Why does water warm up slowly, and how much slower than cooking oil?

Name _____ Date _____

MATERIALS

You supply everything. Tick each item as you gather it.

- ☐ A microwave oven and two microwave-safe cups
- ☐ A kitchen scale (grams) and a thermometer that reads at least 100 °C
- ☐ Tap water and cooking oil
- ☐ A timer, oven mitts, a spoon, paper and a calculator

SAFETY

Hot liquids burn. Heat for only 20 seconds at a time and never more than 100 g of liquid in a cup. Water can become hotter than boiling without bubbling and then boil over when stirred, so heat only briefly, stir gently before measuring, and use oven mitts. Cooking oil can get very hot, so an adult should do the oil trials and the cup must be microwave safe. Keep your face away from the cup. Let everything cool before cleaning.

PROCEDURE

1. Weigh 100 g of water into a cup and measure its temperature. Record it as the start temperature.
2. Heat it in the microwave for exactly 20 seconds. Stir gently with the thermometer, and record the highest temperature you see. Calculate the temperature change (final minus start).
3. Let the cup cool. Repeat with 200 g of water, with the same 20 seconds and the same power setting.
4. Repeat with 100 g of cooking oil in a clean, dry cup for 20 seconds. Have an adult handle the hot oil.
5. Calculate the energy absorbed by the water using $q = m \times c \times \Delta T$, with $c = 4.18$ J/(g·°C) for water.
6. Because the microwave delivered the same energy to the oil as to the water in the same time, use $q = m \times c \times \Delta T$ for both to find the specific heat of the oil: $c(\text{oil}) = c(\text{water}) \times \Delta T(\text{water}) \div \Delta T(\text{oil})$, for equal masses.

RECORD YOUR DATA

Sample	Mass (g)	Start (°C)	Final (°C)	Change ΔT (°C)
Water, 100 g	100			
Water, 200 g	200			
Cooking oil, 100 g	100			

LAB REPORT

Write a report that gives your table, shows the energy and the specific heat of the oil calculations with units, and explains why water changes temperature less than oil for the same energy. Describe how this property of water affects the climate of coastal regions and the oceans.

Report the numbers you actually got, even when they disagree with the lesson. Write on the lines, or type your report on the website and send it to a teacher there.

Question and hypothesis *State the question in your own words, what you expect to happen, and why you expect it.*

Method *What you changed, what you measured, what you kept the same, and how many trials you ran.*

Observations *Describe what you saw, including anything unexpected. Your data tables are added to the report automatically.*

Calculations *Show each calculation step by step, with units.*

Claim and reasoning *Answer the question using your numbers, then explain why, using the science from the unit.*

Limits and next step *What could have affected your results, and one change you would make next time.*