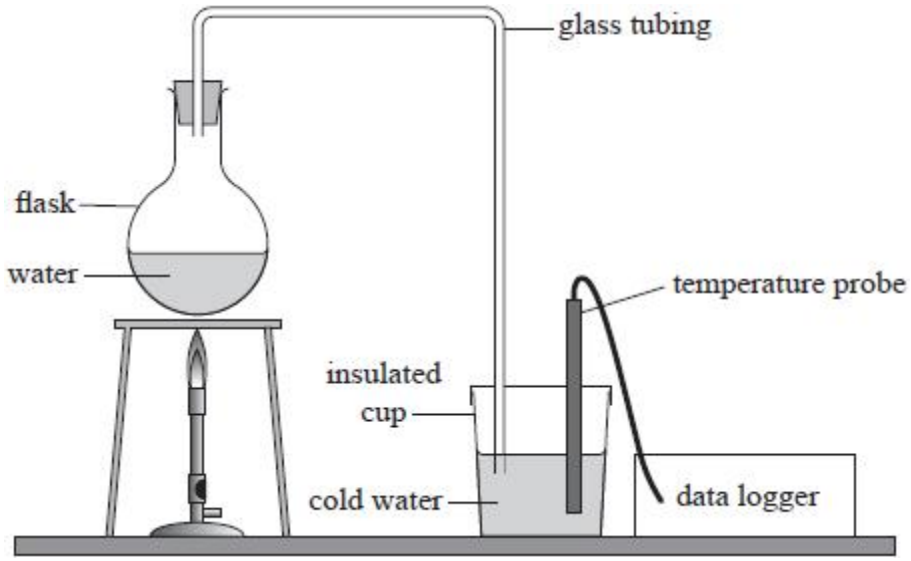
Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Q1.

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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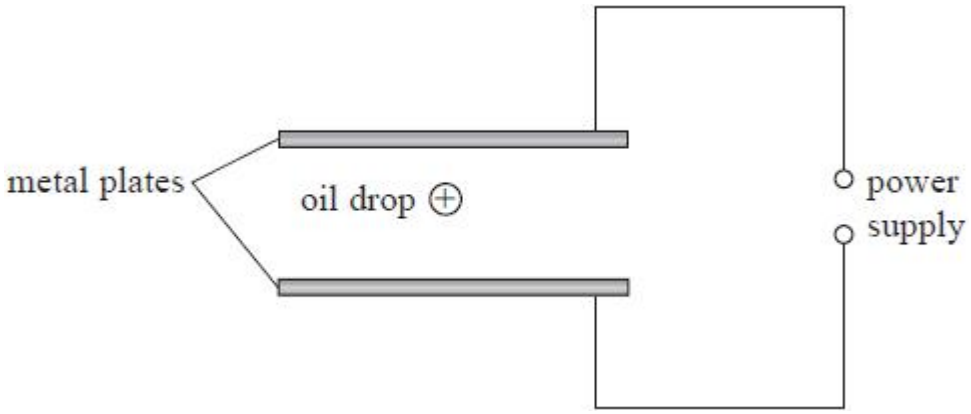
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(Total for question = 4 marks)

Q2.

A student investigated the behaviour of small, positively charged oil drops in an electric field.

He introduced an oil drop between two horizontal metal plates. A potential difference *V* was applied to bring the oil drop to rest as shown.



The student determined the terminal velocity of the oil drop in order to obtain a value for the weight of the oil drop.

He disconnected the power supply and the oil drop fell downwards. He viewed the oil drop through a microscope.

(i) Explain why the student should wait a short while before starting to take measurements.

(2)

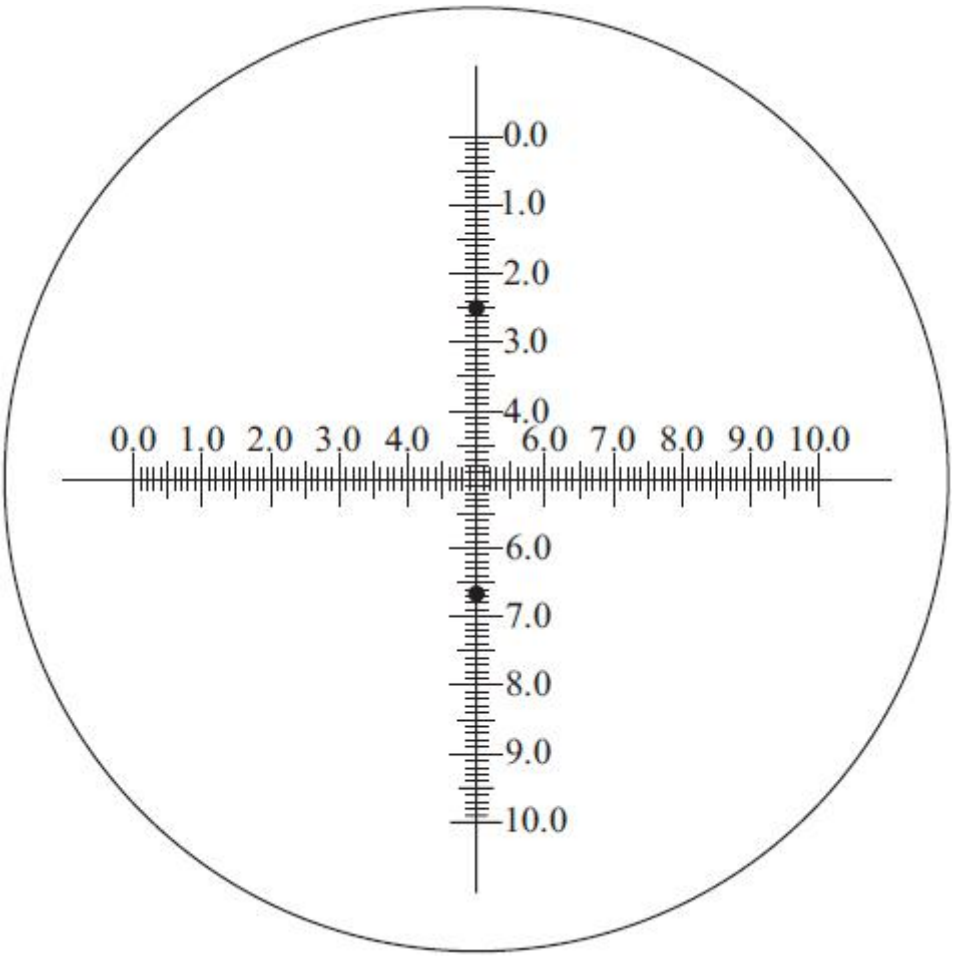
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(ii) The view through the microscope is shown below. The scale is in millimetres.

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The position of the oil drop at the start and end of a 120s time interval is indicated by the black dots.
Determine the terminal velocity of the oil drop.

(3)

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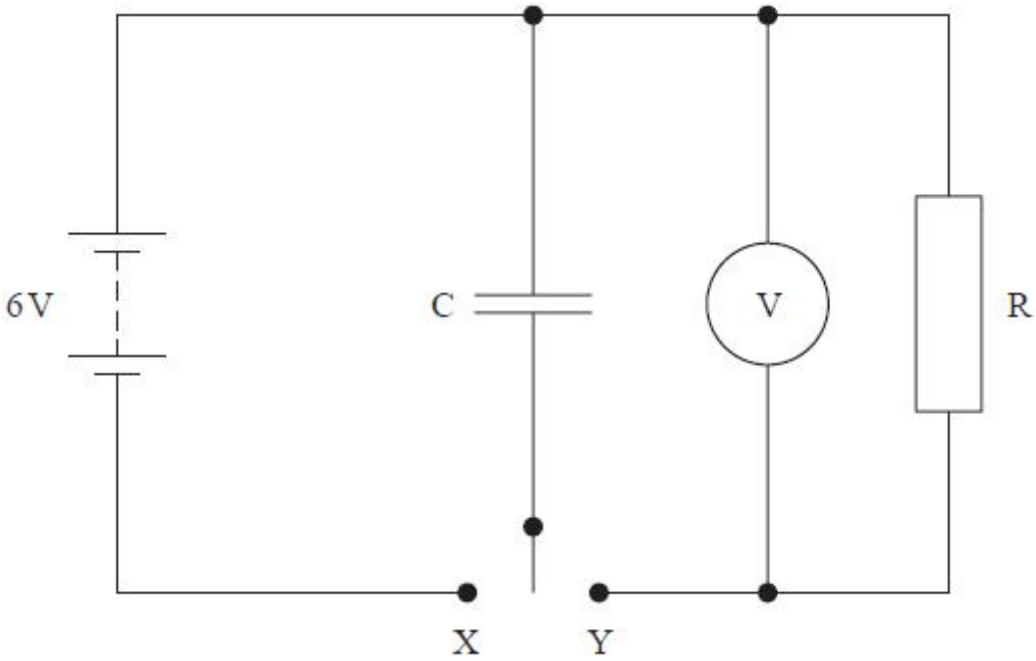
Terminal velocity = ...

(Total for question = 5 marks)

Q3.

A student investigated the discharge of a capacitor C through a resistor R using the circuit shown.

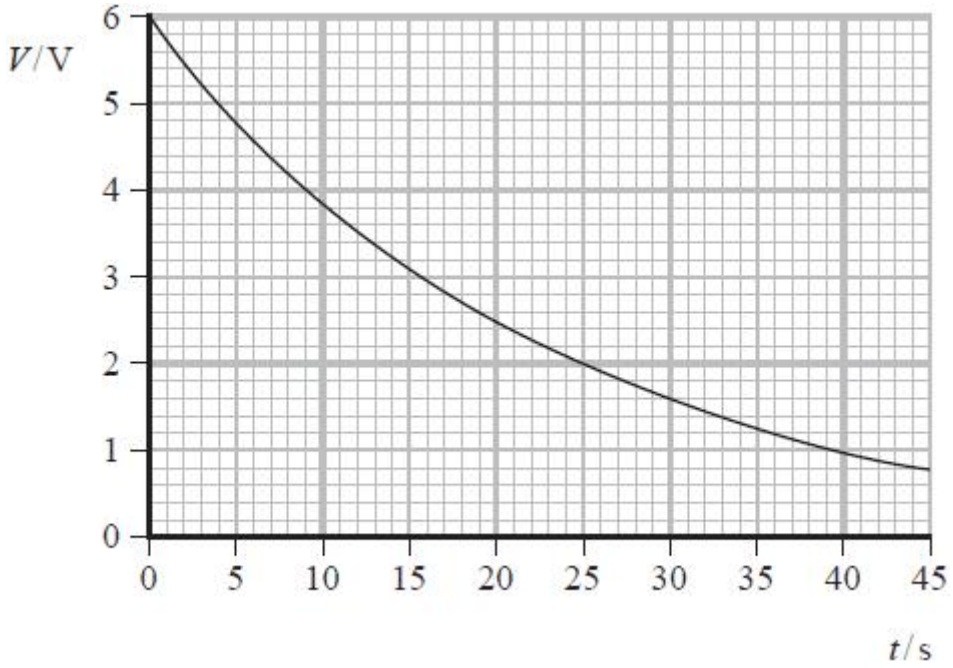
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The student used the switch to connect C to X to charge the capacitor. She then connected C to Y to discharge the capacitor through R.

As the capacitor discharged, she recorded values of the potential difference *V* across *C* and corresponding values of time *t*. She used a stopwatch to measure *t*.

The student used her results to plot the following graph.



The capacitor was marked 220 μF ± 20%.

Deduce whether the student's data give a value of capacitance within the stated range.

R = 82 kΩ

(5)

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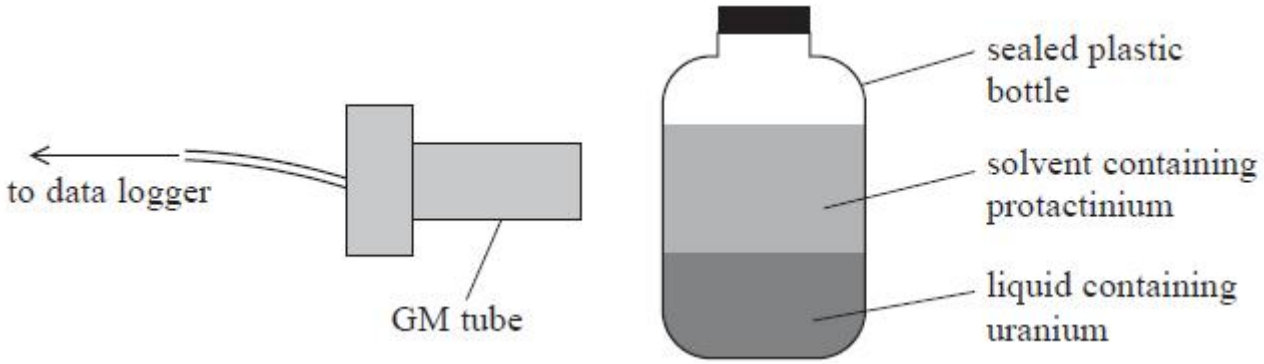
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(Total for question = 5 marks)

Q4.

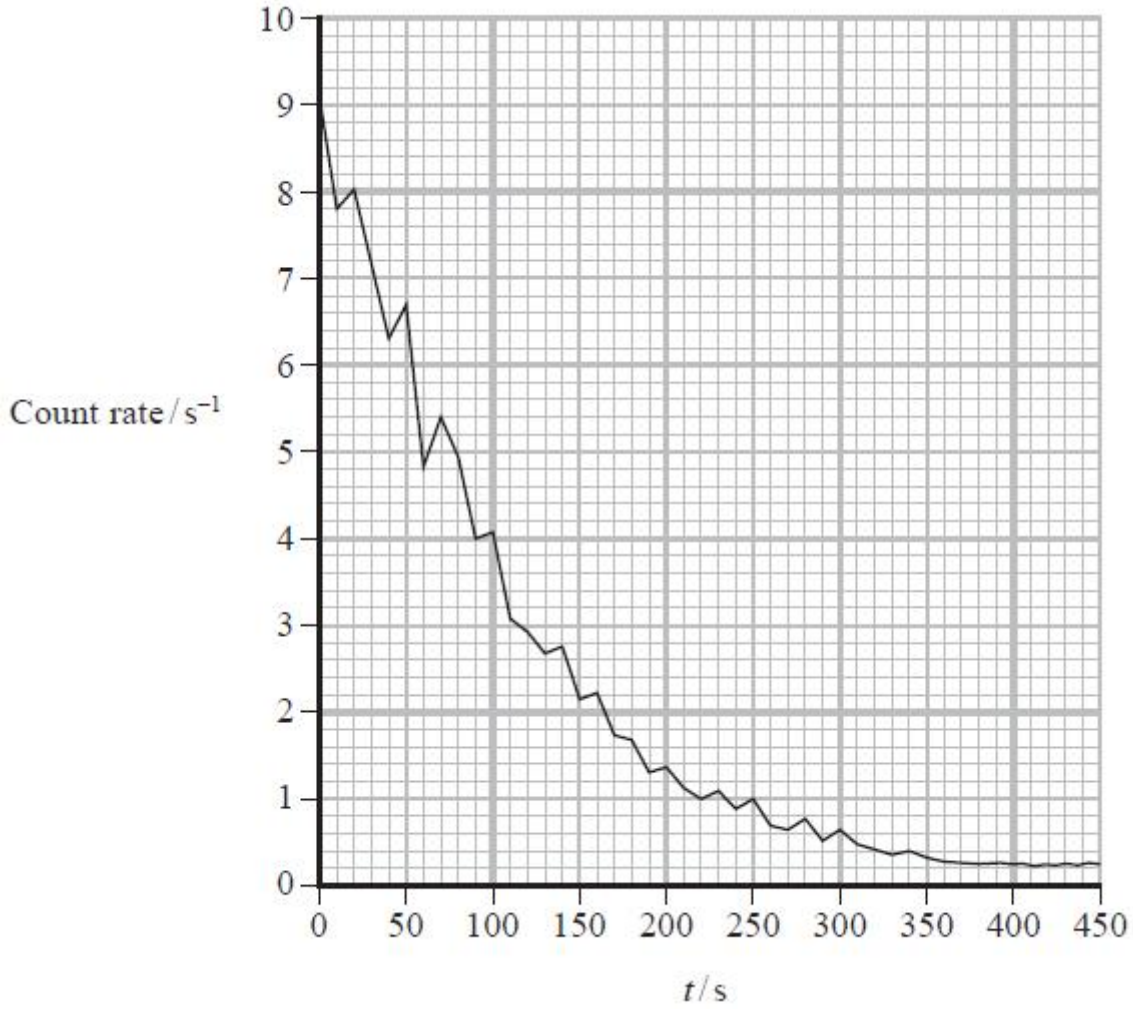
A teacher demonstrated the decay of protactinium using a Geiger-Müller (GM) tube connected to a data logger.

A sealed plastic bottle contains a solvent floating above a liquid containing a uranium salt. Protactinium is produced from the decay of uranium and is present in the solvent as shown.



The data logger output is shown below.

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(i) Determine the half-life of the protactinium.

(4)

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Half-life of protactinium = ...

(ii) Explain why the count rate doesn't reach zero.

(2)

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(Total for question = 6 marks)

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