

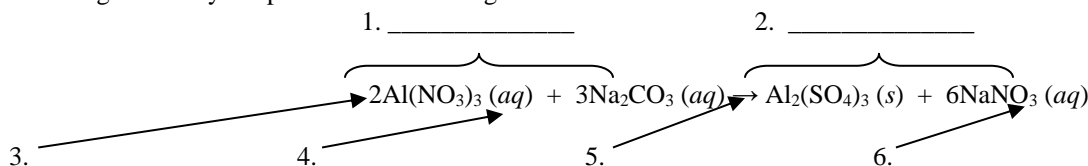
Name: _____

Date: _____

Per#: _____

Reactions Topic #9**WS#1: Intro to Reactions**

Labeling – Identify the parts of the following reaction.

**Matching**

- | | |
|--------------------------------------|--|
| 7. ___ (s) | a. gas evolved from reaction |
| 8. ___ ↑ | b. electrolysis (electric current) |
| 9. ___ (g) | c. precipitate (solid forming when two solutions are mixed) |
| 10. ___ ↓ | d. abbreviation for precipitate |
| 11. ___ (l) | e. catalyst (use of a surface or chemical to speed up a reaction) |
| 12. ___ $\xrightarrow{\Delta}$ | f. aqueous |
| 13. ___ (aq) | g. solid |
| 14. ___ $\xrightarrow{\text{elect}}$ | h. addition of energy to a reaction |
| 15. ___ $\xrightarrow{\text{cat}}$ | i. gas |
| 16. ___ ppt | j. liquid |
| 17. ___ chemical reaction | a. substance that enters into a chemical reaction |
| 18. ___ reactant | b. their arrangement determines whether or not an atom will bond |
| 19. ___ product | c. process where new substances with different physical/chemical properties are produced |
| 20. ___ valence electrons | d. needed to initiate a chemical reaction |
| 21. ___ energy | e. substance produced in a chemical reaction |

What are the five indicators a reaction has occurred?

22. _____ 25. _____
23. _____ 26. _____
24. _____

WS#2: Nomenclature/Balancing/Word Equations

Write the chemical formula for each of the following.

- | | | | |
|------------------------|-------------------------|----------------------------|--------------------------|
| 1. potassium chloride | 6. aluminum (III) oxide | 11. nitric acid | 15. ammonium dichromate |
| 2. sodium hydroxide | 7. silver (I) nitrate | 12. hydrochloric acid | 16. copper (II) chlorate |
| 3. calcium oxide | 8. calcium carbonate | 13. sulfuric acid | |
| 4. iron (III) fluoride | 9. magnesium nitrate | 14. molybdenum (V) sulfide | |
| 5. silicon dioxide | 10. sodium bicarbonate | | |

Write the formula for each of the following molecular elements.

17. hydrogen _____ 19. nitrogen _____ 21. bromine _____ 23. sulfur _____ 25. fluorine _____
18. chlorine _____ 20. phosphorus _____ 22. oxygen _____ 24. iodine _____

26. In each of the following formulas, write the total number of atoms present.

- a. 4SO_2 b. 8O_2 c. $3\text{Al}_2(\text{SO}_4)_3$ d. $6 \times 10^{23} \text{HNO}_3$

Balance the following equations.

27. $\text{Fe} + \text{H}_2\text{SO}_4 \rightarrow \text{Fe}_2(\text{SO}_4)_3 + \text{H}_2$ 30. $\text{B}_2\text{Br}_6 + \text{HNO}_3 \rightarrow \text{B}(\text{NO}_3)_3 + \text{HBr}$
28. $\text{SnO}_2 + \text{H}_2 \rightarrow \text{Sn} + \text{H}_2\text{O}$ 31. $(\text{NH}_4)_3\text{PO}_4 + \text{Pb}(\text{NO}_3)_4 \rightarrow \text{Pb}_3(\text{PO}_4)_4 + \text{NH}_4\text{NO}_3$
29. $\text{NH}_3 + \text{O}_2 \rightarrow \text{NO} + \text{H}_2\text{O}$ 32. $\text{SeCl}_6 + \text{O}_2 \rightarrow \text{SeO}_2 + \text{Cl}_2$

Write the word equation for the following reactions.

Example: Solid sulfur was heated in the presence of oxygen to produce the gas sulfur dioxide

Word equation: sulfur (s) + oxygen (g) → sulfur dioxide (g)

Example: solid sodium is added to water to produce a solution of sodium hydroxide

Word equation: sodium + water → sodium hydroxide

33. Solid silver is added to gaseous chlorine to produce solid silver chloride.
34. Hydrogen gas and chlorine gas react to produce hydrogen chloride gas.
35. Hydrochloric acid reacts with a solution of sodium hydroxide to produce water and aqueous sodium chloride.
36. Solid magnesium hydroxide when added to nitric acid produces a solution of magnesium nitrate and water.
37. Solid calcium carbonate decomposes into calcium oxide and carbon dioxide.

WS#3: Formula Equations

From the word equation, write the balanced formula equation.

Example 1:

Charges: 0 0 2+ 1-

Word equation: magnesium + iodine → magnesium iodide₂

Formula equation: Mg + I₂ → MgI₂

Balance: (already balanced)

Example 2:

Charges: (no charges because the product is a molecular compound)

Word equation: nitrogen + oxygen → dinitrogen monoxide

Formula equation: N₂ + O₂ → N₂O

Balance: 2N₂ + O₂ → 2N₂O

Example 3:

Charges: 3+ 2- 0 0

Word equation: aluminum₂(III) oxide₃ → aluminum + oxygen

Formula equation: Al₂O₃ → Al + O₂

Balance: 2Al₂O₃ → 4Al + 3O₂

Example 4:

Charges: 1+ 2- 2+ 1- 1+ 1- 2+ 2-

Word equation: potassium carbonate + iron (II) nitrate₂ → potassium nitrate + iron (II) carbonate

Formula equation: K₂CO₃ + Fe(NO₃)₂ → KNO₃ + FeCO₃

Balance: K₂CO₃ + Fe(NO₃)₂ → 2KNO₃ + FeCO₃

Example 5:

Charges: 0 3+ 1- 3+ 1- 0

Word equation: chlorine + chromium (III) bromide₃ → chromium (III) chloride₃ + bromine

Formula equation: Cl₂ + CrBr₃ → CrCl₃ + Br₂

Balance: 3Cl₂ + 2CrBr₃ → 2CrCl₃ + 3Br₂

Example 6:

Charges: 0 3+ 1- 2+ 1- 0

Word equation: calcium + chromium (III) bromide₃ → calcium chloride₂ + chromium

Formula equation: Ca + CrBr₃ → CaCl₂ + Cr

Balance: 3Ca + 2CrBr₃ → 3CaCl₂ + 2Cr

Example 7:

Charges: no charges on a combustion reaction

Word equation: nonane (C₉H₂₀) + oxygen → carbon dioxide + water

Formula equation: C₉H₂₀ + O₂ → CO₂ + H₂O

Balance: C₉H₂₀ + 14O₂ → 9CO₂ + 10H₂O

1. zinc + copper (II) sulfate → zinc (II) sulfate + copper
2. potassium chlorate Δ → potassium chloride + oxygen
3. water ^{elect} → hydrogen + oxygen
4. aluminum + oxygen → aluminum (III) oxide
5. iron(III) chloride + ammonium hydroxide → iron(III) hydroxide + ammonium chloride
6. chromium + sulfuric acid → chromium (III) sulfate + hydrogen
7. sodium carbonate + calcium hydroxide → sodium hydroxide + calcium carbonate
8. phosphorus + oxygen → diphosphorus pentoxide
9. sodium + water → sodium hydroxide + hydrogen
10. calcium oxide + water → calcium hydroxide
11. iron(II) sulfide + hydrochloric acid → hydrogen sulfide + iron(II) chloride
12. potassium oxide + water → potassium hydroxide
13. sulfur dioxide + water → sulfurous acid
14. sodium carbonate + hydrochloric acid → sodium chloride + water + carbon dioxide
15. aluminum + iron(III) oxide → aluminum (III) oxide + iron
16. calcium carbonate Δ → calcium oxide + carbon dioxide
17. copper(II) nitrate + ammonium hydroxide → copper(II) hydroxide + ammonium nitrate
18. fluorine + cadmium (II) iodide → cadmium (II) fluoride + iodine
19. decane (C₁₀H₂₂) + oxygen → carbon dioxide + water
20. propane (C₃H₈) + oxygen → carbon dioxide + water

WS#4: Types of Chemical Equations

Matching

- | | |
|---|--|
| 1. $\underline{\quad} A + X \rightarrow AX$ | a. decomposition |
| 2. $\underline{\quad} A + BX \rightarrow AX + B$ | b. direct combination (synthesis) |
| 3. $\underline{\quad} AX + BY \rightarrow AY + BX$ | c. double-replacement (double-displacement) |
| 4. $\underline{\quad} C_xH_y + O_2 \rightarrow CO_2 + H_2O$ | d. single-replacement cation (single-displacement) |
| 5. $\underline{\quad} X + BY \rightarrow BX + Y$ | e. combustion |
| 6. $\underline{\quad} AX \rightarrow A + X$ | f. single-replacement anion (single-displacement) |

Describe in words each of the following types of reactions.

- | | |
|-----------------------------------|--------------------------------|
| 7. direct combination (synthesis) | 10. single-replacement anionic |
| 8. decomposition | 11. combustion |
| 9. single-replacement cationic | 12. double-replacement |

Identify the type of each reaction and balance.

(C), synthesis (S), decomposition (D), single-replacement (SR(c) or SR(a)), or double-replacement (DR) reaction.

- | | |
|---|--|
| 13. $\underline{\quad} CO_2 \rightarrow \underline{\quad} C + \underline{\quad} O_2$ | 23. $\underline{\quad} C_6H_6 + \underline{\quad} O_2 \rightarrow \underline{\quad} CO_2 + \underline{\quad} H_2O$ |
| 14. $\underline{\quad} Zn + \underline{\quad} H_2SO_4 \rightarrow \underline{\quad} ZnSO_4 + \underline{\quad} H_2$ | 24. $\underline{\quad} KClO_3 \rightarrow \underline{\quad} KCl + \underline{\quad} O_2$ |
| 15. $\underline{\quad} NaCl + \underline{\quad} AgNO_3 \rightarrow \underline{\quad} NaNO_3 + \underline{\quad} AgCl$ | 25. $\underline{\quad} CH_4 \rightarrow \underline{\quad} C + \underline{\quad} H_2$ |
| 16. $\underline{\quad} NaOH + \underline{\quad} HCl \rightarrow \underline{\quad} NaCl + \underline{\quad} H_2O$ | 26. $\underline{\quad} Ca(OH)_2 + \underline{\quad} HNO_3 \rightarrow \underline{\quad} Ca(NO_3)_2 + \underline{\quad} H_2O$ |
| 17. $\underline{\quad} S_8 + \underline{\quad} Cl_2 \rightarrow \underline{\quad} SCl_2$ | 27. $\underline{\quad} Pb(NO_3)_2 + \underline{\quad} Mg \rightarrow \underline{\quad} Pb + \underline{\quad} Mg(NO_3)_2$ |
| 18. $\underline{\quad} Al_2(SO_4)_3 + \underline{\quad} Ca(OH)_2 \rightarrow \underline{\quad} CaSO_4 + \underline{\quad} Al(OH)_3$ | 28. $\underline{\quad} Na_2O + \underline{\quad} CO_2 \rightarrow \underline{\quad} Na_2CO_3$ |
| 19. $\underline{\quad} BaCl_2 + \underline{\quad} NaOH \rightarrow \underline{\quad} NaCl + \underline{\quad} Ba(OH)_2$ | 29. $\underline{\quad} HgO \rightarrow \underline{\quad} Hg + \underline{\quad} O_2$ |
| 20. $\underline{\quad} H_2 + \underline{\quad} O_2 \rightarrow \underline{\quad} H_2O$ | 30. $\underline{\quad} H_2 + \underline{\quad} N_2 \rightarrow \underline{\quad} NH_3$ |
| 21. $\underline{\quad} Zn + \underline{\quad} CuSO_4 \rightarrow \underline{\quad} ZnSO_4 + \underline{\quad} Cu$ | 31. $\underline{\quad} Mg + \underline{\quad} HCl \rightarrow \underline{\quad} MgCl_2 + \underline{\quad} H_2$ |
| 22. $\underline{\quad} Cl_2 + \underline{\quad} NaBr \rightarrow \underline{\quad} NaCl + \underline{\quad} Br_2$ | |

WS#5: Activity Series of Elements

Using the activity series table, determine whether each of the possible reactions will occur. Circle the R for a reaction or the NR for a no reaction. For the reactions, write a full balanced equation, with the correct products. ($Zn \rightarrow Zn^{2+}$, $Sn \rightarrow Sn^{4+}$, $Cd \rightarrow Cd^{2+}$, $Cu \rightarrow Cu^{1+}$, $Cr \rightarrow Cr^{3+}$, $Pt \rightarrow Pt^{4+}$, $Mg \rightarrow Mg^{2+}$, $Ni \rightarrow Ni^{2+}$, $Au \rightarrow Au^{3+}$, $Al \rightarrow Al^{3+}$, and $Fe \rightarrow Fe^{3+}$ for reactions involving these metals.)

- | | |
|---|---|
| 1. $\underline{\quad} Zn(s) + \underline{\quad} H_2O(l) \xrightarrow{\text{Water is } 50^\circ C} \underline{\quad} + \underline{\quad}$ R/NR | 9. $\underline{\quad} Ni(s) + \underline{\quad} H_2O(l) \rightarrow \underline{\quad} + \underline{\quad}$ R/NR |
| 2. $\underline{\quad} Sn(s) + \underline{\quad} O_2(g) \rightarrow \underline{\quad} + \underline{\quad}$ R/NR | 10. $\underline{\quad} Br_2(l) + \underline{\quad} KI(aq) \rightarrow \underline{\quad} + \underline{\quad}$ R/NR |
| 3. $\underline{\quad} Ca(s) + \underline{\quad} Pb(NO_3)_2(aq) \rightarrow \underline{\quad} + \underline{\quad}$ R/NR | 11. $\underline{\quad} Au(s) + \underline{\quad} HCl(aq) \rightarrow \underline{\quad} + \underline{\quad}$ R/NR |
| 4. $\underline{\quad} Cu(s) + \underline{\quad} HCl(aq) \rightarrow \underline{\quad} + \underline{\quad}$ R/NR | 12. $\underline{\quad} Fe(s) + \underline{\quad} HCl(aq) \rightarrow \underline{\quad} + \underline{\quad}$ R/NR |
| 5. $\underline{\quad} Cr(s) + \underline{\quad} H_2O(l) \rightarrow \underline{\quad} + \underline{\quad}$ R/NR | 13. $\underline{\quad} Mg(s) + \underline{\quad} Fe(NO_3)_2(aq) \rightarrow \underline{\quad} + \underline{\quad}$ R/NR |
| 6. $\underline{\quad} Pt(s) + \underline{\quad} O_2(g) \rightarrow \underline{\quad} + \underline{\quad}$ R/NR | 14. $\underline{\quad} Al(s) + \underline{\quad} ZnCl_2(aq) \rightarrow \underline{\quad} + \underline{\quad}$ R/NR |
| 7. $\underline{\quad} Sn(s) + \underline{\quad} HBr(aq) \rightarrow \underline{\quad} + \underline{\quad}$ R/NR | 15. $\underline{\quad} Mn(s) + \underline{\quad} NaCl(aq) \rightarrow \underline{\quad} + \underline{\quad}$ R/NR |
| 8. $\underline{\quad} Mg(s) + \underline{\quad} \text{steam}(g) \rightarrow \underline{\quad} + \underline{\quad}$ R/NR | 16. $\underline{\quad} Li(s) + \underline{\quad} Au(NO_3)_3(aq) \rightarrow \underline{\quad} + \underline{\quad}$ R/NR |

WS#6: Predicting Products

Groups (Large Whiteboard)

In each of the following examples:

- | | |
|--|--|
| a. identify type of reaction: SR(c), SR(a), D, S, or DR | 2. sodium chloride ($\xrightarrow{\text{electrolyzed}}$) |
| b. write the name of the products | 3. calcium phosphate plus aluminum (III) sulfate \rightarrow |
| c. write a formula equation | 4. sodium plus cobalt (II) nitrate \rightarrow |
| d. balance the chemical equation | 5. chlorine and lead (IV) bromide \rightarrow |
| 1. lithium oxide plus carbon dioxide (forms a carbonate) \rightarrow | 6. propane (C_3H_8) plus oxygen gas \rightarrow |

Homework (Just the balanced formula equation)

- | | |
|---|--|
| 7. oxygen plus sulfur (forms a dioxide) \rightarrow | 15. aluminum plus nickel (II) nitrate \rightarrow |
| 8. water ($\xrightarrow{\text{electrolyzed}}$) \rightarrow | 16. barium chloride plus cesium sulfate \rightarrow |
| 9. iron(III) nitrate plus rubidium phosphate \rightarrow | 17. hydrogen plus oxygen \rightarrow |
| 10. cadmium plus lead (IV) nitrate \rightarrow | 18. barium carbonate ($\xrightarrow{\text{heated } \Delta}$) \rightarrow |
| 11. platinum (IV) chloride plus fluorine \rightarrow | 19. iron(III) iodide plus copper (II) nitrate \rightarrow |
| 12. magnesium oxide and water (makes a hydroxide) \rightarrow | 20. barium plus hydroiodic acid \rightarrow |
| 13. lithium sulfide (heated) \rightarrow | 21. fluorine and chromium (III) iodide \rightarrow |
| 14. mercury (II) sulfate plus ammonium chromate \rightarrow | 22. hexane (C_6H_{14}) and oxygen gas \rightarrow |