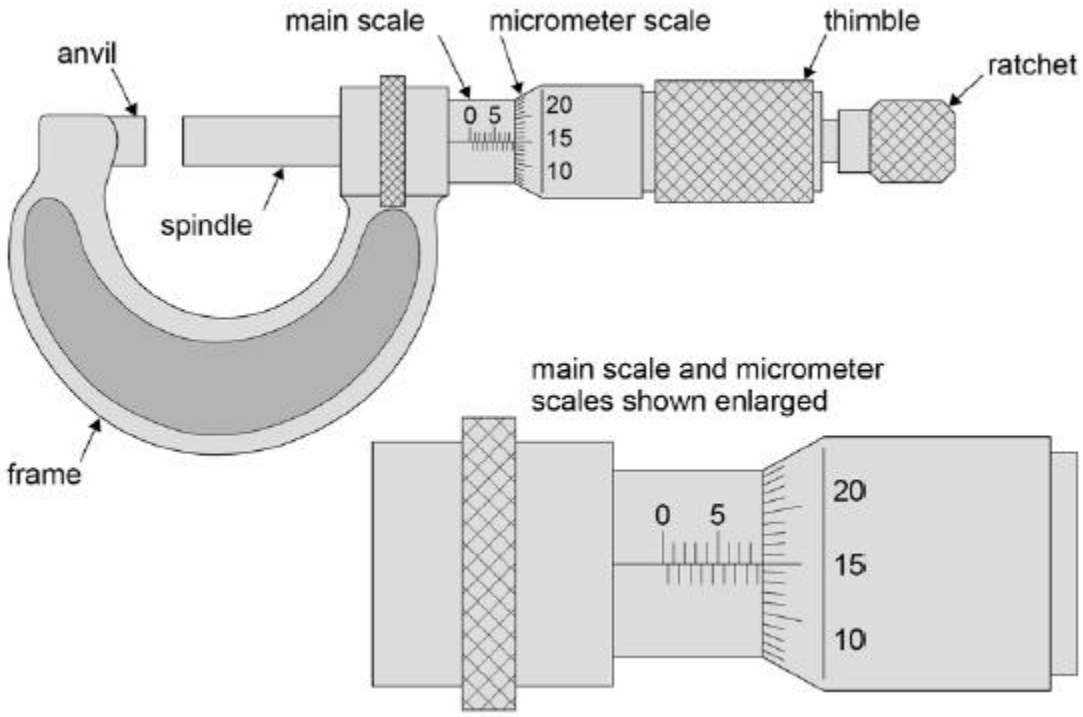
Name of the Student:_____
Max. Marks : 22 Marks **Time :** 22 **Minutes**

Q1.

This question is about the determination of the resistivity of a wire.

Figure 1 shows a micrometer screw gauge that is used to measure the diameter of the wire.

Figure 1



(a) State the resolution of the **main scale** on the micrometer in **Figure 1**.

resolution = _____mm

(1)

(b) Determine the distance between the anvil and the spindle of the micrometer in **Figure 1**. State any assumption you make.

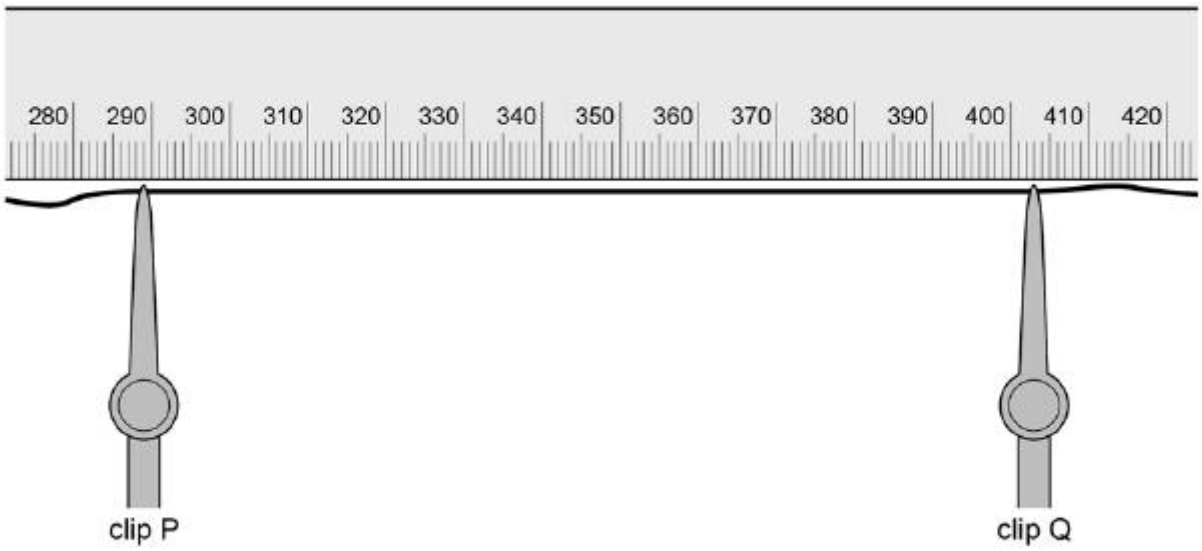
distance = _____mm

(2)

(c) A student must also determine the length L of the wire between clips P and Q that will be connected into a circuit.

Figure 2 shows the metre ruler being used to measure L.

Figure 2



Determine L

L = _____ mm

(1)

(d) Calculate the percentage uncertainty in your result for L.

percentage uncertainty = _____ %

(2)

(e) State and explain what the student could have done to reduce uncertainty in the reading for L.

_____

_____

_____

(1)

(f) The student intends to make measurements that will allow her to determine the resistance of one metre of the wire. She uses an ohm-meter to measure the resistance R for different lengths L of the wire. The student's measurements are shown in the table below.

L/cm	***R/Ω***	
81.6	8.10	
72.2	7.19	
63.7	6.31	
58.7	5.85	
44.1	4.70	

Determine the value that the student should record for the resistance per metre of the wire.

Use the additional column in the table above to show how you arrived at your answer.

resistance of one metre of wire = _____ Ω

(2)

(g) Determine the resistivity of the wire. Give a suitable unit for your answer.

mean diameter of the wire = 0.376 mm

resistivity = _____ unit = _____

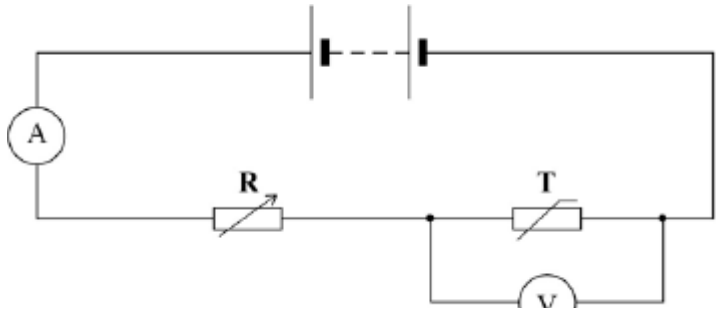
(4)

(Total 13 marks)

Q2.

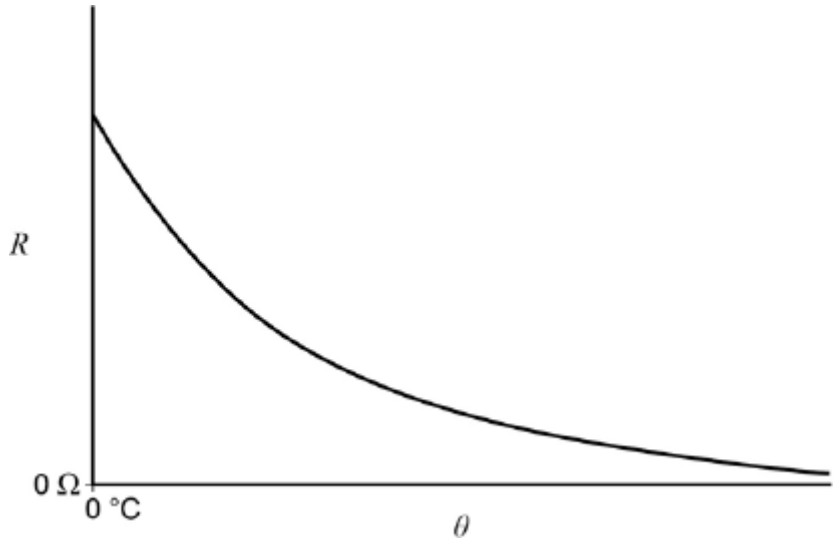
Figure 1 shows a circuit including a thermistor **T** in series with a variable resistor **R**. The battery has negligible internal resistance.

Figure 1



The resistance–temperature ($R-\theta$) characteristic for **T** is shown in **Figure 2**.

Figure 2



(a) The resistor and thermistor in **Figure 1** make up a potential divider.

Explain what is meant by a potential divider.

_____

_____

_____

(1)

(b) State and explain what happens to the voltmeter reading when the resistance of **R** is increased while the temperature is kept constant.

_____

_____

_____

_____

_____

_____

(3)

(c) State and explain what happens to the ammeter reading when the temperature of the

thermistor increases.

_____

_____

_____

_____

(2)

(d) The battery has an emf of 12.0 V. At a temperature of 0 °C the resistance of the thermistor is $2.5 \quad 10^3$ Ω.

The voltmeter is replaced by an alarm that sounds when the voltage across it exceeds 3.0 V.

Calculate the resistance of R that would cause the alarm to sound when the temperature of the thermistor is lowered to 0 °C.

resistance = _____ Ω

(2)

(e) State **one** change that you would make to the circuit so that instead of the alarm coming on when the temperature falls, it comes on when the temperature rises above a certain value.

_____

_____

_____

(1)

(Total 9 marks)