

COPY OF LIMITING REACTANTS

Lesson Overview

In this lesson, students will continue their understanding of stoichiometry by exploring the concept of limiting reactants. Students will be able to connect making paper pizzas to the concept of limiting reactants by the end of the lesson. This concept is important to not only chemists but to every one. A limiting reactant tells a chef, cook, even a carpetener how much product they can make with the ingredients that they have. During this lesson, the students will complete a lab assignment in which they are imagining that they are pizza chefs and making pizzas. After the lab activity has been completed, there will be a class discussion on the connection of making pizzas to stoichiometry, specifically the concept of the limiting reactant.

Standards

National Standards

SC Science Standards

HS-PS1.6: Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.*

Materials

Lab Handouts
PowerPoint Slide with Bellringer and exit ticket
construction paper
scissors
paper plates

Documents

[Pizza Lab.docx](#) (60KB)

[Pizza Lab key.docx](#) (60KB)

[Discussion Questions For Microteach Lesson.docx](#) (12KB)

Web Links

Instructional Plans

Engage 1 (5 min)

1. Engage Details

Sub-components:

Prior Knowledge

Representative Questions:

(1) What do you know about...?

Engage Description:

In order to engage the students, I will assess their prior knowledge by asking the students to write down the two parts of a chemical equation because this is needed in order to complete and understand the lab activity.

2. Formative Assessments

Warm-Up

What are the two parts of a chemical equation? The answer is the products and the reactants. The product is the result of the chemical equation and the reactants are the ingredients that are added in order to make the product.

Explore 1 (30 min)

1. Explore Details

Sub-components:

Test, Collect

Representative Questions:

(1) What do you need to collect? (2) How will you organize your information?

Explore Description:

I am going to handout a lab assignment in which students will make pizzas and determine limiting ingredients. I am using this lab as a visual for the concept of limiting reactants that connect with students' lives. This lab assignment will help students to collect data as they are recording their completed and uncompleted orders in a chart. Before the lab, I will ask the class a question in order to lead into the lab. "What is the best way to organize data that you have collected in an experiment?" Then we will discuss why charts and tables are important in the science community. Charts are important in the science community because they help to organize the data that was collected and it is easy to read.

Once they have finished the lab handout, students will be expected to write each of the pizzas orders in the form of a chemical equation with the amounts written underneath the formula. Students will share their answers on the board and these answers will be discussed. This section of the lab is used for a review from the day before when we discussed chemical equations and how to balance them.

2. Formative Assessments

Observation, Record/Data Collection

Students will be given a lab assignment in which they will be making paper pizzas in order to explore the concept of limiting reactants and excess reactants. During this lab assignment, the students will be working with a partner of their choice. The students will make the pizzas and record the completed pizzas in a chart for each order as well as the pizzas that they cannot make based on the amount of ingredients present. They will also determine the limiting ingredient and the excess ingredient. This will help the students to improve on the data collecting skills. As the students are working on the assignment, I will be walking around the room to make sure that the students do not have any questions about the assignment or the concept in general.

Explain 1 (30 min)

1. Explain Details

Sub-components:

Interpret, Communicate, Analyze

Representative Questions:

(1) Explain what happened? (2) What pattern(s) did you notice? (3) What

surprised/puzzled you? What is still confusing? (4) How would you explain...? (5) What trend does the data show? (6) What do you mean when you say, ...? (7) How is this similar or different from...? (8) How does this apply to what we learned before? (9) What has been learned? (10) Where have you encountered a similar phenomenon?

Explain Description:

After the lab assignment is complete, the whole class will come together in order to discuss the assignment. Before we begin going over the lab assignment as a class, I will ask two questions "Who can tell me what a limiting reactant is?" A limiting reactant is an ingredient in a chemical equation that limits the products. In other words, you can only make so much product with the ingredients that you have. "Who can tell me what an excess reactant is?" An excess reactant is an ingredient in a chemical equation where there is more ingredient left over after the reaction has taken place and the maximum amount of product has been made.

As a class, we will go through the lab and talk about each situation and discuss the answers to the questions. As we go through the lab, I will ask the students to justify their answer in the best way that they can. Students will then share their chemical equations on the board as a review for the previous lesson. This also helps the students to apply the pizza orders to chemistry by writing the orders in a mathematical model.

2. Formative Assessments
Whole Class Discussion

Based on the lab that you did, what can you say about chemical equations or reactions?

Chemical reactions will usually have a limiting reactant that limits the amount of product that can be made and an excess reactant, which is the ingredient that has leftover reactant after the maximum amount of product has been produced.

(Another way to ask the question) How can you connect making pizzas with chemical reactions and chemical equations?

What do you think represents the reactants in the lab? The products? Why?

Reactants are represented by the ingredients that are used to make the pizza. The products are represented by the completed pizzas because the goal is to make the pizzas.

Extend 1 (10 min)

1. Extend Details

Sub-components:

Apply, Transfer

Representative Questions:

(1) How do you think... applies to ...? (2) How can this be used in the Real-World?

Extend Description:

Students will be asked how the lab applies to the concept of stoichiometry, specifically

limiting reactants. I will also ask the students how can limiting reactants be used in the Real-World other than making pizzas.

2. Formative Assessments

Elaborate on current Investigation, Real-World Application

We will discuss how the lab applies to the concept of the limiting reactant. I will have the students to write down what a limiting reactant is in their own words as well as an excess reactant. I will also ask them to write down any Real-World application that they can think of other than making pizzas. This will be used as an exit ticket for the class.

What can you say about chemistry based on the lab and the discussion that we had in class?

Chemistry is used every day by every one whether they realize it or not.

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