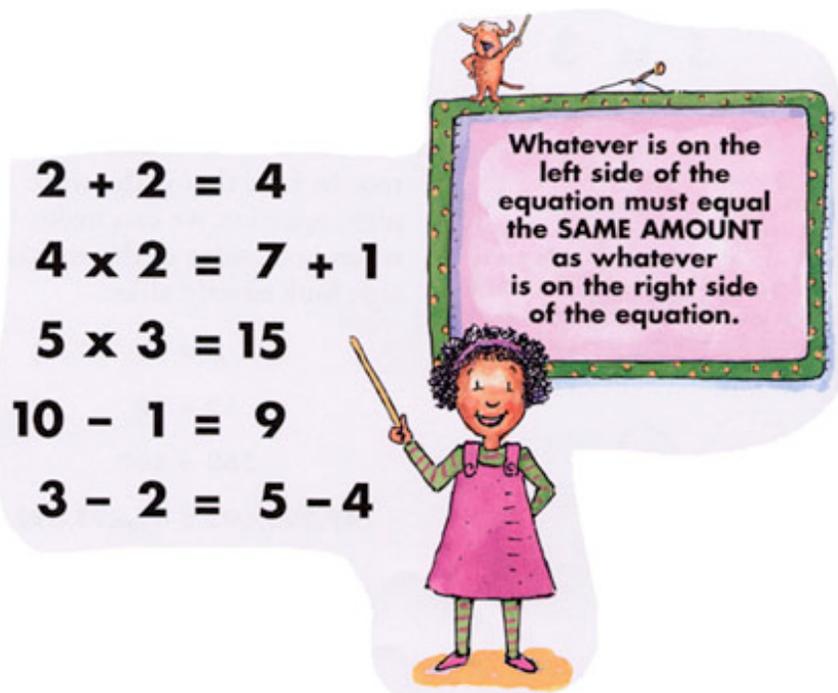


Chemistry B

Equations Packet



CHEMISTRY B – EQUATIONS PACKET
WORKSHEET #1: A QUICK REVIEW OF NAMING COMPOUNDS

NAME _____ HR _____ page 2

Think back to Chemistry A to answer the following questions. Use the word bank for questions 1-12.

Ionic	Elements	Subscripts	Oxidation Numbers	Compounds	Zero
H ⁺¹	Hydro	Cations	“ic”	“ous”	Anions

1. Chemical symbols (H, Na, K, Cl...) represent _____.
2. Chemical formulas (NaCl, Mg(OH)₂, HCl) represent _____.
3. The charges that you use to help you write the correct formulas are called _____.
4. The small numbers that you insert when you write formulas are called _____.
5. The total charge on any compound is _____.
6. Positive ions are called _____.
7. Negative ions are called _____.
8. Compounds that have names that end with the suffix “-ide” are _____.
9. What ion is common to all acids? _____
10. Binary acids have names that start with the prefix “_____” and end with the suffix “ic”.
11. Polyatomic acids containing an “-ate” polyatomic ion are named with the suffix “_____”.
12. Polyatomic acids containing an “-ite” polyatomic ion are named with the suffix “_____”.

13. Define “polyatomic ions”, that is, tell what they are and how they behave.

14. Why can't polyatomic ions ever stand-alone? _____.
15. What is true of the oxidation number of all metal ions? _____.
16. Give the seven common metals that form ions with two different charges and given the two charges of each metal: _____

17. Write the formulas for:

Sodium chloride _____ calcium iodide _____ potassium oxide _____

18. Write the formulas for:

Sodium hydroxide _____ calcium phosphate _____ ammonium oxide _____

19. Write the formulas for:

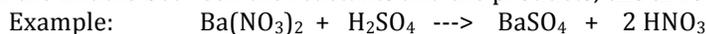
Perchloric acid _____ chloric acid _____ chlorous acid _____ hypochlorous acid _____
and hydrochloric acid _____

CHEMISTRY B – EQUATIONS PACKET
WORKSHEET #2: INTRODUCTION TO EQUATIONS

NAME _____ HR _____ page 3

We have learned **symbols for elements** and to write **formulas for compounds**. Now we must learn to write **equations to represent chemical reactions**. **Chemical reactions obey the Law of Conservation of Matter:** matter is neither created nor destroyed during a chemical reaction. This means that in any chemical reaction we simply rearrange the atoms much like shuffling of cards rearranges the cards but does not change the whole number of each type of card present.

Chemical reactions produce new substances with new properties. The starting materials in a chemical reaction are called reactants while the materials that are formed are called products. When we write an equation we put an arrow in the middle between the reactants and the products; **the arrow means “yields” or “produces”**.



The names of the reactants are: _____

The names of the products are: _____



The names of the reactants are: _____

The name of the product is: _____

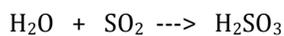
In order to recognize patterns and be able to predict the products of chemical reactions we classify most chemical reactions as one of **four common types of reaction—composition (C), decomposition (D), single replacement (SR) and double replacement (DR)**.

In composition reactions elements combine to form a compound; or, in some cases, simple compounds combine to form a more complex compound.



The names of the reactants are : _____

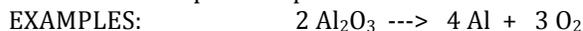
The name of the product is: _____



The names of the reactants are : _____

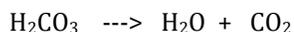
The name of the product is: _____

In decomposition reactions compounds are broken apart to form elements; or, in some cases, complex compounds are decomposed to form simpler compounds.



The name of the reactant is: _____

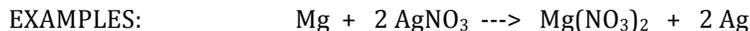
The names of the products are: _____



The name of the reactant is: _____

The names of the products are: _____

In single replacement reactions one element takes the place of a second element in a compound.

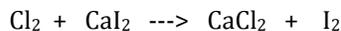


The names of the reactants are: _____

The names of the products are: _____

Which element was replaced? _____

Which element did the replacing? _____



The names of the reactants are: _____

The names of the products are: _____

Which element was replaced? _____

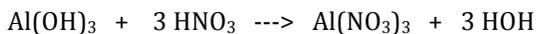
Which element did the replacing? _____

In double replacement reactions two compounds react with each other--the positive ion of one compound combines with the negative ion of the second compound and vice versa.



The names of the reactants are: _____

The names of the products are: _____



The names of the reactants are: _____

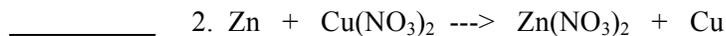
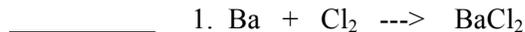
The names of the products are: _____

Now let's summarize what we just learned...

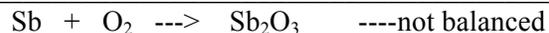
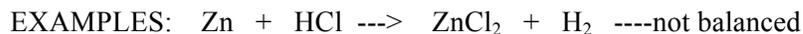
1. Chemical equations represent _____.
2. The starting materials in an equation are called the _____.
3. The arrow in an equation means _____.
4. The ending materials in an equation are called the _____.
5. We must balance equations because "matter is neither created nor destroyed in an ordinary chemical reaction". This statement is known as the _____.
6. Name the four general types of chemical reactions:
_____.

WORKSHEET #3: CLASSIFYING and BALANCING EQUATIONS

Classify each of the following reactions as composition, decomposition, single replacement or double replacement.

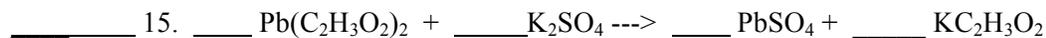
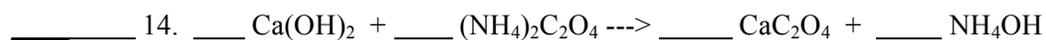
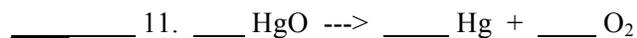
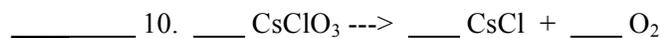
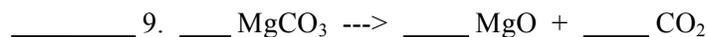
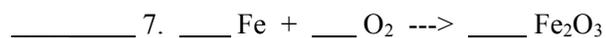
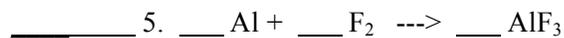
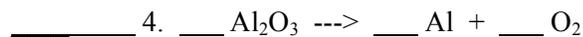
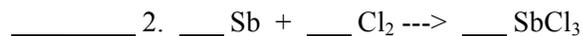
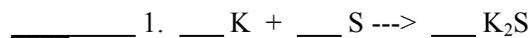


When a chemical reaction occurs it must obey the Law of Conservation of Matter--matter is neither created nor destroyed in an ordinary chemical reaction. That means that **for any element in the reaction there must be the same number of atoms on each side of the arrow.** These atoms are in different combinations or groupings but you must not create nor destroy atoms. It is very much like shuffling and dealing cards--you don't create or destroy cards, you just change the combinations.) **A balanced chemical equation obeys the law of conservation of matter--the equation is not true and has no meaning until it is balanced.** We balance equations by inserting coefficients in front of the formulas You may only use coefficients to balance the equations; **you never change the subscripts, which are needed to give the correct formulas--DO NOT CHANGE THE FORMULAS!** We have spent weeks learning to write correct formulas--we don't abandon all of that when we start to balance equations.



Classify each of the following reactions as composition, decomposition, single replacement or double replacement. **Then balance** each of the equations.

Note: When you have **polyatomic ions they may usually be balanced as a group**; only when the ion is broken apart do you have to look at individual atoms within the group.



CHEMISTRY B – EQUATIONS PACKET
WORKSHEET #4: PRACTICING BALANCING EQUATIONS

NAME _____ HR _____ page 7

As you learn to balance equations it is very important to remember that **coefficients** (large numbers in front of the formulas) **can be inserted or changed, while the subscripts** (small numbers within the formulas) **CANNOT be changed**.

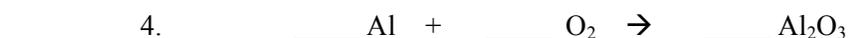
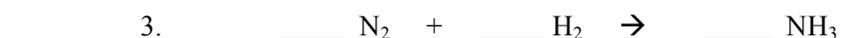
There are also a few important symbols you will need to recognize and use. As was already mentioned an **arrow** is placed between the reactants and products and means “**yields**” or “**produces**”. Some reactions require **heating** in order to occur. In this case a **triangle** (delta symbol) is placed over the arrow. Other reactions require **electricity to decompose**. This is called an **electrolysis** reaction and is symbolized with the letters **DC** over the arrow.

Combustion reactions are a specific type of decomposition in which a **fuel burns by reacting with oxygen**. This means that O_2 will always be a reactant in a combustion equation. The fuel in this reaction is generally a **hydrocarbon**. This is a general term for a chemical made of **carbon and hydrogen**. The **product of combustion** is **carbonic acid** (H_2CO_3), which then **decomposes into carbon dioxide and water**.

You may have noticed that several elements had a subscript 2 after them in the previous worksheet. There are seven elements that exist as **diatomic molecules** when they **are not in compounds**. The seven elements are: **hydrogen- H_2 , oxygen- O_2 , fluorine- F_2 , bromine- Br_2 , and iodine- I_2 , nitrogen- N_2 , chlorine- Cl_2** . These elements **DO NOT** have to be in twos in compounds--you continue to write the formulas for compounds just as you always have. **They are in twos only when they are single elements**.

1. The numbers we insert to balance an equation are called _____.
2. A triangle over the arrow in an equation means _____.
3. DC over the arrow in an equation means _____.
4. A word that means to decompose a compound by electricity is _____.
5. Write formulas for the molecules of the seven elements that exist in diatomic molecules:
_____.
6. When carbonic acid forms as a product it decomposes to give _____.
7. Burning means chemical combination with oxygen so you must add the formula _____ on the left.
8. Another word that means burning is _____.
9. Our common fuels are called _____ and contain the elements C and H.
10. The product of combustion of a hydrocarbon produces energy plus _____ and _____.
11. List the formulas for the 7 diatomic molecules: _____.

Balance the following by inserting the appropriate coefficient for each term. Also write the type of reaction in the blank to the left.



- _____ 8. _____ HgO $\xrightarrow{\Delta}$ _____ Hg + _____ O₂
- _____ 9. _____ Ba(OH)₂ + _____ HNO₃ → _____ Ba(NO₃)₂ + _____ HOH
- _____ 10. _____ P₄ + _____ O₂ → _____ P₄O₁₀
- _____ 11. _____ Al + _____ CuSO₄ → _____ Al₂(SO₄)₃ + _____ Cu
- _____ 12. _____ Cl₂ + _____ NaI → _____ NaCl + _____ I₂
- _____ 13. _____ Ba(OH)₂ + _____ HNO₃ → _____ Ba(NO₃)₂ + _____ HOH
- _____ 14. _____ Ca(C₂H₃O₂)₂ + _____ K₂C₂O₄ → _____ CaC₂O₄ + _____ KC₂H₃O₂
- _____ 15. _____ NaClO₃ $\xrightarrow{\Delta}$ _____ NaCl + _____ O₂
- _____ 16. _____ AgNO₃ + _____ ZnCl₂ → _____ AgCl + _____ Zn(NO₃)₂
- _____ 17. _____ FeCl₃ + _____ NaOH → _____ Fe(OH)₃ + _____ NaCl
- _____ 18. _____ Al + _____ H₂SO₄ → _____ Al₂(SO₄)₃ + _____ H₂
- _____ 19. _____ P₄ + _____ O₂ → _____ P₄O₆
- _____ 20. _____ K + _____ HOH → _____ KOH + _____ H₂
- _____ 21. _____ Ba(C₂H₃O₂)₂ + _____ (NH₄)₂SO₄ → _____ BaSO₄ + _____ NH₄C₂H₃O₂
- _____ 22. _____ Zn + _____ HCl → _____ ZnCl₂ + _____ H₂
- _____ 23. _____ Sb + _____ O₂ → _____ Sb₂O₅
- _____ 24. _____ KClO₃ → _____ KCl + _____ O₂
- _____ 25. _____ Pb(NO₃)₂ + _____ Na₂CrO₄ → _____ PbCrO₄ + _____ NaNO₃
- _____ 26. _____ Fe₂O₃ + _____ C $\xrightarrow{\Delta}$ _____ Fe + _____ CO₂
- _____ 27. _____ H₂ + _____ O₂ → _____ H₂O
- _____ 28. _____ NaOH + _____ H₂SO₄ → _____ Na₂SO₄ + _____ HOH
- _____ 29. _____ SO₂ + _____ O₂ → _____ SO₃
- _____ 30. _____ Al₂O₃ \xrightarrow{DC} _____ Al + _____ O₂
- _____ 31. _____ Fe(ClO₃)₃ + _____ NaSCN → _____ Fe(SCN)₃ + _____ NaClO₃
- _____ 32. _____ CaCO₃ $\xrightarrow{\Delta}$ _____ CaO + _____ CO₂
- _____ 33. _____ KOH + _____ H₃PO₄ → _____ K₂HPO₄ + _____ HOH
- _____ 34. _____ H₂O₂ → _____ H₂O + _____ O₂
- _____ 35. _____ CaCO₃ + _____ HCl → _____ CaCl₂ + _____ H₂O + _____ CO₂

On the previous worksheets you were given the skeleton equations and simply had to balance them by inserting the correct coefficients. On this page you are given word equations, so for each reaction you must:

1. Write a skeleton equation containing all of the correct formulas (they are provided on this worksheet)
2. Balance the equation by inserting the appropriate coefficients.

Put a triangle over the arrow for heat and DC for electrolysis.

USE A SEPARATE SHEET OF PAPER TO WRITE EQUATIONS FOR THE FOLLOWING REACTIONS.

Composition Reactions (A + B → AB)

1. magnesium Mg plus sulfur yields magnesium sulfide MgS
2. barium Ba plus oxygen O₂ yields barium oxide BaO
3. aluminum Al plus chlorine Cl₂ yields aluminum chloride AlCl₃
4. lithium Li plus iodine I₂ yields lithium iodide LiI

Decomposition Reactions (AB → A + B)

5. potassium chlorate KClO₃ is heated and yields potassium chloride KCl and oxygen O₂
6. aluminum oxide Al₂O₃ is decomposed by electricity yielding aluminum and oxygen O₂
7. hydrogen peroxide H₂O₂ is exposed to uv light and decomposes to water H₂O and oxygen O₂

Single Replacement Reactions (A + BC → AB + C)

8. zinc Zn plus hydrochloric acid HCl yields zinc chloride ZnCl₂ and hydrogen H₂
9. nickel Ni plus copper (II) sulfate CuSO₄ yields nickel sulfate NiSO₄ plus copper Cu
10. aluminum Al plus silver nitrate AgNO₃ yields aluminum nitrate Al(NO₃)₃ plus silver Ag
11. aluminum Al plus sulfuric acid H₂SO₄ yields aluminum sulfate Al₂(SO₄)₃ plus hydrogen H₂
12. sodium plus water HOH yields sodium hydroxide NaOH plus hydrogen H₂
13. iron (III) oxide Fe₂O₃ plus carbon C when heated yields iron Fe and carbon monoxide CO
14. copper Cu plus silver chlorate AgClO₃ yields copper (II) chlorate Cu(ClO₃)₂ and silver Ag
15. methane CH₄ burns (reacts with oxygen O₂) to yield carbon dioxide CO₂ and water H₂O

Double Replacement Reactions (AB + CD → AD + CB)

16. sodium hydroxide NaOH plus sulfuric acid H₂SO₄ yields sodium sulfate Na₂SO₄ plus water HOH
17. barium hydroxide Ba(OH)₂ plus nitric acid HNO₃ yields barium nitrate Ba(NO₃)₂ plus water HOH
18. magnesium hydroxide Mg(OH)₂ plus sulfurous acid H₂SO₃ yields magnesium sulfite MgSO₃ plus water HOH

Extra Challenges

19. calcium carbonate CaCO₃ plus hydrochloric acid HCl yields calcium chloride CaCl₂, water H₂O, and carbon dioxide CO₂
20. calcium hydroxide Ca(OH)₂ plus acetic acid C₂H₄O₂ yields calcium acetate Ca(C₂H₃O₂)₂ and water HOH

Note: When you add an active metal to water or when you react an acid with a base and produce water it makes it easier to balance the equation if you write water as HOH and treat it as hydrogen hydroxide when you balance it. In any other reaction it is easier to write H₂O and count the H's and O's separately.

Write the balanced chemical equations for each of the following word equations.

1. Write the skeleton equation. The reactants are provided in the word equation. This time you must predict the products by considering what type of reaction it is. By looking at the reactants and knowing what the type of reaction you can determine the most likely products and therefore write the equation.
2. Balance the equation using coefficients.

Single Replacement Reactions ($A + BC \rightarrow AB + C$) OR ($A + BC \rightarrow AC + B$)

Note: metals replace other metals or hydrogen; nonmetals replace other nonmetals.

1. zinc Zn reacts with silver nitrate $AgNO_3$ to produce...
2. aluminum Al reacts with copper (II) sulfate $CuSO_4$ to produce...
3. bromine Br_2 reacts with lithium iodide LiI to produce...
4. magnesium Mg reacts with tin (II) chloride $SnCl_2$ to produce...
5. chlorine Cl_2 reacts with potassium bromide KBr to produce...

Double Replacement Reactions ($AB + CD \rightarrow AD + CB$)

6. silver nitrate $AgNO_3$ reacts with beryllium chloride $BeCl_2$ to produce...
7. aluminum nitrate $Al(NO_3)_3$ reacts with ammonium hydroxide NH_4OH to produce...
8. cesium hydroxide CsOH reacts with sulfuric acid H_2SO_4 to produce...

Extra Challenges

9. calcium hydroxide $Ca(OH)_2$ reacts with potassium phosphate K_3PO_4 to produce...
10. barium acetate $Ba(C_2H_3O_2)_2$ reacts with potassium carbonate K_2CO_3 to produce...

CHEMISTRY B – EQUATIONS PACKET
WORKSHEET #7 PREDICTING REACTION PRODUCTS

NAME _____ HR _____ page 11

Classify each of the reactions below as single replacement (SR) or double replacement (DR). After determining the type of reaction, you can predict the product(s) and write the balanced equation.

USE A SEPARATE SHEET OF PAPER TO WRITE BALANCED EQUATIONS FOR THE REACTIONS BELOW.

- _____ zinc is added to sulfuric acid (H_2SO_4)
- _____ zinc is added to copper (II) sulfate (CuSO_4)
- _____ magnesium is added to silver nitrate (AgNO_3)
- _____ chlorine (Cl_2) reacts with zinc iodide (ZnI_2)
- _____ nickel reacts with copper (II) chloride (CuCl_2)
- _____ aluminum acetate ($\text{Al}_2(\text{C}_2\text{H}_3\text{O}_2)_3$) reacts with calcium hydroxide ($\text{Ca}(\text{OH})_2$)
- _____ sodium hydroxide (NaOH) reacts with sulfurous acid (H_2SO_3)
- _____ aluminum reacts with hydrochloric acid (HCl)
- _____ barium hydroxide ($\text{Ba}(\text{OH})_2$) reacts with carbonic acid (H_2CO_3)
- _____ lead (II) nitrate ($\text{Pb}(\text{NO}_3)_2$) is mixed with rubidium chromate (Rb_2CrO_4)
- _____ iron (III) nitrate ($\text{Fe}(\text{NO}_3)_3$) reacts with sodium thiocyanate (NaSCN)
- _____ lithium reacts with water (HOH)
- _____ barium bromide (BaBr_2) with ammonium sulfate ($(\text{NH}_4)_2\text{SO}_4$)
- _____ lithium hydroxide (LiOH) reacts with carbonic acid (H_2CO_3)
- _____ calcium bromide (CaBr_2) reacts with rubidium oxalate ($\text{Rb}_2\text{C}_2\text{O}_4$)
- _____ sodium hydroxide (NaOH) reacts with sulfurous acid (H_2SO_3)
- _____ mercury (II) nitrate ($\text{Hg}(\text{NO}_3)_2$) reacts with hydrogen sulfide (H_2S)

WRITING EQUATIONS

On this page you are given word equations, so for each reaction you must:

1. Write a skeleton equation containing all of the correct formulas (they are NOT provided this time!).
Remember all the rules you learned about writing formulas in Chemistry A (Swap & Drop etc..)
Remember that when you write a formula you always write the positive portion first, then the negative.
2. Balance the equation by inserting the appropriate coefficients in front of the formulas

Remember to use H₂, N₂, O₂, F₂, Cl₂, Br₂, and I₂ when these elements are not in compounds. Put a triangle over the arrow for heat and DC for electrolysis.

USE A SEPARATE SHEET OF PAPER TO WRITE EQUATIONS FOR THE FOLLOWING REACTIONS.

Composition Reactions (A + B → AB)

2. sulfur dioxide plus water (H₂O) yields sulfurous acid

Decomposition Reactions (AB → A + B)

3. potassium chloride undergoes electrolysis yielding potassium and chlorine
4. heating calcium hydroxide yields calcium oxide and water (H₂O)
5. heating silver oxide yields silver and oxygen
6. heating potassium chlorate yields potassium chloride and oxygen
7. heating sodium bicarbonate produces sodium carbonate and water (H₂O) and carbon dioxide

Single Replacement Reactions (A + BC → AB + C)

8. calcium plus water (HOH) yields calcium hydroxide and hydrogen
9. aluminum hydroxide plus nitric acid yields aluminum nitrate plus water (HOH)
10. calcium carbonate plus hydrochloric acid yields calcium chloride and water (H₂O) and carbon dioxide

Double Replacement Reactions (AB + CD → AD + CB)

11. silver nitrate plus (III) chloride yields silver chloride and iron (III) nitrate
12. iron (II) sulfide plus hydrochloric acid yields iron (II) chloride and hydrogen sulfide
13. lead (II) acetate plus ammonium chromate yields lead (II) chromate and ammonium acetate
14. tin (II) nitrate plus cesium carbonate yields tin (II) carbonate and cesium nitrate
15. sodium chromate plus silver nitrate yields sodium nitrate plus silver chromate
16. ammonium hydroxide plus hydrofluoric acid yields ammonium fluoride and water (HOH)
17. potassium plus water (HOH) yields potassium hydroxide plus hydrogen
18. sodium oxalate plus barium bromide yields sodium bromide plus barium oxalate
19. iron (II) cyanide plus hydrochloric acid yields iron (II) chloride plus hydrogen cyanide

PREDICTING AND WRITING EQUATIONS

Classify each of the reactions below as single replacement (SR) or double replacement (DR). After determining the type of reaction, you can predict the product(s) and write the balanced equation.

USE A SEPARATE SHEET OF PAPER TO WRITE BALANCED EQUATIONS FOR THE REACTIONS BELOW.

1. _____ magnesium hydroxide reacts with hydrochloric acid
2. _____ potassium cyanide reacts with hydrobromic acid
3. _____ chlorine is bubbled through a solution of calcium iodide
4. _____ tin (II) carbonate reacts with hydrofluoric acid
5. _____ copper (II) carbonate reacts with nitric acid
6. _____ calcium carbonate reacts with hydrochloric acid
7. _____ sodium reacts with water (HOH)
8. _____ chlorine reacts with magnesium bromide
9. _____ silver nitrate reacts with beryllium iodide
10. _____ potassium reacts with water (HOH)
11. _____ calcium chloride reacts with sodium phosphate
12. _____ calcium reacts with water (HOH)
13. _____ zinc reacts with sulfuric acid
14. _____ ammonium hydroxide reacts with sulfurous acid
15. _____ aluminum hydroxide reacts with nitrous acid
16. _____ oxalic acid reacts with calcium hydroxide
17. _____ barium reacts with hot water (HOH)
18. _____ mercury (I) nitrate reacts with lithium chloride

MORE PREDICTING AND WRITING EQUATIONS

Classify each of the reactions below as single replacement (SR) or double replacement (DR). After determining the type of reaction, you can predict the product(s) and write the balanced equation.

USE A SEPARATE SHEET OF PAPER TO WRITE BALANCED EQUATIONS FOR THE REACTIONS BELOW.

1. _____ bromine reacts with lithium iodide
2. _____ nitric acid reacts with calcium hydroxide
3. _____ calcium carbonate reacts with hydrochloric acid
4. _____ sodium hydroxide reacts with phosphoric acid
5. _____ calcium phosphate reacts with sulfuric acid
6. _____ iron (III) chloride reacts with barium hydroxide
7. _____ calcium bromide reacts with sodium silicate
8. _____ silver chlorate reacts with ammonium sulfide
9. _____ aluminum reacts with hydrochloric acid
10. _____ aluminum hydroxide reacts with sulfuric acid
11. _____ zinc chloride reacts with sodium hydroxide
12. _____ calcium hydroxide and aluminum sulfate react
13. _____ calcium nitrate reacts with potassium oxalate
14. _____ milk of magnesia (magnesium hydroxide) reacts with stomach acid (hydrochloric acid)
15. _____ magnesium reacts with battery acid (sulfuric acid)
16. _____ baking soda (sodium bicarbonate) reacts with vinegar (acetic acid)

1. List the seven elements that exist as diatomic molecules.

2. Name the four general types of chemical reactions.

4. What element do all acids start with? _____

5. What symbol represents heat in an equation? _____
What symbol represents electricity in an equation? _____

6. What is another word for burning? _____
What reactant do you add to the left side of the equation to show burning? _____

7. What products are formed during the complete combustion of a hydrocarbon (fuel)? _____
and _____

8. What is the difference between a chemical *formula* and a chemical *equation*?

9. When carbonic acid is produced in a reaction it immediately decomposes into _____ and _____

9. Use the word bank to fill in the blanks:

physical	chemical	exothermic	endothermic	subscript	coefficient
oxidation number		solute	solvent	destroyed	precipitate

A. Matter is neither created or _____

B. A reaction that releases heat _____

C. A solid formed during a chemical reaction _____

D. The charges needed in order to write formulas _____

E. Small numbers inserted to write correct formulas _____

F. Large numbers inserted to balance equations _____

G. A reaction that requires heat to be added _____

H. A substance that does not dissolve _____

I. A substance that does dissolve _____

J. A change in form that can be reversed _____

K. A rearrangement of atoms that cannot be reversed _____

10. We must balance chemical equations so that they follow the law of _____

****USE THE CHEMISTRY DEMONSTRATIONS SHEET TO ANSWER #11 – 13**

11. What is an exothermic reaction?

Draw the energy profile for an exothermic reaction:



12. What is an endothermic reaction?

Draw the energy profile for an endothermic reaction:



13. What are the differences between chemical and physical changes?

*Label each equation as composition, decomposition, single replacement or double replacement. Then write the **balanced** equations for the following reactions.*

14. _____ sodium hydroxide NaOH plus sulfuric acid H₂SO₄ yields sodium sulfate Na₂SO₄ plus water HOH.

15. _____ methane CH₄ burns O₂ giving carbon dioxide CO₂ and water H₂O

16. _____ barium hydroxide Ba(OH)₂ plus nitric acid HNO₃ yields barium nitrate Ba(NO₃)₂ plus water HOH

17. _____ aluminum oxide Al₂O₃ is decomposed by electricity yielding aluminum Al and oxygen O₂

OVER →

*Label each equation as composition, decomposition, single replacement or double replacement. Then **predict the products** and write the **balanced** equations for the following reactions.*

18. _____ calcium bromate $\text{Ca}(\text{BrO}_3)_2$ reacts with sodium silicate Na_2SiO_3 to produce...

19. _____ silver chlorate AgClO_3 reacts with ammonium sulfate $(\text{NH}_4)_2\text{SO}_4$ to produce...

20. _____ magnesium Mg reacts with hydrochloric acid HCl to produce...

21. _____ aluminum hydroxide $\text{Al}(\text{OH})_3$ reacts with sulfurous acid H_2SO_4 to produce...

22. _____ magnesium chloride MgCl_2 reacts with sodium hydroxide NaOH to produce...

EXTRA CHALLENGES

23. _____ calcium hydroxide and aluminum sulfite react

24. _____ calcium nitrite reacts with potassium oxalate

25. _____ milk of magnesia (magnesium hydroxide) reacts with stomach acid (hydrochloric acid)

26. _____ magnesium reacts with battery acid (sulfuric acid)