

Lesson plan for *Reactants, Products, and Leftovers*:

<http://phet.colorado.edu>

This activity was used in a one-hour recitation at CU for Introductory Chemistry.

Learning Goals:

Students will be able to:

- Predict how many products are made given the initial amounts of two reactants and the chemical equation
- Identify how many reactants do not react (are “leftover”) given the initial amounts of two reactants and the chemical equation
- Deduce how many reactants were available given the amounts of products and excess reactants (“leftovers”) and the chemical equation

Background:

Introductory chemistry at CU is a large course with three lectures, a one-hour recitation, and a two-hour lab each week. It serves to prepare students with a weak chemistry background for general chemistry. It covers chemistry at an elementary level, and the mathematical skills needed to do well in general chemistry. The prerequisite is one year of high school algebra.

Reactants, Products, and Leftovers **Introduction:**

You may want to read the “[Tips for Teachers](#)” for this simulation provided by the design team.

Lesson:

Before the activity, the lab was equipped with 10 computers (each section had 20 students). The sound of each computer was turned ON. A link to the RPAL simulation was saved to the desktops of the lab computers, so that students had no need to access the internet. At the start of the recitation, students were told to work in pairs and to use the activity sheet for guidance. During the activity, the instructor (TA) went about the room to answer student questions.

Assessment:

After the activity, students took the multiple-choice (MC) post-test. The test questions are taken from the chemical education research literature and are designed to elicit student misconceptions. The CU students averaged 50% correct on the first two questions, and 20% correct on the third question. An instructor may wish to give the test before and after the activity, to measure learning *gains* rather than absolute learning. Also included in the contribution is an open-response version of the post-test.