

Goodness Gracious, Great Balls of Fire!

Chemical Reactions

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Grade Level	9th – 11th Grade	**Time Frame**	125 minutes
Course	Chemistry, Physical Science	**Duration**	2-3 periods

Essential Question

What happens to atoms during chemical reactions?

Summary

This lesson is a basic introduction to setting up a chemical equation. This could be part of a unit for physical science and can be done as a refresher or opener in chemistry for chemical equations.

Snapshot

Engage

Students identify what they know about chemical reactions and watch a phenomenon on a reaction between a lit candle and water.

Explore

Students organize and decide reactants and products for various scenarios.

Explain

Students watch a video of the different types of reactions and an ICAP video in which Battalion Chief Benny Fulkerson discusses the career opportunities and the different reactions OKC firefighters face.

Extend

Students apply and demonstrate the different types of chemical reactions.

Evaluate

Students explain their understanding of matter flow in a reaction using the I Used to Think, But Now I Know instructional strategy.

Standards

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

IOD302: Understand basic scientific terminology
IOD304: Determine how the values of variables change as the value of another variable changes in a simple data presentation
EMI403: Determine which models imply certain information
EMI404: Identify similarities and differences between models
EMI603: Use new information to make a prediction based on a model

Oklahoma Academic Standards (Physical Science)

PS.PS1.7 : Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
PS.PS1.7.1: The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions.

Attachments

- Chain Notes & Exit Ticket—Goodness Gracious, Great Balls of Fire! - Spanish.docx
- Chain Notes & Exit Ticket—Goodness Gracious, Great Balls of Fire! - Spanish.pdf
- Chain Notes & Exit Ticket—Goodness Gracious, Great Balls of Fire!.docx
- Chain Notes & Exit Ticket—Goodness Gracious, Great Balls of Fire!.pdf
- Chemical Equation Card Sort Cards—Goodness Gracious, Great Balls of Fire!.docx
- Chemical Equation Card Sort Cards—Goodness Gracious, Great Balls of Fire!.pdf
- Chemical Equation Card Sort Handout—Goodness Gracious, Great Balls of Fire! - Spanish.docx
- Chemical Equation Card Sort Handout—Goodness Gracious, Great Balls of Fire! - Spanish.pdf
- Chemical Equation Card Sort Handout—Goodness Gracious, Great Balls of Fire!.docx
- Chemical Equation Card Sort Handout—Goodness Gracious, Great Balls of Fire!.pdf
- Chemical Equations Chat Stations—Chemistry—Goodness Gracious, Great Balls of Fire! - Spanish.docx
- Chemical Equations Chat Stations—Chemistry—Goodness Gracious, Great Balls of Fire! - Spanish.pdf
- Chemical Equations Chat Stations—Chemistry—Goodness Gracious, Great Balls of Fire!.docx
- Chemical Equations Chat Stations—Chemistry—Goodness Gracious, Great Balls of Fire!.pdf
- Chemical Equations Chat Stations—Physical Science—Goodness Gracious, Great Balls of Fire! - Spanish.docx
- Chemical Equations Chat Stations—Physical Science—Goodness Gracious, Great Balls of Fire! - Spanish.pdf
- Chemical Equations Chat Stations—Physical Science—Goodness Gracious, Great Balls of Fire!.docx
- Chemical Equations Chat Stations—Physical Science—Goodness Gracious, Great Balls of Fire!.pdf
- Chemistry Chat Station Cards—Goodness Gracious, Great Balls of Fire! - Spanish.docx
- Chemistry Chat Station Cards—Goodness Gracious, Great Balls of Fire! - Spanish.pdf
- Chemistry Chat Station Cards—Goodness Gracious, Great Balls of Fire!.docx
- Chemistry Chat Station Cards—Goodness Gracious, Great Balls of Fire!.pdf
- Lesson Slides—Goodness Gracious, Great Balls of Fire!.pptx
- Physical Science Chat Station Cards—Goodness Gracious, Great Balls of Fire! - Spanish.docx
- Physical Science Chat Station Cards—Goodness Gracious, Great Balls of Fire! - Spanish.pdf
- Physical Science Chat Station Cards—Goodness Gracious, Great Balls of Fire!.docx
- Physical Science Chat Station Cards—Goodness Gracious, Great Balls of Fire!.pdf
- Types of Chemical Reactions & S-I-T—Goodness Gracious, Great Balls of Fire! - Spanish.docx
- Types of Chemical Reactions & S-I-T—Goodness Gracious, Great Balls of Fire! - Spanish.pdf
- Types of Chemical Reactions & S-I-T—Goodness Gracious, Great Balls of Fire!.docx
- Types of Chemical Reactions & S-I-T—Goodness Gracious, Great Balls of Fire!.pdf

Materials

- Lesson Slides (attached)
- Chain Notes & Exit Ticket handout (attached; one per student)
- Chemical Equation Card Sort Cards (attached; one per group)
- Chemical Equation Card Sort Handout (optional; attached; one per student)
- Types of Chemical Reactions & S-I-T handout (attached; one per student)
- Chemical Equation Chat Stations - Physical Science handout (attached; one per student)
- Physical Science Chat Station Cards (attached)
- Chemical Equation Chat Stations - Chemistry handout (attached; one per student)
- Chemistry Chat Station Cards (attached)
- 5 Molecular Model Kits

Preparation

Explore Card Sort Preparation

Before the lesson, print the attached **Chemical Equation Card Sort Cards** and cut out the cards ahead of time for your groups. Printing the cards on heavier paper, such as card stock, and laminating them will ensure that they last longer than just one lesson!

Extend Chat Station Preparation

Physical Science Prep Work

Choose an example of each of the 5 types of reaction from the provided **Physical Science Chat Station Cards**, CK-12 1.4 Types of Chemical Reactions, or any other resource you may have. For each station, provide students with the written reactant(s) side only. You may consider making 2–3 sets of the 5 stations for larger class sizes. Post each example in different locations on walls or tables around the room.

Chemistry Prep Work

Choose an example of each of the 5 types of reaction from the provided **Chemistry Chat Station Cards**, CK-12 1.4 Types of Chemical Reactions, or any other resource you may have. For each station, provide students with the written reactant(s) and using the **Molecular Model Kit**, set up the model for the reactant's side. Supply the correct number of atoms and bonds for the product side. You may consider making 2–3 sets of the 5 stations for larger class sizes. Post each example in different locations on walls or tables around the room.

20 minutes

Engage

Use the attached **Lesson Slides** to guide the lesson. Begin with **slide 3.** Briefly, read aloud the essential question: “How are atoms/mass conserved during a chemical reaction?”

Then, move to **slide 4** and share the learning objectives with students to the extent you feel necessary.

Place students in groups of four and review the Chain Notes instructional strategy with students. **Slides 5–9** will provide directions for students to complete their chain notes. Pass out the attached **Chain Notes & Exit Ticket** handout to each student, display **slide 5** and have them answer the following prompt:

- Write three things you already know about chemical reactions.

Instruct students to pass their papers clockwise. Explain to students that they should choose one of the points their classmate has made and add an additional fact, idea, or correction to it using words or a drawing. Move through the provided instructional slides to guide each round. Repeat this process of passing clockwise and writing until the papers get back to their original writers. After the original writers review the comments their classmates have made, ask each group to summarize their ideas to share with the class. Select one student from each group to share their summary.

This is a good time to evaluate students' prior experience related to the topic of the next video. Have students save the handout to complete the I Used to Think, But Now I Know Exit Ticket at the end of the lesson.

Display **slide 10**. Have students to watch the CBS Pittsburgh KDKA news video, titled *Experts Warn Against Using Water to Douse Candle Fires*. In response to the video, ask students to use the back of their chain notes handout to write an equation for what took place.

Embedded video

https://youtube.com/watch?v=ZI30ZnePn60

Teacher's Note

For the Chain Notes, to boost students’ confidence, remind students that they are simply writing whatever comes to mind when they hear the words *chemical reaction*, *chemical,* or *reaction*.

30 minutes

Explore

Teacher's Note: Setting Up an Equation

Write on the board as students explain how to set up the formula. This is a good way for them to work through misconceptions as a group as they recall how to set it up. For example, "Let's recap how an equation is set up. I will write on the board as you guys walk me through it. What is the term that we use for components that fall on the left side of the equation? Right side? What symbol do we use to show there was a reaction that took place between the reactants to make a product?"

Scaffold students to remember the set up for a chemical reaction and write it on the board as they figure it out. Once students have given their final response, display **slide 11** to affirm where the reactants and products fall for an equation.

Organize students into groups of 3–4 and pass out the **Chemical Equation Card Sort** cards to each group. Instruct students not to open their cards until after you have finished giving the instructions. Move to **slide 12**. Explain to students that they will complete a Card Sort instructional strategy, grouping the correct cards and using them to create the correct equations for each scenario. When they are finished, review the correct matches with the students by displaying **slides 13–22.**

Optional Shortening of Card Sort

There are 10 scenarios in the Card Sort. To save time, you can limit it to 5 and still get the same point across.

Optional Card Sort Justification Activity

Copy and pass out the **Chemical Equation Card Sort** handout and have students write out their equations and give justification for why they set up their card sorts the way they did.

Teacher's Note: Resist the Urge to Help

Walk around the room and monitor students as they arrange the cards but don't assist them with the Card Sort beyond sharing the basic instructions.

20 minutes

Explain

Teacher's Note: ICAP

The following activity adds a career exploration element to this lesson. This way, students can discover different types of chemical reactions and a career that encounters them.

Move to **slide 23,** pass out the attached **Types of Chemical Reactions & S-I-T** handout to each student and invite them to take notes of the different types of reactions and examples. Instruct students to fill out their Note Catcher as they watch the following video: *K20 ICAP - Goodness Gracious, Great Balls of Fire!*

Embedded video

https://youtube.com/watch?v=4zWpTgsinL8

Emphasize for students to put the definitions in their own words. You may choose to pause the video in between reactions to double check students got each definition or review them again after the video.

Display **slide 24**. Explain the following information to students: "Next, we are going to learn about a profession that involves chemical reactions on a daily basis. We are going to meet Batt. Chief Benny Fulkerson of the Oklahoma City Fire Department."

Embedded video

https://youtube.com/watch?v=Pf9zB7kYUDA

Before playing the second video, ask students to consider the different types of reactions and the variety of jobs involved in the fire department. Additionally, instruct students to complete on their Types of Chemical Reactions & S-I-T handout, using the S-I-T (Surprising, Interesting, Troubling) instructional strategy as they watch. In doing so, explain to students that they should individually identify *one surprising fact or idea*, *one interesting fact or idea*, and *one troubling fact or idea* from the video.

When the video is over, have students discuss in groups of 2–4. Encourage students to spend 5 minutes sharing their findings from the video and how the types of reaction and the job of a firefighter correlate. Finally, ask each group to share out a summary of what they learned.

50 minutes

Extend

Physical Science Instructions:

Display **slide 25** and invite students to participate in the Chat Stations instructional strategy. Move students into groups of 2–4, pass out the **Chemical Equations Chat Stations—Physical Science** handout to each group. Assign each group to a station to start their first example. Inform students to discuss within their groups the correct product(s) for the reactant(s) and write them down on their handout. Inform students that they can try to figure out how to balance the equation for extra credit if they so choose. Give students about 3–5 minutes at each station, then rotate.

Chemistry Instructions:

Display **slide 26**. Invite students to participate in the Chat Stations instructional strategy. Move students into groups of 4, pass out the **Chemical Equations Chat Stations—Chemistry** handout to each group. Assign each group a station to start their first example. Inform students they will have 10 minutes at their stations to discuss within their group the correct product for the reactant(s) they have based on the type of reaction indicated at each station. Students will then use the molecular model kit to create the Lewis Dot structure of the product(s). Finally, have students draw the model they created, write down the equation for their answers, balance the equation on their handouts, and disassemble the products only of the molecular models for the next group. Once time is called, have students move to the next station.

Teacher's Note: Simplify

As students rotate through the stations, walk around, and facilitate discussions. Note areas of disagreement or key points and identify any misconceptions.

To simplify the stations: For physical science, using the second set of five cards in the provided **Physical Science Chat Station Cards**, you could provide the product's side of the equation and have students just identify what type of reaction it is. For Chemistry, using the second set of five cards in the provided **Chemistry Chat Station Cards**, you could provide the product's side of the equation and color code each atom in the equation to the associated color in the model kit.

5 minutes

Evaluate

Move to **slide 26.** Instruct students to return back to their **Chain Notes & Exit Ticket** from the beginning of the lesson. Have students complete the I Used to Think...But Now I Know activity, comparing what they used to think about chemical reactions that includes their stance the essential question posed at the beginning: "What happens to atoms during chemical reactions?"

Resources

- CBS-Pittsburg. (2017, December 11). Experts warn against using water to douse candle fires [Video]. YouTube. https://www.youtube.com/watch?v=ZI30ZnePn60
- CK-12. (2021, January 15). Flexbooks. 1.4. Combination reactions. Webpage. https://flexbooks.ck12.org/cbook/cbse-chemistry-class-10/section/1.4/primary/lesson/combination-reactions/
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