Practice Question Set For A-Level
Subject : Physics
Paper-3 Topic : Practical Skills

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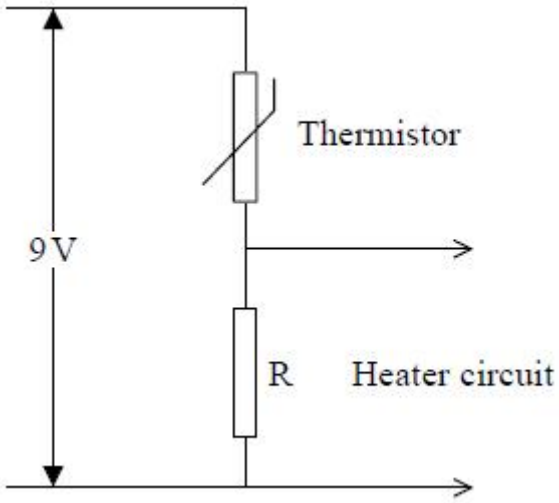
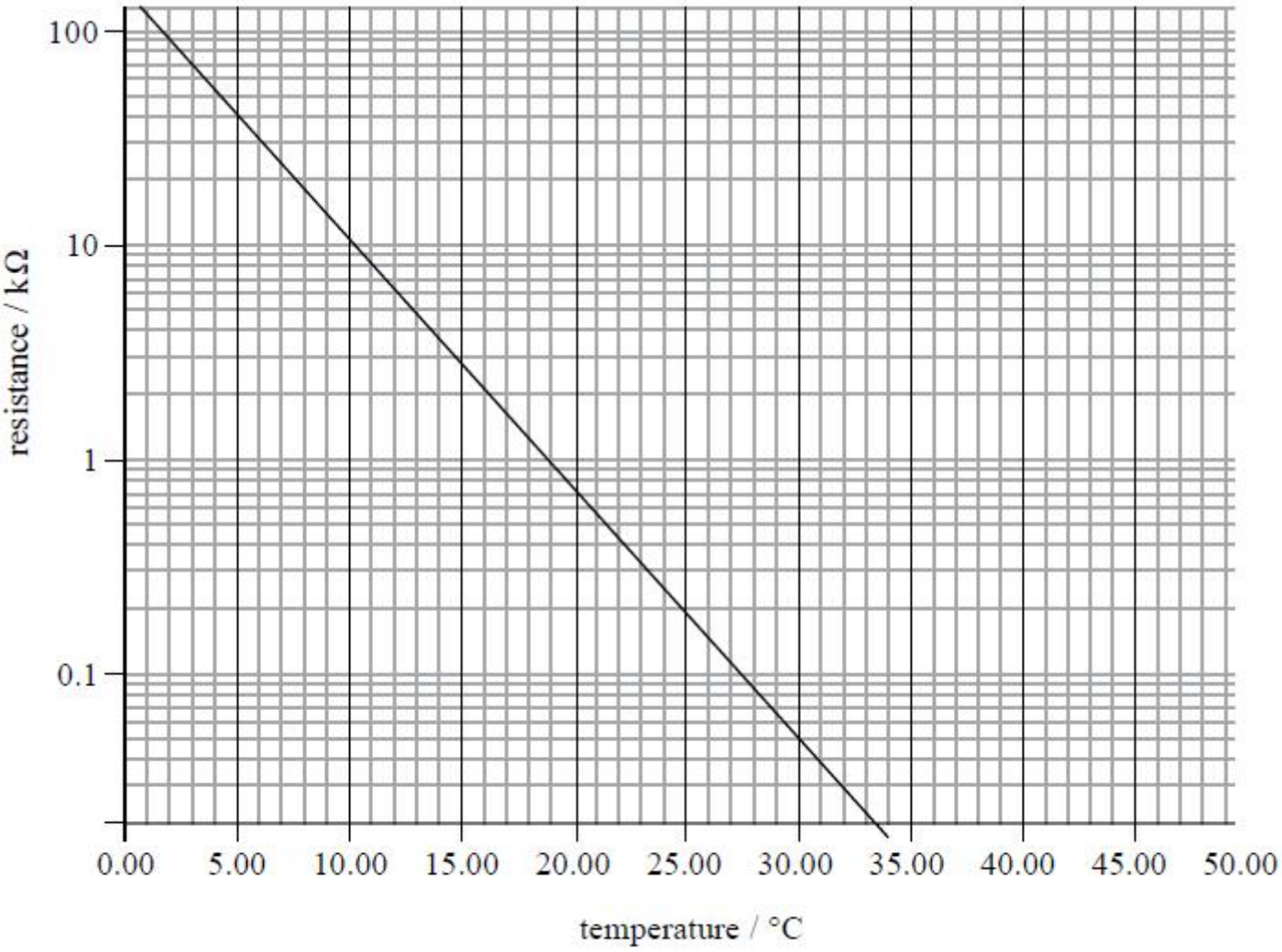
Name of the Student:_____
Max. Marks : 21 Marks **Time : 21 Minutes**

Q1.

A thermistor can be used to control a heater. When the temperature falls below a certain value the heater is switched on. The thermistor is connected in series with a fixed resistor R in a potential divider circuit as shown.



The heater circuit is connected across R and will switch on when the potential difference across it is above 5.5 V.
The variation of resistance of the thermistor R_T with temperature is shown on the graph.



(Source: http://reviseomatic.org/help/e-resistors/ThermistorLogGraph.gif)

With reference to charge carriers, explain why the resistance of the thermistor R_T, changes with temperature.

(2)

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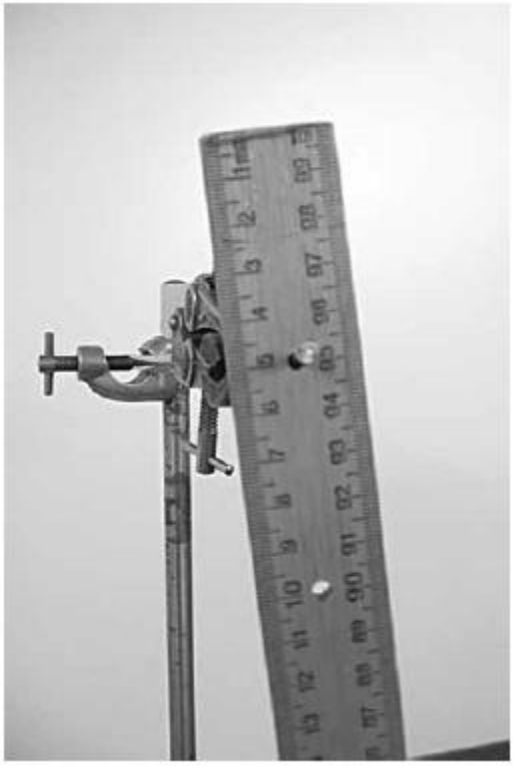
(Total for question = 2 marks)

Q3.

A metre rule has a small hole drilled at the 5 cm mark. The rule is hung on a horizontal pin passing through the hole.



The rule is rotated through a small angle and released. It then oscillates about the pin as a pendulum with a time period *T*.

(i) Describe how to use a stopwatch to determine a value for *T*.

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(ii) State **two** reasons why repeating the readings will improve the results for *T*.

(2)

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(Total for question = 4 marks)

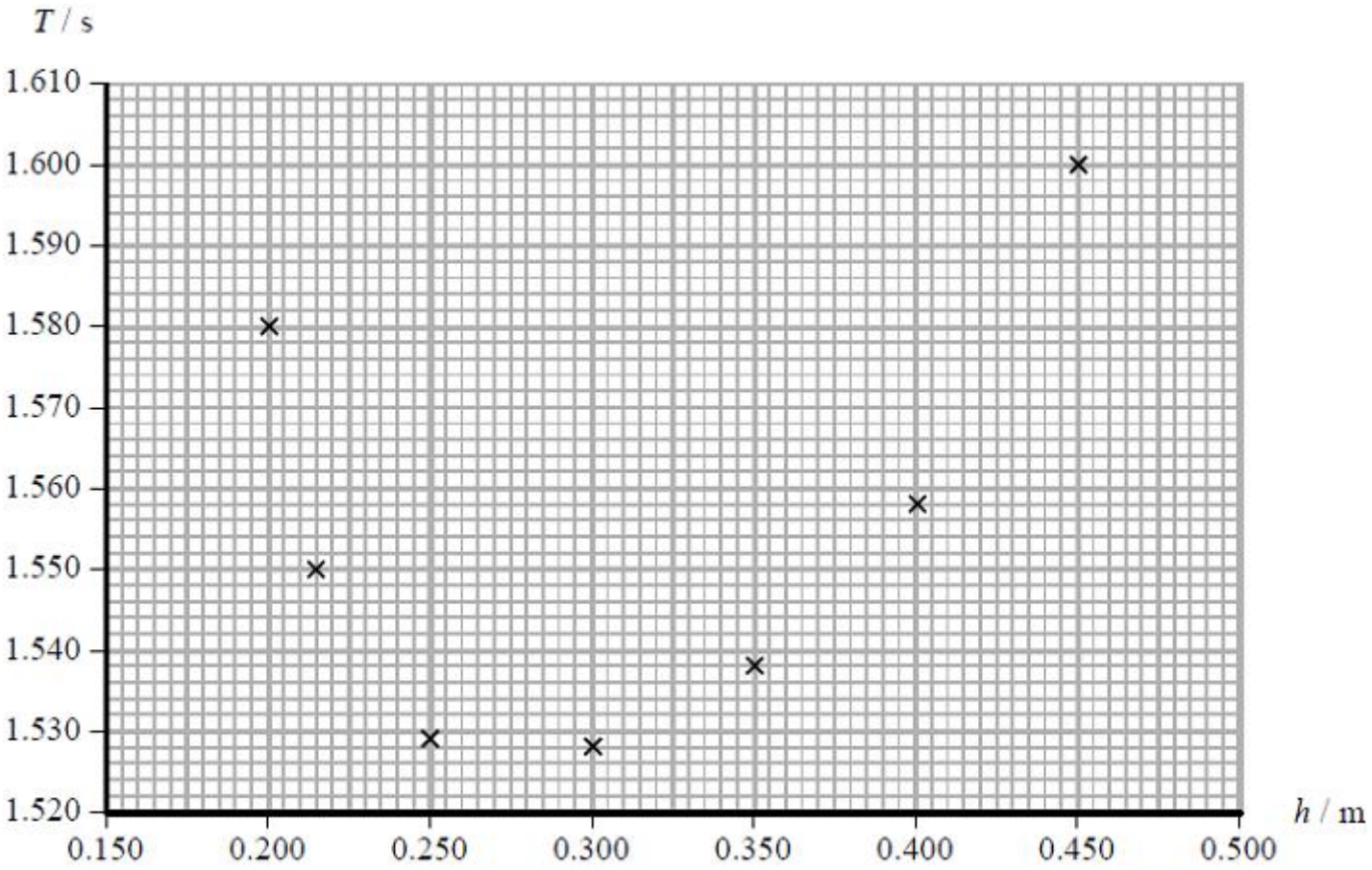
Q4.

A metre rule has a small hole drilled at the 5 cm mark. The rule is hung on a horizontal pin passing through the hole.

(a) There are six more holes drilled at intervals down the rule. The rule is hung from each hole and the distance *h* from the pin to the 50 cm mark is recorded.

T is determined for each value of *h* and a graph of *T* against *h* is plotted.

h/m	*T*/s
0.450	1.601
0.400	1.558
0.350	1.538
0.300	1.528
0.250	1.529
0.215	1.550
0.200	1.580



(i) Draw a line of best fit on the graph.

(1)

(ii) Use your line to determine the value of h that would produce the smallest value of T.
Record these values.

(2)

h = ...T = ...

(b) The graph of T against h does **not** produce a straight line.

The variables T and h are related by
$T^2h = 4\pi^2h^2/g + C$
where C is a constant.
Describe a graphical method to determine a value for C and state the unit for C.

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(Total for question = 6 marks)

Q5.

The photograph shows a tea cup on a saucer.

A student notices that walking with this sort of tea cup when it is filled with tea is particularly difficult to do without spilling it.

While walking, the tea starts to oscillate from side to side in the cup, rapidly increasing in amplitude and spilling over the edge.

The student develops the hypothesis that spillage occurs most when the frequency of the steps taken by a person matches the natural frequency of oscillation of tea in the cup.

*(i) Devise an experiment to investigate the hypothesis.

(6)

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(ii) Describe how the measurements taken will be used to come to a conclusion.

(3)

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(Total for question = 9 marks)