

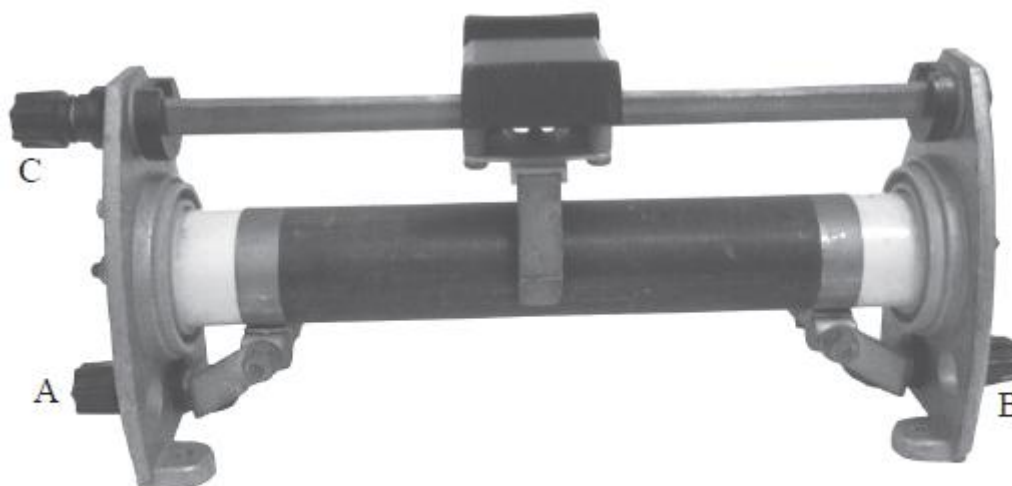
Name of the Student: _____

Max. Marks : 18 Marks

Time : 18 Minutes

Q1.

Photograph 1 shows a rheostat (a variable resistor).

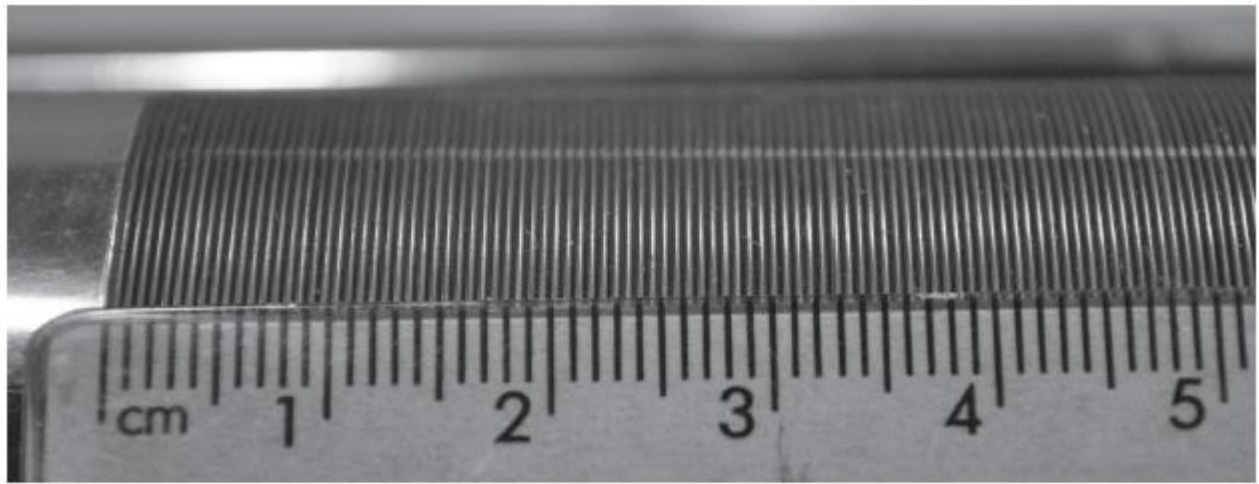


Photograph 1

The rheostat is made of a long resistance wire coiled around an insulating cylinder. The turns of wire are also separated from each other by insulation of negligible thickness. The ends of the wire are connected to the sockets A and B at either end and there is a sliding contact in the centre connected to the socket C. The resistance between A and C is varied by moving the sliding contact.

(a) A student decides to determine the resistivity of the material from which the wire is made by measuring the dimensions of the wire and its resistance.

Photograph 2 shows a section of the rheostat and a scale.



Photograph 2

- (i) Take measurements from the photograph and use them to show that the cross-sectional area of the wire is about $2 \times 10^{-7} \text{ m}^2$.

(3)

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- (ii) Calculate the resistivity of the material from which the wire is made.

resistance of wire = 22Ω

length of wire = 12 m

(3)

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Resistivity = ...

- (iii) Suggest an advantage for the student of using a photograph rather than taking direct measurements.

(1)

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- (b) The coil of the rheostat is 10.2 cm long. A potential difference of 12 V is applied across AB and the slider C is 7.0 cm from the end of the coil near A.

(2)

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Potential difference = ...

(Total for question = 9 marks)

Q2.

A physicist investigates how light intensity varies with distance from a light bulb. She sets up the apparatus as shown.

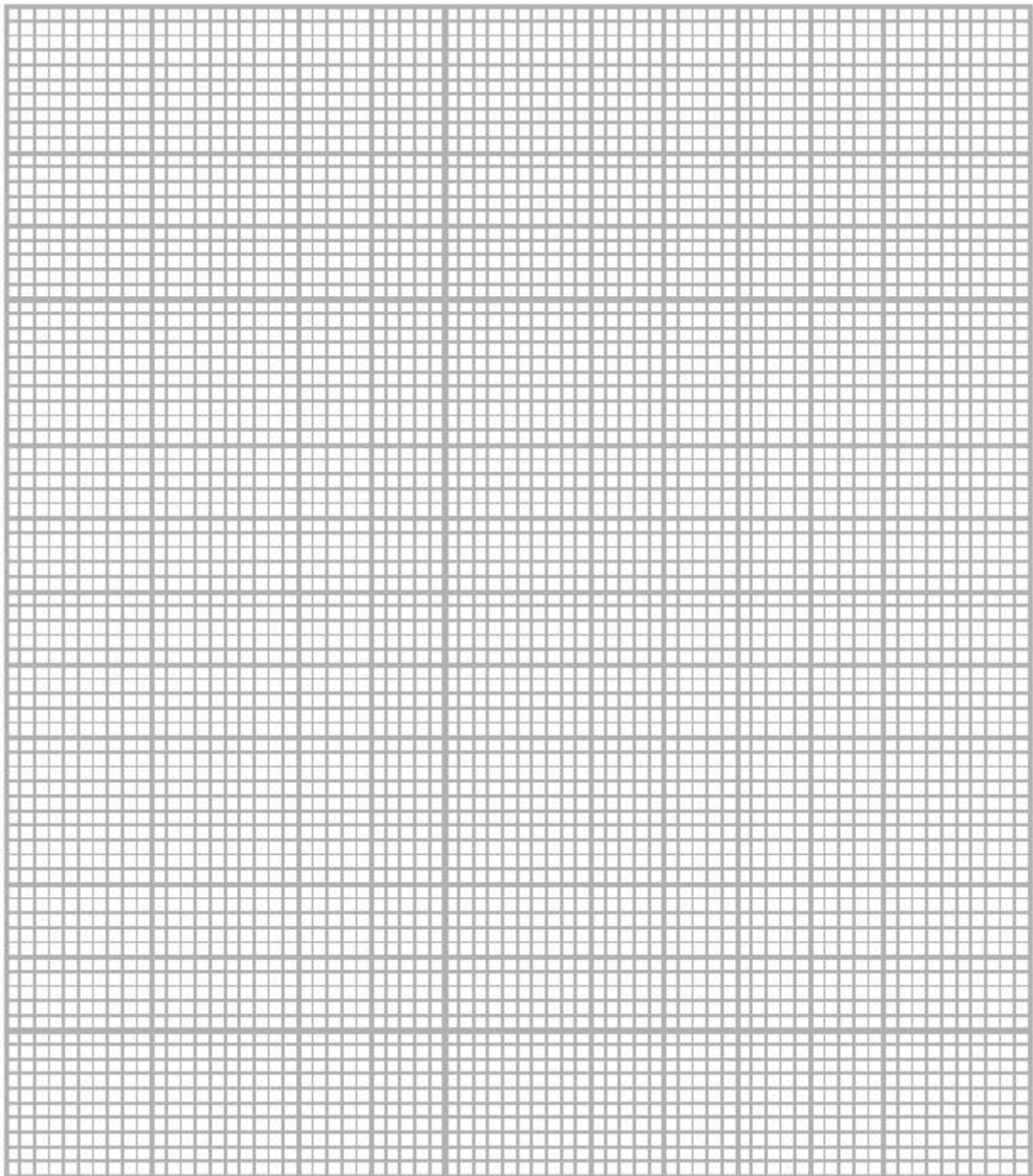


She measures R for different values of d and records the following results.

d/m	$R/\text{k}\Omega$		
1.00	1.79		
1.20	2.24		
1.60	3.32		
2.00	4.04		
2.60	5.50		

(i) Plot a graph of $\ln R$ against $\ln d$. Use the columns provided to show any processed data.

(5)



(ii) Determine the mathematical relationship between R and d .

(4)

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(Total for question = 9 marks)