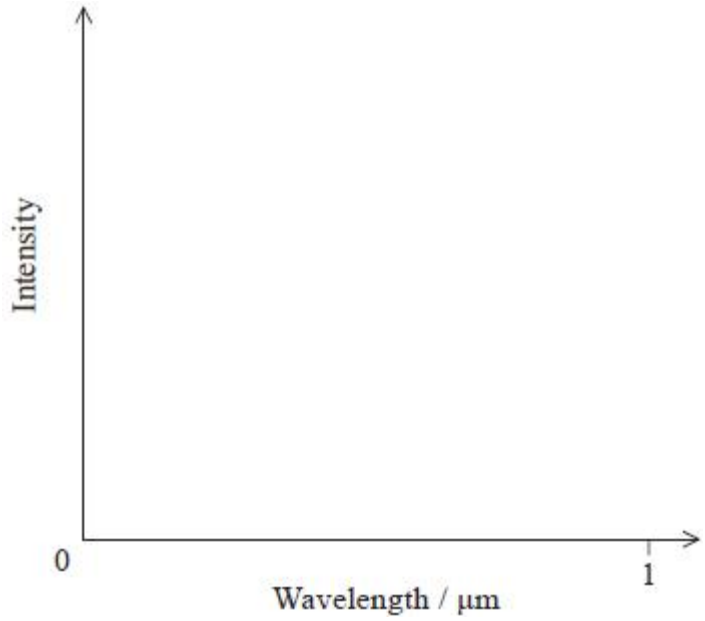
Name of the Student:_____
Max. Marks : 19 Marks **Time : 19 Minutes**

Q1.

Rigel A in the constellation of Orion is one of the brightest stars in the sky. It is a massive blue variable star with an intensity peak at a wavelength λ_{max} of 0.25 μm.

On the axes below, sketch a graph of the intensity of radiation emitted by Rigel A against the wavelength of that radiation.

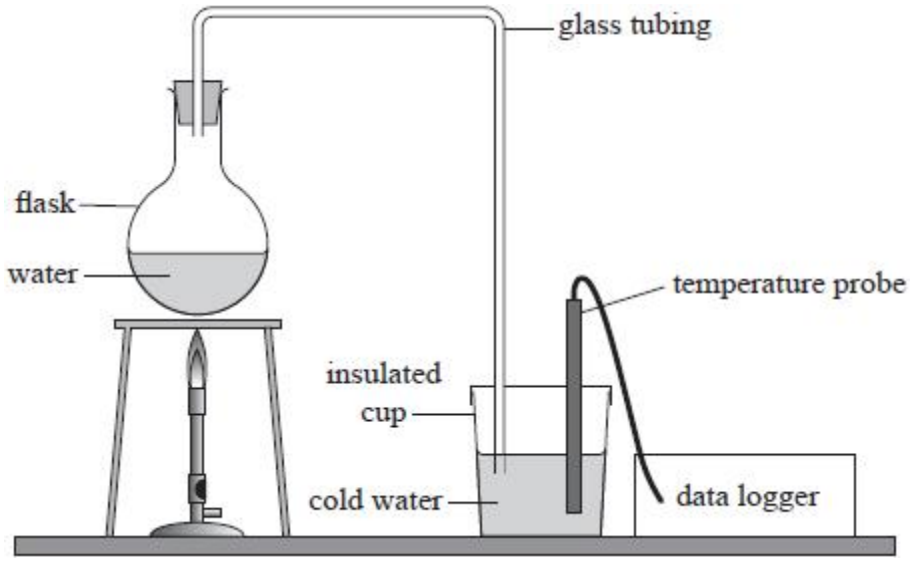
(2)



(Total for question = 2 marks)

Q2.

A student carried out an experiment to determine the specific latent heat of vaporisation of water using the apparatus shown.



The water in the flask was heated and steam was forced out of the flask and through the glass tubing into the cold water in the insulated cup. The steam condensed as it passed into the cold water.

(i) Explain why the water was heated to boiling point and left boiling for a few minutes before the insulated cup of cold water was put in place.

(2)

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(ii) Identify a significant source of error in this experiment and the steps that should be taken to minimise its effect on the calculated value of the specific latent heat of vaporisation of water.

(2)

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(Total for question = 4 marks)

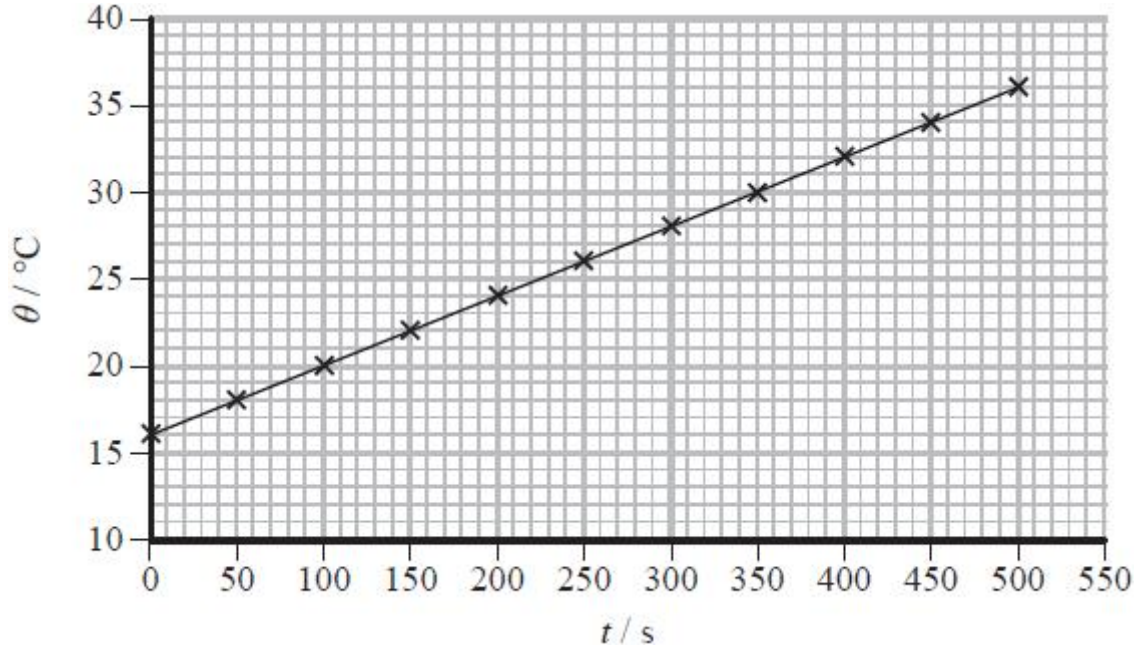
Q3.

A student determined the specific heat capacity of aluminium.

She used an electrical heater to heat an aluminium block and measured the temperature of the block with a digital thermometer.

The student monitored the temperature θ of the aluminium block over the time t for which the heater was switched on.

Her results are plotted on the graph.



(i) Determine the specific heat capacity of aluminium.

power of heater = 37.5 W
mass of aluminium block = 0.986 kg

(3)

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Specific heat capacity of aluminium = ...

(ii) The student looked up the accepted value for the specific heat capacity of aluminium. Using this value, the student predicted that it should have taken 240 s for the temperature of the aluminium block to increase by 10 °C.

Explain the difference between the predicted time and the student's actual observations.

(2)

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(Total for question = 5 marks)

Q4.

It is suggested that before making tea in a teapot, the teapot should be warmed by pouring hot water into it. This allows more flavour to be extracted from the tea.

(a) Suggest why a pre-warmed teapot may allow more flavour to be extracted.

(1)

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(b) (i) 0.26 kg of water at 95 °C is added to a stainless steel teapot. In a very short time the teapot and water both reach a temperature of 81 °C.

Show that the energy transferred from the water is about 15 kJ.
specific heat capacity of water = 4200 J kg^{-1} K^{-1}

(2)

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(ii) Calculate the specific heat capacity of stainless steel, stating any assumption you make.
mass of teapot = 0.43 kg
initial temperature of teapot = 22 °C

(3)

Assumption

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Specific heat capacity = ... J kg^{-1} K^{-1}

(iii) The accepted value for the specific heat capacity of stainless steel is about 500 J kg^{-1} K^{-1}. Compare this with the value you have calculated and explain the difference.

(2)

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(Total for question = 8 marks)