

# COFFEE-CREAM PROBLEM

Print NAME \_\_\_\_\_ Period \_\_\_\_\_

**PURPOSE:** To measure which keeps the coffee warmest: Adding the cream immediately or waiting eight minutes before adding the cream?

And to discuss how the following two laws apply:

**Newton's Law of Cooling:** *The rate of heat conduction is directly proportional to the temperature difference between the surfaces.*

**The Stefan-Boltzman Law of Radiation:** *The rate of heat radiation is proportional to the Fourth Power of the Absolute Temperature.*

1. Use two 250ml beakers for *coffee cups* and two 100ml beakers for *creamers*.
2. Put 200ml of water (*coffee*) in the cups and 40ml of water (*cream*) in the *creamers*.
3. Heat the *coffees* to boiling (don't evaporate much).
4. Set both *cups ON THE TABLE*.
5. To one cup, add the *cream* immediately.

6. **On the back**, record the temperatures for BOTH *cups* simultaneously every 30 seconds for 8 minutes.
7. Add the *cream* to the creamless cup and continue to record the temperature for another two minutes.
8. Graph the temperature-time curves on the SAME set of axes, and evaluate the results.
9. Explain the results with the two laws of cooling above.
10. Write a critique for this lab.

