Extension 1.4 ACD

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Reactant, Products & Leftovers

**Introduction**

Atoms are made of subatomic particles; protons (positive charged), neutrons (neutrally charged) and electrons (negatively charged). Protons and neutrons are found in the nucleus of the atom. Electrons are found in orbitals surrounding the nucleus. The number of protons an atom contains is known as it atomic number and defines the name of the element. The atomic mass is equal to the total number of protons plus neutrons. Atoms of the same element with different number of neutrons are known as isotopes. Atoms with a different number of electrons compared to the protons are called ions and carry a positive or negative charge.

**Directions**

**Open up the simulation “Reactant, Products & Leftovers.”**

* Type in: http://phet.colorado.edu/en/simulation/reactants-products-and-leftovers
* Click on **Play** button

**Sandwiches**

In this screen you will be making a cheese sandwich. Start by defining your sandwich (select 2 pieces of bread and 1 slice of cheese).

* Under the “BEFORE REACTION” box, select 2 slices of bread and 1 slice of cheese.
* You will notice that this will make your defined sandwich, with no leftovers.
* Write your defined reaction along with the results of the simulation: (correct sample done for you)

**2 breads + 1 cheese → 1 sandwich**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reactants** | |  | **Products** | | |
| 2  bread | 1  cheese | → | 1  sandwich | 0  left over bread | 0  left over cheese |

* Next, under the “BEFORE REACTION” box, select 3 slices of bread and 2 slices of cheese. Record the “AFTER REACTION” results in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reactants** | |  | **Products** | | |
| bread | Cheese | → | sandwich | left over bread | left over cheese |

* Next, under the “BEFORE REACTION” box, select 4 slices of bread and 7 slices of cheese. Record the “AFTER REACTION” results in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reactants** | |  | **Products** | | |
| bread | cheese | → | sandwich | left over bread | left over cheese |

**Meat & Cheese Sandwich**

* Select “Meat & Cheese Sandwich” at the top of screen.
* Next, determine how many slices of bread, meat, and cheese will define your sandwich. Write the formula in the space below. Any combination you choose of the three types is fine.
* Under the “BEFORE REACTION” box, select any number of slices of bread, meat and cheese. Record the “AFTER REACTION” results in the table below. Repeat two times changing values.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Reactants** | | |  | **Products** | | | |
| bread | meat | cheese | → | sandwich | left over bread | left over meat | left over cheese |
| bread | meat | cheese | → | sandwich | left over bread | left over meat | left over cheese |
| bread | meat | cheese | → | sandwich | left over bread | left over meat | left over cheese |

**Molecules**

Select the the “molecules” Tab at the bottom of the screen. You will now be applying the law of conservation to real reactions.

**Make Water**

* Select the “Make Water” selection from the top of the screen. Write the chemical equation below:
* Next, under the “BEFORE REACTION” box, select the number of hydrogen (H2) and oxygen (O2) atoms which would make the product without any leftovers. Record the “AFTER REACTION” results in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reactants** | |  | **Products** | | |
| H2 | O2 | → | H20 | left over H2 | left over O2 |

* Next, under the “BEFORE REACTION” box, change the number of hydrogen (H2) and oxygen (O2) atoms. Record the “AFTER REACTION” results in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reactants** | |  | **Products** | | |
| H2 | O2 | → | H20 | left over H2 | left over O2 |
| H2 | O2 | → | H20 | left over H2 | left over O2 |

**Make Ammonia**

* Select the “Make Ammonia” selection from the top of the screen. Write the chemical equation below:
* Next, under the “BEFORE REACTION” box, select the number of nitrogen (N2) and hydrogen (H2) atoms which would make the product without any leftovers. Record the “AFTER REACTION” results in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reactants** | |  | **Products** | | |
| N2 | H2 | → | NH3 | left over N2 | left over H2 |

* Next, under the “BEFORE REACTION” box, change the number of nitrogen (N2) and hydrogen (H2) atoms. Record the “AFTER REACTION” results in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reactants** | |  | **Products** | | |
| N2 | H2 | → | NH3 | left over N2 | left over H2 |
| N2 | H2 | → | NH3 | left over N2 | left over H2 |

**Combust Methane**

* Select the “Combust Methane” selection from the top of the screen. Write the chemical equation below:
* Next, under the “BEFORE REACTION” box, select the number of methane (CH4) and oxygen (O2) atoms which would make the products without any leftovers. Record the “AFTER REACTION” results in the table below.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Reactants** | |  | **Products** | | | |
| CH4 | O2 | → | CO2 | H2O | left over CO2 | left over H2O |

* Next, under the “BEFORE REACTION” box, change the number of methane (CH4) and oxygen (O2) atoms. Record the “AFTER REACTION” results in the table below.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Reactants** | |  | **Products** | | | |
| CH4 | O2 | → | CO2 | H2O | left over CO2 | left over H2O |
| CH4 | O2 | → | CO2 | H2O | left over CO2 | left over H2O |

Now let’s play the game.

**Reactants, Products & Leftovers Game**

* Click on the “Game!” tab at the bottom of the screen.
* Select the following settings: Timer (on) and Show all.
* Click the “level 1” button to start
* First, look at the chemical formula. Answer the question by counting the molecules in either the product or reactant side. Make sure that you have the exact number of each molecule on the product side as the reactant side. (This is challenging at first, but hopefully you will get the hang of it)
* After you complete Level 1 move on to Levels 2 and 3. Each level gets a little more difficult. Record your data in the table below. *(If time permits, you may replay the games to improve your score or times)*

**Game Scores**

|  |  |  |
| --- | --- | --- |
| Level 1 | Time: | Score: |
| Level 2 | Time: | Score: |
| Level 3 | Time: | Score: |
| TOTALS | Time: | Score: |

***\*The student with highest score and the lowest recorded time will be rewarded ☺***

**Conclusion**

Chemical Equations are important in chemistry. Label and define the following.

**Parts of a Chemical Equation**

* **Reactants** –
* **Products** –

**Label the Chemical Equation**

Label the chemical equation using PRODUCTS and REACTANTS

**2 Mg + O2 → 2 MgO**