Phys CP4 Investigating radiation

Your teacher may watch to see if you can:

- take careful measurements
- present your results as a line graph.

Aim

You are going to investigate the effect of different coloured surfaces on the amount of energy transferred by radiation from a boiling tube of hot water.

Method

A Cover four boiling tubes in different coloured materials. Try to use the same type of material (e.g. paper) for each tube, and the same thickness. Fasten the materials in place with sticky tape.

B Use the measuring cylinder to help you to pour the same volume of hot, but not boiling, water from a kettle into each tube.

C Measure the temperature of the water in each tube and start a stop clock.

D Record the temperature of the water in each tube every two minutes for 20 minutes.

Apparatus

- four boiling tubes
- test tube rack
- measuring cylinder
- four thermometers
- stop clock
- insulating materials
- sticky tape
- hot water

Recording your results

1 Draw a table like this to record your results.

Time (min)	Temperature (°C)			
	Tube 1	Tube 2	Tube 3	Tube 4
0				
2				

2 Draw a line graph to present your results. Time should go on the horizontal axis. Plot all four sets of results on the same axes and join each set of points with a smooth curve.

Considering your results/conclusions

3 Describe what your graph shows about the rate of cooling of the water in each tube.

4 Which colour is best at emitting radiation? Which is the worst? Explain your conclusion.

Evaluation

5 How well do your results support your conclusion? Your answer should refer to your graph.

6 Can you draw a general conclusion from your results (such as that light colours emit more radiation than dark colours)? Explain your answer.

Phys CP4 A model swimming pool

Your teacher may watch to see if you can:

- make accurate readings and record them clearly.

Introduction

You are going to use a laboratory water bath as a model for the control of water temperature in a public swimming pool. The pool should be maintained at a constant temperature for the comfort of swimmers. A laboratory water bath has a water heater, just like a swimming pool.

Prediction

1 Explain how you think the temperature of the water in the water bath will change if it is left on.

Apparatus

- clamp and stand
- stop clock
- thermometer
- water bath
- ruler

Method

A Set up your thermometer in the water bath, using a clamp and stand. If another group is using the same water bath, then it will be more interesting to compare the results if you position your thermometers at different depths. Measure the depth of the thermometer bulb under the water.

B Measure the starting temperature as you start your stop clock.

C Every 30 seconds, record the temperature of the water bath. Do not adjust the control settings on the water bath, but continue taking readings even if your teacher changes the controls. If your teacher *does* adjust the controls, note down the times at which this happened and how the control was changed.

D Your teacher may ask you to repeat the experiment using a different water bath.

Recording your results

2 Draw a table to record the temperature measurements.

Considering your results/conclusions

3 Plot a line graph showing how the temperature changed during the time for which you measured it. Time should be on the *x*-axis and temperature on the *y*-axis.

4 Describe how the temperature changes (or stays the same) over the time you measured it. Are there any big changes in temperature? Explain why you think the temperature behaved as it did.

5 Explain the transfer of energy (energy inputs and outputs) in each of the following situations.

a Water bath temperature remains constant.

b Water bath temperature is going up.

c Water bath temperature is falling.