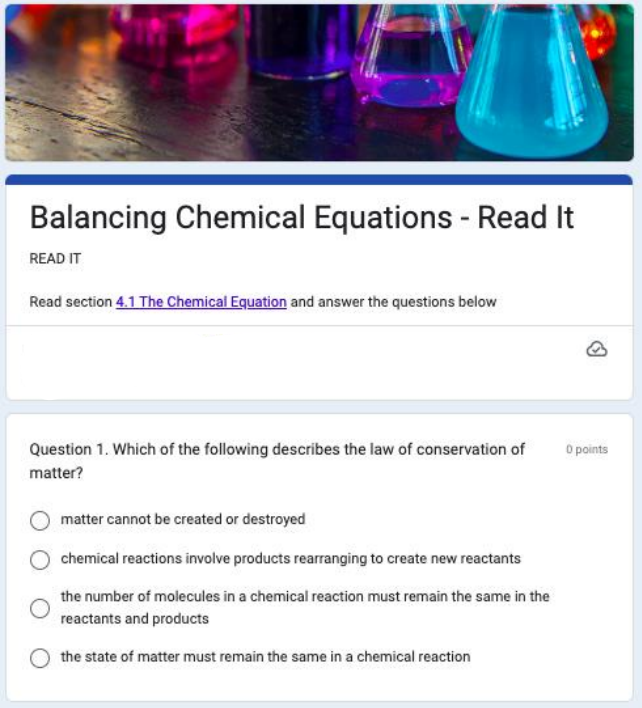
Appendix A.

This document contains images of the activities of the Balancing Chemical Equations Learning Stations Assignment;; it does not contain any live links. Please use the website https://sites.google.com/view/avramlearningstations/home to access and interact with the electronic version of these activities.



Balancing Chemical Equations - Read It

READ IT

Read section 4.1 The Chemical Equation and answer the questions below

Question 1. Which of the following describes the law of conservation of matter? 0 points

- matter cannot be created or destroyed
- chemical reactions involve products rearranging to create new reactants
- the number of molecules in a chemical reaction must remain the same in the reactants and products
- the state of matter must remain the same in a chemical reaction

Question 2. Based on the reaction, which of the following corresponds to the reactants? 1 point

$$2H_2 + O_2 \rightarrow 2H_2O$$

$2H_2O$

A

$O_2 + H_2O$

B

$H_2 + H_2O$

C

$2H_2 + O_2$

D

Question 3. Which term applies to the blue 2 in front of the formula for H2O? 1 point

$$2H_2 + O_2 \rightarrow 2H_2O$$

- quotient
- subscript
- superscript
- coefficient

Question 4. Which of the following is true when a reaction is balanced? 1 point

- The reactants and products have the same number of molecules
- The reactants and products have the same number of atoms of each element
- The reactants and products have different states of matter
- The sum of the coefficients of the reactants and products are the same

Question 5. What does it mean when a molecular formula does not have a coefficient in front of it? 1 point

- the coefficient is "0"
- the coefficient is "1"
- the coefficient has no impact on the reaction
- the coefficient is equal to the sum of the coefficients of the products

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Explore It

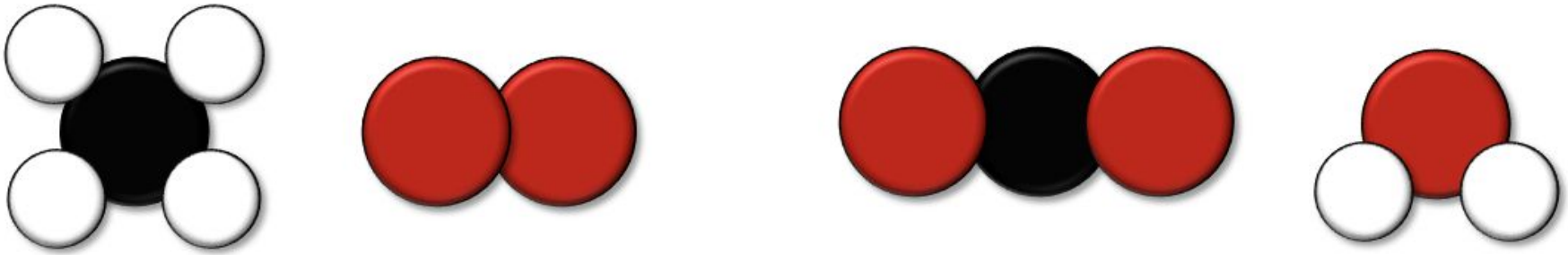
Input Station

The ***law of conservation of matter*** states that matter cannot be created or destroyed. It can only be rearranged to form new substances.

Explore It

The chemical reaction below depicts the combustion of methane (CH_4).
(This reaction is NOT balanced)

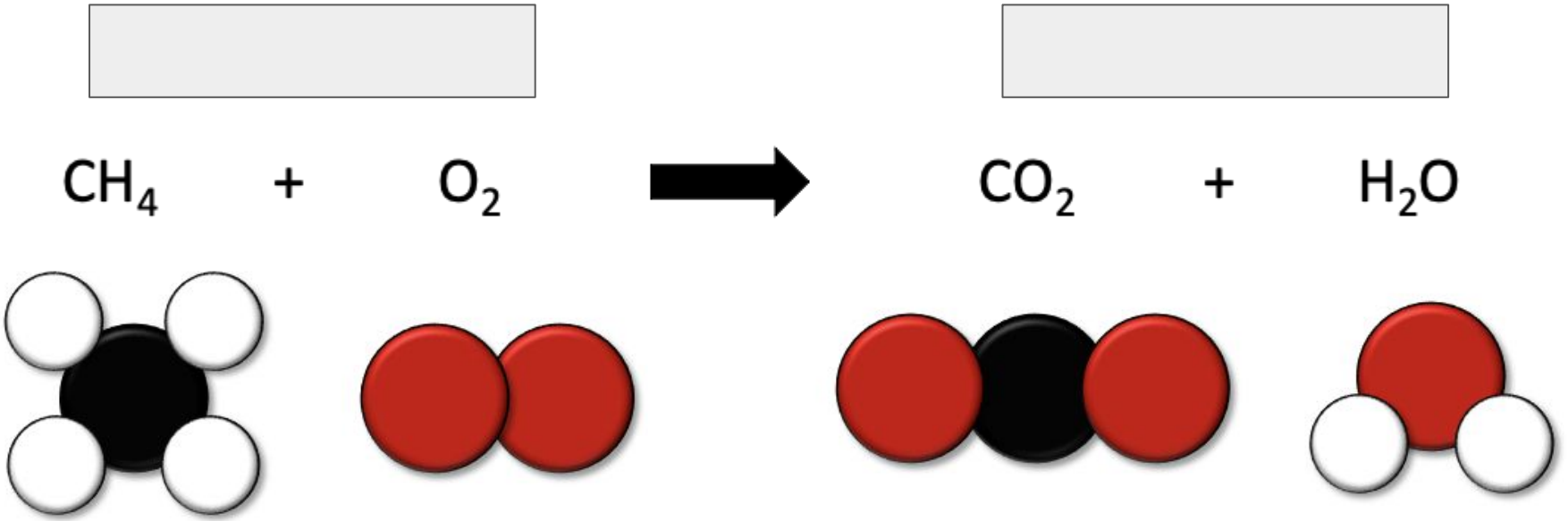
$$CH_4 + O_2 \rightarrow CO_2 + H_2O$$



Carbon = Black Oxygen = Red Hydrogen = White

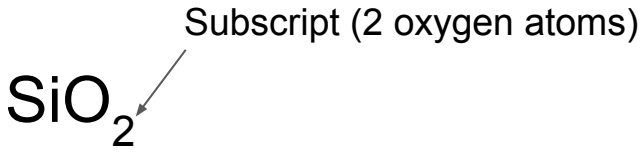
Elements or compounds on the left side of a reaction arrow are called ***reactants***. On the right side, they are called ***products***.

Using the gray boxes, label the reactants and the products in the unbalanced reaction below



Carbon = Black Oxygen = Red Hydrogen = White

Remember that a **subscript** in a molecular formula indicates the number of atoms of the element that precedes the number.



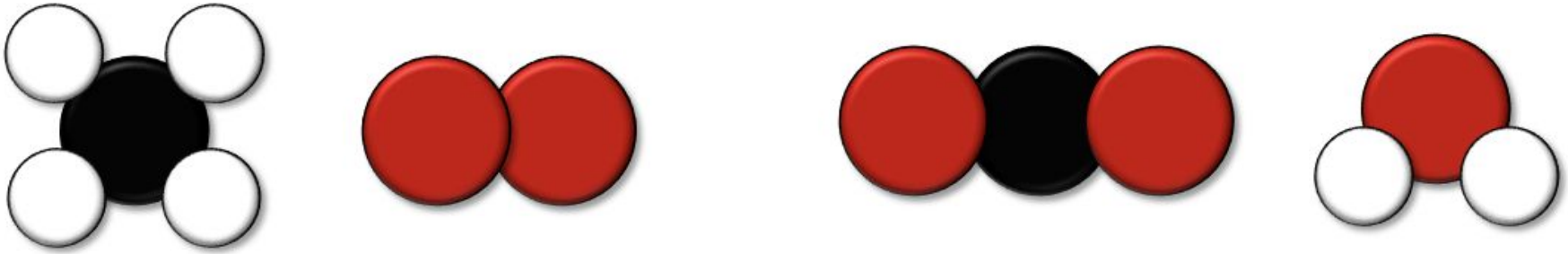
For each formula in the table, write the number of oxygen atoms present.

Molecular Formula	Number of OXYGEN atoms present
O_2	
H_2O	
CO_2	
$C_6H_{12}O_6$	

Use the formulas and/or count the number of each color of sphere below, write the number of each atom in the table

Reactants		**Products**	
Carbon (black)		Carbon (black)	
Oxygen (red)		Oxygen (red)	
Hydrogen (white)		Hydrogen (white)	

$CH_4 + O_2 \rightarrow CO_2 + H_2O$



A balanced chemical reaction will have the same number of each type of atom on the reactant side and the product side.

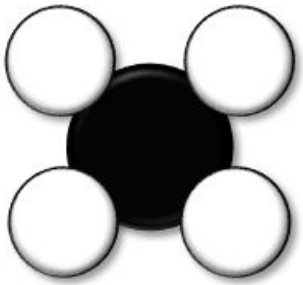
Transfer your numbers from the previous slide into the table below, then indicate which elements are balanced and which are not.

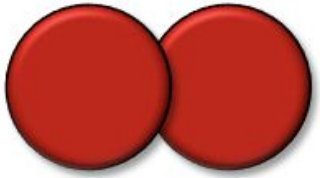
Element	# in reactants	# in products	Balanced? Yes or No
Carbon (black)			
Oxygen (red)			
Hydrogen (white)			

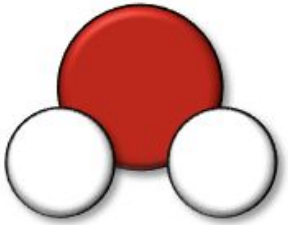
Balance the following reaction by dragging an image down to add a molecule. (there are more structures than you will need)

Hint: you should have the same number of red circles on each side of the line

CH_4 + O_2 → CO_2 + H_2O

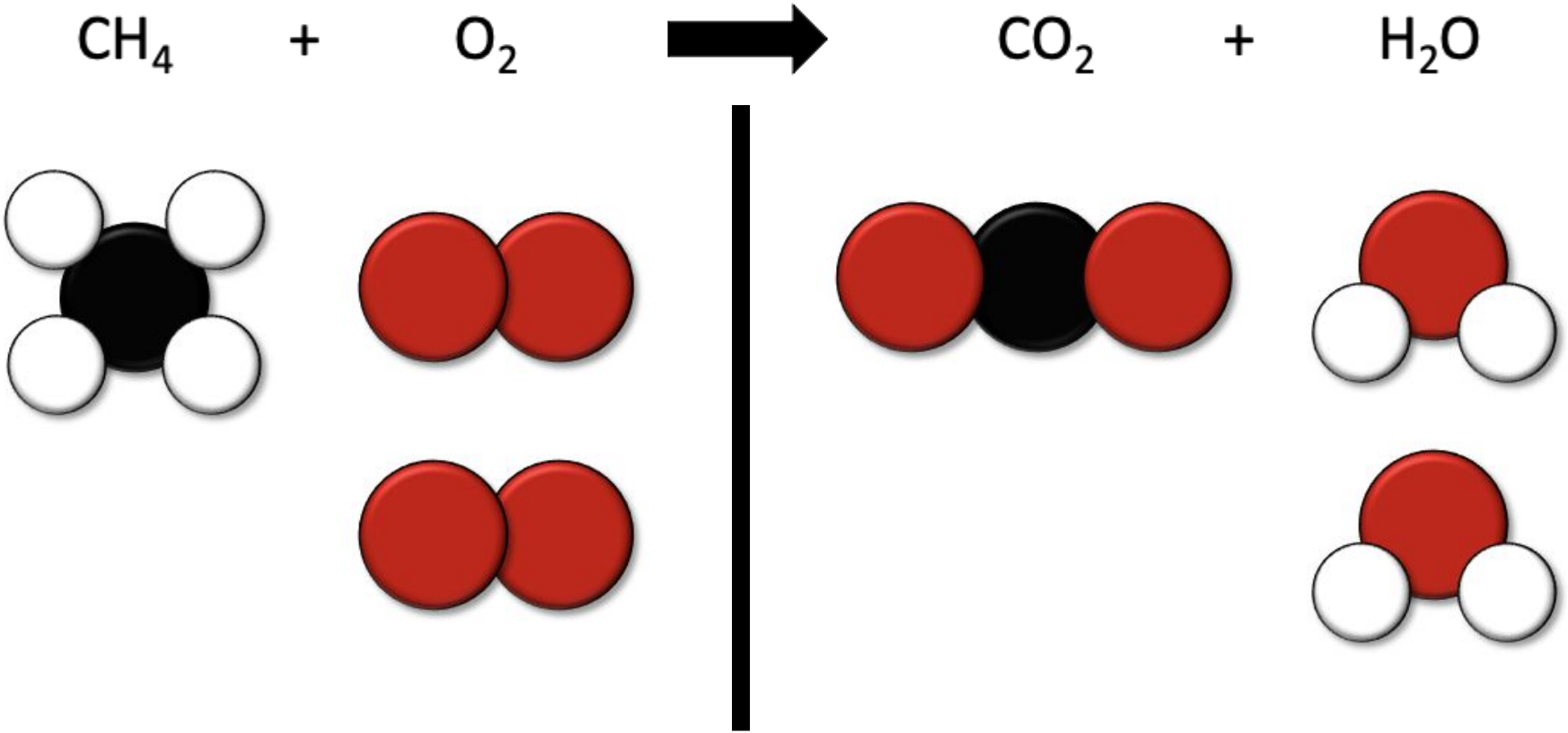






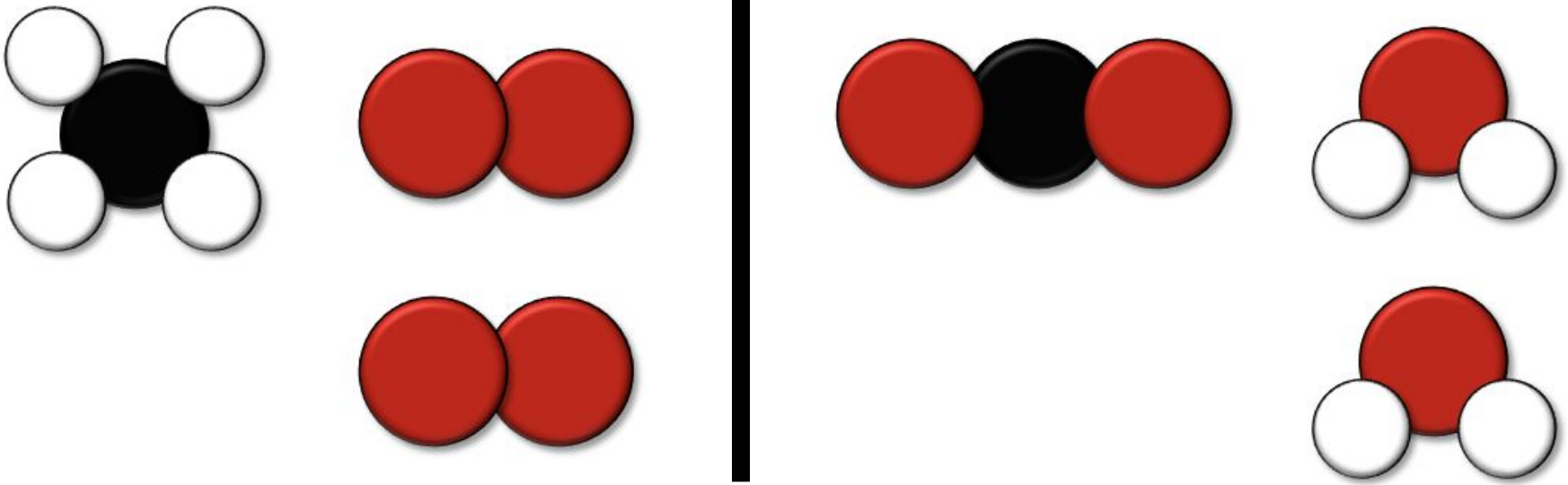
Check your work…

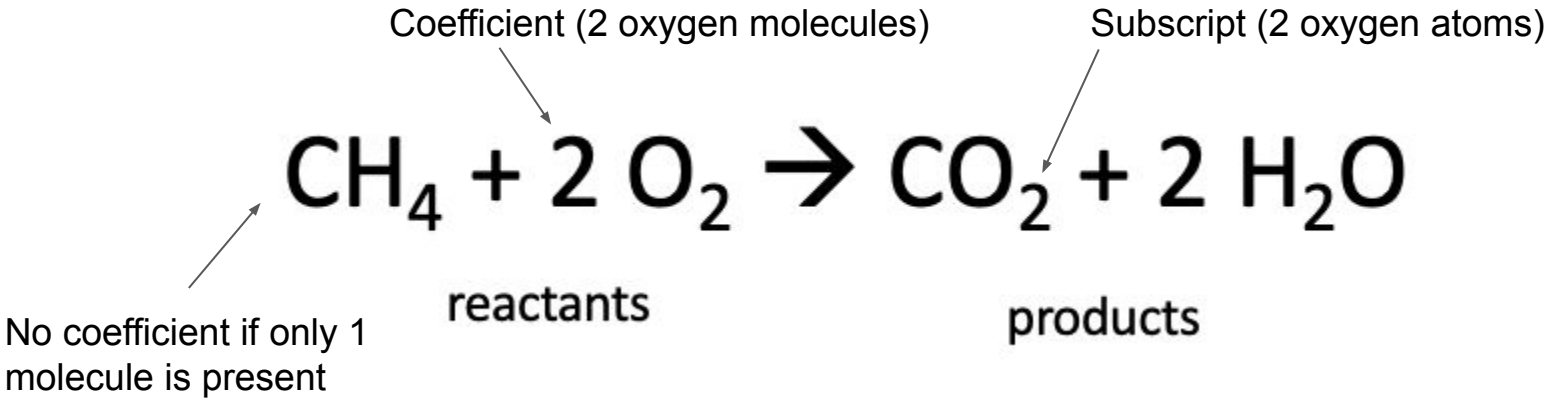
Did you have two molecules of O_2 and two molecules of H_2O?



Notice that the **formulas** for the molecules did not change.
Now count the number of each molecule and place that number in front of the formula in the gray boxes. For example, type 1 for methane (CH_4). These are the **coefficients** indicating the number of each molecule.

1 CH_4 + ☐ O_2 → ☐ CO_2 + ☐ H_2O





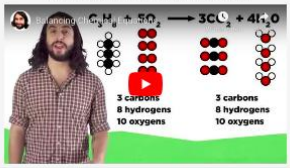
Here is the balanced chemical reaction for the combustion of methane. Notice that the coefficients equal to “1” have been removed. *If no coefficient is stated, this implies the coefficient is one*.

Notice that you did not change the **subscripts** of the formulas when balancing this chemical reaction, you only changed the **coefficients** to indicate the number of molecules needed for the reaction to be balanced.

Balancing Chemical Equations
WATCH It

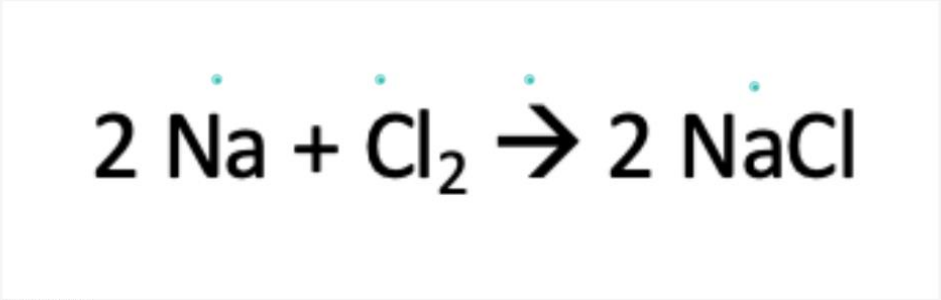
Watch It

Watch the video and answer the questions below



Labeling Chemical Equations

Click each blue dot in the image below and label the parts of the chemical reaction using the following terms: reactant, product, reaction arrow (terms may be used more than once)



0 out of 4 completed.

Matching

Match each term to its definition

subscript	indicates a chemical reaction occurred and new molecules are formed
coefficient	number of atoms of an element in a molecule
reaction arrow	number of molecules in a reaction

Using Subscripts

Use the subscripts in the molecular formulas to determine the total number of hydrogen atoms are in each molecule.

Molecular Formula	# of hydrogen atoms (H)
H_2O	
C_3H_8	
NaOH	
CH_3COOH	

Using Coefficients

Coefficients indicate the number of molecules that are present in a reaction.

For each of the following, indicate the TOTAL number of hydrogens using the the coefficient and the molecular formula

Molecular Formula	# of hydrogen atoms (H)
3 H_2O	
2 C_3H_8	
8 NaOH	
5 CH_3COOH	

Balancing Chemical Equations - Research It

RESEARCH IT

1. Open the simulation and select "introduction"
2. In the upper right corner use the "Tools" drop-down to select the scales option
3. Using the up arrows, add one molecule each of N2, H2, and NH3
4. Answer the questions below

What color are the spheres that represent nitrogen (N)? 0 points

Your answer

What color are the spheres that represent hydrogen (H)? 1 point

Your answer

In the simulation, on the product side (right), change the coefficient to "2" (it should now read 1 N2 + 1 H2 --> 2NH3) 1 point

According to the scales, which element is not balanced in the reaction now?

- ◯ N (nitrogen)
- ◯ H (hydrogen)

The simulation should show more hydrogen atoms (white spheres) on the product side (right) than on the reactants side (left). 0 points

How many more hydrogen atoms are needed on the reactants side to equal the number of hydrogen atoms on the product side?

- ◯ 0
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ 6

Use the arrows to change the number of each molecule until the reaction is balanced. 0 points

How does the simulation confirm that reaction is balanced? enter your answer below

Your answer

In the simulation at the bottom of the screen, select a different reaction type (separate water or combust methane)

- ◯ separate water
- ◯ combust methane

Use the simulation to balance the reaction you chose and write the balanced equation in the space below 1 point

Your answer

Optional Challenge: Select the "Game" mode at the bottom of the screen. Which level(s) did you complete and how many stars did you earn?

Your answer

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Balancing Chemical Equations
Illustrate It

Illustrate It

Draw a model with shapes to represent the reaction at the station as it is written. Give each element a particular color/shape. Indicate whether the equation (as written) is balanced or unbalanced.

Balancing Chemical Equations organize It

Sort each equation based on whether it is balanced or unbalanced

Click on an equation and then select whether it is balanced or unbalanced from the dropdown menu that appears.

$4\ C_7H_{17} + 45\ O_2 \rightarrow 28\ CO_2 + 34\ H_2O$	$CH_4 + O_2 \rightarrow CO_2 + H_2O$	$NaBr + Cl_2 \rightarrow 2\ NaCl + Br_2$	$2HNO_3 + 2NaHCO_3 \rightarrow 2NaNO_3 + H_2O + CO_2$
$2KClO_3 \rightarrow 2KCl + 3O_2$	$2AgI + Na_2S \rightarrow Ag_2S + 2NaI$	$2H_2 + O_2 \rightarrow 2H_2O$	$NH_3 + O_2 \rightarrow NO + H_2O$

Balanced Chemical Equations	Unbalanced Chemical Equations

SAVED HAND IN WORK

Balancing Chemical Equations - Write It

WRITE IT

Use complete sentences to answer the questions below

1. Explain the law of conservation of matter 0 points

Your answer

2. Explain the difference between a coefficient and a subscript in a chemical equation 1 point

Your answer

3.What does it mean when a chemical equation is said to be "balanced"? 1 point

Your answer

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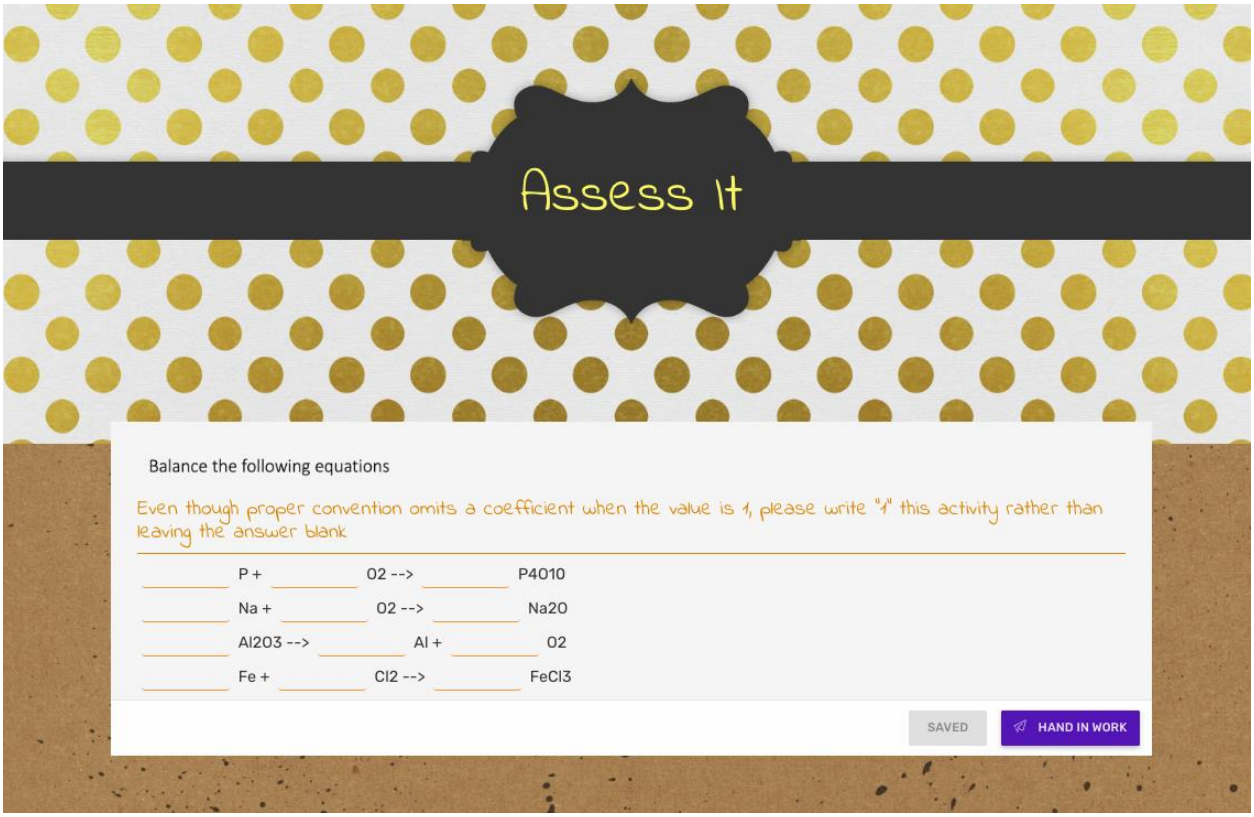
Assess It
Balance the following equations
Even though proper convention omits a coefficient when the value is 1, please write "1" this activity rather than leaving the answer blank
P + 02 --> P4010
Na + 02 --> Na20
Al203 --> Al + 02
Fe + Cl2 --> FeCl3
SAVED
HAND IN WORK