

CHEMICAL REACTIONS ANIMATION PROJECT

There are four *conceptual levels* involved in most chemistry concepts:

- 1) The **macro** level (what you experience)
Example: hydrogen and oxygen produce a loud boom when they react to form water.
- 2) The **particle** level
Example: 2 molecules of hydrogen react with 1 molecule of oxygen to produce 2 molecules of water.
- 3) The **symbolic** level
Example: $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$ (+ energy)
- 4) The **mathematic** or **quantitative** level
Example: 4 grams of hydrogen react with 32 grams of oxygen to produce 36 grams of water.
 $4 \text{ g H}_2 + 32 \text{ g O}_2 \rightarrow 36 \text{ g H}_2\text{O}$

In Toxins 2, we have focused on the symbolic (chemical equations) and the quantitative (balancing equations). This project will allow you to see how the symbolic and quantitative levels are connected both to the particle level and the macro level. Being able to visualize what is occurring at the particle level is often a good test of whether you understand one or more of the other three levels.

In this project, you will use software called *Chemsense* to animate particles in a chemical reaction, showing them colliding, rearranging, and forming new particles (products).

- Particles only react if they collide, and only if they collide at a high enough energy to react. This is called collision theory. **Your animation will consist of showing all reactants in stoichiometric ratios, colliding them, and rearranging them into products.**
- **You also need to connect what is happening at the particle level with what your experience of the reaction is, and so you will describe what occurs at the macro level during these rearrangements.**

Your assignment is to animate a precipitation reaction and a redox reaction.

The redox must show all aqueous species and the exchange of electrons.

You must GET YOUR TWO REACTIONS APPROVED - you may choose any reaction you've done in class.

Reactions will be graded as follows:

FRAMES (this is repeated for each reaction type)	precipitation rxn pts	redox points
1. 1 st frame: the balanced equation is written in symbols, <i>including states</i> , the reaction type is written underneath, and your name is at the bottom.	3	3
2. The reaction is animated (15-25 frames). These frames all consist of circles and symbols representing atoms or ions, and text for annotation: example:  or 		
A. Show reactants in balanced amounts and moving toward each other	3	3
B. Show reactants colliding (annotate this)	3	3
C. Show atoms (or electrons) rearranging (annotate this)	3	3
D. Show newly formed products in balanced amounts and moving apart (annotate)	3	3
3. Connections of animation to what is experienced on the macroscopic level.	3	3

There are a final **10 points** for the following:

It is important for you to THINK about what are doing and what you are learning.

So, on the last slide of your last animation, please describe/answer the following:

1. WHAT YOU LEARNED FROM THIS PROJECT, WHAT CONCEPTS ABOUT CHEMICAL REACTIONS WERE CLARIFIED BY THE PROJECT.
2. WHAT DO YOUR ANIMATIONS TELL YOU ABOUT THE NEED FOR REACTIONS TO OCCUR IN RATIOS FROM BALANCED EQUATION?
3. COMMENT ON THE DIFFERENCE BETWEEN THE INTERACTIONS OF PARTICLES (WHAT YOU ARE ANIMATING) AND WHAT YOU YOURSELF MIGHT EXPERIENCE DURING A CHEMICAL REACTION

COMPLETE SENTENCES PLEASE! **HONORS: incorporate what you've learned about reactions and equilibrium.**

PROJECT IS WORTH A TOTAL OF 46 POINTS. No project accepted below 37 points.

INSTRUCTIONS FOR SETTING UP CHEMISTRY ANIMATION USING CHEMSENSE

1. On desktop, click on start then go to science, then go to Chemsense.
2. Using the text **T** button at upper left, *write* 1) the equation, 2) the equation type, 3) your name.
Now follow the following instructions for animating the reaction you wrote in slide 1.
3. Determine the atoms and molecules you will need for your animation.
To help you get started, you may want to create a brief sketch with pencil and paper of what you are going to animate.
5. Create a blank second slide by pressing **Add Frame** at bottom, then highlight and delete the contents.
On slide 2, Draw the atoms and molecules you will need for you presentation as follows:
 - A. Draw an atom on the frame by clicking on the **H** button at upper left. Choose the desired element from the periodic table. If using an ion, be sure to check the ion box under the periodic table. Repeat until you have all your atoms. Choose a different fill color for each element. Color the atoms/ions using the FILL box at top.
 - B. Click on arrow head at top left and use the mouse to bring atoms together so they are touching to form molecules. Drag arrow around the whole molecule and press **Ctrl + G** (on keyboard) to group. This makes it easier to keep them together.

You can copy your molecule if needed by clicking on it, then press Ctrl C and then Ctrl V.

6. Set up your frame by arranging the molecules on the slide according to the reaction you are doing.
7. Now, click ADD FRAME at bottom. This frame duplicates the one you just made. Now you can move each particle slightly to begin creating the sense of movement from frame to frame, SO,
8. Move each particle slightly in the direction you would like them to move in the animation, and click on ADD FRAME at bottom. Repeat step 7 as many times as needed to complete your animation. Add text when needed using the **T** button
9. Any time you want to check your animation, click on the arrow (play) at far lower left. The two boxes just to the right of the play arrow allow you to navigate to any frame to fine tune your animation.
10. You can slow down the animation (good idea for text pages) by adjusting Frame Speed at lower right.
11. Polyatomic ions should be treated as a single unit, so put the whole ion in a single circle.
12. **When finished with one reaction, click on ADD FRAME to begin your next reaction. Start again at step 2 above with each reaction.**

SAVING YOUR ANIMATION:

Save your animation frequently. If you have a PC, you can also directly export your animation to quicktime. This function does NOT work on a mac OS (lame).

I hope that one of your animations inspires the next round of mail order kits from MEL science (<https://melscience.com/en/>). In Canvas, you will submit TWO links to youtube videos that is publicly available. One video is the precipitation reaction, the other is the redox reaction.

Note: Your work must be worth a minimum of 37 points to be accepted. If your project is not of acceptable quality, you will have to revise for a *maximum* of 37 points.

PROJECT TOTAL = 46 POINTS

BE CREATIVE! HAVE FUN!

Your group must choose 2 reactions: one redox (single replacement) and one precipitation reaction.

I'd imagine you want to choose reactions from the last lab on predicting products, but you may propose a reaction from a different lab this school year if you'd like!

Slide	Points	Comment
1 precipitation 1 st slide	/3	
A balanced rctnts/moving	/3	
B colliding (annotate)	/3	
C atoms rearranging (annotate)	/3	
D products balanced/moving (annotate)	/3	
macro description	/3	
2 redox 1 st slide	/3	
A balanced rctnts/moving	/3	
B colliding (annotate)	/3	
C electron transfer (annotate)	/3	
D products balanced/moving (annotate)	/3	
macro description	/3	
Final slide - comments	/10	

***A note about water molecules: just like I did in my redox video, you may use a few frames to show and explain how aqueous substances are solvated by water molecules, and then omit them the rest of the animation for clarity. You may also leave the water molecules in the whole time if you'd like.**

As I assess parts A-D, I am keeping these things in the back of my head:

- Law of conservation of matter (super important!)
 - Are the proportions logical (based on the balanced equation)?
 - Do numbers stay consistent? (E.g, things do not "magically" appear or disappear)
- How molecules/formula units are represented
 - Are appropriate charges represented as needed? Are charges shown when they are NOT needed?
 - Aqueous only:
 - *Are ionic compounds dissociated when dissolved?
 - *Are water molecules appropriately oriented around ions?
 - *Do polyatomic ions stay in tact?
- States of matter
 - Do solids look like solids with respect to particle spacing?
 - Gases look like gases?
 - Liquids look like liquids?

