

# Limiting Reactant

## Standard

**SC3. Obtain, evaluate, and communicate information about how the Law of Conservation of Matter is used to determine chemical composition in compounds and chemical reactions.**

**SC3e. Plan and carry out an investigation to demonstrate the conceptual principle of limiting reactants**

### Learning Goals

- 1. I can define "Limiting Reactant"**
- 2. I can distinguish between Limiting and Excess Reactants**
- 3. I can determine the Limiting and Excess Reactants in examples given to me.**
- 4. I can plan an investigation to determine Limiting Reactant**
- 5. I can demonstrate the conceptual principle of "Limiting Reactant" through a planned investigation**

## **Bell-Ringer (Write Question Number and the answer option of your choice on the card given)**

1. Pretend you have a job building tricycles. If you had 100 handle bars, 150 wheels, 250 pedals, and 75 seats how many tricycles could you build?

- A 50
  - B 75
  - C 120
  - D 125
  - E None of these are correct.
- 

2. In problem 1, what is the limiting reactant?

- A handle bars
  - B wheels
  - C pedals
  - D seats
  - E None of these are correct.
- 

3. In problem 1, how many pedals are left over after you have built the tricycles?

- A 0
- B 100
- C 150
- D 200
- E None of these are correct.

**Definition**  
What is a Limiting reactant?

**Bell-Ringer (Write Question Number and the answer option of your choice on the card given)**

**Learning Goal 1:**  
I can define "Limiting Reactant"

Limiting Reactant

Excess Reactant

Watch this video on Limiting Reactant  
<https://www.youtube.com/watch?v=9oZZwdWvChw>  
and define Limiting Reactant in your own words. You certainly will want to define the Limiting Reactant in at least three different ways.

1.

2.

3.

**Learning Goal 2:**  
I can determine the Limiting and Excess Reactants in examples given to me.

**Guided Practice: Example 1: You are making cheeseburgers**

You have

- 24 hamburger buns
- 15 hamburgers
- 40 slices of cheese

**What are the most cheeseburgers can you make?**

**Learning Goal 2:**  
I can distinguish between Limiting and Excess Reactants

**Collaborative Practice: Example 2: At the gym, the class wants to play basketball**

- The gym has 5 full courts
- You have 3 basketballs
- There are 20 of you who want to play

**How many games can you play at once?**

Having learned what a Limiting Reactant, write in your own words, the difference between a Limiting Reactant and an Excess Reactant

**Collaborative Practice: Example 2: At the gym, the class wants to play basketball**

- The gym has 5 full courts
- You have 3 basketballs
- There are 20 of you who want to play
- How many games can you play at once?

**Collaborative Practice: Example 3: You have a contract to make centerpieces for a party.**

- Each centerpiece needs 1 vase, 3 flowers and a ribbon
- You have 31 vases, 78 flowers and 300 ribbons
- How many centerpieces can you make?
- What part limits the number of centerpieces you can make?

**Collaborative practice: Example 4: You have 5 moles of hydrogen and 5 moles of nitrogen.**

**Which is the limiting reactant?**

**The directions for making a product are in the balanced chemical equation.**

**Hydrogen plus nitrogen make ammonia**



**Independent Practice: Example 5: In Example 4, if you have 5 grams of hydrogen and 5 grams of nitrogen.**

**Which is the limiting reactant?**



**Independent Practice: Example 6: You have 12 grams of hydrogen and 20 grams of nitrogen. Which one is the excess reactant?**

**How much nitrogen would you need to use all the hydrogen?**

## Review and Summarization

At the end of the Interactive Discussion, list some of the reasons why we need to deal with limiting and excess reactants. (Formative Assessment). You will want to watch this video:

[https://www.youtube.com/watch?v=oCq\\_X4ESdBk](https://www.youtube.com/watch?v=oCq_X4ESdBk)

## Learning Goal 4: I can plan an investigation to determine Limiting Reactant (Formative Assessment)

With the given materials, plan an investigation to determine the Limiting Reactant in the intended chemical Reaction. Use **Google docs** to write you plan and share it with me. Your plan needs to be detailed in different sections as given below:

Materials

Measurements

Procedure

Expected Results

Please note that you will not proceed to the investigation, unless and until your plan has been approved by the teacher.

**Learning Goal 5: I can demonstrate the conceptual principle of “Limiting Reactant” through a planned investigation (End-of Lesson Assessment)**

**Use the teacher-approved plan of investigation and carry out the investigation and demonstrate the conceptual principle of Limiting Reactant. Attach Data Chart and a graph as necessary. (This is a Graded Task – End of Lesson Summative Assessment).**

**Rubric: Adoption of Approved Plan: 20 Pts (Process: 10 Pts; Mass: 5 Pts; Substances: 5 Pts); Independent Variables: 5 Pts; Dependent Variables: 5 Pts; Completed Data Chart: 10 Pts; Graph: 20 Pts (X axis Entity: 5 Pts; X-axis Unit: 5 Pts; Y axis entity: 5 Pts; Y axis Unit 5 Pts); Interpretation of Graph: 20 Pts (Name of the Pattern: 4 Pts: Explanation of the Part 1 of the Graph: 8 Pts; Interpretation of Part 2 of the Graph: 8 Pts; Reporting of Limiting and Excess Reactants: 5 Pts (2.5 Pts each); Theoretical Prediction of the Behavior of the Reverse Scenario: 15 Pts (Expected Measurements in the Investigation: 5 Pts; Proposed Graphical Representation with axes, parameters, and units: 5 Pts; Expected Outcomes of the Investigation; 5 Pts)**

