

Chemistry Sci 8

Lab: Identifying Elements, Compounds, and Mixtures

Directions: Read through the review chart below and answer the pre-lab questions.

Elements	Compound	Mixture
<ul style="list-style-type: none"> 1 • <u>pure substance</u> made up of only one kind of atom 2 • All elements are located on the <u>Periodic Table of Elements</u> 3 • <u>Cannot be separated</u> into any simpler form chemically or physically 	<ul style="list-style-type: none"> 1 • <u>2 or more elements</u> that are <u>chemically combined</u> to make a new substance 2 • Properties of the elements used to make the compound are changed 	<ul style="list-style-type: none"> • 2 or more elements <i>physically</i> combined • Elements used keep their original properties (not chemically combined) <p>Homogeneous – two or more substance that are evenly mixed, unable to identify the different substances</p> <p>Heterogeneous -a mixture in which different substances can be identified</p>

Pre-Lab Questions:

1. What is the difference between an element and a compound?

Element is a pure substance / compounds are 2 or more elements.

2. How is a heterogeneous mixture different from a homogeneous mixture?

Heterogeneous is like a tossed salad while homogeneous - is like saltwater (solutions)

3. How is the way a mixture is combined DIFFERENT from how a compound is combined?

Mixtures are simply physically mixed while compounds are chemically combined.

4. What is easier to separate, a mixture or a compound? Explain why?

Mixtures require less energy typically. Compound require more chem.

5. Which can be found on the periodic table: elements, compounds or mixtures?

↑

1. **Synthesis Reaction:** when two or more substances combine during a chemical reaction and become one.

Synthesis = to build



https://youtu.be/Y3kDZXP4_5A?t=222

2. **Decomposition Reaction:** describes when one compound breaks down into two or more simpler substances.

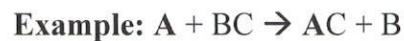
Decompose = to break down, break apart, etc.



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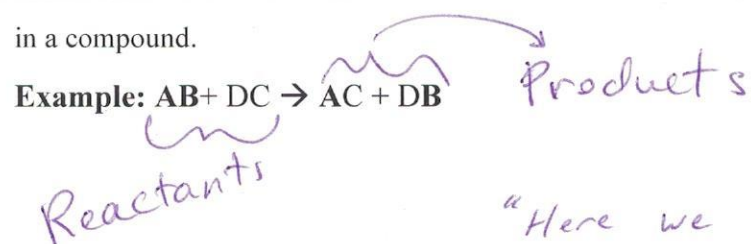
3. **Single Displacement Reaction:** this is when one element replaces another in a compound.

"Like when two people are dancing and another cuts in."



<https://youtu.be/OxGjbHzxQSI>

4. **Double Displacement Reaction:** this is when two elements replace each other, in a compound.



"Here we have two pairs of dancers, couple AB & couple DC. Both couples switch dancing partners with one another."

Types of Chemical Reactions

Directions: Write the correct letter on the line that best defines each term.

Term	Definition
<u>F</u> 1. Double Displacement	A . when two or more substances combine together during a chemical reaction and become one. ($A + B \rightarrow AB$)
<u>B</u> 2. Decomposition Reaction	B . describes when one substance breaks down into two or more simpler substances. ($AB \rightarrow A + B$)
<u>D</u> 3. Single - Displacement	D . this is when one element replaces another in a compound. ($A + BC \rightarrow AC + B$)
<u>A</u> 4. Synthesis Reaction	F . this is when two elements replace each other in a compound ($AB + DC \rightarrow AC + DB$)

Directions: Identify the types of chemical reaction using the word bank below:

Synthesis Reaction

Single Displacement

Decomposition Reaction

Double Displacement

Double Replc. 1. $AgNO_3 + H_2S \rightarrow Ag_2S + 2HNO_3$

Synthesis 2. $Al + N_2 \rightarrow 2AlN$

Single Replc. 3. $Fe_2O_3 + H_2 \rightarrow 2Fe + 3H_2O$

Decomposition 4. $Mg(ClO_3)_2 \rightarrow Mg + Cl_2 + O_2$

Balancing Chemical Equation Notes

Quick Review

Chemical Formula- representation of how elements combine to make up compound

Shows TWO things

- the elements that make up the compound
- the number of atoms of each element called subscripts

H₂O = the **2** is a **subscript**.

(H= 2 and O= 1)



Coefficient is the number of molecules in a chemical reaction.

2KI = the 2 represents a coefficient.

So, 2 KI units are involved in this reaction.

Or KI and KI

Examples:



Chemical Equation - describe ratios of atoms in a simple way

Balancing Chemical Equations:

Kinds of Atoms	Number of Atoms			Single Replacement
	2 Ag + H ₂ S	→	Ag ₂ S + H ₂	
Ag <i>metal</i>	Ag : 1 2		Ag : 2 2	✓
H <i>alkali</i>	H : 2 2	→	H : 2 2	✓
S <i>non metal</i>	S : 1 1		S : 1 1	✓



Balanced

Label Reaction type

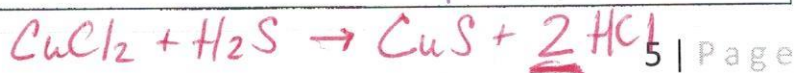
Kinds of Atoms	Number of Atoms		Synthesis	
	$\underline{2}\text{Mg} + \text{O}_2 \rightarrow \underline{2}\text{MgO}$			
Mg metal	Mg: 1	2	Mg: 1	2 ✓
O nonmetal	O: 2	2	O: 1	2 ✓



Kinds of Atoms	Number of Atoms		Single Displacement	
	$\text{Cl}_2 + \underline{2}\text{NaBr} \rightarrow \underline{2}\text{NaCl} + \text{Br}_2$ ← (exception)			
Cl halogen	Cl: 2	2	Cl: 1	2
Na alkali	Na: 1	2 →	Na: 1	2
Br halogen	Br: 1	2	Br: 1	2

"Bromine is a diatomic element so the 2 becomes a subscript."

Kinds of Atoms	Number of Atoms		Double Displacement	
	$\text{CuCl}_2 + \text{H}_2\text{S} \rightarrow \text{CuS} + \underline{2}\text{HCl}$			
Cu metal	Cu: 1	1	Cu: 1	1
Cl halogen	Cl: 2	2 →	Cl: 1	2
H alkali	H: 2	2	H: 1	2
S nonmetal	S: 1	1	S: 1	1



Balancing Act

Atoms are not created or destroyed during a chemical reaction. Scientists know that there must be the *same* number of atoms on *each side* of the equation. REMEMBER - you may *add coefficients* in front of the chemical formulas, but you *can not* add or change the *subscripts*.



$$\begin{array}{l} \text{Ca} = 1 \quad | \quad 2 \\ \text{O} = 2 \quad | \quad 2 \end{array}$$

$$\begin{array}{l} \text{Ca} = 1 \quad | \quad 2 \quad \checkmark \\ \text{O} = 1 \quad | \quad 2 \quad \checkmark \end{array}$$

Synthesis
 $2 \text{Ca} + \text{O}_2 \rightarrow 2 \text{CaO}$



$$\begin{array}{l} \text{C} = 3 \quad | \quad 3 \\ \text{H} = 8 \quad | \quad 8 \\ \text{O} = 2 \quad | \quad 10 \end{array}$$

$$\begin{array}{l} \text{C} = 1 \quad | \quad 3 \\ \text{H} = 2 \quad | \quad 8 \\ \text{O} = 3 \quad | \quad 10 \end{array}$$

Double Displacement
(Combustion)



$$\begin{array}{l} \text{Cu} = 2 \quad | \quad 4 \\ \text{O} = 1 \quad | \quad 2 \\ \text{C} = 1 \quad | \quad 1 \end{array}$$

$$\begin{array}{l} \text{Cu} = 1 \quad | \quad \frac{8}{4} \quad \checkmark \\ \text{O} = 2 \quad | \quad 2 \quad \checkmark \\ \text{C} = 1 \quad | \quad 1 \quad \checkmark \end{array}$$

Single Replacement

$2 \text{Cu}_2\text{O} + \text{C} \rightarrow 4 \text{Cu} + \text{CO}_2$



$$\begin{array}{l} \text{Na} = 1 \quad | \quad 4 \\ \text{H} = 2 \quad | \quad 8 \\ \text{O} = 1 \quad | \quad 4 \end{array}$$

$$\begin{array}{l} \text{Na} = 1 \quad | \quad 4 \quad \checkmark \\ \text{H} = 3 \quad | \quad \frac{8}{8} \quad \checkmark \\ \text{O} = 1 \quad | \quad 4 \quad \checkmark \end{array}$$

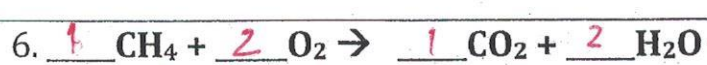
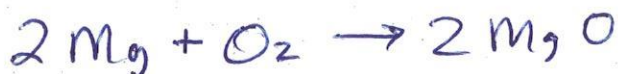
Single Displacement
 $4 \text{Na} + 4 \text{H}_2\text{O} \rightarrow 4 \text{NaOH} + 2 \text{H}_2$



Synthesis

$$\begin{array}{l|l} \text{Mg} = 1 & 2 \\ \text{O} = 2 & 2 \end{array}$$

$$\begin{array}{l|l} \text{Mg} = 1 & 2 \\ \text{O} = 1 & 2 \end{array}$$



Double Displacement
(Combustion)

$$\begin{array}{l|l} \text{C} = 1 & 1 \\ \text{H} = 4 & 4 \\ \text{O} = 2 & 4 \end{array}$$

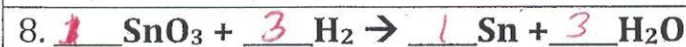
$$\begin{array}{l|l} \text{C} = 1 & 1 \\ \text{H} = 2 & 4 \\ \text{O} = 3 & 4 \end{array}$$



Synthesis

$$\begin{array}{l|l} \text{Al} = 1 & 2 \\ \text{O} = 2 & 6 \end{array}$$

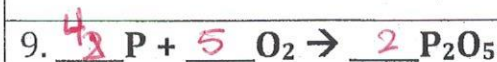
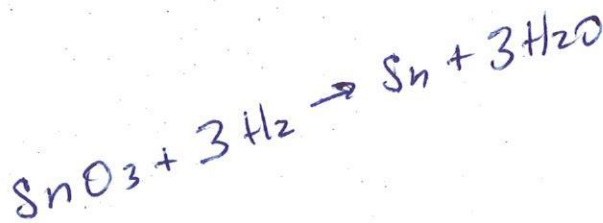
$$\begin{array}{l|l} \text{Al} = 1 & 2 \\ \text{O} = 3 & 6 \end{array}$$



Single Replacement

$$\begin{array}{l|l} \text{Sn} = 1 & 1 \\ \text{O} = 3 & 3 \\ \text{H} = 2 & 6 \end{array}$$

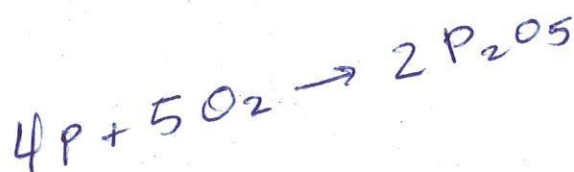
$$\begin{array}{l|l} \text{Sn} = 1 & 1 \\ \text{O} = 1 & 3 \\ \text{H} = 2 & 6 \end{array}$$



Synthesis

$$\begin{array}{l|l} \text{P} = 1 & 4 \\ \text{O} = 2 & 10 \end{array}$$

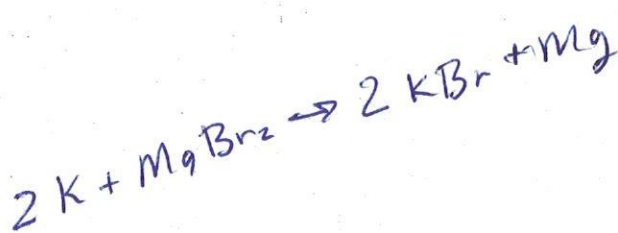
$$\begin{array}{l|l} \text{P} = 2 & 4 \\ \text{O} = 5 & 10 \end{array}$$



Single Displacement

$$\begin{array}{l|l} \text{K} = 1 & 2 \\ \text{Mg} = 1 & 1 \\ \text{Br} = 2 & 2 \end{array}$$

$$\begin{array}{l|l} \text{K} = 1 & 2 \\ \text{Mg} = 1 & 1 \\ \text{Br} = 1 & 2 \end{array}$$



Balancing Equations

Directions: Balance the following equations. You must show all your work.

