# Untwining and Intertwining

## Chemical Reactions

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| **Grade Level** | 9th – 12th Grade | **Time Frame** | 1-2 class period(s) |
| **Subject** | Science | **Duration** | 90 minutes |
| **Course** | Chemistry, Physical Science | | |

## Essential Question

What is the benefit of classifications?

## Summary

Students will investigate different classifications chemical reactions. This lesson is intended to not only focus on critical thinking skills to help build context, but there are no chemicals used at all, so is low budget. However, if you can afford chemicals, go take a look at the lesson Happy, Mad, Sleepy, Sad for classification of chemical reactions using real reactions (which is of course, best).

## Snapshot

**Engage**

Students complete a "What is classification?" Card Sort activity.

**Explore**

Students predict definitions based on their prior knowledge.

**Explain**

Students complete a Gallery Walk to learn about the five types of chemical reactions while filling out Frayer Models.

**Extend**

Students create their own analogies in groups on a poster.

**Evaluate**

Students share/act out their analogies to the whole class.

## Standards

*Next Generation Science Standards (Grades 9, 10, 11, 12)*

**HS-PS1-2:** Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

*Oklahoma Academic Standards (8th Grade)*

**8.ESS1.2.1:** Earth and its solar system are part of the Milky Way Galaxy, which is one of the many galaxies in the universe.

*Oklahoma Academic Standards (8th Grade)*

**PS.PS4.2.1:** Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses.

## Attachments

- Engage Classification - Spanish.docx
- Engage Classification.docx
- Explain Chemical Reactions - Spanish.docx
- Explain Chemical Reactions.docx
- Explain Frayer Models - Spanish.docx
- Explain Frayer Models.docx
- Explain Reaction Types Gallery Walk - Spanish.pptx
- Explain Reaction Types Gallery Walk.pptx
- Extend Evaluate Rubric - Spanish.docx
- Extend Evaluate Rubric.docx
- Extend Student Example 2.JPG
- Extend Student Example 3.JPG

## Materials

- Classification pictures printed, cut out, and sorted into individual bags (attached)
- Sticky easel pad paper
- Sticky notes
- Frayer Model cards (attached) or reusable Frayer Models
- Markers (Mr. Sketch, Sharpie, etc.)
- Reaction Types Gallery Walk handout (attached)
- Chemical Reactions handout (attached)
- Rubric handout (attached)
- Dry erase markers (for reusable Frayer models)
- Pencils/pens

# Engage

Cut up the objects found in the Engage Card Sort. Pass out a set to each pair of students, and tell them to put the objects into groups that make sense to them.

**Teacher's Note: Keeping Lips Sealed**

Students will probably (most likely, pretty definitely) ask how many groups there are or how they should try to group the objects. Frankly, there are multiple ways of grouping the objects, and that is on purpose. Do NOT tell them that, though. Reasoning is a huge critical thinking skill, and you're helping them work on that skill. If you feel tempted, just shrug your shoulders.

Once the students are done, have the pairs share out how they grouped and why they grouped the way they did.

**Teacher's Note: Justify!**

Push students to provide reasons for their groups, even if it's something as simple as "they're all red." The justifications are WAY more important than the groups themselves.

# Explore

Post the following words on the board for all the students to see:

- Combustion
- Synthesis
- Decomposition
- Single Displacement
- Double Displacement
- Precipitation (optional)
- Acid-Base (optional)
- Oxidation-Reduction (optional)

Tell the pairs of students that they need to reflect over everything they know, inside and out of this class, to predict definitions and examples for each of these words. To help the students contextualize, tell them that these are categories in chemistry.

### Teacher's Note: Helping Appropriately

Just like the Engage, we are trying to work on critical thinking skills, this time predicting. Some of the predictions will be easier than others. For the difficult ones, be helpful, but also don't give too much away. It's OK if they don't get it correct right now, misconceptions will be cleared up in the Explain. For now, just prompt them to try to figure out the word based on what they already know about similar words.

After they are done, have the pairs share out. To ensure that there is enough sharing, engage in a Take Five strategy. That is, at least five pairs need to share at least one prediction before moving on.

# Explain

Students will go on a gallery walk (print off slides from Explain Chemical Reactions Type Gallery Walk and place them at 5 distinct stations around the room) to 'observe' the types of chemical reactions.

As they rotate between the stations (about 4 minutes at each station), students will fill out Frayer Models of each of the reaction types (see Explain: Frayer Models).

**Teacher's Note: On The Prowl**

As students rotate, you should mingle and move as well. This is the time to make sure they are writing things down correctly and staying on task.

# Extend

Students will create their own analogies to differentiate between types of reactions.

**Teacher's Note: Crosscutting Concepts**

The content of this lesson addresses the crosscutting concept of patterns. This Extend is intended to carry the pattern beyond just within classifying chemical reactions and into real-world ideas that matter to students.

Students will work in groups of 2-4 students, and create an easel-sized poster that has the following information:

- name of each reaction type
- at least one analogy for each of the reaction types
- at least two chemistry examples of each reaction

The posters can be graded based on the provided rubric (see Extend Rubric).

**Teacher's Note: Make It Fun**

This can be either really boring, or really fun. And whichever it turns out to be depends on you! As the teacher, you are the one that sets the tone. Make it creative, make it fun.

# Evaluate

Student teams will present their analogies to the class. Encourage them to include as many motions or skit-like behaviors to make the presentations fun and memorable to the students.

## Resources


- K20 Center. (n.d.). Card Sort. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f506976b
- K20 Center. (n.d.). Take Five. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f506b3f9
- K20 Center. (n.d.). Frayer Model. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f505d709