

Derricks to Desks Lesson Plan

Purpose: Appreciate the importance of petroleum in our daily lives. Understand the basic manufacturing process involved in the production of petroleum products.

Relative State Standard: Explain how structures of alkanes relate to their properties and how those properties affect the uses of specific alkanes.

Materials:

- 1) Textbook with discussion of fractional distillation and the properties of alkanes.
- 2) Copy of student handout: "Petroleum in Our Lives".

Activities:

- 1) Students have already covered the important structural feature of saturated hydrocarbons (alkanes), and are able to name and write structural formulas for alkanes.
- 2) Introduce topic by asking students for a definition of petroleum. Show them a quart of common motor oil. What other common products are made from petroleum?
- 3) Brainstorm with students on common products made from petroleum. Provide students with a comprehensive list of petroleum products.
- 4) Ask the question: "How are these products made?"
- 5) Read section in text relating to the properties and uses of alkanes. Topics include physical states, boiling points, and combustion. Key vocabulary: Natural Gas, Petroleum, Fractional Distillation, and Octane Rating.
- 6) Pass around a sample of crude oil. Point out that crude is a solution of different hydrocarbons. Have students review the chapter on solutions to determine which properties of solutions are mentioned in this section.
- 7) Deal with the common misconception that oil was formed from decayed dinosaurs. Although some of the organic material that makes up existing oil reserves may have come from dinosaur tissue, the vast majority has come from plants and bacteria.
- 8) Have on display a basic distillation apparatus. Show them a model of a fractional distillation tower. Have students brainstorm about how a series of distillation columns can help produce a very pure product.
- 9) Be sure students recognize that the boiling point of the alkane increases as the number of carbon atoms increases. This is also reflected in the state of the alkane at room temperature. Demonstrate the holding power of different lengths of Velcro strips. The longer the strip of Velcro, the more difficult it is to separate it from another strip. Similarly, the longer the straightchain alkane is, the greater its attraction to other alkanes and the higher its boiling point.
- 10) Study a table showing boiling point ranges and molecule size range of various fractions.

- 11) Ask students why the hydrocarbons with only one, two, and three carbon atoms are not on the table. (The smaller hydrocarbons are volatile and are not in the gasoline fraction.) Once again, be sure students recognize the relationship between the number of carbon atoms and the boiling point. The larger hydrocarbons have higher boiling points because they experience stronger intermolecular attractions.

Evaluation: Draw a simple diagram of a distillation tower. Write a detailed description of the process involved in taking crude oil and turning it into various petroleum products.

Enrichment Activities:

- 1) Plastic has revolutionized many aspects of our lives. Students can find out about the great changes plastic has made in certain industries citing specific plastic products and telling why they have taken the place of previously used products.
- 2) Construct a poster suitable for hanging showing the process of refining. Include the crude oil coming from the derrick to the storage tank to the tubular heater to the fractionating tower.
- 3) Have students research and report to the class on various types of gasoline. Include the ideas of "knock" and "octane rating". Discuss the use of various additives including "MTBE".