Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

7010015919

PHYSICS **5054/32**

Paper 3 Practical Test **October/November 2014**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
For each of the questions in Section A, you will be allowed to work with the apparatus for a maximum of 20 minutes. For the question in Section B, you will be allowed to work with the apparatus for a maximum of 1 hour.

You are expected to record all your observations as soon as these observations are made.
An account of the method of carrying out the experiments is **not** required.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
3	
4	
Total	

This document consists of **12** printed pages.

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Section A

Answer **all** the questions in this section.

1 *In this experiment, you will determine the density of the material of a length of wire.*

You are provided with

- a length of wire,
- a metre rule,
- a 30 cm ruler,
- four pieces of adhesive tape,
- a wooden rod.

(a) Using two pieces of adhesive tape, stick the wire to the bench and ensure that it is straight. Measure the length L of the wire.

L = ... [1]

(b) Carefully wind the wire around the wooden rod, ensuring that the turns of wire are as close as possible. This is shown in Fig. 1.1. You may use adhesive tape to fix the ends of the wire to prevent the turns unwinding.

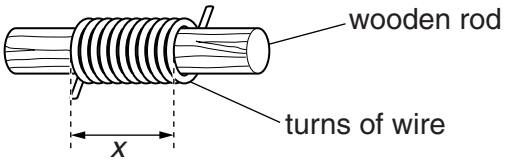


Fig. 1.1

(i) Count the number N of turns of wire on the rod.

N = ...

(ii) Measure the length x of the coil as shown in Fig. 1.1.

x = ...

(iii) Calculate the diameter d of the wire using $d = \frac{x}{N}$.

d = ...
[2]

(c) Remove the coil of wire from the rod.

(i) Using the top-pan balance, measure the mass m of the coil of wire.

m = ...

(ii) Calculate the density ρ of the material of the wire using the equation

$$\rho = \frac{4m}{\pi d^2 L}.$$

ρ = ...
[2]

[Total: 5]

2 *In this experiment, you will investigate virtual images using a converging lens.*

You are provided with

- a converging lens,
- a stand, boss and clamp to hold the lens,
- a half-metre rule,
- a boss and clamp to hold the half-metre rule,
- a small piece of Blu-Tack,
- a set square.

(a) Fig. 2.1 consists of six printed lines and a black square.

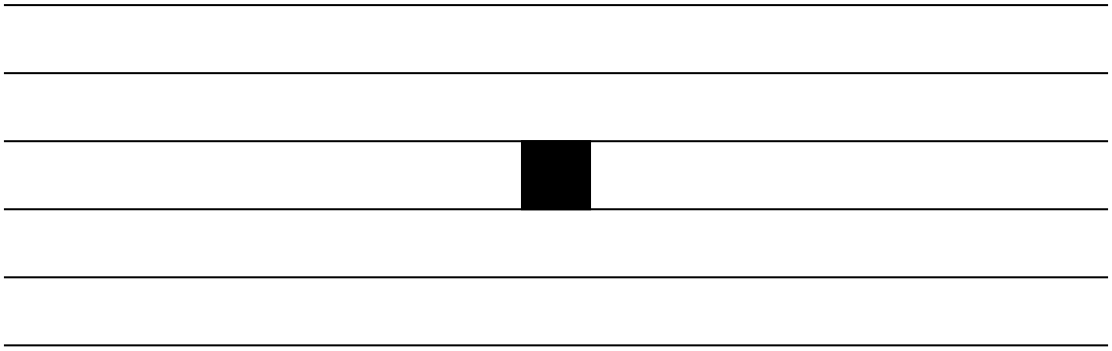


Fig. 2.1

Determine, as accurately as possible, the average separation *s* of the lines on Fig. 2.1.

s = ... [1]

(b) Place the stand, boss and clamp on this page of the question paper and set up the apparatus as shown in Fig. 2.2. The centre of the converging lens should be held horizontally directly above the black square on Fig. 2.1. The distance *x* between the centre of the lens and the black square should be as small as possible.

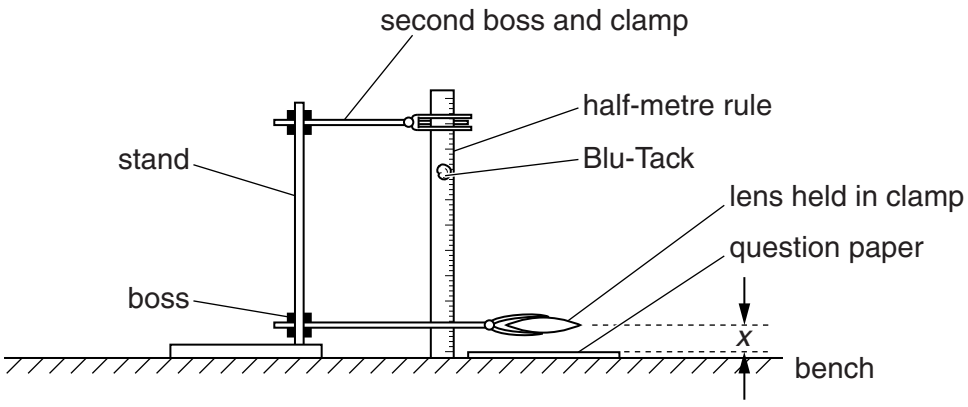


Fig. 2.2

(c) Keep your eye between 30 cm and 40 cm above the page. You may mark this position on the half-metre rule with the Blu-Tack if you wish. Observe the black square through the lens.

(i) Describe any difference between the image that you see through the lens and the object.

.....

.....

.....

(ii) Release the boss holding the lens and slowly raise the lens, keeping your eye between 30 cm and 40 cm above the page.

State what happens to the magnification of the image and describe how your observations show this.

.....

.....

.....

[2]

(d) With your eye in the same position, adjust the height *x* of the lens above the paper in order to view a magnified image of the spacing between the lines.

(i) When the separation of the lines seen through the lens appears to be double the separation of the lines on the paper, tighten the boss and measure *x.*

x = ...

(ii) Describe how to obtain a more accurate value for *x* and determine this accurate value.

.....

.....

accurate *x* = ...

[2]

[Total: 5]

3 *In this experiment, you will find the frictional force opposing the motion of a block of wood across the bench.*

You are provided with

- a block of wood labelled A, with a small hook at the end,
- a 10 g slotted mass hanger, nine 10 g slotted masses and one 100 g slotted mass,
- a pulley arrangement,
- string passing over the pulley, with loops attached to the block A and the mass hanger,
- a stopwatch,
- a metre rule,
- a stand, boss and clamp to hold the metre rule,
- a set square.

(a) The Supervisor has set up the apparatus as shown in Fig. 3.1.

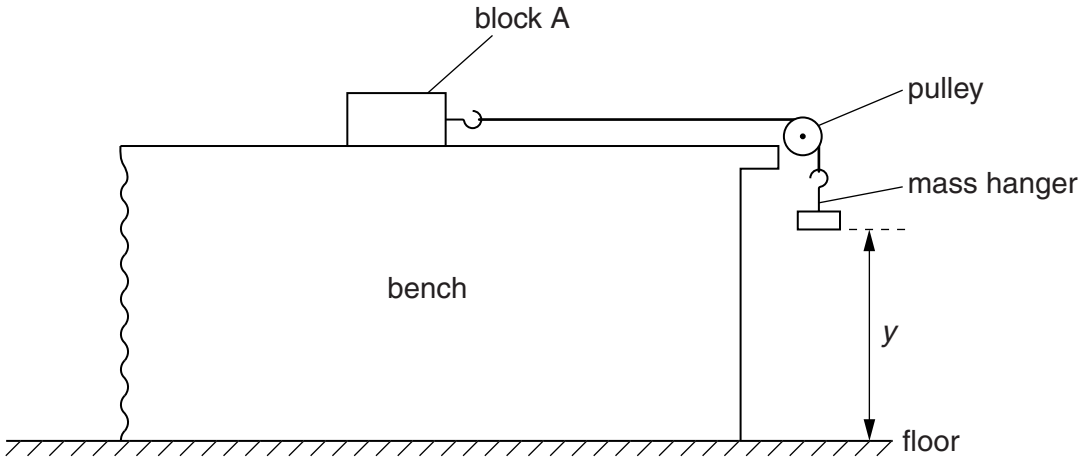


Fig. 3.1

Move the block away from the pulley until the mass hanger is just below the pulley. Clamp the metre rule vertically close to, but not touching, the mass hanger. Measure the distance *y* from the base of the mass hanger to the floor. Give your answer in metres.

y = ...m [1]

(b) **(i)** Place sufficient slotted masses on the mass hanger to ensure block A **accelerates** across the bench when released. It should take between 1 s and 2 s for the mass hanger to fall to the floor. Record the total mass *m* of the mass hanger and the slotted masses. Give your answer in kg.

m = ... kg

(ii) Move the block away from the pulley until the base of the mass hanger is at the same height *y* above the floor. Release block A. Determine the average time *t* for the mass hanger to fall to the floor.

t = ...
[2]

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(c) Record the mass M of block A, which is written on the label on the block.

$M =$ ..... kg

(d) Calculate

(i) the final velocity v of the block using $v = \frac{2y}{t}$,

$v =$ ..... m/s

(ii) the final kinetic energy E_K of the block and falling mass using

$$E_K = \frac{1}{2}(M + m)\, v^2$$

$E_K =$ .....

(iii) the potential energy E_P lost by the falling mass using $E_P = mgy$, where the gravitational field strength g is 10 N/kg,

$E_P =$ .....

(iv) the average resistive force F opposing the motion of the block using

$$F = \frac{E_P - E_K}{y}.$$

$F =$ .....
[2]

[Total: 5]

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[Turn over

Section B

4 *In this experiment, you will determine the resistance of a resistor.*

You have been provided with a circuit consisting of

- a cell,
- a resistor X,
- a length of resistance wire attached to a metre rule,
- two crocodile clips,
- a switch.

The circuit is shown in Fig. 4.1.

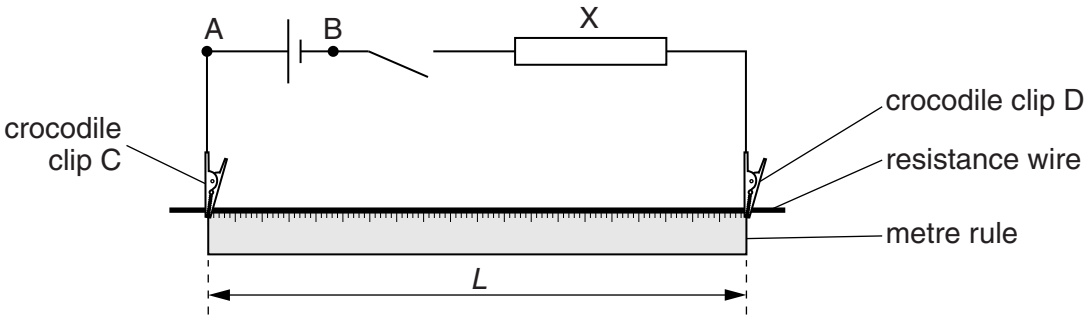


Fig. 4.1

You are also provided with

- a voltmeter,
- connecting leads,
- a card giving the resistance R of a 1.000 m length of the resistance wire.

(a) (i) Use the additional connecting leads to connect the voltmeter between points A and B. With the switch open, record the reading V_0 on the voltmeter.

V_0 = ... [1]

(ii) Record the total length L of resistance wire between the crocodile clips C and D. Give your answer in metres.

L = ... m

(iii) In this experiment the ratio $\frac{L}{V_0} = K$ m/V. Calculate the value of K.

K = ...
[1]

(b) (i) Disconnect the voltmeter from points A and B. Connect the voltmeter between points C and D. Move the crocodile clip at D to a point that is a distance $l = 0.900$ m from C. This is shown in Fig. 4.2.

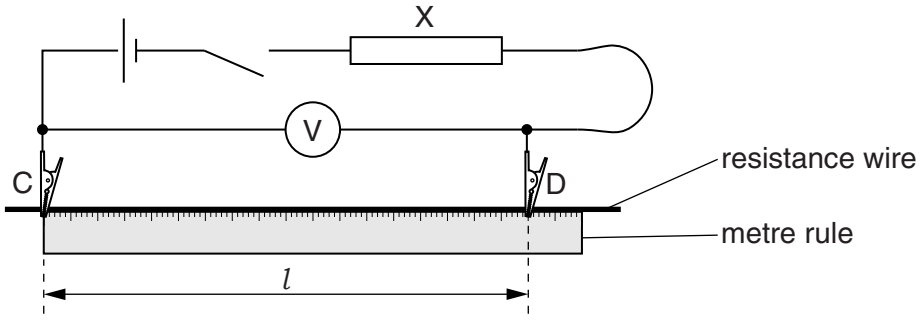


Fig. 4.2

(ii) Close the switch and record the reading V on the voltmeter.

$V =$ ..... [1]

Open the switch.

(c) By placing the crocodile clip D at different positions on the wire, repeat **(b)(ii)** for a wide range of values of l. **The minimum value of l that you should use is 0.300 m**. (If you go below this length, the current will be high and the wire will get hot.)

Record your results for l and V in Fig. 4.3. The values of l should be recorded in metres. Include columns for $1/V$ and $1/l$. Also include your results from **(b)(ii)** in Fig. 4.3.

[4]

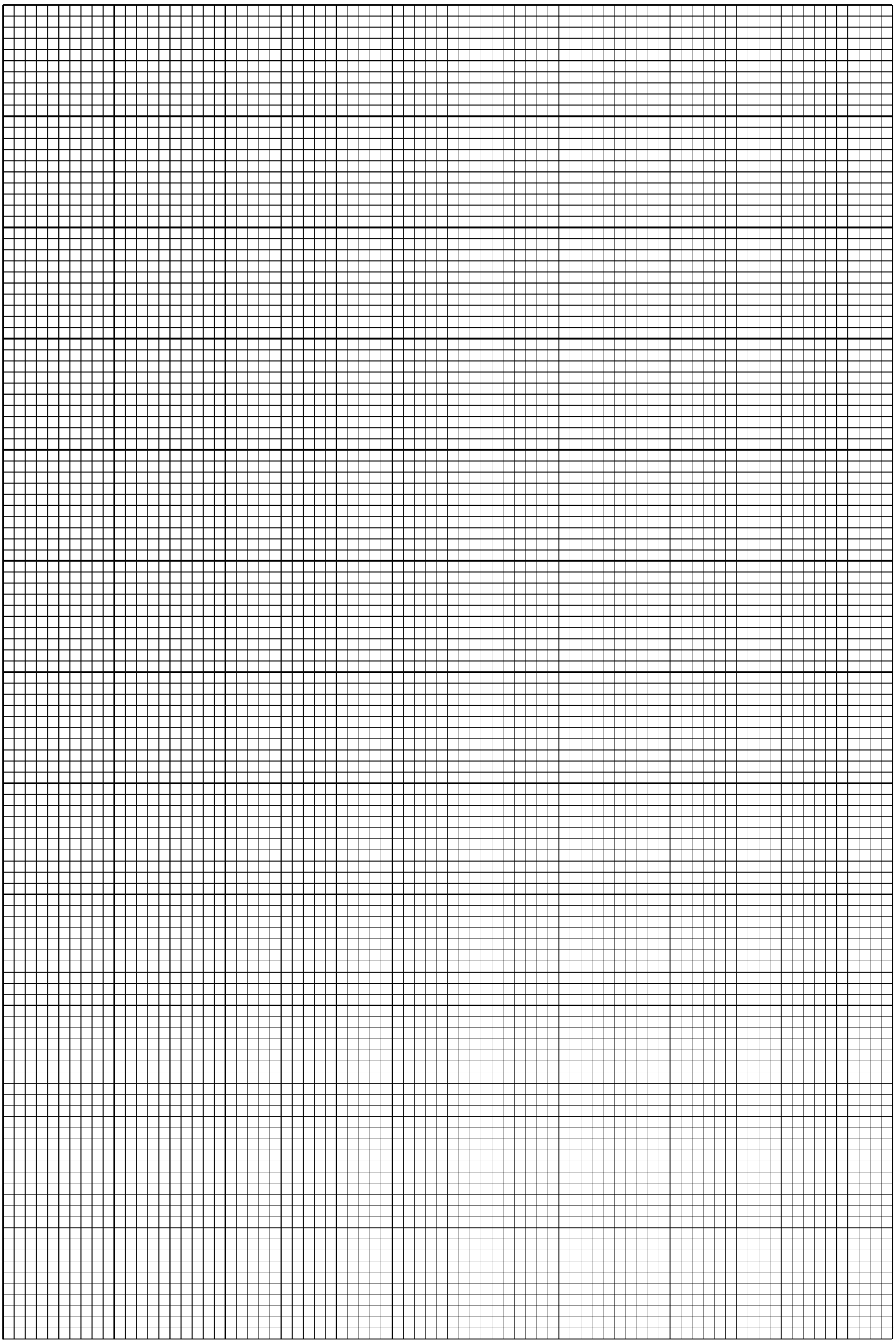
Fig. 4.3

(d) Using the grid opposite, plot a graph of $\frac{1}{V}$/(1/V) against $\frac{1}{l}$/(1/m). Draw the straight line of best fit. [4]

(e) Determine the gradient G of the line of best fit.

G = ... [2]

Question 4 continues on page 12.



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[Turn over

(f) The resistance R_X of X may be found using the equation

$$R_X = \frac{GR}{K}$$

where R is the resistance of the resistance wire, which is given on the card.

(i) Record R.

R = ...

(ii) Using your answers to **(a)(iii)**, **(e)** and **(f)(i)**, calculate R_X.

R_X = ...
[2]

[Total: 15]

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