

Efficiency Investigation

Name: _____

Date: _____

Purpose

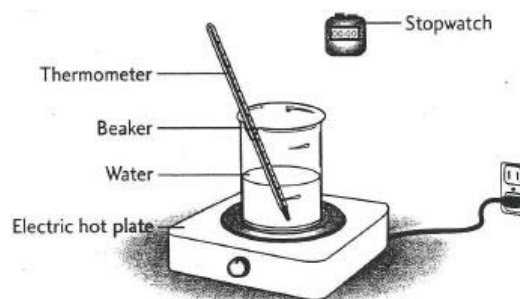
The purpose of this lab is to calculate the percent efficiency of a hot plate. This experiment will be done by heating a beaker of water for a recorded amount of time and then performing some basic energy calculations.

Materials

Hot Plate

Thermometer or Vernier Lab Quest Probes

Stop watch



Procedure

1. Set up the apparatus as shown in the diagram. Follow all safety precautions as outlined by the teacher and from your safety lessons. Look at the heating apparatus and record the power rating in Watts.
2. Measure out 200 mL of water (1 mL of water has a mass of 0.001kg) into a clean, dry beaker.
3. Place the thermometer into the beaker and wait for the thermometer to reach thermal equilibrium (a steady temperature). Record this temperature.
4. Turn on the heating apparatus and place the beaker filled with the water on the hot plate. Start the stop watch at this time.
5. Heat the water until the temperature rises a considerable amount. A temperature of 50°C or 60°C will work. **DO NOT GO PAST THIS TEMPERATURE; BURNS CAN BE SEVERE.**
6. Turn off the heating system and stop the stop watch at this point, but **you must** continue to stir the water gently with the thermometer until the temperature reaches its maximum point. Record this final temperature.

Observations & Data Collection

Analysis

Refer to your notes for equations and/or example calculations if you are unsure.

1. Calculate the heat gained by the water.
2. Calculate the maximum heat energy that was produced by the heater in the time that it was on.
3. Calculate the percent efficiency of the energy transfer in the heating apparatus. Compare your value with your classmate's values.

Questions

1. How could you improve the heating apparatus so that it would be more efficient?
2. Is it possible to make a heat transfer system that is 100% efficient?