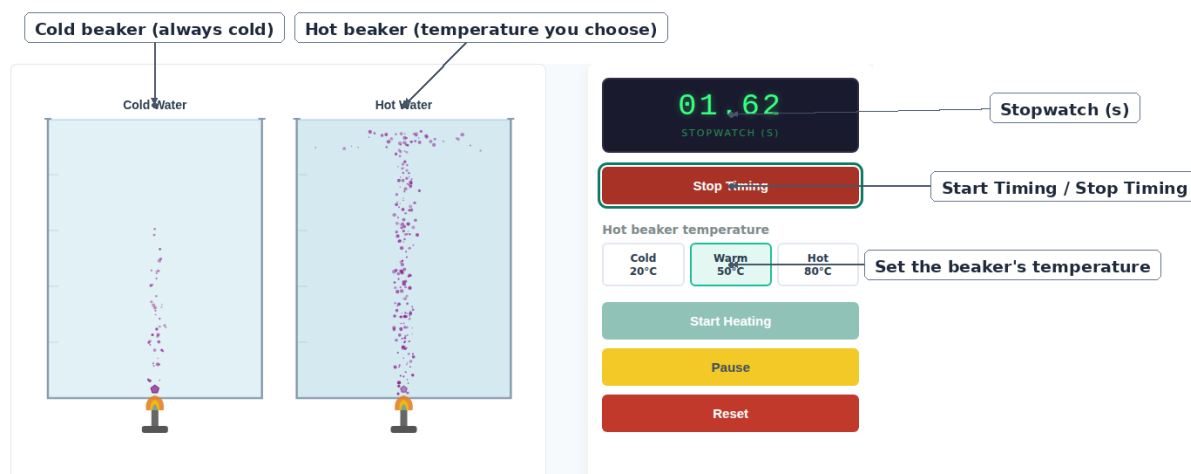


Investigating Convection

Water Temperature and Convection Currents

Aim:

You are investigating how water temperature affects the rate of convection.



Prediction:

The left-hand beaker is always cold. You will set the right-hand beaker to Warm or Hot. Which beaker do you predict will show the purple dye complete one full circuit faster?

My prediction:

Test it in the simulation.

Method:

1. Click Start Heating, then click Start Timing as soon as you see the purple dye begin to circulate in the cold (left) beaker.
2. When the dye completes one full circuit of the cold beaker, click Stop Timing. Record "Cold" as the water temperature, the circuit time, and a short description of the current in your results table.
3. Click Reset. Use the temperature selector to set the right-hand beaker to Hot (80°C). Repeat the timing for the right-hand beaker and record "Hot" in your table.
4. Click Reset again, set the temperature selector to Warm (50°C), and repeat, recording "Warm" in your table.
5. Repeat the whole procedure (steps 1–4) a second time so you have two timings for each temperature.

Results:

Water temperature	Time for one full circuit (s)	Description of convection current

Analysis:

Compare your two timings for each temperature. Are they consistent, or did the times vary? Why is it good practice to repeat a timing?

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As the water temperature increases from cold to warm to hot, what happens to the time for one full circuit?

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Plot temperature ($^{\circ}\text{C}$) on the horizontal axis and circuit time (s) on the vertical axis, using the mean of your two timings at each temperature. Describe the shape of your graph.

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Explaining why:

The purple dye traces the path taken by moving water — the convection current.

The Bunsen burner heats the water at the base of the beaker. Explain, step by step, why this makes water rise at the centre of the beaker and sink at the sides, using the words expand and density.

In terms of the kinetic energy of the water molecules, explain why the convection current's speed changes with temperature.

A radiator warms a room mainly by convection, even though it is fixed near the floor or wall rather than in the centre of the room. Using your explanation above, describe how a convection current would carry warmth around the whole room.
