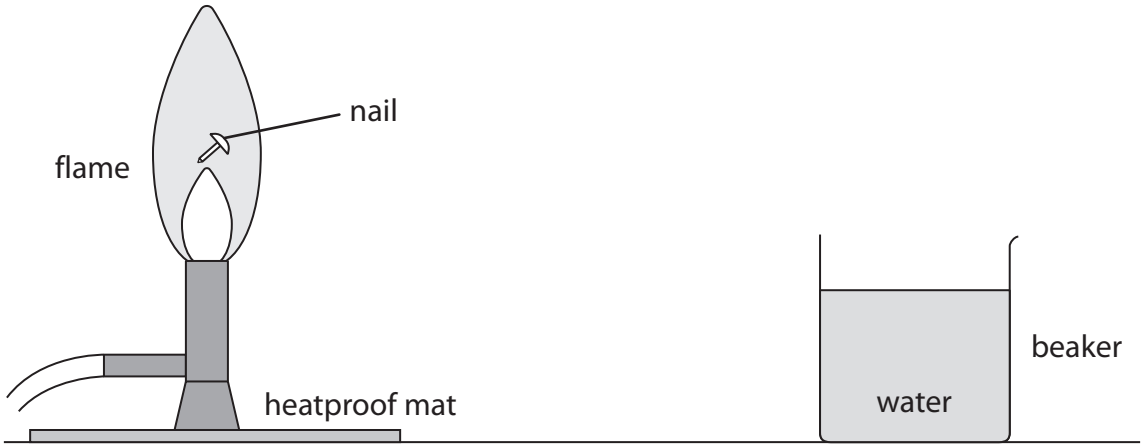
9 A student uses a small iron nail and a beaker of water to estimate the temperature of a flame. The diagram shows some of the equipment used.



This is the student's method

- place a thermometer into the beaker of water
- record the temperature of the water
- heat the nail in the flame for a long period of time
- quickly move the nail into the beaker of water
- record the highest temperature of the water

(a) State a safety precaution the student should take.

(1)

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(b) While in the water, the thermal energy store of the nail decreases and the thermal energy store of the water increases until their temperatures are the same.

The energy lost from the nail is equal to the energy gained by the water.

The table shows the student's results.

Mass of water in g	138
Specific heat capacity of water in J/kg °C	4200
Temperature change of water in °C	5.0
Mass of nail in g	4.8
Specific heat capacity of iron in J/kg °C	450

(i) Show that the energy gained by the water is approximately 3000 J.

(2)

(ii) Calculate the temperature change of the nail.

(3)

Temperature change = ... °C

(iii) Give a reason why the calculated temperature change of the nail is lower than the actual temperature change.

(1)

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(Total for Question 9 = 7 marks)

TOTAL FOR PAPER = 70 MARKS