Cambridge O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

5160355031

PHYSICS **5054/32**

Paper 3 Practical Test **May/June 2017**

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 **10** printed pages and **2** blank pages.

CAMBRIDGE International Examinations

Section A

Answer **all** questions in this section.

1 *In this experiment, you will investigate the time taken for a mass to rotate on the end of a wire.*

You are provided with

- a stopwatch,
- a length of wire,
- a 100 g mass hanger with a pointer,
- seven 100 g slotted masses,
- safety glasses,
- a stand, boss and clamp to hold the wire and mass set.

The Supervisor has set up the apparatus as shown in Fig. 1.1 with all seven slotted masses on the mass hanger. **You must wear the safety glasses throughout this experiment.**

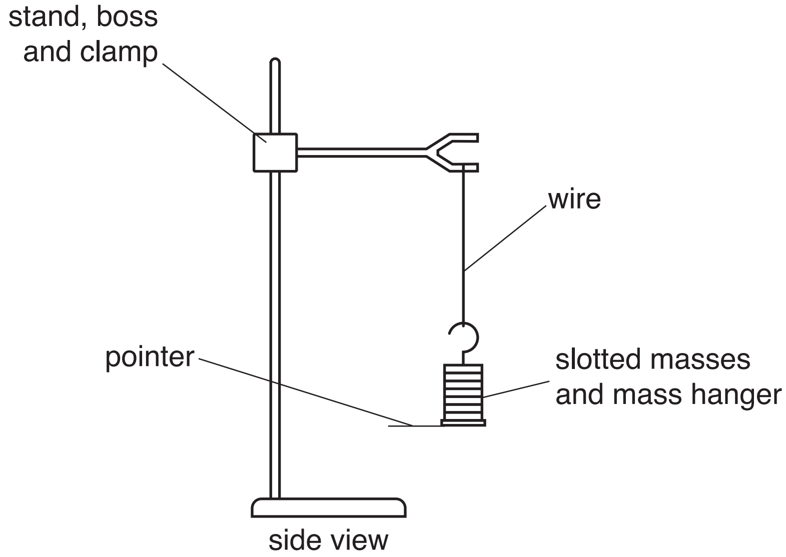

Fig. 1.1

Observe the position of the pointer when the mass is at rest.

(a) By pushing against the end of the pointer, rotate the mass through two complete revolutions in a clockwise direction as shown in Fig. 1.2.

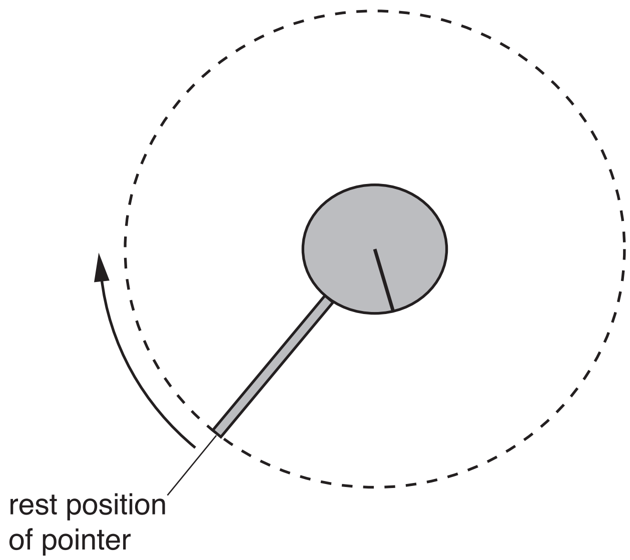

Fig. 1.2

When released the mass rotates in an anticlockwise direction until it stops for the first time. It then rotates in a clockwise direction.

Determine an accurate time t_1 for the mass to rotate from this initial position until it stops for the first time.

t_1 = ... [2]

(b) Remove six slotted masses from the mass hanger. Repeat **(a)** to determine the new time t_2.

t_2 = ... [1]

(c) Calculate $\frac{t_1}{t_2}$.

$\frac{t_1}{t_2}$ = ... [2]

2 *In this experiment, you will investigate the width of a shadow.*

You are provided with

- a lamp in a lamp holder connected to a power supply,
- an opaque cylindrical object,
- a 30 cm ruler.

Place the lamp holder on Fig. 2.1 on page 5 so that the centre of the filament of the lamp is directly above the point labelled **X**.

Place the cylinder upright on Fig. 2.1 so that its centre is on the point labelled **Y**.

With the lamp switched on, there is a shadow of the cylinder on Fig. 2.1.

(a) Determine the length L_s of the shadow along the line PZQ.

L_s = ... [1]

(b) (i) Describe how you could investigate the relationship between the cylinder's position along the line XYZ and the length of the shadow along PZQ.

....

....

....

.... [2]

(ii) On Fig. 2.2, sketch a graph of the relationship between the cylinder's position along the line XYZ and the length of the shadow along PZQ.

Fig. 2.2

[2]

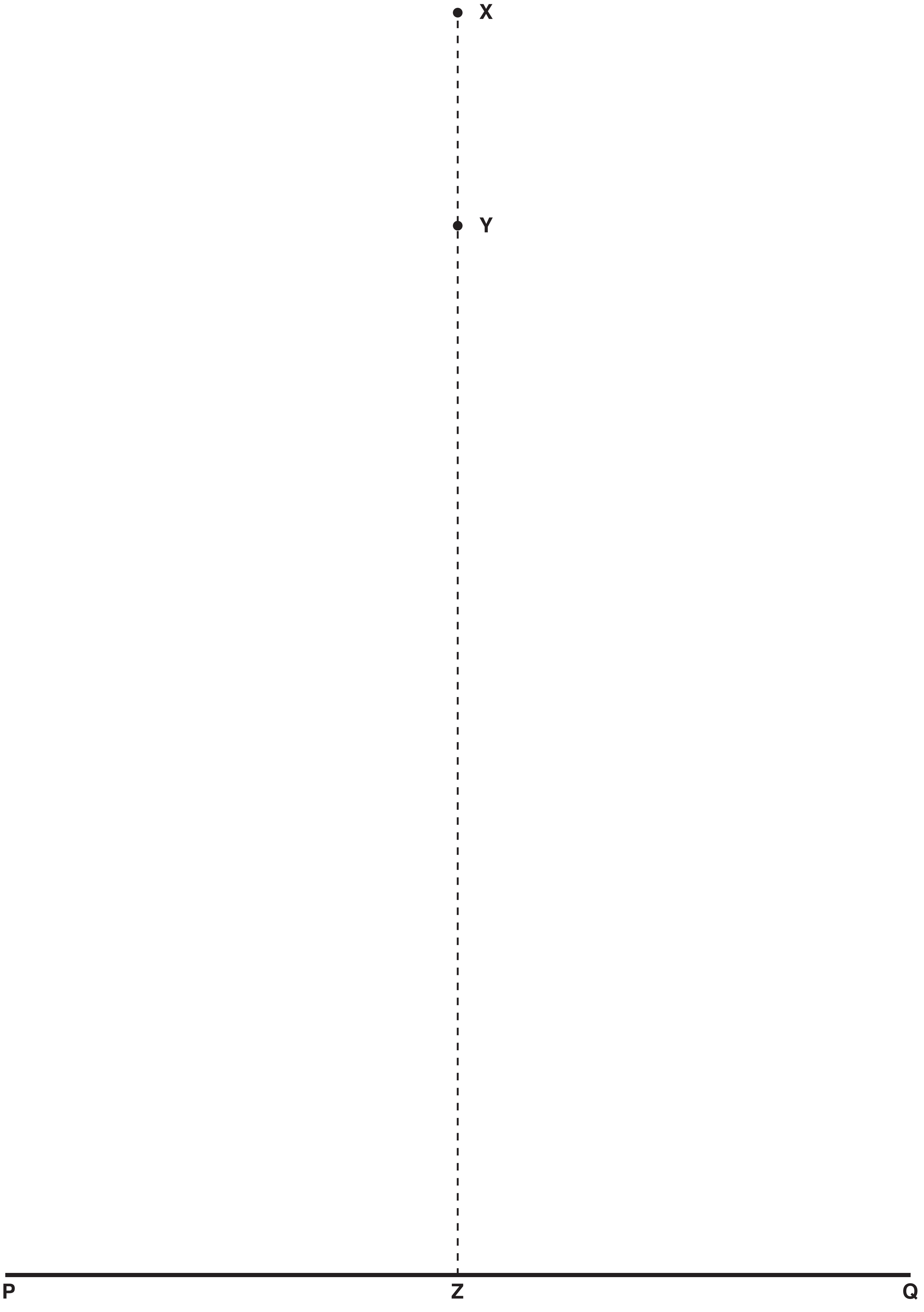

Fig. 2.1

3 *In this experiment, you will investigate an electrical circuit containing a light-emitting diode (LED).*

You are provided with

- a power supply,
- a switch,
- a 330 Ω resistor,
- a light-emitting diode (LED).

The Supervisor has set up the circuit as shown in Fig. 3.1.

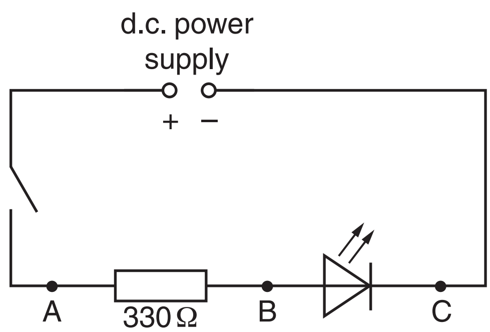

Fig. 3.1

You are also provided with

- a voltmeter with two connecting leads that may be connected between various points in the circuit.

(a) (i) Connect the voltmeter across the 330 Ω resistor between points A and B.
Ensure that the positive (+) terminal of the voltmeter is connected to A.
Close the switch. Record the voltmeter reading V_{AB}.

V_{AB} = ... [1]

(ii) Open the switch.
Disconnect the voltmeter from points A and B.
Connect the voltmeter across the LED between points B and C.
Ensure that the positive (+) terminal of the voltmeter is connected to B.
Close the switch. Record the voltmeter reading V_{BC}.

V_{BC} = ... [1]

(iii) Open the switch.
Disconnect the voltmeter from points B and C.
Connect the voltmeter between points A and C.
Ensure that the positive (+) terminal of the voltmeter is connected to A.
Close the switch. Record the voltmeter reading V_{AC}. Open the switch.

V_{AC} = ... [1]

(b) The current I in the circuit is given by

$$I = \frac{V_{AB}}{R}$$

where $R = 330\,\Omega$.

Calculate I.

I = ... [1]

(c) Calculate the resistance R_L of the LED using

$$R_L = \frac{V_{BC}}{I}.$$

R_L = ... [1]

BLANK PAGE

Section B

4 *In this experiment, you will investigate the rate of temperature increase of a coil of wire.*

You are provided with

- a cell,
- a switch,
- an ammeter,
- a thermometer,
- a length of coiled wire,
- connecting leads,
- a stopwatch.

The Supervisor has set up a circuit as shown in Fig. 4.1. It shows a wire coiled around the end of a thermometer. The switch is open.

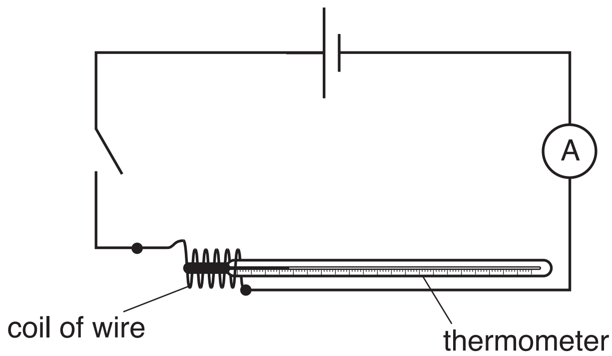

Fig. 4.1

(a) Record the temperature θ_r of the thermometer at room temperature.

θ_r = ... [1]

(b) When the switch is closed, heat from the coil is transferred to the thermometer and shown as a rise in temperature.

(i) Close the switch and record the ammeter reading I after 5 seconds. Immediately open the switch.

I = ... [1]

(ii) Calculate the power P supplied to the coil using

$$P = I^2R$$

where the resistance R, of the coil, is 4.0Ω.

P = ... W [1]

(c) You will record the reading on the stopwatch when the thermometer reaches certain temperatures.

You will start the stopwatch when the thermometer reaches 2.0 °C more than your value for θ_r in **(a)**.

(i) Write headings in the top row of the results table of Fig. 4.2.

(ii) Close the switch.
Start the stopwatch when the temperature is θ_r + 2.0 °C.

(iii) For each further 2.0 °C rise in temperature record the time shown on the stopwatch. Continue to record times until the temperature has risen by 18.0 °C. Open the switch.

Record all of your results in the table of Fig. 4.2. Include the temperature reading when you started the stopwatch.

Fig. 4.2

[5]

(d) Using the grid opposite, plot a graph of time on the *y*-axis against temperature on the *x*-axis. [4]

(e) Determine the gradient of your graph when the temperature is θ_r + 11 °C.

gradient = ... [3]

BLANK PAGE