**Exploring Chemical Reactions and the Law of Conservation of Mass**

**(Phet: Reactants, Products, and Leftovers)**

1. **Enter the Sandwiches Site:** Access via Google Classroom

2. **Examine the** Sandwich formula given at the top, **what and how much** of those ingredients are needed to make a sandwich?

3. **Answer before doing.** In a bit you are going to add four pieces of bread and two cheese, **how** many sandwiches will you make?

4. In this simulation **what do you think** the bread and cheese separately represent, the atom or the molecule? **Justify your answer.**

5. In this simulation **what do you think** the sandwich represents, the atom or the molecule? **Justify your answer.**

6. **Explore** **by conducting several trials** of this simulation. **Choose** your own number of bread and cheese before the reaction and document what is your product and the leftovers.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Trial Number | # of Bread  **Before Reaction** | # of Cheese  **Before Reaction** | # of Sandwiches  After Reaction | Describe # of Leftovers  After Reaction |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |
| 5 |  |  |  |  |

7. **Did you** ever see a piece of bread or cheese go missing?

8. If a piece of break or cheese was not used in a Sandwich, **what happened to it?**

9. **Conduct the SAME trials** as you did above, but this time **count the number** of ingredients you started with and that you ended up with. **You are NOT counting sandwiches**, but all the individual ingredients.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Trial Number | # of Bread  Before Reaction | # of Cheese Before Reaction | # of Bread  After Reaction | # of Cheese  After Reaction |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |
| 5 |  |  |  |  |

10. **What is** the major trend in your data for #9? (pay attention to the number of pieces you started with to the number of pieces you ended with)

11. **How does** this data represent the “Law of Conservation of Mass” we have discussed in class?

12. Now, go ahead and **explore this simulation** **further** by clicking on “Meat and Cheese” and “Custom.” After exploring, **how is your** experience similar to what we just did for “Cheese.”

13. **Enter the Molecules Site:** Access via Google Classroom

14. **What do** each individual ball or particle represent, an atom or molecule? **Explain.**

15. When two of those balls or particles are stuck (bonded) to each other, **what do** they represent, an atom or a molecule? **Explain.**

16. **Explore by conducting** several trials of this simulation. **Choose** your own number of Hydrogen and Oxygen molecules and document your products and leftovers.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Trial Number | # of Hydrogen Molecules  **Reactants: Before the Reaction** | # of Oxygen Molecules  **Reactants: Before the Reaction** | # of Water Molecules  Products: After the Reaction | Describe # of Leftovers  After the Reaction |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |
| 5 |  |  |  |  |

17. **Did you** see a particle go missing?

18. If a particle was not utilized, **what happened** to it?

19. **Conduct the SAME trials** as you did above, but this time count the number of atoms you started with and that you ended up with. **You are NOT counting molecules**, but all the individual atoms.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Trial Number | # of Hydrogen Atoms  Before Reaction | # of Oxygen Atoms  Before Reaction | # of Hydrogen Atoms  After Reaction | # of Oxygen Atoms  After Reaction |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |
| 5 |  |  |  |  |

20. **What is** the major trend in your data for #19? (pay attention to the number of particles you started with to the number of particles you ended with)

21. **How does** this data represent the “Law of Conservation of Mass” we have discussed in class?

22. **Examine** the new matter “Product” created in this reaction. **What** makes this new matter unique? **How** is new matter created?

23. **Explain** the similarities between the “Sandwich” site and the “Molecule” site? **What** did you learn?

24. **Enter the Game site:** Access via Google Classroom.

25. **Start with** level 1 and see if you can match the correct number of reactants to products. **Play** as long as assigned and see how far you can get. **You can advance** to level 2 and 3 if you have mastered the others.