CH_3COO_2 Name Key Date _____ Class _____

TEACHING TRANSPARENCY WORKSHEET 31

The Activity Series

Use with Chapter 9, Section 9.2

1. For each of the following pairs of elements, underline the one that would replace the other element in a compound.
   - **a.** calcium, tin
   - **b.** bromine, fluorine
   - **c.** aluminum, potassium
   - **d.** zinc, sodium
   - **e.** iron, copper
   - **f.** iodine, chlorine
   - **g.** silver, lead

2. For each of the following reactants, use the activity series to determine whether the reaction would take place or not. If no reaction takes place, write *NR* in the blank. If a reaction does take place, write the formulas for the products of the reaction. (Hint: If an active metal replaces the hydrogen in water, the hydroxide of the active metal forms.)
   - **a.** $Li(s) + Fe(NO_3)_3(aq) \rightarrow$ $LiNO_3 + Fe$
   - **b.** $Au(s) + HCl(aq) \rightarrow$ No Rxn.
   - **c.** $Cl_2(g) + KBr(aq) \rightarrow$ $KCl + Br_2$
   - **d.** $Cu(s) + Al(NO_3)_3(aq) \rightarrow$ No Rxn
   - **e.** $Ag(s) + HBr(aq) \rightarrow$ No Rxn.
   - **f.** $Ni(s) + SnCl_2(aq) \rightarrow$ $NiCl_2 + Sn$

3. Magnesium metal can be used to remove tarnish from silver items. Silver tarnish is the corrosion that occurs when silver metal reacts with substances in the environment, especially those containing sulfur. Why would magnesium remove tarnish from silver?

   Mg more reactive would replace silver bonded to sulfur (environment) leaving silver.

4. Use the activity series for metals to explain why copper metal is used in plumbing where the water might contain compounds of many different metals.

   Cu not very reactive - won't react w/ metals in water.

5. The last four metals in the activity series of metals are commonly referred to as the "coinage metals." Why would these metals be chosen over more active metals for use in coins? Why do you think some more active metals, such as zinc or nickel, are sometimes used in coins?

   less reactive

   lighter, more common

Soluble or Insoluble?

Use your solubility table to determine if the following chemicals are soluble or insoluble in water. Write the terms "aqueous" or "solid" next to each chemical.

$(C_2H_3O_2)_2$

1. $Ba(CH_3COO)_2$ ~~soluble~~ aqueous
2. $LiOH$ aqueous – Li = alkali metal exception
3. $K_2Cr_2O_7$ ~~solid~~ aqueous – alkali metal K
4. FeS solid
5. K_2SO_4 aqueous
6. NH_4NO_3 aqueous
7. $NaCl$ aqueous
8. $Ca(NO_2)_2$ aqueous
9. $Zn_3(PO_4)_2$ solid
10. Potassium Iodide aqueous
11. Aluminum Chloride aqueous
12. Lithium Sulfate aqueous
13. Calcium Fluoride – solid
14. Silver Acetate Ag^+ exception – solid
15. Copper (I) Dichromate – solid
16. Zinc Sulfide solid
17. Calcium Nitrate aqueous
18. Iron (II) Chlorate aqueous
19. Lead (IV) Iodide aqueous only Pb^{2+} exception
20. Silver chloride solid ~~a~~ silver exception

look up fluoride frequently insoluble – add to chart

21. Determine 3 chlorides that are soluble and 3 chlorides that are insoluble.

   $NaCl$, $FeCl_3$, $AlCl_3$ — $AgCl$, Hg_2Cl_2, $PbCl_2$

22. If you where testing water to see if any phosphate ions were present, what metal ions could you add to observe a precipitation reaction?

   ~~somethi~~ anything but alkali metals or NH_4^+ ion

23. Anytime you see a chemical that has nitrate, sodium, potassium, or ammonium, what should you conclude about its solubility?

   will remain aqueous.

WORKSHEET ON SINGLE & DOUBLE REPLACEMENT REACTIONS

Predict the products. Write formulas & balance each reaction. If there is no reaction, then just put NO RXN.

Single Replacement: A + BC → B + AC or A + BC → C + BA (when A and C are negative ions)

1. Zinc + 2 Hydrogen chloride → $ZnCl_2 + H_2$ Zinc Chloride + Hydrogen
2. 2 Magnesium + 2 Hydrogen Sulfate → $2MgSO_4 + H_2$ Magnesium sulfate + Hydrogen
3. 2 Copper (II) chloride + 2 Flourine → $CuF_2 + Cl_2$ Copper (II) Fluoride + Chlorine
4. Silver + Sodium Hydroxide → No Rxn
5. 2 Potassium iodide + 2 Bromine → $2KBr + I_2$ Potassium Bromide + Iodine
6. Calcium + 2 Hydrogen hydroxide → $Ca(OH)_2 + H_2$ Calcium Hydroxide + Hydrogen
7. Iron IV oxide + Hydrogen → No Rxn

Solve on notebook paper! In addition to the writing the balanced reactions and the word equations, for any double replacement reaction write the net ionic reaction as well.

Double Replacement: AB + CD → AD + CB

1. 3 Barium chloride$_2$ + 2 Aluminum sulfate → $3BaSO_4 + 2AlCl_3$ No Rxn - both aqueous (on next page)
2. Calcium nitride + water → $Ca(OH)_2(s) + H_3N$ Calcium hydroxide + hydronitric acid
3. Calcium hydroxide + Hydrogen phosphate → $Ca_3(PO_4)_2(s) + H_2O$ Calcium Phosphate + water
4. Hydrogen sulfate + Sodium hydrogen carbonate → $Na_2SO_4(aq) + H_2CO_3(s)$ Sodium Sulfate + hydrogen bicarbonate
5. Calcium hydroxide + Ammonium chloride → $CaCl_2 + NH_4OH(s)$ Calcium Chloride + Ammonium Hydroxide
6. Potassium iodide + Lead II Nitrate → $KNO_3 + PbI_2(s)$ Potassium Nitrate + Lead (II) Iodide
7. Sodium acetate + Calcium sulfide → $Na_2S(s) + Ca(C_2H_3O_2)_2$ Sodium sulfide + Calcium acetate

Complete each word equation, write formulas and balance the reaction equation. Then identify and place the type of reaction (single replacement or double replacement) in the blank provided.

SR 1. Zinc + 2 Silver nitrate → $Zn(NO_3)_2 + 2Ag$ Zinc nitrate + Silver

SR 2. 2 Aluminum + 6 Hydrogen chloride → $2AlCl_3 + 3H_2$ Aluminum Chloride + Hydrogen

DR 3. Magnesium oxalate + Ammonium carbonate → Magnesium Carbonate $MgCO_3$ + Ammonium oxalate $(NH_4)_2C_2O_4$

SR 4. 3 Calcium + 2 Aluminum nitrate → $3Ca(NO_3)_2 + 2Al$ Calcium Nitrate + Aluminum

DR 5. 2 Potassium flouride + Lead (II) Nitrate → $2KNO_3 + PbF_2$ Potassium Nitrate + Lead (II) Fluoride

DR 6. Calcium bromide$_2$ + 2 Silver nitrate → $Ca(NO_3)_2 + 2AgBr$ Calcium Nitrate + Silver Bromide

DR 7. 2 Ammonium phosphate + 3 Barium acetate$_2$ → $6NH_4C_2H_3O_2 + Ba_3(PO_4)_2$

SR 8. Sodium chloride + Potassium → $KCl + Na$

9. Magnesium nitrate + ammonium chloride →
10. Iron (III) chlorate + calcium →
11. Chlorine + Sodium bromide →
12. Potassium chloride + Silver nitrate →
13. Calcium hydroxide + Hydrogen nitrate →
14. Lead II nitrate + Potassium chloride →
15. Strontium carbonate + Hydrogen nitrate →
16. Gold + Potassium nitrate →
17. Zinc + Silver nitrate → $Zn(NO_3)_2 + Ag$
18. Aluminum + Copper II sulfate → $Al_2(SO_4)_3 + Cu$

Solve on notebook paper! In addition to the writing the balanced reactions and the word equations, for any double replacement reaction write the net ionic reaction as well.