

# Matter, Heat and Insulation Secondary

Name \_\_\_\_\_

Phenomenon #1: Look at the picture of waxy crude oil. List 3 questions you have about it.

- 1.
- 2.
- 3.

Phenomenon #2: List 3 structural designs that you think the hot beverage thermos has that enables it to keep hot chocolate warm for a long time.

- 1.
- 2.
- 3.

## Materials:

Using these ideas and materials you will design a container to keep your water hot. You will need one film canister/cup, hot water, bubble wrap, cotton balls, other insulating materials, roll of tape per group and a thermometer.

Initial Container Design: Draw the container below as you will be using it for your first experiment. The hot water, entire container, and insulation materials must be included and labeled.



**Evidence Section**

Data Table (your evidence from the experiment): Measure and record the temperature of water in the container every 5 minutes. While waiting, work through the scenarios that follow this data table.

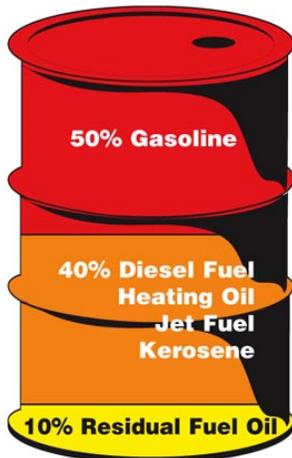
Container #	Temp Start	Temp 5 min.	Temp 10 min.	Temp 15 min.	Temp 20 min.	Temp 25 min.
Trial #1						

Answer research questions as a group while you wait.

1. Why does the waxy crude oil cool off when it is brought out of the ground.
2. What problems would that make for [transportation](#) of the waxy crude oil?

3. Using this diagram write several summary statements about what crude oil is used to make.

**Typical U.S. Refinery Yield from a Barrel of Crude Oil**



4. Why would a cross section of a pipe carrying waxy crude oil would look like this?



5. How can what you learn from your design help to engineer an oil pipeline that will enable the better flow of waxy crude oil?

**Redesign your second container** with its insulation and sketch it here. Please label all the changes that you are going to make. Write a statement describing how the structure of differing materials allows them to function as insulators.

Container #	Temp Start	Temp 5 min.	Temp 10 min.	Temp 15 min.	Temp 20 min.	Temp 25 min.
Trial #2						

Reasoning

1. Which container maintained the original or starting temperature for the longest period of time?  
Why do you think this was the case?

2. Which container maintained the original or starting temperature for the shortest period of time?  
Why do you think this was the case?

Explanation: Write a claim statement providing evidence (data) to support the claim. You must include reasoning and describe why the structure of your insulating materials functioned as an insulator. Include the words "heat transfer, heat energy, temperature, or heat loss" in your explanation.