



BRAINIACS OLYMPIAD

GRADES 11-12

PHYSICS SAMPLE PAPER (PRACTICAL PART)



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Grade: 11-12

Time: 120 minutes

Total points: 100

Equipment: Not required

TASK 1 (Written): lens

1. A student is determining the focal length f of a lens.

Fig. 3.1 shows the apparatus used.

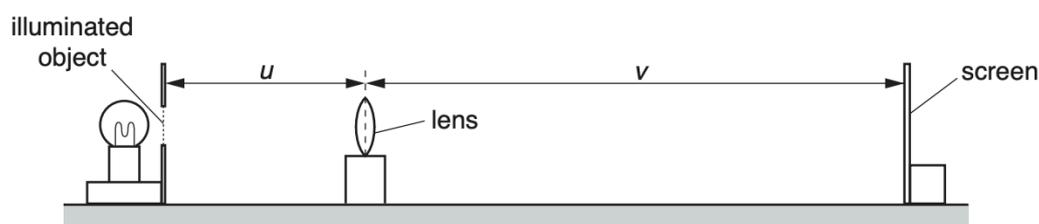


Fig. 3.1

(a)•

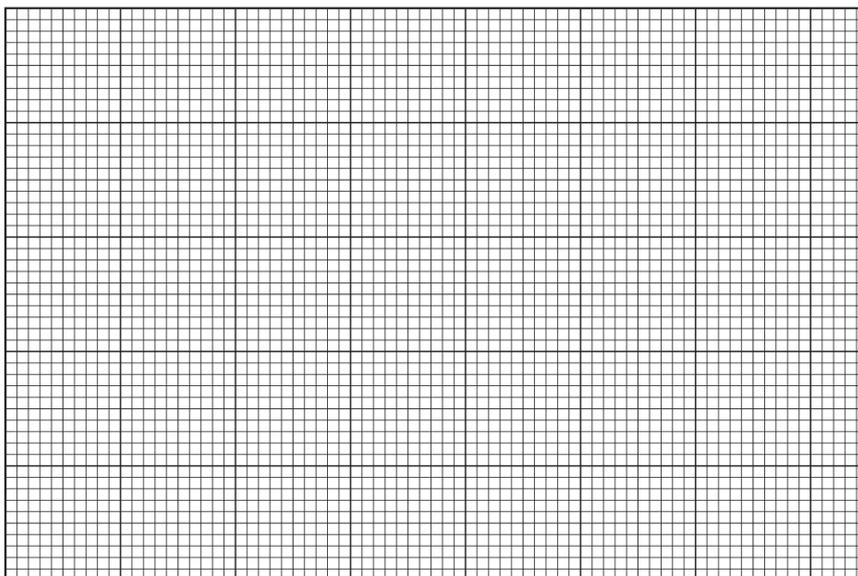
The student places the screen about 100cm from the illuminated object.

- She places the lens between the object and the screen so that the centre of the lens is at a distance $u = 20.0\text{cm}$ from the object.
- She adjusts the position of the screen until a clearly focused image is formed on the screen.
- She measures the distance v between the centre of the lens and the screen.
- She repeats the procedure using values for u of 22.0cm, 25.0cm, 30.0cm and 35.0cm.
- The readings are shown in Table 3.1.

Table 3.1

u/cm	v/cm
20.0	60.0
22.0	47.1
25.0	37.5
30.0	29.8
35.0	26.3

Plot a graph of v / cm (y-axis) against u / cm (x-axis). You do not need to start your axes at the origin (0, 0). Draw the best-fit curve.



[18]

- (b) (i) • Mark, with a cross, the point on the graph grid where $u = 25.0\text{cm}$ and $v = 25.0\text{cm}$.
- Mark with a cross, the point on the graph grid where $u = 35.0\text{cm}$ and $v = 35.0\text{cm}$.
 - Join these two points with a straight line. [4]
- (ii) • Record u_1 , the value of u at the point where the straight line crosses your graph line.

$u_1 = \dots\dots\dots\text{cm}$

- Record v_1 , the value of v at the point where the straight line crosses your graph line.

$v_1 = \dots\dots\dots\text{cm}$ [4]

- (iii) Calculate the focal length f of the lens using the equation

$$f = \frac{(u_1 + v_1)}{4}.$$

f =cm [8]

(c) Suggest two differences that you would expect to see between the appearance of the illuminated object and the image on the screen.

1.
.....

2.
..... [8]

(d) Suggest two precautions that you would take in order to obtain reliable readings in this experiment.

1.
.....

2.
..... [8]

TASK 2 (Physical): Resistivity of a Wire

- In this experiment, you will determine the resistance per unit length of a wire. The circuit has been set up for you as shown in Fig. 3.1. Carry out the following instructions, referring to Fig. 3.1.

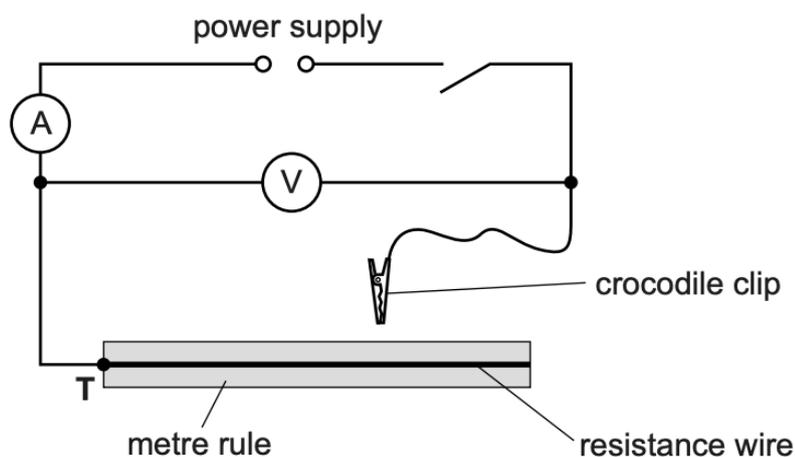


Fig. 3.1

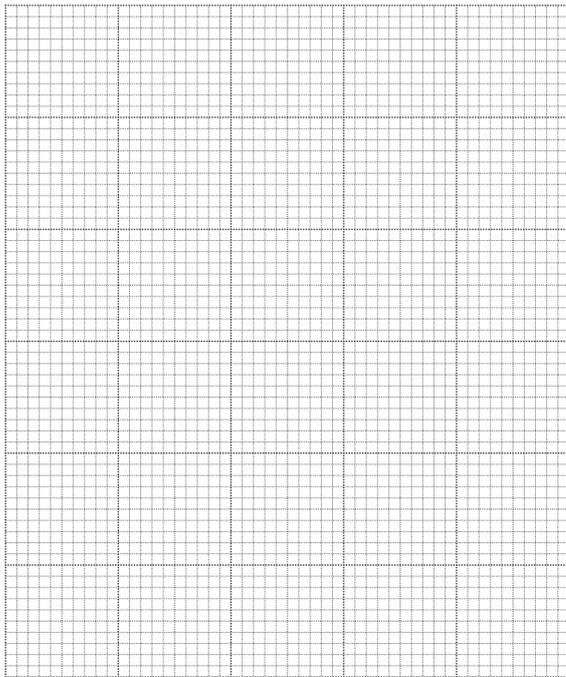
- Connect the crocodile clip to a length l of the resistance wire where $l = 0.900$ m measured from the end T. Switch on. Measure, and record in Table 3.1, the potential difference V and the current I . Switch off.
 - Repeat **(a)(i)** for $l = 0.800$ m, 0.700 m, 0.600 m and 0.500 m.

Table 3.1

l/m	V/V	I/A	R/Ω
0.900			
0.800			
0.700			
0.600			
0.500			

[10]

- Calculate, and record in the table, the resistance R of each length of the wire, using the equation $R = \frac{V}{I}$ [5].
- Plot a graph of R / Ω (y-axis) against l / m (x-axis).



[20]

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

$G = \dots\dots\dots$ [5]

(ii) For this experiment and wire, the resistance per unit length r of the wire is numerically equal to G . Give a value for r , to a suitable number of significant figures for this experiment. Include the unit.

$r = \dots\dots\dots$ [10]