Unit 5 - Chemical Reactions
Interactive Notebook

Name:

Word Wall	Unit 4 Learning Tracker	Assignment Log	Task Set 0 Tribal Resource management
Task Set 1 Sources of Polution	Task Set 2 How are Pollutants made?	Task Set 3 Predicting Products	Task Set 4 Balancing Reactions

Word Wall:

Term	Definition	Example	Picture
Primary pollutants			
Secondary air pollutants			
Particulates or particulate matter			
Synthesis reaction			
Decomposition reaction			
Single replacement reaction			
Double replacement reaction			
Combustion reaction			
Conservation of mass			
reactants			
products			
Ionic reaction			
Net ionic reaction			

Unit 4 Learning Tracker:

ALT 5 Chemical Reactions: Predict the products of simple chemical reactions, balance equations, construct explanations for observed reaction outcomes, and provide evidence for the conservation of mass.
Anchoring Phenomenon: There is a large variety of natural and manmade sources of pollution. These pollutants have far-reaching impacts on our health, the quality of our air and water, as well as the stability of our climate.
Unit Essential Questions: How are pollutants produced and what are their chemical consequences for our air, water, and climate?

How can we answer the task set EQ?	Responses
TS 0 EQ: How have the tribes managed natural resources before Federal intervention and after?	

TS 1 EQ: How are pollutants produced and how do they affect the environment?

TS2 EQ: How are different pollutants made?	
TS3 EQ: Can we predict the outcomes of reactions using patterns of valence electron configurations and electronegativity?	
TS4 EQ: How are atoms cycled in earth's systems, where does the matter go?	
TS5 EQ: How do we make water safe to drink?	
Unit Essential Questions: How are pollutants produced and what are their chemical consequences for our air, water, and climate?	
Response to Unit Essential Question:	

Task Set 0: How have the tribes managed natural resources before Federal intervention and after?

Reflect:

- What did you learn about Tribal Resources management that confirmed what you knew or challenged your thinking?

End of Task Check-In:

- What words do you need to define in your word wall?
- How does this new information help us understand our essential question? Go back to the Learning Tracker for TS 0 and fill it in!

Task Set 1: What are the sources of pollution and how are their effects measured?

This summer Oregon was significantly impacted by forest fires. This created hazardous air quality conditions that required people to stay indoors. In Oregon we often aren't as concerned about air quality because of our geographical location and weather patterns that we experience; these often keep our air quality in the "green zone". This summer, the combination of forest fires and a change in our weather patterns kept a heavy layer of smoke, soot, and smog positioned over the Portland metro area.

Although the Portland area usually experiences clean air, there are still pollutants present. Use the Unit Opener slides and these student researched slides to help you answer these questions:

What is the difference between a primary pollutant and a secondary pollutant?	

Give an example of a primary pollutant and its source.	
Give an example of a secondary pollutant and its source.	
Use this site to find a location in the US or Canada that has an air quality index outside of the green zone. Include a screenshot --->	
Explain the difference between wet deposition and dry deposition. How are their impacts different?	
What are the concerns of increased acid rain?	

Reflect:

- What sources of pollution were most interesting to you and why?

End of Task Check-In:

- What words do you need to define in your word wall?
- How does this new information help us understand our essential question? Go back to the Learning Tracker for TS 1 and fill it in!

Task Set 2: How are different pollutants made?

Do the activity in Goformative.
In this task set we'll work on identifying types of chemical reactions. From our goformative work, we came up with patterns to describe the five types of reactions. The table below organizes these patterns:

Name of Type	Description	Example (use symbols or letters to show a general example)
Example: Neutralization	The H from the acid molecule combines with the OH from the base molecule to form water (HOH) and a salt.	%H + #OH → HOH + %#

Reflect:

- What patterns did you notice about the types of reactions that for pollutants

End of Task Check-In:

- What words do you need to define in your word wall?
- How does this new information help us understand our essential question? Go back to the Learning Tracker for TS 2 and fill it in!

Task Set 3: Can we predict the outcomes of reactions?

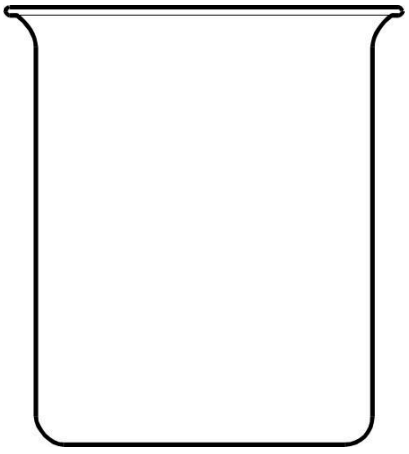
In this task set we'll look closely at the outcomes of reactions. How can we predict what these outcomes will be? The three reactions we'll focus on are: single replacement, double replacement, and combustion reactions.

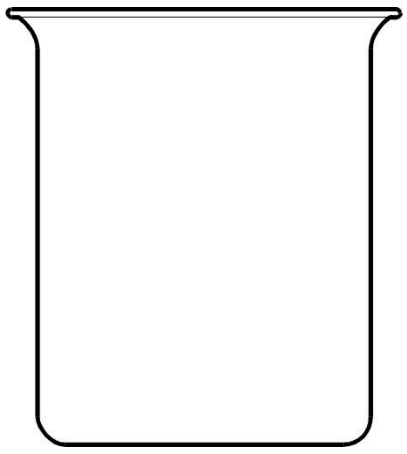
From our notes and classwork, respond to the following questions:

How do you know which elements will pair together as products?	
In the case of a single replacement, how do you know if this will occur?	
What is the rule regarding subscripts when writing new products?	

To show understanding of what is occurring at the particle level, we'll use this simulation. The simulation will show different reactions and will ask you questions about the products that are formed. This is a review of predicting products AND an introduction into small particle models.

The simulation will have two beakers for each reaction. One shows the particles BEFORE the reaction begins, and the other shows the particles AFTER the reaction.





BEFORE -------> AFTER

The simulation may alternate the order of the reactions each time you open it, so skip around when answering the questions, as needed.

Questions #1-3 are referring to this reaction: $1\ Mg\ (s)\ +\ 2\ HCl\ (aq)\ \rightarrow\ 1\ MgCl_2\ (aq)\ +\ 1\ H_2\ (g)$

1. In the reaction below, indicate what each substance looks like in the beaker.

$$1\ Mg\ (s)\ +\ 2\ HCl\ (aq)\ \rightarrow\ 1\ MgCl_2\ (aq)\ +\ 1\ H_2\ (g)$$

Mg - no charges, touching each other
HCl -
$MgCl_2$ -
H_2 -

2. The beaker model shows what the particles look like when (aq).
    a. Why are some touching, and some aren't?

    b. What do the ones that are NOT touching have in common?

3. What does the location of the particles in the beaker say about their state of matter?

4. In the following reaction the SPM indicates that there are some Zn(s) particles in the beaker AFTER the reaction. Speculate how that can be possible.

$$AgF(aq)\ +\ Zn\ (s)\ \rightarrow\ Ag\ (s)\ +\ ZnF_2\ (aq)$$

5. In this reaction, the simulation does not show an AFTER beaker. Explain what the AFTER beaker would contain.

$$NaCl\ (aq)\ +\ Br_2\ (l)\ \rightarrow$$

6. In the following reaction, indicate how many of each substance is in the beakers on the lines below.

$$CaI_2\,(aq) + Br_2\,(l) \rightarrow I_2\,(s) + CaBr_2\,(aq)$$

____ ____ ____ _____

Is the SPM picture an accurate representation of the number of particles? Explain why or why not.

Mystery Droppers Lab

We'll use our skills of predicting products, evidence of chemical change, and writing reactions (as well as our problem-solving skills) to figure out what substances are in each of the 5 droppers.

The situation (slides): Five droppers have been used in a chemistry lab, but the labels have accidentally been removed before the contents were disposed of. It is important to know the contents of each dropper so they can be disposed of properly! Your job is to figure out what substance is in each dropper.

Step 1: open the virtual lab and take a screenshot of the simulation work space

(place screenshot here)

Step 2: Data Collection

You will be combining known ionic solutions in a digital well plate and observing for signs of a reaction. Follow the directions in the simulation (or watch this video) to combine the drops in the well plate and record your observations for EVERY cell using the pencil icon. Click Record Your Observations and Screenshot BOTH the well plate & data table.

Data Table 1--Knowns:

Well Plate Screenshot	Observations Data Table Screenshot

Data Table 2--Unknowns:

Next, CLICK on **knowns/unknowns**. The **same** solutions now appear in randomly numbered droppers (1-5). Systematically mix the solutions as in Step1. Record your observations for EVERY cell using the pencil icon. Click Record Your Observations and Screenshot BOTH the well plate & data table.

Well Plate Screenshot	Observations Data Table Screenshot

Step 3: Analysis--Identify the Mystery Dropper Contents

A. Identify Contents of Mystery Droppers--Results Table

Now you are ready to solve the mystery of the five droppers. Your goal is to identify which of the five known solutions is in each of the numbered mystery droppers.

Side-by-Side Comparison of the Observations Data Tables for Knowns to Unknowns

Observations Data Table -- Knowns	Observations Data Table -- Unknowns

You are looking for patterns. Which combinations produced a gas? Which combinations produced only yellow solids? Etc. There should be NO GUESSING. You will need to defend each match of ionic solution to its numbered dropper by referring to your observations and comparisons you made between Data Table 1 and Data Table 2. Start typing with each idea you have as a separate bullet point!

Type your own list of predictions, evidence and reasoning here:

-

B. Check Your Results (Predictions)

You cannot go back from this step without repeating the entire lab! So, do not go on until you are satisfied and have a LIST above that matches the dropper number to a solution. Good Luck!

1. CLICK on check your results
2. USE the radio buttons to match each solution to its corresponding numbered dropper.
3. Beneath the table you filled out click the 'check results' box. Screenshot it and paste it in the table below.

Check Results Table:

(insert screenshot here)

Step 4: Identifying and Naming the Precipitates you Observed in Data Table 1

We will predict the formation of a precipitate using a shortened list of solubility rules:

Data Table 1-- Knowns

Copy and Paste your Data Table 1 again (to minimize scrolling)

For each unique pair of solutions you combined that produced a positive reaction you will do the following:

a. List the ions present in each substance just prior to reacting (what the *before* beaker would contain)

b. Use the solubility rules to predict which cation and anion bonded to form the product that caused the positive reaction.
c. Write the balanced chemical compound of the product that caused the positive reaction
d. Write the name of the compound.

1.	Row:____ and Column _____. Color of cell _____.
a. ions	
c. formula	
d. name	

Copy this table as many times as you need it for each unique positive result in your data table.

2.	Row:____ and Column _____. Color of cell _____.
a. ions	
c. formula	
d. name	

Reflect:

- What do you need to know in order to predict the outcome of a reaction?

End of Task Check-In:

- What words do you need to define in your word wall?
- How does this new information help us understand our essential question? Go back to the Learning Tracker for TS 3 and fill it in!

Task Set 4: How are atoms cycled in and between Earth's systems; where does the matter go?

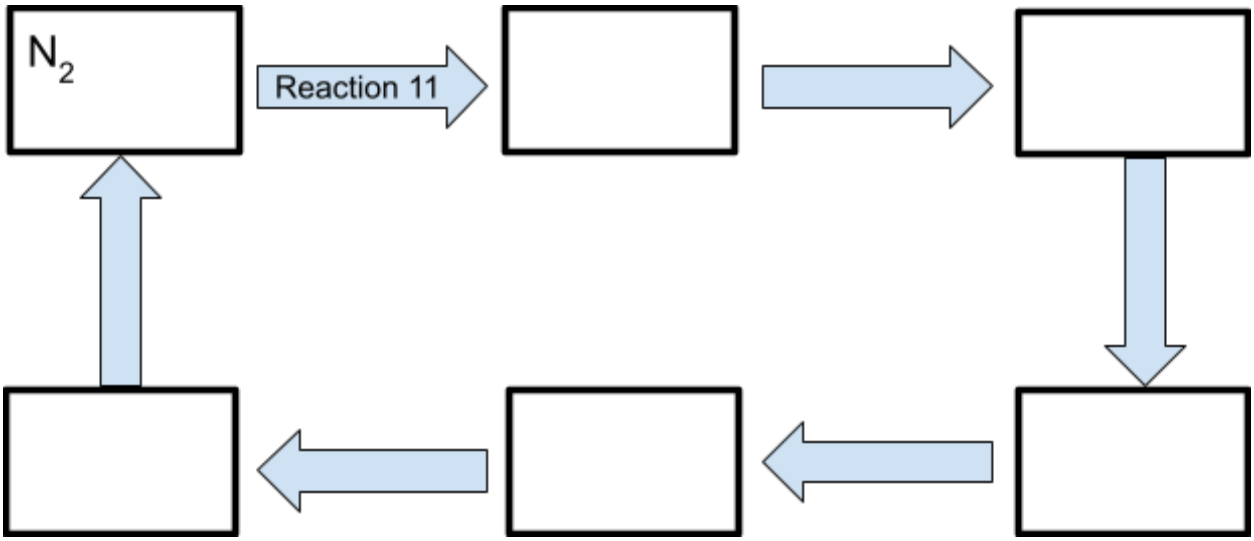
To follow how matter is transformed in a chemical reaction, we need to be able to track the amount of each element. Using the Law of Conservation of Mass, we know that matter cannot be created or destroyed, only transferred from one form to another. To demonstrate this in chemistry, we learn the skill of balancing chemical reactions. The number of each element must balance on both sides of the equation.

Important Mindset: work in pencil and accept that you'll need to go back and erase and rebalance an element that you had already completed. It's ok!

To follow an element as it interacts in multiple reactions, remember that the law of conservation of mass must be followed. To show this, trace the path of nitrogen through the nitrogen cycle. Show how nitrogen begins as N_2, goes through a series of reactions, and then ends as N_2. Use these criteria to complete this problem:

- In each box below, write the nitrogen compound's chemical formula for that step (try for at least 3-4 reactions).

- Create one complete pathway that starts and ends with N_2 below (there are several options available).
- Use the reaction number from the "Balanced or Imbalanced: The Nitrogen Cycle" assignment to show which reaction is linking each box. See the example for "Reaction 11" (which does not exist) to show where the reaction number should go.
- This drawing is just a generic flow chart template so you should add or remove arrows and boxes that are necessary for your chosen path through the nitrogen cycle.



For millennia, the natural cycle of nitrogen between Earth's atmosphere and soil has evolved a balance. Beginning in the early 1900s, humans started introducing additional ways to remove nitrogen from the atmosphere by "fixing" it into forms they could use to fertilize plants. Using the principle of "conservation of mass" and balanced systems, write a claim-evidence-reasoning paragraph (CER resource sheet) that explains why these human-driven processes are both critical for the world's populations and problematic for ecosystems. For more information, you can access this site: **The Nitrogen Cycle: Processes, Players, and Human Impact**

Choose two of the reactions from your diagram and translate them below into words:

Reaction _____	
Reaction _____	

Reflect:

- They say that matter cannot be created or destroyed. How does this relate to atoms that are on the earth?

End of Task Check-In:

- What words do you need to define in your word wall?
- How does this new information help us understand our essential question? Go back to the Learning Tracker for TS 4 and fill it in!

Assignment Log:

Assignment	Due	Turned in on Canvas?
Unit Pre-Assessment		
TS 1 Unit Opener: Pollution		
TS 2: Chemical Reaction Sort		
TS 3: Predicting Reactions		
TS 4: Balancing Equations		
Balanced or Imbalanced?		