Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

0721346136

PHYSICS **5054/42**

Paper 4 Alternative to Practical **October/November 2014**

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.

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1 A student uses a small plotting compass to investigate the magnetic field due to a bar magnet.

The student places a piece of thin card over one end of the magnet, as shown in Fig. 1.1a.

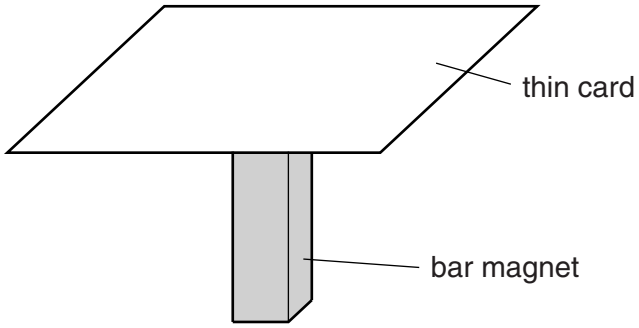


Fig. 1.1a

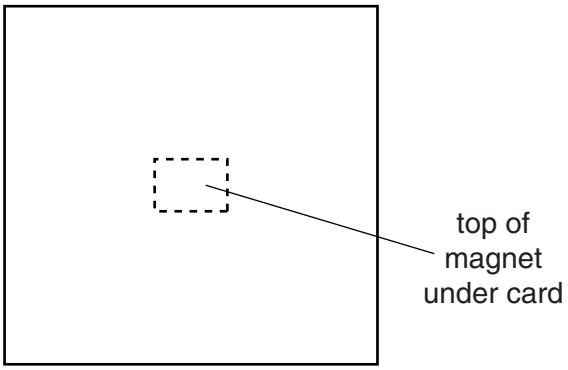


Fig. 1.1b (top view)

(a) Describe how the student can use the small plotting compass to plot the shape of the magnetic field on the card.
You may draw on Fig. 1.1b if you wish.

.....

.....

.....

.....

.....[4]

(b) Explain why the plotting compass must be small.

.....

.....[1]

(c) Apart from the shape, state what else can be deduced about the magnetic field with this apparatus.

.....

.....[1]

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2 A student investigates the use of pulleys to lift a load.

The student uses two pulleys A and B to lift a load *W*, as shown in Fig. 2.1.

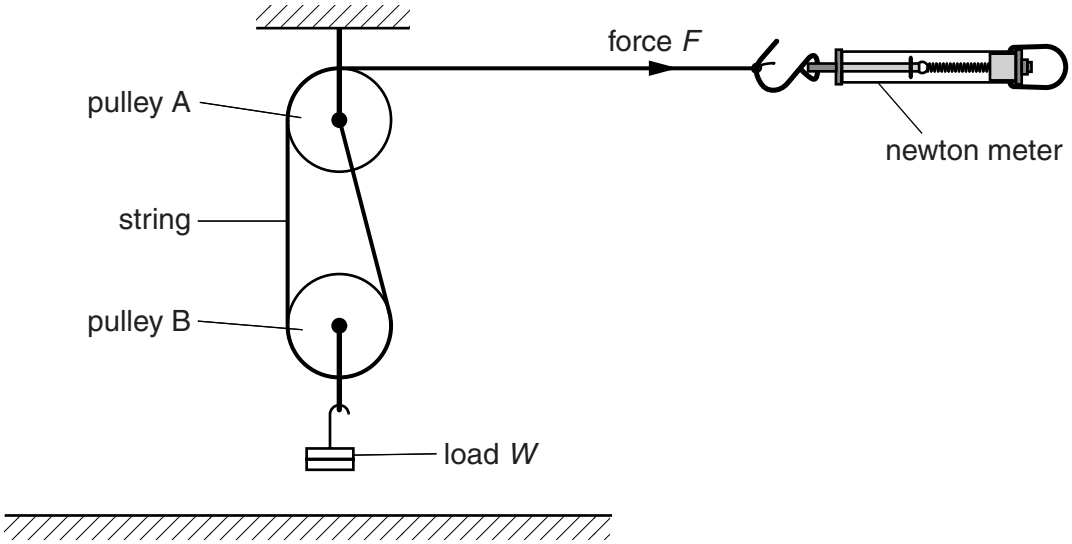


Fig. 2.1

The student uses a newton meter to measure the minimum force *F* needed to raise the load.

(a) The student raises the load at a slow constant speed by pulling on the newton meter.

(i) Explain why the student uses a **constant** speed.

.....

.....[1]

(ii) Suggest a reason for using a **slow** constant speed.

.....

.....[1]

(b) The student measures F for a load W of 0.20 N.
Fig. 2.2 shows the newton meter when the load is raised at a slow steady speed.

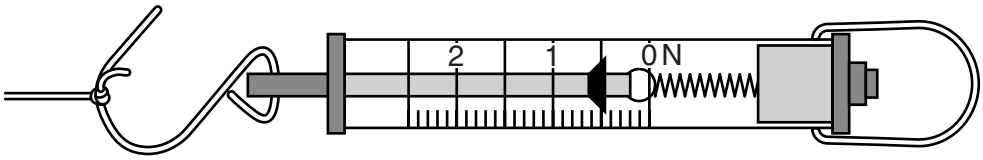


Fig. 2.2

(i) State the force F shown by the newton meter.

F = ...[1]

(ii) On Fig. 2.2, mark the position of the eye of the student when taking the reading. [1]

(c) The student takes a series of readings of F for different values of W.
The readings are shown in Fig. 2.3.

W/N	F/N
0.20	
0.40	0.60
0.60	0.70
0.80	0.85
1.00	0.95
1.20	1.05
1.40	1.20

Fig. 2.3

On Fig. 2.3, write your value of F from **(b)(i)**.

(i) On Fig. 2.4, plot the graph of F/N on the y-axis against W/N on the x-axis.
Start your axes from the origin.
Draw the straight line of best fit. [4]

(ii) Use your graph to find the value of F when $W = 0$.

F = ...[1]

(iii) Suggest a reason why the line of best fit does not pass through the origin.

.....

.....[1]

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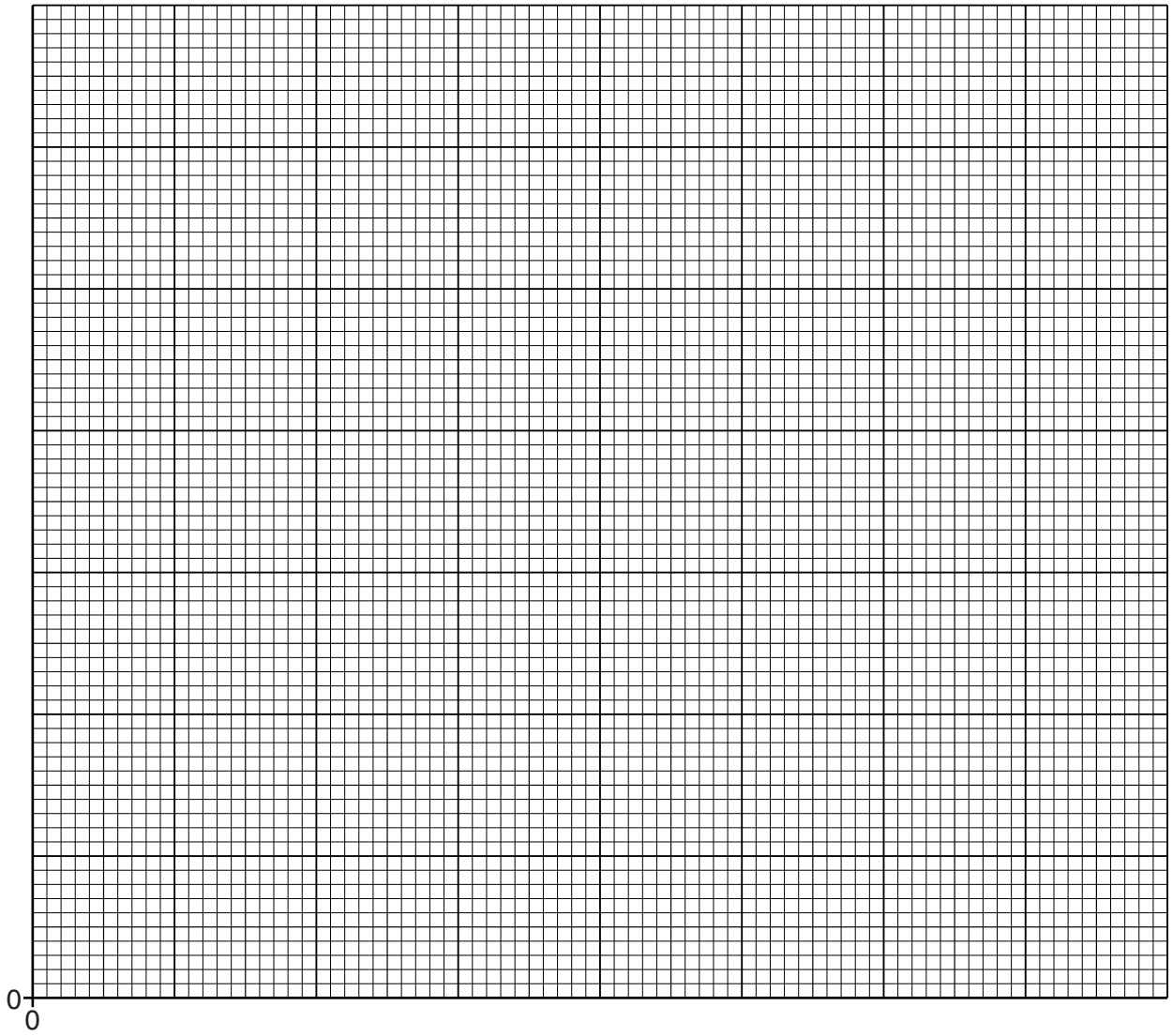


Fig. 2.4

(d) Determine the gradient of the line. Show your working.
Give your answer to 2 significant figures.

gradient = ...[2]

3 **(a)** A student is given two resistors of resistance 24 Ω and 24 kΩ. Each resistor is marked with three coloured bands.

Fig. 3.1 shows the resistor colour code.

black	0
brown	1
red	2
orange	3
yellow	4
green	5
blue	6
violet	7
grey	8
white	9

Fig. 3.1

State the colours of the bands on the resistors given to the student.

	first band	second band	third band
24 Ω	.....	.....	.....
24 kΩ	.....	.....	.....

[2]

(b) The student uses three identical 24 Ω resistors.

(i) Describe in words how the three resistors are combined to give the smallest possible resistance.

.....[1]

(ii) Fig. 3.2 shows one possible combination of the three resistors connected between the points A and B.

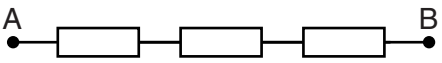


Fig. 3.2

In the three boxes of Fig. 3.3, draw three other possible combinations of all three resistors connected between points A and B. [2]

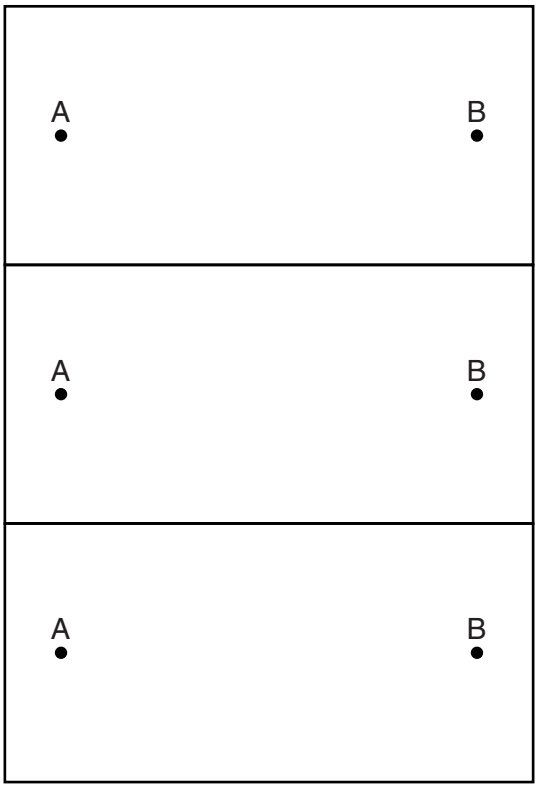


Fig. 3.3

(iii) The student needs a resistance of 36 Ω for his experiment.
On Fig. 3.3, mark with the letter E the combination that has this resistance. [1]

Please turn over for Question 4.

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4 A student is given a cylindrical 250 cm^3 beaker.
He is asked to find the outside diameter of the beaker.
The other apparatus available is shown below.

Apparatus List	
two half-metre rules	*marker pen*
30 cm ruler	*pencil*
2 m thin string	*scissors*
2 m thick string	*Blu-Tack*
plain paper	*Sellotape*
blocks of wood	*lined paper*

(a) Describe in detail how the student can obtain an accurate value for the outside diameter of the beaker.

In your account you should
- state the equipment used,
- explain how the equipment is used,
- state any readings taken,
- explain how the value for the diameter is obtained,
- describe how to make the measurement accurate.

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.....

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.....

.....

.....[5]

(b) Suggest one reason why it is more difficult to measure the internal diameter of the beaker.

.....

.....[1]

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