	Aluminum	Al	Zinc	Zn	Iron	Fe	Lead	Pb	(Hydrogen)	(H)*	Copper	Cu	Mercury	Hg	Silver	Ag
METAL	SYMBOL																												
Lithium	Li																												
Potassium	K																												
Calcium	Ca																												
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Lead	Pb																												
(Hydrogen)	(H)*																												
Copper	Cu																												
Mercury	Hg																												
Silver	Ag																												
REACTION GUIDELINE EXAMPLES	<ol style="list-style-type: none"> 1. $Mg + Zn(NO_3)_2 \rightarrow Mg(NO_3)_2 + Zn$ <i>Mg replaces Zn; Mg is above Zn on the chart</i> $Mg + 2 AgNO_3 \rightarrow Mg(NO_3)_2 + 2 Ag$ <i>Mg replaces Ag; Mg is above Ag on the chart</i> $Mg + LiNO_3 \rightarrow \text{No Reaction (NR)}$ <i>Mg cannot replace Li; Li is above Mg on the chart</i> 2. $Cl_2 + 2NaBr \rightarrow 2NaCl + Br_2$ 																												

Solubility Table Common Ionic Compounds

	Group 1										Transition Metals					
	NH ₄ ⁺	Li ⁺	Na ⁺	K ⁺	Mg ²⁺	Ca ²⁺	Ba ²⁺	Al ³⁺	Fe ³⁺	Cu ²⁺	Ag ⁺	Zn ²⁺	Pb ²⁺			
F ⁻	sol	sol	sol	sol	insol	insol	sl sol	sol	sl sol	sol	sol	sol	insol			
Cl ⁻	sol	sol	sol	sol	sol	sol	sol	sol	sol	sol	insol	sol	sol			
Br ⁻	sol	sol	sol	sol	sol	sol	sol	sol	sol	sol	insol	sol	sl sol			
I ⁻	sol	sol	sol	sol	sol	sol	sol	sol			insol	sol	insol			
OH ⁻	sol	sol	sol	sol	insol	sl sol	sol	insol	insol	insol		insol	insol			
S ²⁻	sol	sol	sol	sol		sl sol	sol		insol	insol	insol	insol	insol			
SO ₄ ²⁻	sol	sol	sol	sol	sol	sl sol	insol	sol	sol	sol	sl sol	sol	insol			
CO ₃ ²⁻	sol	sol	sol	sol	insol	insol	insol			sl sol	insol	insol	insol			
NO ₃ ⁻	sol	sol	sol	sol	sol	sol	sol	sol	sol	sol	sol	sol	sol			
PO ₄ ³⁻	sol	insol	sol	sol	insol	insol	insol	insol	insol	insol	insol	insol	insol			
CrO ₄ ²⁻	sol	sol	sol	sol	sol	insol	insol		insol	insol	insol	insol	insol			
CH ₃ CO ₂ ⁻	sol	sol	sol	sol	sol	sol	sl sol	sl sol	sol	sol	sol	sol	sol			

sol — soluble >1g/100 mL

sl sol — slightly soluble (0.1 to 1) g/100 mL

insol — insoluble <0.1g/100 mL

(blank) — not enough solubility data

available to be determined

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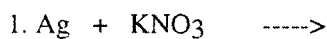
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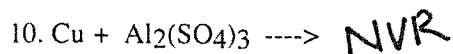
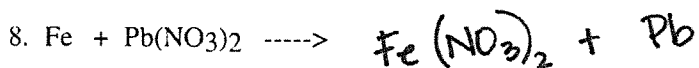
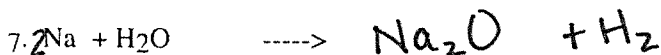
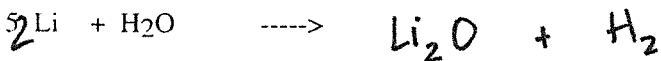
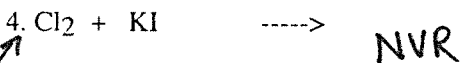
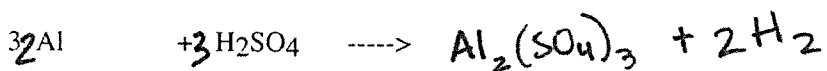
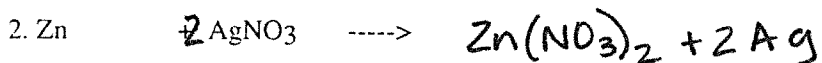
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Practice Reactions:



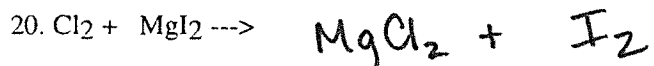
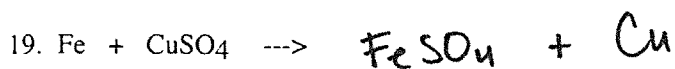
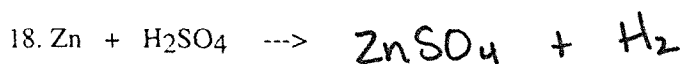
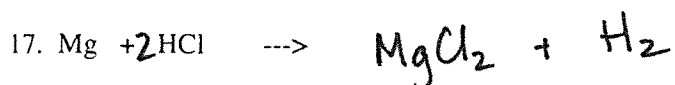
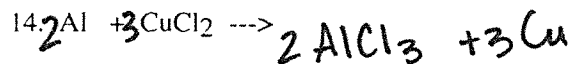
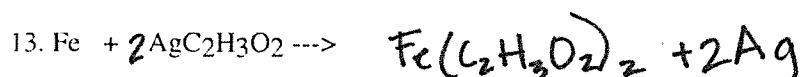
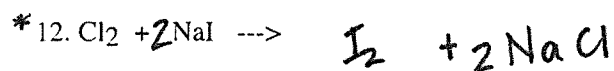
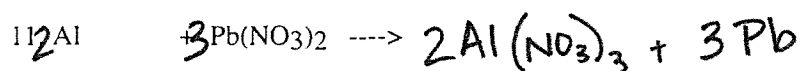
no reaction (NVR)



anion -
use what you
know about
halogen
reactivity...

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Solubility Rules Worksheet

1. Classify each of the substances as being soluble or insoluble in water.

- KBr =
- PbCO₃ =
- zinc hydroxide =
- sodium acetate =
- silver iodide =
- zinc carbonate =

- silver acetate =
- copper (II) sulfide =
- Mg₃(PO₄)₂ =
- KOH =
- NH₄OH =
- Hg₂SO₄ =
- PbI₂ =

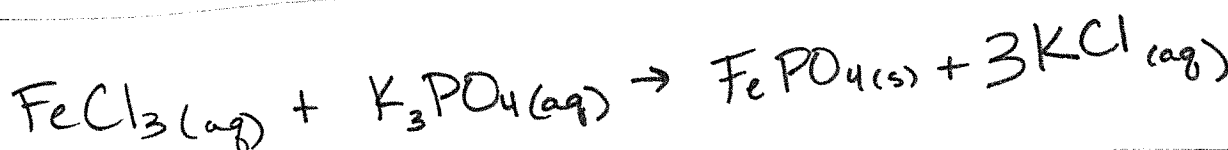
2. Identify the two new compounds which form if the solutions, as suggested by the following table, were mixed. CIRCLE the names of the compounds which would precipitate from the solutions.

	KBr	Na ₂ CO ₃	CaS	NH ₄ OH
AgNO ₃	AgBr + KNO ₃	NaNO ₃ + Ag ₂ CO ₃	Ca(NO ₃) ₂ + Ag ₂ S	AgOH + NH ₄ NO ₃
BaCl ₂	KCl + BaBr ₂	NaCl + BaCO ₃	CaCl ₂ + BaS	Ba(OH) ₂ + NH ₄ Cl
Al(NO ₃) ₃	AlBr ₃ + KNO ₃	NaNO ₃ + Al ₂ (CO ₃) ₃	Ca(NO ₃) ₂ + Al ₂ S ₃	NH ₄ NO ₃ + Al(OH) ₃
CuSO ₄	CuBr ₂ + K ₂ SO ₄	Na ₂ SO ₄ + CuCO ₃	CuS + CaSO ₄	(NH ₄) ₂ SO ₄ + Cu(OH) ₂

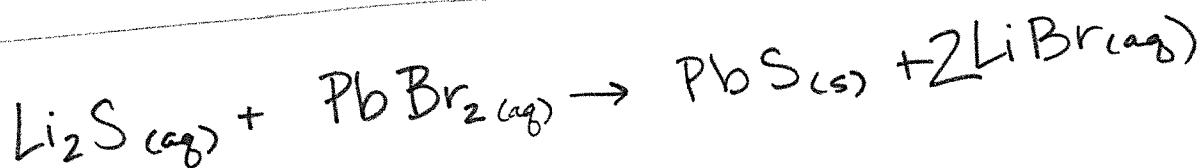
3. a) ammonium chloride + silver nitrate →



b) iron (iii) chloride + potassium phosphate →



c) lithium sulfide + lead (ii) bromide →



d) sodium carbonate + calcium sulfate →

