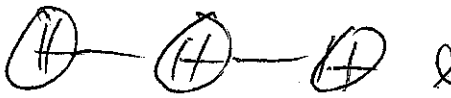
Conservation of mass- guided reading notes: Name Key #2

1. Chemical equations are shorter to write by using Symbols instead of words.
2. Chemical symbols stand for elements
3. Identify the chemical symbol for each of the following elements: Chlorine Cl, Hydrogen H Iron Fe Sodium Na Carbon C
4. A chemical formula is a combination of symbols that represent elements in a compound
5. Write the chemical formulas for each of the following compounds:
   a. Methane CH_4
   b. Carbon Dioxide CO_2
   c. Sugar $C_{12}H_{22}O_{11}$
   d. Baking Soda $NaHCO_3$
   e. Rubbing alcohol C_3H_8O
6. What is a subscript? Subscripts show the # of atoms of an element in a molecule or the ratio of elements in a compound.
7. Draw what H_3 would look like.  all bonded
8. How does ~~H_3~~ compare to 3H? ~~compare~~ bonded how many of each
9. The materials at the beginning of an equation are called reactants, these are like ingredients that will react together to make something new.
10. The arrow in a chemical equation means yields, which shows the chemical reaction.
11. Products are What is made by the reaction
12. Copy the equation from the center of page 26

$$H_2 + O_2 \rightarrow H_2O_2$$

13. How is a class of students being dismissed into the hallway like a chemical reaction? All of the students are still there they have just formed into new arrangements
14. Write the full description of the law of conservation of mass. Mass is not created or destroyed during a chemical reaction only changes

15. Where does some of the mass from burning something in a fire go?
Some is release as Water Vapor + CO_2 and ash

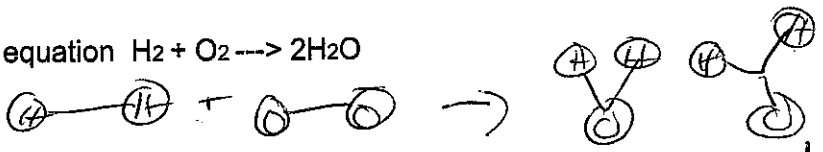
16. Conservation of mass means the number of atoms before the reaction and after the reaction are equal. Look at the equation in the book on the bottom of page 27, it states
$H_2 + O_2 \rightarrow H_2O$. 2-4 - 2-O → 2H - 1O
Count the number of atoms on each side of the equation. Are the equal? NO

17. To balance an equation you NEVER change a subscript, that would cause an inaccurate compound, however, you can change the Coefficient, which is the number placed in front of the formula.

18. The coefficient tells you how many atoms or Molecules there is of each reactant or product.

19. When you add a coefficient in front of a symbol or formula you must Multiply everything behind the coefficient by that number.

20. Draw the equation $H_2 + O_2 \rightarrow 2H_2O$



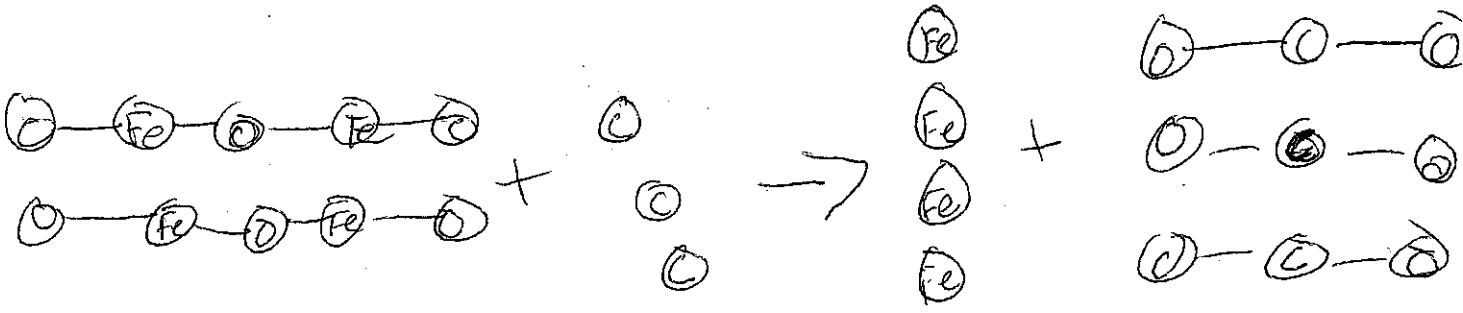
How many hydrogen MOLECULES do you have on the reactants side? 1 How many hydrogen ATOMS do you have? 2
How many hydrogen MOLECULES do you have on the product side? 0 How many hydrogen atoms? 4
Are these numbers equal? NO

21. In order to balance the above equation you must add a coefficient of 2 in front of the hydrogen on the products side.

22. Copy the model of the chemical equation on the bottom of page 28 AND count how many atoms you have of each element on each side. Are the equal? Yes

23. BALANCE the following equation by adding the correct coefficient(s):
$Fe_2O_3 + C \rightarrow Fe + CO_2$ $2Fe_2O_3 + 3C \rightarrow 4Fe + 3CO_2$

Create a visual model for the balanced equation in the space below **and** explain how you know it is balanced and if mass has been conserved.



Key

Before we start..... REVIEW TIME

Think think think- match the terms to the correct definitions

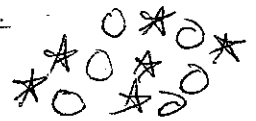
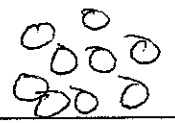
B Molecule — A. 2 or more substances physically mixed together

E Element — B. 2 or more atoms bonded together (same or different)

C Compound — C. 2 or more elements bonded together chemically

A Mixture — D. A pure substance made of only one type of atom

Compare:
What is the difference between heterogenous and homogenous mixtures? Explain and draw a picture of each.

Heterogenous mixture- A mixture that looks different	Homogenous mixture- A mixture that looks the same
Draw: 	Draw: 

Differentiate:
When 2 substances are mixed together that is a Physical change, when 2 substances react together that is a Chemical change.

Think about it:
What is the Law of conservation of mass?
When there is a chemical reaction mass is not created or destroyed, it stays the same

Does mass remain the same in a physical change? Yes, because the substance is only changing form

Does mass remain the same in a chemical change? Yes, because reactants are just rearranged in to new molecules/products.

Video Questions: Video 1

1. When the water evaporates from the glass, did the matter disappear? No
2. Reactants are the things that get Changes
3. Product is what reactants make
4. The law that says mass/matter is never lost is the law of Conservation of mass
5. Does the sugar and water solution show that physical changes conserve mass? Yes

Video 2:

6. Building something with legos can show mass Changes but not created or destroyed.
7. Is mass conserved during a chemical reaction? Yes
8. How can you tell mass is conserved during a chemical reaction. Measure before + after reactions
9. The mass of the products will always equal the mass of the reactants.
10. Matter Never goes away.

Demonstration Notes:

- Ways to prove the law of conservation of mass:
  - Count atoms before + after
  - Weight before + after
  - Balance an equation

Demonstration:

Name of substance	Mass of substance
Polyvinyl Alcohol	90 g
Sodium Borate	10g

Type of change occurring: Chemical
Evidence: Temp drops, New thing made, Can't undo it

Name of Substance	Mass of substance:
Gak	100g

Compare the properties of the starting substances to the properties of the new substance:

Before:	After:
2 liquids transparent	translucent semisolid colder

- Was mass conserved during this reaction? Yes How can you prove it?
  By Comparing Weights

Compound	Symbol	Formula	How Many can you make?	Picture of Molecule
Water	H_2O	H+H+O → H_2O		
Table Salt	NaCl			
Carbon Dioxide	CO_2	O + __ + __ → _____		
Methane	CH_4			
Hydrochloric Acid	HCl	H + ___ → HCl		
Acetic Acid	$C_2H_4O_2$			

Part Three: Law of Conservation of Matter (Mass) (Team Leader please read aloud)

When certain elements or compounds are mixed, a **chemical reaction** occurs. During a chemical reaction, chemical bonds between atoms are BROKEN, and NEW, DIFFERENT chemical bonds are formed. This means that the original substance or substances can change into new substances. The new substances can have very different properties from the original substances. The substances that react are called **reactants** and the substances that are produced from the reaction are called **products**. Reactions can be written down in the form of an equation, with an arrow pointing from the reactants to the products.

Example:

$$N_2 + 3H_2 \rightarrow 2NH_3$$

Reactants Product

Although new molecules and compounds can be made, there is a very important rule regarding chemical reactions. The **Law of Conservation of Matter (Mass)** states that atoms are neither created of destroyed during a chemical reaction, the molecules are only rearranged. That means the TYPE of and NUMBER of atoms does not change, but the chemical bonds DO change.

Step 1: Build 4 H_2 molecules. **Step 2:** Build 2 O_2 molecules.

Step 3: These molecules are called the reactants.

Step 4: BOOM! A chemical reaction occurs! Take apart each of your reactants and rebuild them into water molecules. H_2O

- How many molecules of water can you make? _____

Now perform the following chemical reactions. Starting with the OLDEST, each student will choose a chemical reaction to create out of legos. The other team members will observe and coach.

Team Member	Reaction	Equation	# of **atoms** before reaction	# of **atoms** after reaction	Is mass conserved during this reaction? Y/N
	Burning Methane				
	Acid-Base Reaction	HCl + NaOH →NaCl + H_2O			
	Iron Oxidation (rust)	$4Fe + 3O_2 \rightarrow 2Fe_2O_3$			
	Baking Soda and Vinegar	$NaHCO_3 + C_2H_4O_2 \rightarrow NaC_2H_3O_2 + H_2O + CO_2$			

After lab questions:

1.What is the difference between a compound and a molecule?

_____

2. How is an atom different than a molecule?

_____

3. Which side of a chemical equation is a reactant on? _____ What is it?

_____

4. Which side of a chemical equation is a product on? _____ What is it?

_____

5. Is mass conserved during chemical reactions? _____, because

_____

6. Based on the lab, what is one way to show the conservation of mass in a chemical reaction?

Lego Chemistry Lab

Name_____

Learning Goals: In this activity, you will -

- Create compounds, elements, and molecules
- Use the Law of Conservations of Mass to demonstrate chemical reactions

Group roles: Team leader, task master, paper pusher, materials manager

Starting with the youngest person in your group, each person should choose one Lego color you will be in charge of, the Team Leader and Task Master will have more than one color.

Part One: ELEMENTS (Equipment Manager please read aloud)

Everything you can touch is made of **matter**. The smallest parts of matter called **atoms**. Atoms are too small to see. Millions and millions of atoms are needed to become visible to our eyes.

A substance that is made of atoms that are all the same type of atom is called an element. **Elements** are the ingredients that make up everything in the universe. The Periodic Table of Elements is a complete list of all of the elements that make up our world.

Each LEGO color represents a different element. In the box below, pick which color will represent the different elements.

Color	Element
	Chlorine (Cl)
	Carbon (C)
	Oxygen (O)
	Sodium (Na)
	Hydrogen (H)

Molecules:

Many types of atoms don't like to be alone. They form connections called **chemical bonds** with other atoms by **sharing electrons.** Two or more atoms joined together in this way form **molecules**. To represent a chemical bond you will "snap" the legos together.

As a group- model the following molecules below and DRAW your product and how you think the atoms that make up the molecules would look.

Substance	Lego Model	What atoms might look like
Ozone (O_3)		
Hydrogen gas (H_2)		

Hydrogen gas can combine with oxygen in the air and explore, releasing energy and creating WATER!

How would Na_3 be different than 3Na? You can explain or draw models of each.

Na_3	3Na

Part Two: COMPOUNDS (Paper Pusher please read aloud)

Only the first 92 elements on the Periodic Table occur naturally on earth, so how can it be that there are so many types of matter? Different elements can form chemical bonds called **compounds**. Compounds are new substances that can have properties very **different** from the elements that make them up.

Step 3: Build compounds by connecting different colors of legos together. Use the chart to in PART ONE to know which color of lego to use for each element. Build as many molecules as you can of your compound using the legos you have. Draw a picture of each molecule in your science notebook.

Balancing equations practice. Name_____

Analyze the following equations to tell if they are balanced or not.

- First count and record the number of atoms of reactants and products
- Answer if the equation is balanced or not
- If the equation is not balanced, balance the equation by changing/adding necessary coefficients

1. $Zn + HCl \rightarrow ZnCl_2 + H_2$

Atom type	# before	# after

Balanced?_____

New Equation:

Balanced? _____

Because_____

2. $S_8 + F_2 \rightarrow SF_6$

Atom type	# before	# after

Balanced?_____

New Equation:

Balanced? _____

Because_____

3. $C_2 + H_6 + O_2 \rightarrow CO_2 + H_2O$

Atom type	# before	# after

Balanced?_____

New Equation:

Balanced? _____

Because_____

Fill in the blank with the correct number to balance each equation:

Ex: $\underline{1}CH_4 + \underline{2}\ O_2 \rightarrow \underline{1}CO_2 + \underline{2}H_2O$

4. _____Al + __ ___O_2 → __ ___ Al_2O_3

5. _____Al + _____ HCl → _____ $AlCl_3$ + _____H_2

Draw each of the balanced equations below

6. $C + O_2 \rightarrow CO_2$

7. $C + H + H + H + H \rightarrow CH_4$

Balancing Equations - Proving the conservation of mass.

ample

- $5\ H_{12} + O_2 \rightarrow CO_2 + H_2O$

st - Count the number of each type of atom before and after the reaction

Before	After
5	1
12	2
2	3

Is the equation balanced?

(NO)

How can I tell? # of atoms before + after reaction ≠

Balance the equation by making the atoms = on both sides. Add coefficients, No Changes to subscripts. Remember if atoms are together coefficients multiply subscripts.

Original equation:

$C_5H_{12} + O_2 \rightarrow CO_2 + H_2O$

New Equation:

$C_5H_{12} + 8O_2 \rightarrow 5CO_2 + 6H_2O$

C=5 H=12 O=16 → C=5 O=10 + H=12 O=6

C=5 O=10+6=16 # = 12

Is the equation balanced Now? Yes

how do I know? Both sides reactants and products have an equal # of atoms.

Name: _____ Section: _____

Analyzing Chemical Formulas

Directions - Complete the following charts by providing the appropriate number of molecules/compounds or atoms for each of the chemical formulas present.

CO_2

Component	Total Number
CO_2 - molecules	
C - atoms	
O - atoms	
O_2 - molecules	

$C_6H_{12}O_6$

Component	Total Number
$C_6H_{12}O_6$ - molecules	
C - atoms	
H - atoms	
O - atoms	

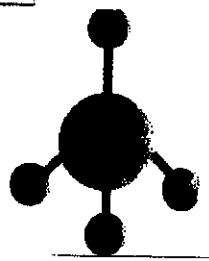
18 H_2O

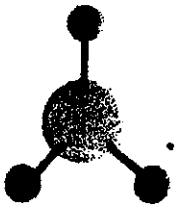
Component	Total Number
H_2O -molecules	
H - atoms	
O - atoms	
H_2 - molecules	

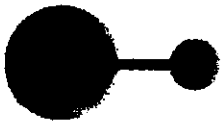
2 C_8H_{18}

Component	Total Number
C_8H_{18} - molecules	
C - atoms	
H - atoms	

NH_3 Match the formula to the model







Name: _____ Section: _____

Analyzing Chemical Equations

Directions: Read the following descriptions of the chemical reactions, look at the chemical equations, and complete the chart that follows.

1. ***Propane burns. Propane combines with oxygen in the air to make carbon dioxide and water vapor. This chemical reaction takes place when a "gas" grill is used for cooking.***

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

Which chemical formula(s) represents the *reactants*?	Which chemical formula(s) represents the *products*?
How many of each atom is present in the *reactants*? C - H - O -	How many of each atom is present in the *products*? C - H - O -
Is this a balanced equation? Explain.	

2. ***An iron bar rusts. The iron reacts with oxygen in the air to make rust.***

$$4Fe + 3O_2 \rightarrow 2Fe_2O_3$$

Which chemical formula(s) represents the *reactants*?	Which chemical formula(s) represents the *products*?
How many of each atom is present in the *reactants*? Fe - O -	How many of each atom is present in the *products*? Fe - O -
Is this a balanced equation? Explain.	

3. ***A silver spoon tarnishes. The silver reacts with sulfur in the air to make silver sulfide, the black material we call tarnish.***

$$2Ag + S \rightarrow Ag_2S$$

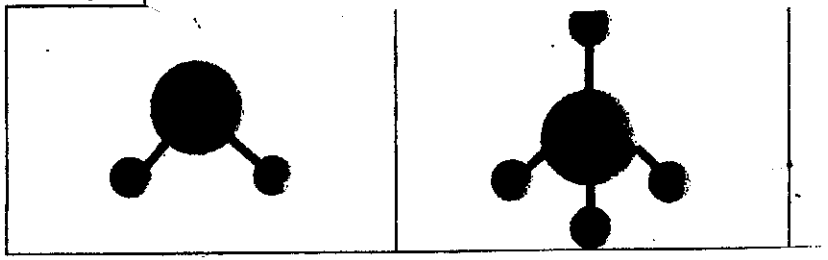
Which chemical formula(s) represents the *reactants*?	Which chemical formula(s) represents the *products*?
How many of each atom is present in the *reactants*? Ag - S -	How many of each atom is present in the *products*? Ag - S -
Is this a balanced equation? Explain.	

4. ***Living cells obtain energy from glucose molecules through the process of respiration which is the combustion of glucose to obtain energy.***

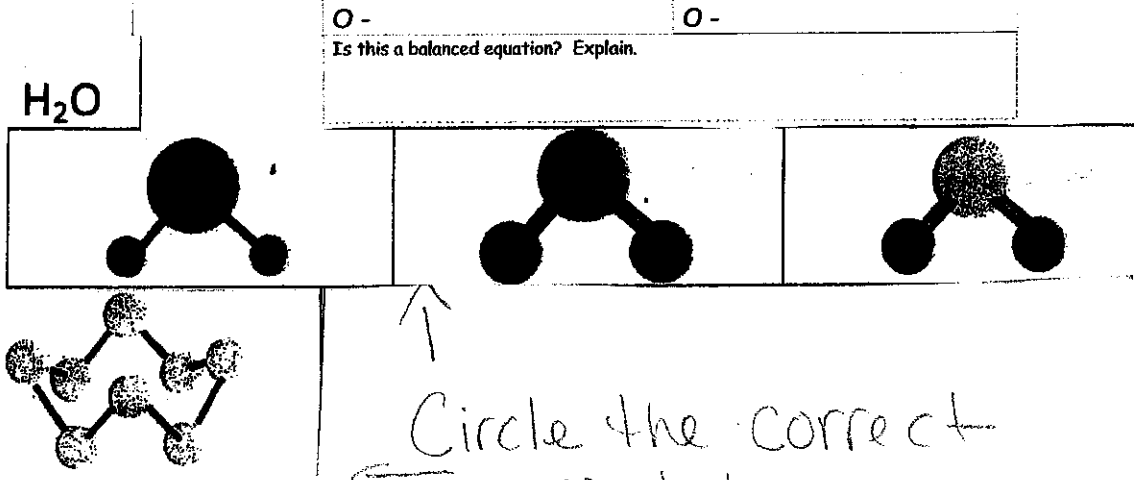
$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{energy}$$

Which chemical formula(s) represents the *reactants*?	Which chemical formula(s) represents the *products*?
How many of each atom is present in the *reactants*? C - H - O -	How many of each atom is present in the *products*? C - H - O -
Is this a balanced equation? Explain.	

CH_4



H_2O



Circle the correct models