

Refinery Maze Teacher Guide

Background

After crude oil is brought to the surface, it is transported in order to be separated into its many products. The first step to separating the crude oil into its components is distillation. This takes place in a refinery where a fractional distillation tower, or fractioning tower, is used to separate the products by boiling them. The crude oil is pumped into the tower and heated. Parts of the crude oil mixture turn into gases as the crude boils. The bottom of the tower is very hot, while the top of the tower is allowed to be much cooler. The gas molecules of the crude oil move up the tower based on their boiling points. Larger molecules with higher boiling points and higher densities will collect at the bottom, while smaller molecules with lower boiling points and lower densities will try to push their way to the top. As gas molecules meet an area of the tower that is cooler than their boiling temperature, these gases will condense. There are plates staged throughout the tower that the gases condense onto and then are pumped out of the tower with the materials of similar molecular makeup. Each material can then be further processed into other products. This game enables students to visualize how larger molecules are trapped in certain areas while smaller, lighter molecules can move higher in the tower for separation.

Objective

▪Students will be able to describe how crude oil is separated into different compounds using fractional distillation.

Time

▪20-30 minutes

Materials

▪Enough quarters, nickels, pennies, and dimes for the class ▪Refinery Maze Student Guide ▪Scissors and glue (optional)
▪Straws or pipe cleaners (optional)

Preparation

- Make copies of the game board and student guide for each student or group.
- Prepare a copy of the Fractional Distillation Graphic for projection to help showcase the process.
- Gather enough coins so that each student or group has one of each type of coin. If using plastic coins or metal coins, be sure that the coins fit in the various spaces as they move up the column.

Procedure

1. Introduce the activity. Explain that students are going to read about the refinery process called fractional distillation, and model this process using coins.
2. Have students read the text on the student page.
3. Answer questions that students have about the process and connect the reading back to the Deer Park Refinery, in that fractional distillation is one of the processes that takes place on site. Ask questions to help students glean the important facts from the text.
4. Allow students time to work through the set-up of the maze. It is recommended that straws, pipe cleaners, or even hot glue be placed on the borders of the maze. This will prohibit them from “sneaking” a larger molecule up beyond its collection plate.
5. Discuss the results as a class and connect the maze back to the actual process. Have students name items they might associate with each size of coin based on the diagram. Discuss modifications that could be made to create an even better model of the process.

Extension

▪Create a life-sized model of the process in the classroom, where your students are the molecules of various sizes (wearing name tags). Use desks, pool noodles, boxes, and other odds and ends to construct your tower infrastructure.

