Boiling Point Determination

Introduction:

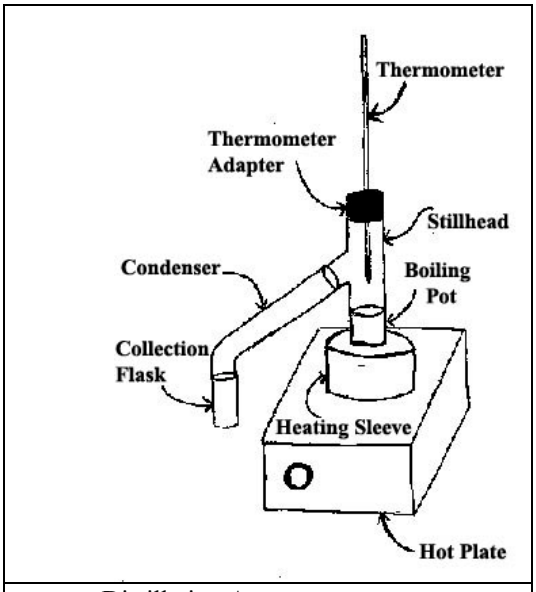
A simple and widely used method for determining the identity of an unknown liquid is by measuring the temperature at which it boils. This temperature, called the boiling point, is a physical property. It can be used to identify liquids much like solids can be identified by melting points. The apparatus to be used is a simple distillation set-up.

In the distillation container, a liquid is heated until it begins to boil. The vapor rises until it hits the thermometer and condenser. As the name implies, the liquid begins to condense and can be collected. Any impurities will remain in the distillation container. The distillate is now pure.

Pre-Lab Questions:

1. What does boiling mean?
2. What is distillation?
3. What physical property is used to purify an impure liquid?

Setup:



Distillation Apparatus

Procedure:

□ 1. Set up your apparatus as demonstrated by the instructor.

□ 2. Add about 2 mL of the assigned liquid and a boiling chip to the flask.
Reason: The boiling chip gives the bubbles an irregular surface on which to form, without the chip the liquid would boil too violently.

□ 3. Insert a thermometer in the top of the setup. Keep the tip of the thermometer slightly below the opening of the condenser.

□ 4. Be prepared to record temperature and time. Heat the solution and record the time once the thermometer reaches 30°C. Continue recording the time and temperature every 15 seconds. Note the rising vapor and its subsequent

condensation. Continue to record until most of the liquid has been transferred from the reaction flask to the collection flask.

□ 5. Record the name and boiling point of the liquid. **Caution:** Do not let the container boil dry.

□ 6. Plot a graph of temperature versus time in order to determine the boiling point and identity of the unknown liquid.

Questions and Calculations:

Possible Liquids	Boiling Point
Acetone	$56^{o}C$
Methanol	$65^{o}C$
2-propanol	$82^{o}C$
Water	$100^{o}C$

Boiling point of your liquid = ____
Identity of your liquid _____

Extensions:

Students can explore separation of two volatile liquids. This could include the location of azeotropes and distillation of alcohol.

Boiling Point Determination
Teacher's Supplement

Objectives: Students will…

- Identify liquids as having characteristic boiling points.

Prior Knowledge: Students should…

- Understand the concept of distillation and know the definition of boiling point.

Curriculum References:

1. State Goal 11
    a. CAS B; CFS 12, 15, 17
    b. CAS C; CFS 6
2. State Goal 13
    a. CAS D; CFS 1-3
3. CASE Blueprint Goals
    a. CS 1; SI 2, 3

Unfolding of Lesson:

Activity	Time (min)
Class business	5
Explanation	5
Distillation	10
Examine Results/ Repeat Distillation as Necessary	15
Discuss Results and Graph	10
Total	45

Assessment:

Adjustments and Variations:
Guiding Questions:
Tips:
Timeline: