



BRAINIACS OLYMPIAD

GRADES 9-10

PHYSICS SAMPLE PAPER (PRACTICAL PART)



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PHYSICS SAMPLE PAPER-PRACTICAL PART

Grade: 9-10

Time: 120 minutes

Total points: 100

Equipment: Not required

TASK 1 (Written): Ohm's Law Graph

1. A student investigates the resistance of a wire. Fig. 2.1 shows the circuit used.

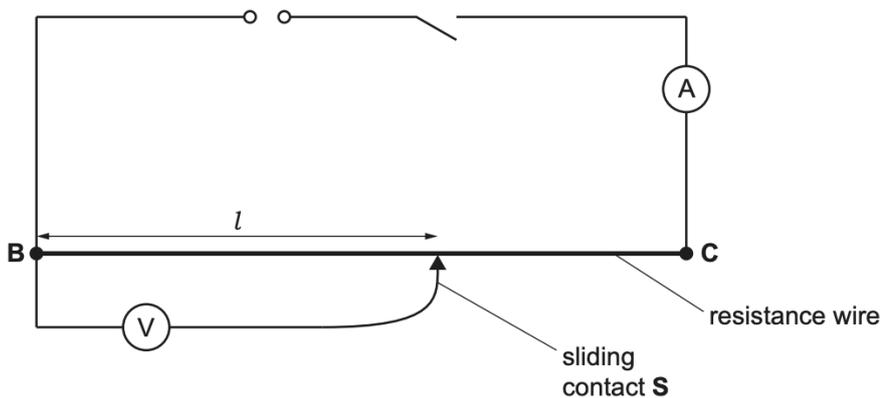


Fig. 2.1

- (a) The student places a sliding contact S at a distance $l = 40.0$ cm from B. She measures the potential difference (p.d.) V across the length l of the resistance wire. She measures the current I in the circuit. The meters are shown in Fig. 2.2 and Fig. 2.3.

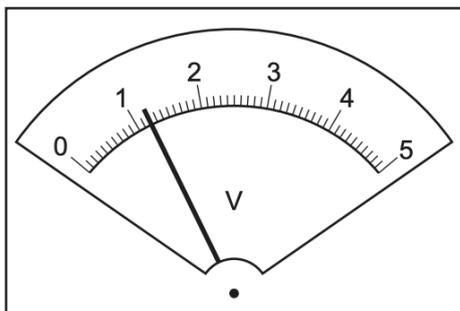


Fig. 2.2

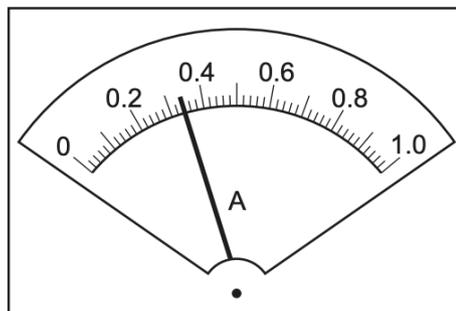


Fig. 2.3

(i) Write down the current I .

$I = \dots\dots\dots [5]$

- (ii) Record the potential difference V reading in the first row of Table 2.1. [5]
- (b) The student repeats the procedure in (a) using $l = 50.0\text{cm}$, 60.0cm , 70.0cm and 80.0cm . The readings are shown in Table 2.1.

(i) Calculate, and record in Table 2.1, the values of resistance R using the equation

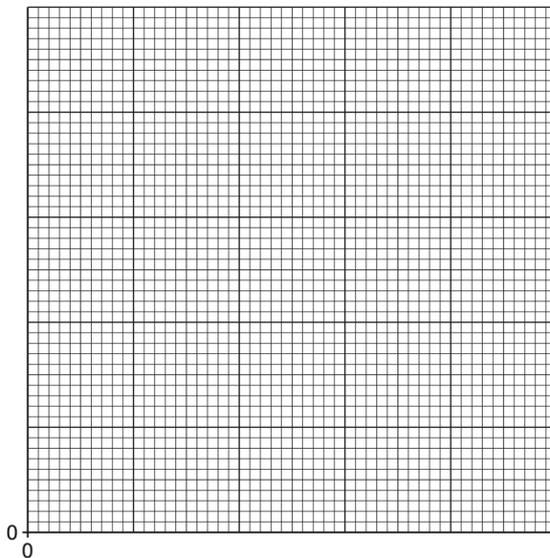
$$R = \frac{V}{I} \quad [9]$$

(ii) Complete the column headings in Table 2.1. [4]

Table 2.1

$l/$	$V/$	$R/$
40.0		
50.0	1.5	
60.0	1.8	
70.0	2.1	
80.0	2.4	

- (c) Plot a graph of R (y-axis) against V (x-axis). Start both axes at the origin (0,0). Draw the best [18]



- (d) Determine the gradient G of the graph. Show clearly on the graph how you obtained the necessary information.

$G = \dots\dots\dots [9]$

TASK 2 (Physical): Hooke's law

1. In this experiment, you will investigate the stretching of a spring. Carry out the following instructions, referring to Fig. 1.1.

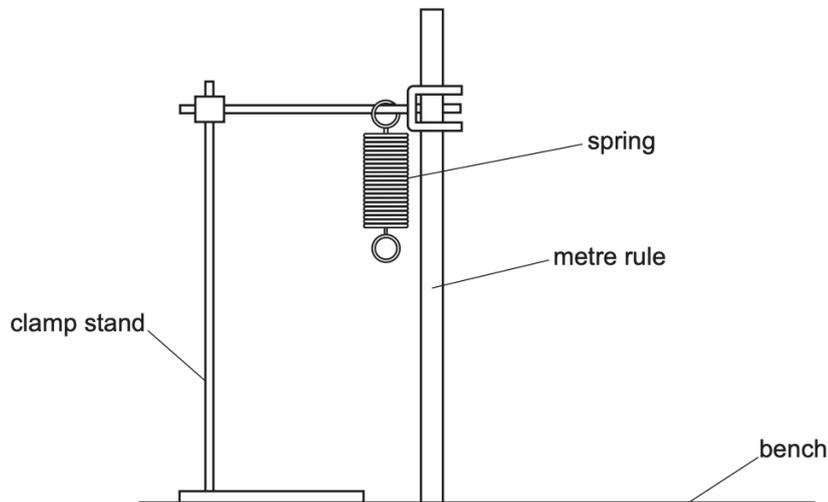


Fig. 1.1

- (a) The metre rule is clamped in position close to the spring. Do not change the position of the metre rule.
- (i) Take two readings from the metre rule to determine the unstretched length ℓ_0 of the coiled part of the spring. Use the set square provided.
- reading 1
- cm
- reading 2
- cm
- $\ell_0 = \dots$
- cm [14]
- (ii) Draw a diagram to show clearly how you used the set square to obtain an accurate reading from the metre rule. [4]

(b) Suspend a load of $P = 1.0\text{N}$ from the spring.

Record the new length ℓ_1 of the coiled part of the spring.

$$\ell_1 = \dots\dots\dots \text{cm}$$

Calculate the extension e_1 using the equation $e_1 = (\ell_1 - \ell_0)$

$$e_1 = \dots\dots\dots \text{cm}$$

Calculate a value for the spring constant k of the spring using the equation

$$k = \frac{P}{e_1}$$

Include the unit.

$$k = \dots\dots\dots [9]$$

(c) Suspend a load of $P = 5.0\text{N}$ from the spring.

Record the new length ℓ_5 of the coiled part of the spring.

$$\ell_5 = \dots\dots\dots \text{cm}$$

Calculate the extension e_5 using the equation $e_5 = (\ell_5 - \ell_0)$

$$e_5 = \dots\dots\dots \text{cm}$$

Calculate a second value for the spring constant k of the spring using the equation

Include the unit.

$$k = \frac{P}{e_5}$$

k = [9]

(d) State whether your two values of the spring constant k can be considered equal within the limits of experimental accuracy.

Explain your answer by referring to your results.

statement.....

.....

explanation.....

.....

.....

.....[7]

(e) A student improves the experiment by taking additional sets of readings.

(i) Suggest the additional apparatus that the student uses.

.....

..... [4] (ii) Suggest how the student uses the additional

results.

.....

..... [3]