LESSON PLAN

Class: Chemistry

Unit: Organic Chemistry

Teacher: J. Erickson

Objective:
Students will be able to describe how mixtures can be separated using a technique called distillation. Students will also be able to predict which parts of a mixture go where in a distillation apparatus.

Standards:
10b. *Students know* the bonding characteristics of carbon that result in the formation of a large variety of structures ranging from simple hydrocarbons to complex polymers and biological molecules.

Anticipatory Set:
Add blue food coloring to water to create a homogeneous mixture. Have the students write down what will happen if the mixture is filtered. What if the mixture is boiled?

Teaching - Input: Lecture on distillation
Video clips
Overhead images of traditional setups
Photos of fractional distillation assemblies from commercial refineries

Teaching - Modeling: Show the distillation apparatus. Demonstrate proper assembly technique and operating procedure.

Teaching – Check for Understanding: Take a short pre-lab quiz.
Give students a written scenario of a distillation with a quiz question.

? Question ?

A mixture of the following volatile liquids is found in a sample of petroleum. This mixture is separated in the lab by fractional distillation. Put the chemicals in the order which they will distill over.

Component	Boiling point
Naphtha	*185ºC*
Octane	*126ºC*
Diesel	*320ºC*
Propane	*0ºC*
Cyclohexane	*81ºC*

LESSON PLAN

Guided Practice: Rinse the soda can clean.

2. Add the solution to be distilled until the can is l/3 to l/2 full. Boiling chips may be added if available, but are by no means necessary.
3. Mount the soda can above the burner on a wire screen supported by an iron ring (attached to the ring stand). Mount the second iron ring around and near the top of the can to prevent it from tipping over.
4. Insert the smaller glass jar into the larger one and surround liberally with an Ice-rich slush bath.
5. Prepare an air-cooled condenser made of aluminum foil. This is best done by wrapping the foil lengthwise around a dowel rod or broom handle, taking care to seal the seam that runs the length of the foil tube by making several folds of foil neatly pressed back on itself. (Failure to do this will result in. poor efficiency during distillation.)
6. Fit one end of the condenser into the opening at the top of the soda can. Gently bend the other end down and Insert it into the smaller glass jar which serves as a receiver flask for the distillation.
7. Heat the soda can and its contents with a steady flame. As the solution boils, some vapor can be seen escaping from around the mouth of the can. Still, enough vapor makes its way through the air-cooled condenser so that condensation soon occurs in the chilled receiver flask.

The procedure above is taken from **http://www.woodrow.org/teachers/chemistry/institutes/1986/exp2.html**

Closure:
Summarize distillation process. Explain that there are other separation techniques. Discuss the benefits and the downsides to distillation as a means for large scale separation of crude oil.

Independent Practice:
Homework assignment – use the textbook of the web to determine 8 different components found in crude oil, along with their approximate boiling temperatures.

Materials:

Chemicals:
crushed ice solution to be distilled--cranberry or apple juice, coke, orange soda, or colored aqueous solution

Equipment:
empty soda can--Pepsi, 7-Up, etc.
4 to 8-oz clear glass jar with narrow opening at top larger jar or other container to hold jar above 4-In x 12-in piece of aluminum foil
Bunsen or alcohol burner
ring stand
iron rings wire screen

Duration:
2 days – one to introduce distillation and one to perform the distillation lab.

John Erickson
August 1, 2005
2005 Derricks to Desks Seminar