

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 of chemical reactions. This lesson focuses on critical thinking to build context without using any actual chemicals, making it a low-budget option. However, if you have the budget for chemicals, check out the lesson Happy, Sad, Sleepy, Mad for classifying chemical reactions using real experiments – which is, of course, the best approach.

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 or act out their analogies to the whole class.

Standards

ACT College and Career Readiness Standards - Science (6-12)

IOD203: Find basic information in text that describes a simple data presentation
IOD302: Understand basic scientific terminology
IOD303: Find basic information in text that describes a complex data presentation

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 (Physical Science)

PS.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, knowledge of the patterns of chemical properties, and formation of compounds.

Attachments

- Classification Card Sort—Untwining and Intertwining.docx
- Classification Card Sort—Untwining and Intertwining.pdf
- Frayer Model—Untwining and Intertwining - Spanish.docx
- Frayer Model—Untwining and Intertwining - Spanish.pdf
- Frayer Model—Untwining and Intertwining.docx
- Frayer Model—Untwining and Intertwining.pdf
- Lesson Slides—Untwining and Intertwining.pptx
- Reaction Types Gallery Walk—Untwining and Intertwining - Spanish.pdf
- Reaction Types Gallery Walk—Untwining and Intertwining - Spanish.pptx
- Reaction Types Gallery Walk—Untwining and Intertwining.pdf
- Reaction Types Gallery Walk—Untwining and Intertwining.pptx
- Rubric—Untwining and Intertwining - Spanish.docx
- Rubric—Untwining and Intertwining - Spanish.pdf
- Rubric—Untwining and Intertwining.docx
- Rubric—Untwining and Intertwining.pdf

Materials

- Lesson Slides (attached)
- Classification Card Sort (attached; one per pair of students; print in color)
- Reaction Types Gallery Walk (attached; print one set per class)
- Frayer Model handout (attached; cut in half; 10 per group)
- Rubric handout (attached; one half sheet per group of 2–3 students)
- Chart paper
- Sticky notes
- Markers

Preparation

Print and cut out the cards in the attached **Card Sort** for each pair of students. Consider storing them in plastic bags to keep the sets together.

Print the slides from the **Reactions Type Gallery Walk** and place them around the room to create five distinct stations.

10 minutes

Engage

Use the attached **Lesson Slides** to guide the lesson. Use **slide 2** to introduce the topic of the lesson. Display **slides 3** and **4** to share the essential question and learning objectives with the class.

Display **slide 5** and pass out a **Classification Card Sort** set to each pair of students. Introduce the class to the Card Sort instructional strategy and explain that they are to put the objects into groups that make sense to them.

Teacher's Note: Object Grouping

Students will probably ask how many groups there are or how they should try to group the objects. There are multiple ways of grouping the objects, and that is on purpose. However, do NOT tell them that. Reasoning is a huge critical thinking skill, and you're helping them work on that skill.

Once the students are done, have the pairs share out how they grouped and why they grouped them 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 more important than the groups themselves.

20 minutes

Explore

Display **slide 6** with the following words for all the students to see:

- Combustion
- Synthesis
- Decomposition
- Single Displacement
- Double Displacement

Optional Additional Words

Depending on the class you are teaching and the level of your students, consider adding the following words to this activity.

- Precipitation
- Acid-Base
- Oxidation-Reduction

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, students 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 okay if they don't get it correct right now, as 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.

Display **slide 7** and introduce students to the Give Me Five instructional strategy. Invite at least five pairs to share out one prediction.

25 minutes

Explain

Display **slide 8** and introduce the Gallery Walk instructional strategy to the class. Explain students will go on a Gallery Walk to 'observe' the types of chemical reactions. As they rotate between the stations, students will fill out a Frayer Model for each of the reaction types. Explain that students will have 4 minutes at each station to complete the **Frayer Model** handout. Inform students they will put the chemical reaction as the vocabulary term and focus on a description, characteristics, example, non-example, and a representing image.

Put students into ten groups. Give each group 10 copies of the half page Frayer Model handout.

Display **slide 9** and start the 4-minute timer on the slide. Once the time has stopped, groups rotate to the next poster and restart the timer. Continue this process until all groups have visited all ten posters.

Teacher's Note: Monitoring

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.

30 minutes

Extend

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.

Display **slide 10** and inform students they will create their own analogies to differentiate between types of reactions.

Divide students into groups of 2–4 students. Inform the students they will create a 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

Share with the class that the **Rubric** handout will be used to grade the posters.

Pass out chart paper, markers, and a rubric to each group.

Teacher's Note: Scaffolding

If students struggle with making analogies, unhide **slide 11** and share the two examples on the slide.

Teacher's Note: Make It Fun

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

30 minutes

Evaluate

Display **slide 12** and inform groups they 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. Provide the students time to plan their presentation. Once groups are ready, allow each group time to present. Consider providing a time limit to make there is time for everyone.

Resources

- K20 Center. (n.d.). Card sort. Strategies. https://learn.k20center.ou.edu/strategy/147
- K20 Center. (n.d.). Frayer model. Strategies. https://learn.k20center.ou.edu/strategy/126
- K20 Center. (n.d.). Gallery walk/carousel. Strategies. https://learn.k20center.ou.edu/strategy/118
- K20 Center. (n.d.). Take five. Strategies. https://learn.k20center.ou.edu/strategy/150
- K20 Center. (n.d.). *K20 Center 4 minute timer* [Video]. YouTube. https://www.youtube.com/watch?v=kpCsfuvzQeY