Name of the Student:_____
Max. Marks : 26 Marks **Time : 26 Minutes**

Q1.

(a) Sketch, on the axes, the light curve for a typical type 1a supernova.
Label the axes with suitable scales.

(3)

(b) Type 1a supernovae can be used as standard candles.

Explain what is meant by a standard candle.

_____

_____

_____

_____

(1)

(c) Measurements of type 1a supernovae in 1999 led to a controversy concerning the behaviour of the Universe.

Describe this controversy and how the measurements led to it.

_____

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(3)

(Total 7 marks)

Q2.

According to NASA nearly 2000 exoplanets had been discovered by 2016, and the search continues. One aim of this search is to find an Earth-like planet orbiting a Sun-like star.

Discuss the difficulties associated with the detection of an Earth-like planet orbiting a Sun-like star.

In your answer you should compare the methods that are used in the search and suggest which may be the most successful.

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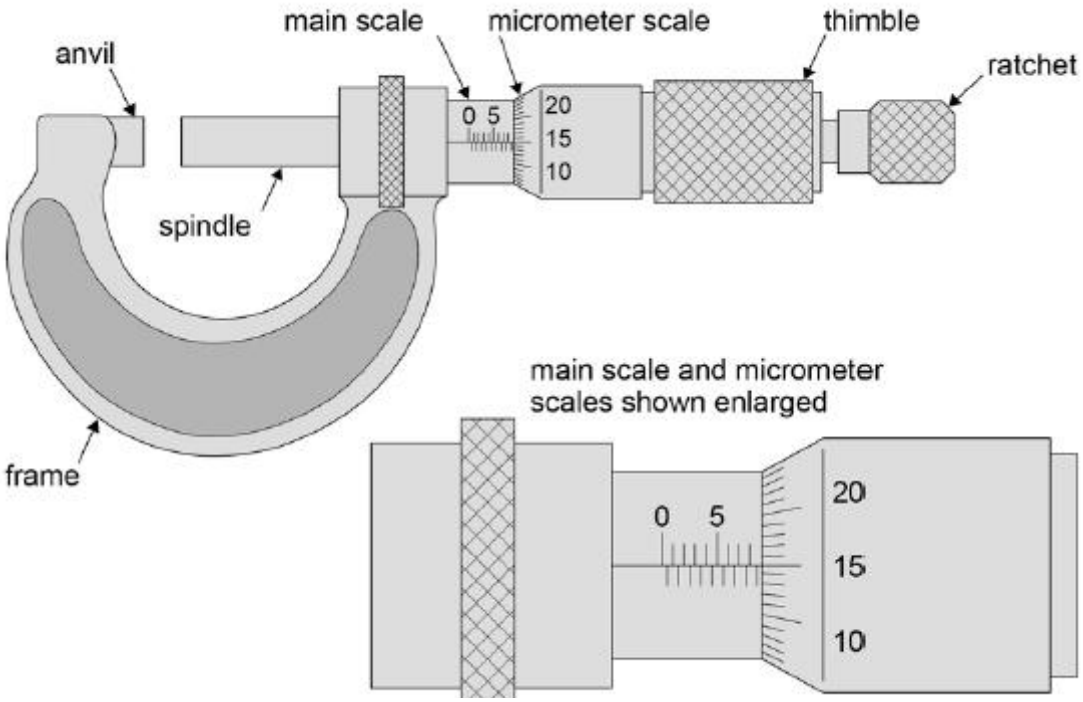
(Total 6 marks)

Q3.

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.

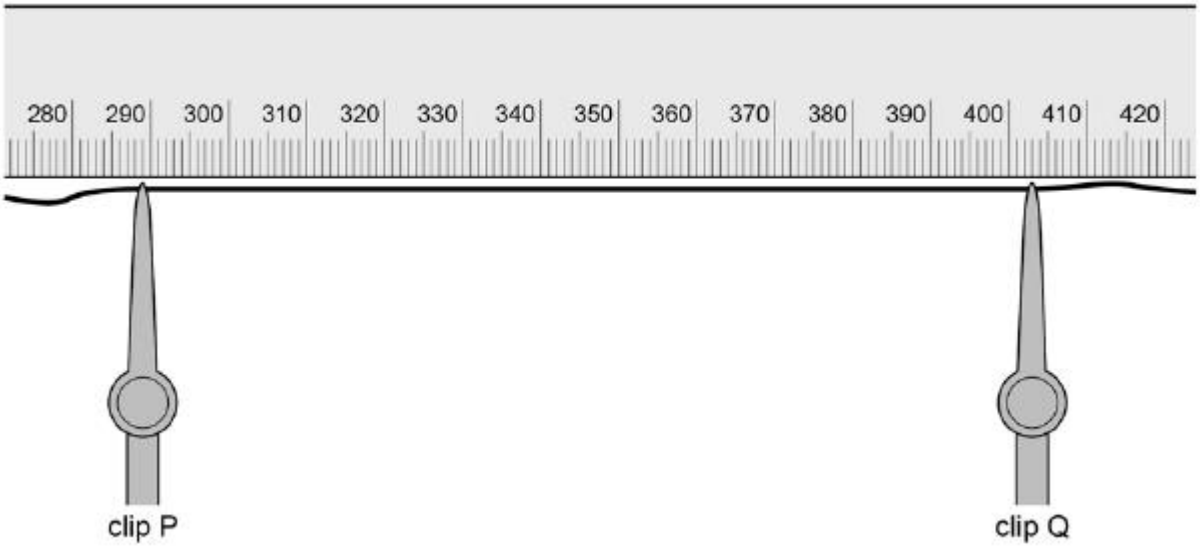
distance = _____mm

(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)