Writing and balancing chemical equations worksheet

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Worksheet: Balancing Equations Name ____________________

I. Fill in the blanks with the most appropriate term:

A _________________ _________________ tells the story of a chemical reaction. _________________ are the starting substances in the reaction while _________________ are the new substances that are formed. The large numbers in front of some of the formulas are called _________________. These numbers are used to _________________ the equation because chemical reactions must obey the Law of _________________ of Matter. The number of atoms of each element on both sides of the equation must be _________________ because matter cannot be _________________ or _________________. When balancing equations, the only numbers that can be changed are _________________; remember that _________________ must never be changed in order to balance an equation.

II. Balance the following equations:

1. $Al + O_2 \rightarrow Al_2O_3$

2. $C_3H_8 + O_2 \rightarrow CO_2 + H_2O$

3. $Al(NO_3)_3 + NaOH \rightarrow Al(OH)_3 + NaNO_3$

Balancing Chemical Equations

Name: _______________

Types of Chemical Reactions Worksheet

Writing Formulas

In order to complete chemical reactions, you must be able to write formulas for ionic compounds. Remember, to write the formula for ionic compounds all you have to do is criss-cross the numerical value of the charges into subscripts for the elements. Remember, polyatomic ions must be kept in brackets if there are more than one of them!

Ex) Ca^{+2} Cl^{-1} criss-crosses to make the formula $CaCl_2$ (we don't write 1's as subscripts)

Ex) Al^{+3} SO_4^{-2} makes $Al_2(SO_4)_3$

Write formulas for the following ionic compounds (salts)

1. magnesium fluoride	________	6. iron (II) sulfate	________
2. calcium nitride	________	7. barium nitrate	________
3. aluminum iodide	________	8. potassium phosphate	________
4. sodium chloride	________	9. cobalt (II) chlorate	________
5. copper (I) sulfide	________	10. zinc carbonate	________

Write formulas for the following basic oxides (metal oxides)

1. lithium oxide	________	6. iron (III) oxide	________
2. magnesium oxide	________	7. silver oxide	________
3. barium oxide	________	8. nickel (II) oxide	________
4. potassium oxide	________	9. tin (IV) oxide	________
5. cesium oxide	________	10. copper (II) oxide	________

Write formulas for the following bases (end in hydroxide)

1. lithium hydroxide	________	6. lead (II) hydroxide	________
2. barium hydroxide	________	7. zinc hydroxide	________
3. aluminum hydroxide	________	8. calcium hydroxide	________
4. potassium hydroxide	________	9. copper (I) hydroxide	________
5. copper (II) hydroxide	________	10. magnesium hydroxide	________

Name:________________________ Date:________________

Balance the following chemical equations.

Ex. _2_ $AgCl$ + _1_ $Na_2S \rightarrow$ _1_ Ag_2S + _2_ $NaCl$

1) ___ $CaCO_3$ + ___ $HNO_3 \rightarrow$ ___ $Ca(NO_3)_2$ + ___ CO_2 + ___ H_2O

2) ___ C_4H_{10} + ___ $O_2 \rightarrow$ ___ CO_2 + ___ H_2O

3) ___ H_2 + ___ $O_2 \rightarrow$ ___ H_2O

4) ___ NH_3 + ___ $O_2 \rightarrow$ ___ NO + ___ H_2O

5) ___ CuO + ___ $NH_3 \rightarrow$ ___ Cu + ___ N_2 + ___ H_2O

6) ___ $AgNO_3$ + ___ $CaCl_2 \rightarrow$ ___ $AgCl$ + ___ $Ca(NO_3)_2$

7) ___ Mg + ___ $HCl \rightarrow$ ___ $MgCl_2$ + ___ H_2

8) ___ Fe + ___ $O_2 \rightarrow$ ___ Fe_2O_3

9) ___ N_2 + ___ $H_2 \rightarrow$ ___ NH_3

10) ___ $KClO_3 \rightarrow$ ___ KCl + ___ O_2

11) ___ $NaCl$ + ___ $Pb(NO_3)_2 \rightarrow$ ___ $PbCl_2$ + ___ $NaNO_3$

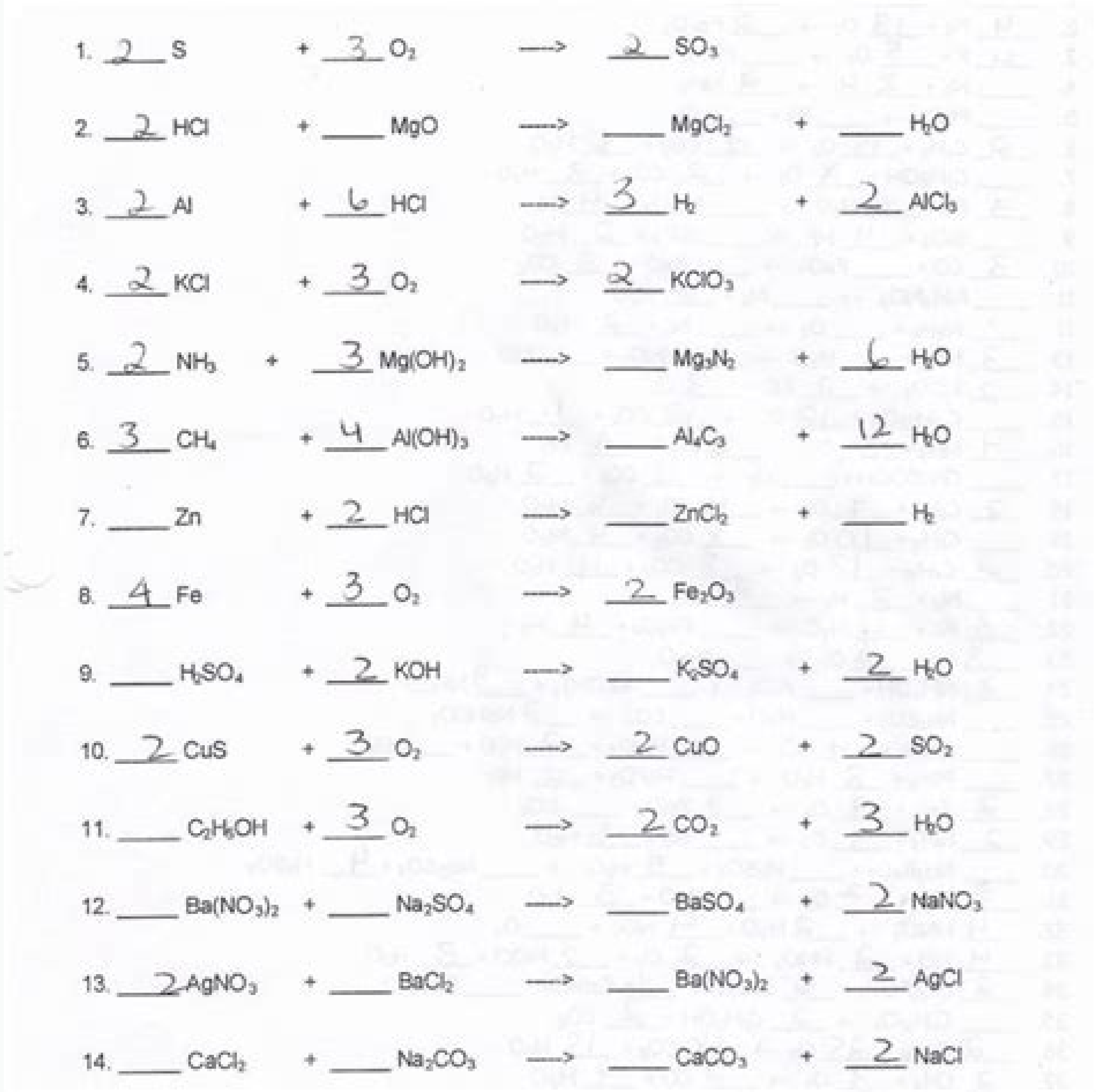
12) ___ CH_4 + ___ $H_2O \rightarrow$ ___ CO + ___ H_2

13) ___ Na + ___ $HBr \rightarrow$ ___ $NaBr$ + ___ H_2

14) ___ $NaBH_4$ + ___ $H_2O \rightarrow$ ___ $NaBO_2$ + ___ H_2

15) ___ $C_6H_{12}O_6$ + ___ $O_2 \rightarrow$ ___ CO_2 + ___ H_2O

16) ___ $KMnO_4$ + ___ $H_2SO_4 \rightarrow$ ___ Mn_2O_7 + ___ H_2O + ___ $KHSO_4$



1. 2 S + 3 O_2 ---> 2 SO_3
2. 2 HCl + ____ MgO ---> ____ $MgCl_2$ + ____ H_2O
3. 2 Al + 6 HCl ---> 3 H_2 + 2 $AlCl_3$
4. 2 KCl + 3 O_2 ---> 2 $KClO_3$
5. 2 NH_3 + 3 $Mg(OH)_2$ ---> ____ Mg_3N_2 + 6 H_2O
6. 3 CH_4 + 4 $Al(OH)_3$ ---> ____ Al_4C_3 + 12 H_2O
7. ____ Zn + 2 HCl ---> ____ $ZnCl_2$ + ____ H_2
8. 4 Fe + 3 O_2 ---> 2 Fe_2O_3
9. ____ H_2SO_4 + 2 KOH ---> ____ K_2SO_4 + 2 H_2O
10. 2 CuS + 3 O_2 ---> 2 CuO + 2 SO_2
11. ____ C_2H_5OH + 3 O_2 ---> 2 CO_2 + 3 H_2O
12. ____ $Ba(NO_3)_2$ + ____ Na_2SO_4 ---> ____ $BaSO_4$ + 2 $NaNO_3$
13. 2 $AgNO_3$ + ____ $BaCl_2$ ---> ____ $Ba(NO_3)_2$ + 2 AgCl
14. ____ $CaCl_2$ + ____ Na_2CO_3 ---> ____ $CaCO_3$ + 2 NaCl

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A balanced equation is an equation for a chemical reaction in which the number of atoms for each element in the reaction and the total charge is the same for both the reactants and the products. In other words, the mass and the charge are balanced on both sides of the reaction. Also Known As: Balancing the equation, balancing the reaction, conservation of charge and mass. An unbalanced chemical equation lists the reactants and products in a chemical reaction but doesn't state the amounts required to satisfy the conservation of mass. For example, this equation for the reaction between iron oxide and carbon to form iron and carbon dioxide is unbalanced with respect to mass: Fe2O3 + C → Fe + CO2 The equation is balanced for charge because both sides of the equation have no ions (net neutral charge). The equation has 2 iron atoms on the reactants side of the equation (left of the arrow) but 1 iron atom on the products side (right of the arrow). Even without counting up the quantities of other atoms, you can tell the equation isn't balanced. The goal of balancing the equation is to have the same number of each type of atom on both the left and right sides of the arrow. This is achieved by changing the coefficients of the compounds (numbers placed in front of compound formulas). The subscripts (small numbers to the right of some atoms, as for iron and oxygen in this example) are never changed. Changing the subscripts would alter the chemical identity of the compound. The balanced equation is: 2 Fe2O3 + 3 C → 4 Fe + 3 CO2 Both the left and right sides of the equation have 4 Fe, 6 O, and 3 C atoms. When you balance equations, it's a good idea to check your work by multiplying the subscript of each atom by the coefficient. When no subscript is cited, consider it to be 1. It's also good practice to cite the state of matter of each reactant. This is listed in parentheses immediately following the compound. For example, the earlier reaction could be written: 2 Fe2O3(s) + 3 C(s) → 4 Fe(s) + 3 CO2(g) where s indicates a solid and g is a gas. In aqueous solutions, it's common to balance chemical equations for both mass and charge. Balancing for mass produces the same numbers and kinds of atoms on both sides of the equation. Balancing for charge means the net charge is zero on both sides of the equation. The state of matter (aq) stands for aqueous, meaning only the ions are shown in the equation and that they are in the water. For example: Ag+(aq) + NO3-(aq) + Na+(aq) + Cl-(aq) → AgCl(s) + Na+(aq) + NO3-(aq) Check that an ionic equation is balanced for the charge by seeing if all the positive and negative charges cancel each other out on each side of the equation. For example, on the left side of the equation, there are 2 positive charges and 2 negative charges, which means the net charge on the left side is neutral. On the right side, there is a neutral compound, one positive, and one negative charge, again yielding a net charge of 0. Frank Krahmer / Getty Images Photosynthesis is the process in plants and certain other organisms that uses the energy from the sun to convert carbon dioxide and water into glucose (a sugar) and oxygen. 6 CO2 + 6 H2O → C6H12O6 + 6 O2 Where:CO2 = carbon dioxide H2O = waterlight is requiredC6H12O6 = glucoseO2 = oxygen In words, the equation may be stated as: Six carbon dioxide molecules and six water molecules react to produce one glucose molecule and six oxygen molecules. The reaction requires energy in the form of light to overcome the activation energy needed for the reaction to proceed. Carbon dioxide and water don't spontaneously convert into glucose and oxygen. A chemical equation tells you what happens during a chemical reaction. A balanced chemical equation has the correct number of reactants and products to satisfy the Law of Conservation of Mass. In this article, we'll talk about what a chemical equation is, how to balance chemical equations, and give you some examples to aid in your balancing chemical equations practice. What Is a Chemical Equation? Simply put, a chemical equation tells you what's happening in a chemical reaction. Here's what a chemical equation looks like: Fe + O2 → Fe2O3 On the left side of the equation are the reactants. These are the materials that you start with in a chemical reaction. On the right side of the equation are the products. The products are the substances that are made as a result of a chemical reaction. In order for a chemical reaction to be correct, it needs to satisfy something called the Law of Conservation of Mass, which states that mass can't be created or destroyed during a chemical reaction. That means that each side of the chemical equation needs to have the same amount of mass, because the amount of mass can't be changed. If your chemical equation has different masses on the left and right side of the equation, you'll need to balance your chemical equation. How to Balance Chemical Equations—Explanation and Example Balancing chemical equations means that you write the chemical equation correctly so that there is the same amount of mass on each side of the arrow. In this section, we're going to explain how to balance a chemical equation by using a real life example, the chemical equation that occurs when iron rusts: Fe + O2 → Fe2O3 #1: Identify the Products and Reactants The first step in balancing a chemical equation is to identify your reactants and your products. Remember, your reactants are on the left side of your equation. The products are on the right side. For this equation, our reactants are Fe and O2. Our products are Fe2 and O3. #2: Write the Number of Atoms Next, you need to determine how many atoms of each element are present on each side of the equation. You can do this by looking at the subscripts or the coefficients. If there is no subscript or coefficient present, then you just have one atom of something. Fe + O2 → Fe2O3 On the reactant side, we have one atom of iron and two atoms of oxygen. On the product side, we have two atoms of iron and three atoms of oxygen. When you write out the number of products, you can see that the equation isn't balanced, because there are different amounts of each atom on the reactant side and the product side. That means we need to add coefficients to make this equation balanced. #3: Add Coefficients Earlier, I mentioned that there are two ways to tell how many atoms of a particular element exist in a chemical equation: by looking at the subscripts and looking at the coefficients. When you balance a chemical equation, you change coefficients. You never change subscripts. A coefficient is a whole number multiplier. To balance a chemical equation, you add these whole number multipliers (coefficients) to make sure that there are the same number of atoms on each side of the arrow. Here's something important to remember about coefficients: they apply to every part of a product. For instance, take the chemical equation for water: H2O. If you added a coefficient to make it 2H2O, then the coefficient multiples across all of the elements present. So, 2H2O means that you have four atoms of hydrogen and two atoms of oxygen. You don't just multiply against the first element present. So, in our chemical equation (Fe + O2 → Fe2O3), any coefficient you add to the product has to be reflected with the reactants. Let's look at how to balance this chemical equation. On the product side, we have two atoms of iron and three atoms of oxygen. Let's tackle iron first. When first looking at this chemical equation you might think that something like this works: 2Fe + O2 → Fe2O3 While that balances out the iron atoms (leaving two on each side), oxygen is still unbalanced. That means we need to keep looking. Taking iron first, we know that we'll be working with a multiple of two, since there are two atoms of iron present on the product side. Knowing that using two as a coefficient won't work, let's try the next multiple of two: four. 4Fe + O2 → 2Fe2O3 That creates balance for iron by having four atoms on each side of the equation. Oxygen isn't quite balanced yet, but on the product side we have six atoms of oxygen. Six is a multiple of two, so we can work with that on the reactant side, where two atoms of oxygen are present. That means that we can write our balanced chemical equation this way: 4Fe + 3O2 → 3Fe2O3 3 Great Sources of Balancing Chemical Equations Practice There are many places you can do balancing chemical equations practice online. Here are a few places with practice problems you can use: Balancing Chemical Equations: Key Takeaways Balancing chemical equations seems complicated, but it's really not that hard! Your main goal when balancing chemical equations is to make sure that there are the same amount of reactants and products on each side of the chemical equation arrow. What's Next? Looking for more chemistry guides? We have articles that go over six physical and chemical change examples, the 11 solubility rules, and the solubility constant (Ksp), as well as info info on AP Chem, IB Chemistry, and Regents Chemistry. Writing a research paper for school but not sure what to write about? Our guide to research paper topics has over 100 topics in ten categories so you can be sure to find the perfect topic for you. Want to know the fastest and easiest ways to convert between Fahrenheit and Celsius? We've got you covered! Check out our guide to the best ways to convert Celsius to Fahrenheit (or vice versa). 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