Cambridge
O Level

**Cambridge International Examinations**
Cambridge Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

*0313264449*

**PHYSICS** **5054/42**

Paper 4 Alternative to Practical **October/November 2018**

**1 hour**

Candidates answer on the Question Paper.

No Additional Materials are required.

**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.

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.

This document consists of **8** printed pages.



CAMBRIDGE International Examinations

**[Turn over**

**1** A student investigates how the current in a thermistor depends upon temperature.

She sets up the circuit shown in Fig. 1.1.

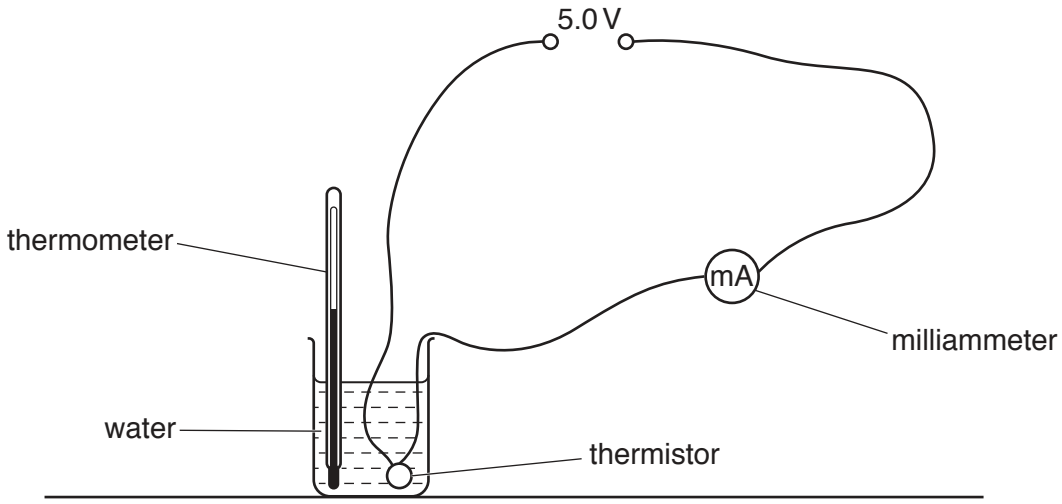


**Fig. 1.1**

- She pours hot water into the beaker.
- She stirs the water, measures its temperature and reads the ammeter.
- She records the values of temperature and current in the table of Fig. 1.2.
- She repeats these readings at 10 °C intervals, as the water cools, until the water reaches room temperature.
- She records all her readings in the table, as shown in Fig. 1.2.

| temperature $\theta$/°C | current $I$/mA |
|---|---|
| 80 | 2.90 |
| 70 | 2.30 |
| 60 | 1.75 |
| 50 | 1.20 |
| 40 | |
| 30 | 0.60 |
| 20 | 0.45 |

**Fig. 1.2**

Fig. 1.3 shows the ammeter reading when the temperature of the water is 40 °C.

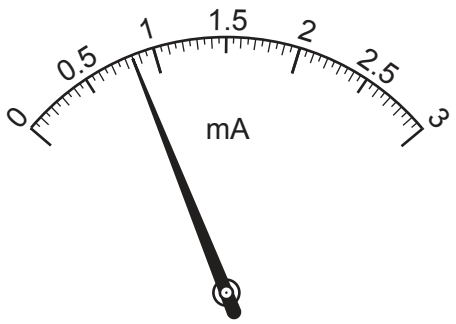


**Fig. 1.3**

**(a) (i)** Read the ammeter and record the missing value of current in the table of Fig. 1.2. [1]

**(ii)** State why the student stirs the water before taking a temperature reading.

.....[1]

**(b)** On Fig. 1.4, plot a graph of $I$ on the *y*-axis against $\theta$ on the *x*-axis. Start both axes from the origin.

Draw the smooth curve of best fit. [4]


**Fig. 1.4**

**(c) (i)** Extend your curve to predict the current for the temperature of 0 °C.

current at 0 °C = .....mA [1]

**(ii)** Suggest how the student can modify her investigation to check the prediction made in **(c)(i)**.

.....

.....[1]

**(d) (i)** Use your graph to estimate the current $I$ when the temperature of the water is 75 °C.

$I$ = .....mA [1]

**(ii)** The voltage $V$ of the power supply is 5.0 V.

Use the equation

$$R = \frac{V}{I}$$

to calculate the resistance $R$ of the thermistor at 75 °C.

$R$ = ..... Ω [2]

**(e) (i)** Describe the relationship between current and temperature for the thermistor, shown by your graph.

.....

.....[2]

**(ii)** Deduce the relationship between resistance and temperature for the thermistor.

.....

.....[1]



**[Turn over**

**2** A student measures the focal length of a convex lens.

He sets up the apparatus shown in Fig. 2.1.

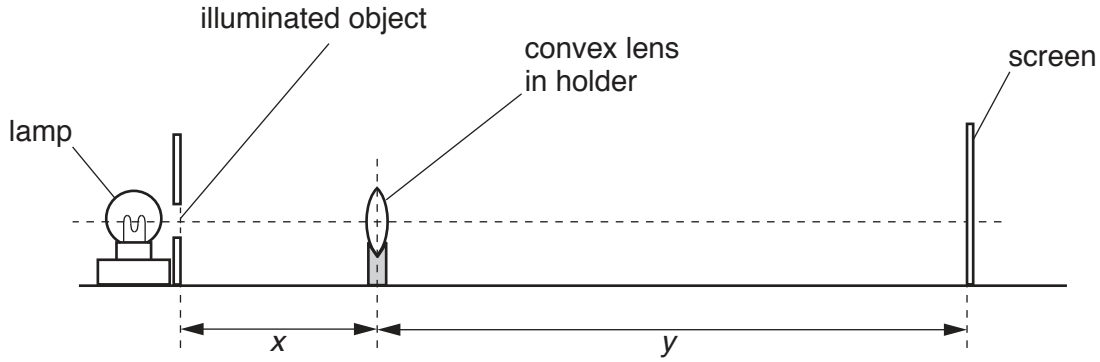


**Fig. 2.1**

- He places the lens a distance from the illuminated object.
- He moves the screen until a sharp image of the object is formed on the screen.

**(a) (i)** Measure, to the nearest millimetre, the length $x$ and the length $y$ on Fig. 2.1.

$x$ = ..... cm

$y$ = ..... cm
[2]

**(ii)** The diagram in Fig. 2.1 is drawn one-eighth full size.

Calculate the distance $u$ from the object to the lens and the distance $v$ from the image to the lens.

$u$ = ..... cm

$v$ = ..... cm
[1]

**(b)** Calculate the focal length $f$ of the lens, using the equation

$$f = \frac{uv}{(u+v)}.$$

Give your answer to 2 significant figures.

$f$ = ..... cm [2]

**(c)** State **one** precaution that the student takes to obtain an accurate value for the focal length $f$ of the lens.

.....

.....[1]

**3** A student and her friend measure an approximate value for the speed of sound in air using echoes.

- She stands a large distance from a reflecting wall.
- She claps her hands at a regular rate.
- She adjusts her rate of clapping until each clap coincides with the echo of the previous clap.
- Her friend then uses a stopwatch to measure the time $t$ between claps.
- They measure the distance to the wall.

The time $t$ between claps is recorded four times.
The values of $t$, measured in seconds, are shown below.

0.87 0.97 0.94 0.88

**(a) (i)** Calculate $t_{av}$, the average value of $t$. Give your answer to 2 decimal places.

$t_{av}$ = ..... s [2]

**(ii)** Suggest why it is sensible to give $t_{av}$ to 2 decimal places.

.....

.....[1]

**(b)** The distance $s$ from the students to the wall is 130 m.

**(i)** A metre rule is not an appropriate device for measuring this distance.

Suggest a device that can be used to measure this distance.

.....[1]

**(ii)** The speed $v$ of sound in air is given by the equation

$$v = \frac{2s}{t_{av}}.$$

Calculate $v$.

$v$ = ..... m/s [1]

**(iii)** Suggest **one** reason why the value for the speed of sound in air measured by this method is only approximate.

.....

.....[1]

**4** A student uses a plotting compass to plot the pattern of the magnetic field **between the North poles** of two bar magnets.

The student places the magnets on a sheet of white paper, as shown in Fig. 4.1.

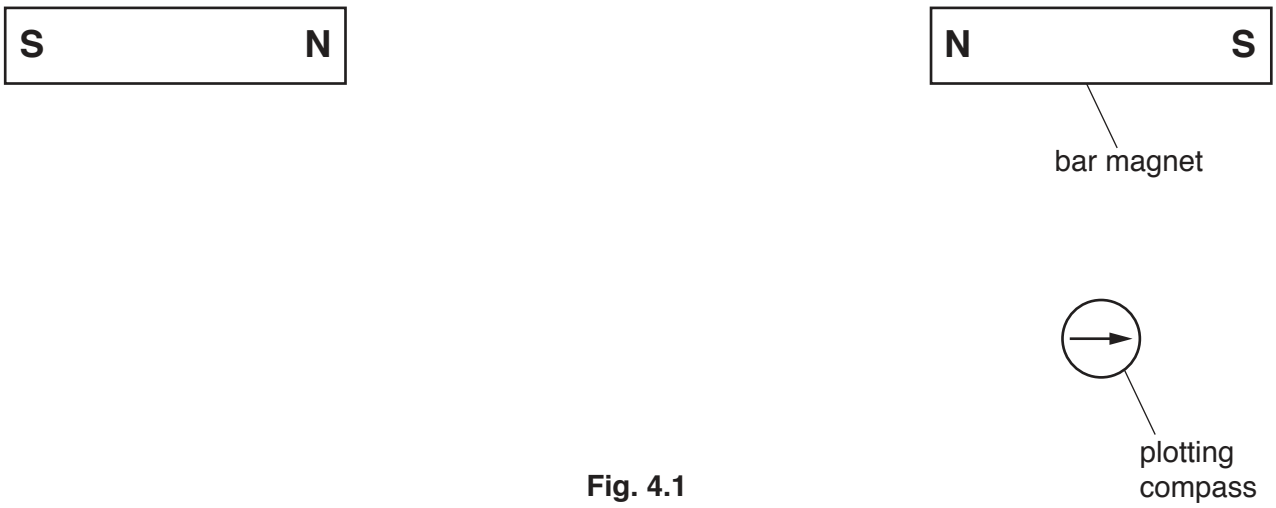


**Fig. 4.1**

**(a)** Describe how the student uses the plotting compass to plot the pattern of the magnetic field.

You may add to Fig. 4.1 to help you explain your answer, if you wish.

.....

.....

.....

.....

.....

.....[3]

**(b)** State what else the student can deduce about the magnetic field in this investigation.

.....[1]