



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

CANDIDATE  
NAME

CENTRE  
NUMBER

--	--	--	--	--

CANDIDATE  
NUMBER

--	--	--	--



**PHYSICS**

**5054/04**

Paper 4 Alternative to Practical

**October/November 2009**

**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 a soft pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, highlighters, glue or correction fluid.

DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

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 **9** printed pages and **3** blank pages.



- 1 (a) A student tries to balance a metre rule. He places the 50.0 cm mark of the rule on a glass prism, as shown in Fig. 1.1.

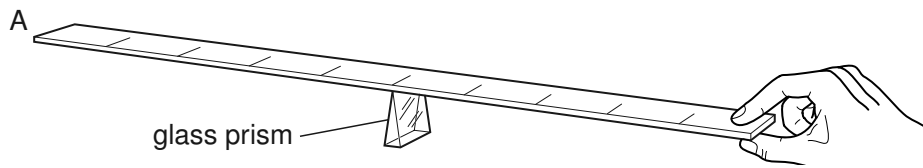


Fig. 1.1

When the metre rule is released, end A goes down.

Suggest a reason why the metre rule does not balance.

.....  
 ..... [1]

- (b) An object P is placed with its centre at the 30.0 cm mark of the metre rule. The 50.0 cm mark is placed on the glass prism. The metre rule is made to balance by placing a disc of mass  $m$  at a distance  $d$  from the centre of the metre rule, as shown in Fig. 1.2.

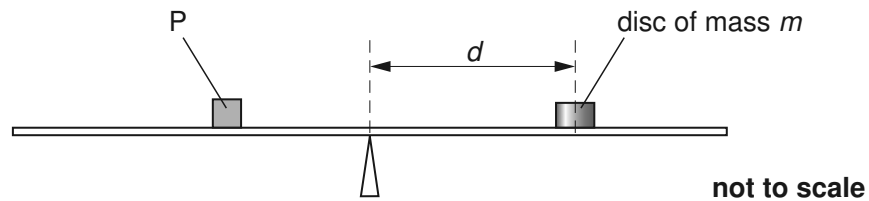


Fig. 1.2

The metre rule has markings every centimetre.

Fig. 1.3 shows the top view of the metre rule when it is balanced with  $m = 50\text{ g}$ .

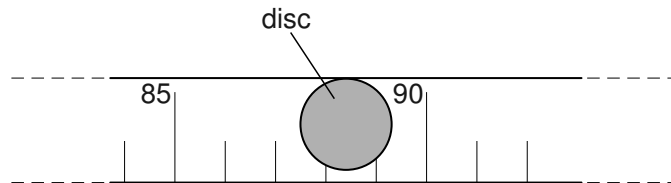


Fig. 1.3

- (i) Use Fig. 1.3 to estimate the position on the rule of the centre of mass of the disc.

Give your answer to the nearest 0.1 cm.

position of centre of disc = ..... [1]

3

(ii) Determine the value of  $d$  for  $m = 50$  g.

$d = \dots\dots\dots$  [1]

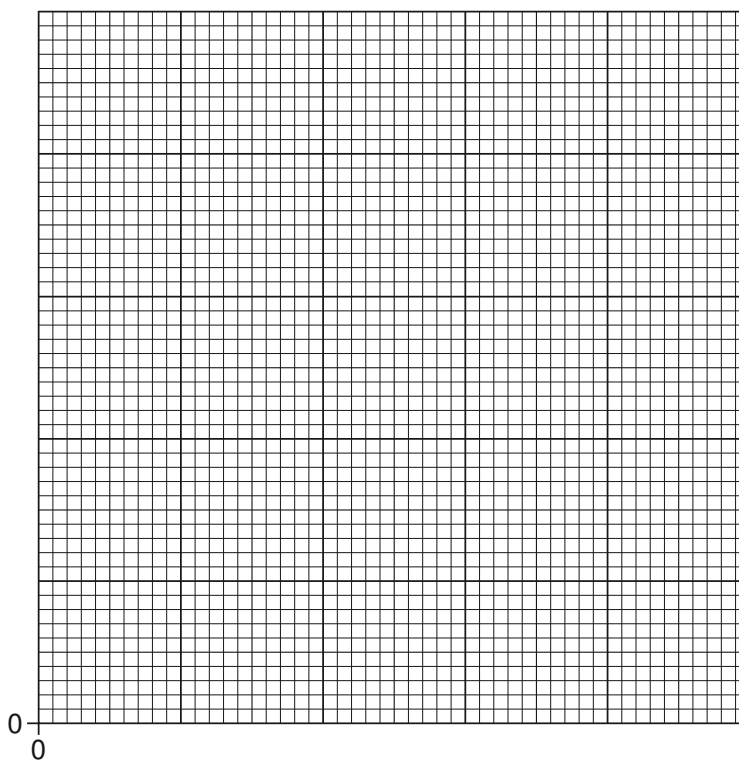
(c) The metre rule is balanced for different values of  $m$  and  $d$ .

(i) The values are recorded in the table below. Insert your value of  $d$  from (b)(ii).

$m/g$	$d/cm$
400	4.8
200	9.9
150	13.0
100	19.8
75	26.2
50	

(ii) On the grid below, plot a graph of  $d$  on the  $y$ -axis against  $m$  on the  $x$ -axis.

Draw a smooth curve of best fit.



[4]

(d) (i) The student decides to take an additional reading, for  $m = 300$  g.

Suggest why this is a good idea.

.....  
..... [1]

(ii) Use the graph to estimate the value of  $d$  for  $m = 300$  g.

Show on your graph how you obtained your value of  $d$ .

$d =$  ..... [2]

(e) Suggest a reason why values of  $m$  less than 40 g are not used.

.....  
..... [1]

2 Fig. 2.1 shows an experiment to measure the speed of sound in air.

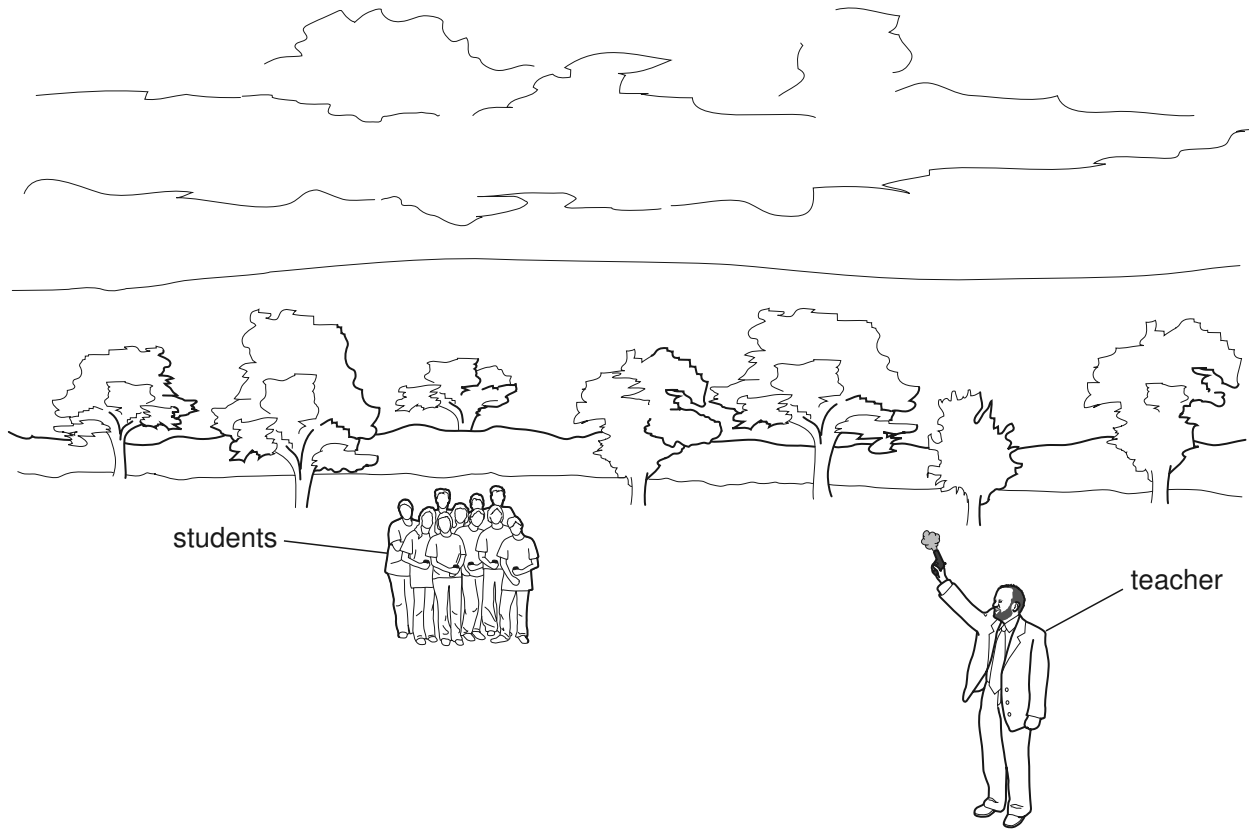


Fig. 2.1

The teacher has a starting pistol that produces a loud bang and a puff of smoke when the trigger is pulled. The students use stopwatches to time the interval between seeing the smoke and hearing the bang.

The teacher stands 100 m away from the students and fires the starting pistol.

(a) Suggest a method of measuring the distance of 100 m from the teacher to the students.

.....  
 ..... [1]

(b) Explain why it is important that the starting pistol produces a puff of smoke at the same time as the bang.

.....  
 ..... [1]

(c) The teacher chooses an open area, well away from any buildings. Explain why.

.....  
..... [1]

(d) Only eight students manage to obtain a suitable reading for the time interval.

Suggest two reasons why the other students did not.

1. ....  
..... [1]

2. ....  
..... [1]

(e) A different group of students does the experiment on a windy day. The wind is blowing from behind the teacher towards the students.

What will be the effect of the wind on their value for the speed of sound?

.....  
..... [1]

3 A student takes three lenses from a drawer labelled 'convex lenses:  $f = 15\text{ cm}$ '.

(a) Describe, with the aid of a labelled diagram, how the student quickly checks that the lenses have the correct focal length.

.....

.....

.....

..... [3]

(b) The student places two of the lenses touching each other, as shown in Fig. 3.1, and then measures the focal length of the two lenses together.



Fig. 3.1

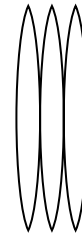


Fig. 3.2

The focal length of two lenses together is found to be 7.5 cm.

The student repeats the experiment with three lenses together, as shown in Fig. 3.2, and the focal length is now 5.0 cm.

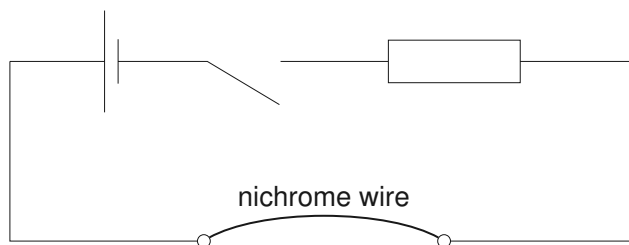
State the relationship between the number of lenses and the focal length.

.....

.....

..... [2]

- 4 Fig. 4.1 is a circuit containing a cell, a resistor, a switch and a 1.0 m length of thin nichrome wire.



**Fig. 4.1**

Measuring the resistance of the nichrome wire allows the diameter of the wire to be determined.

- (a) In the space below, re-draw Fig. 4.1, adding an ammeter and a voltmeter to enable the resistance of the wire to be found.

[2]

- (b) Suggest a reason for including the resistor in the circuit.

.....  
 .....

[1]

- (c) Fig. 4.2 shows the readings on the ammeter and on the voltmeter.



**Fig. 4.2**

State the reading on

- (i) the voltmeter, .....
- (ii) the ammeter. ....

[2]



- (d) The diameter  $d$ , in millimetres, of the nichrome wire is given by the relationship

$$d^2 = \frac{6I}{\pi V}$$

where  $I$  is the ammeter reading in amperes,  
and  $V$  is the voltmeter reading in volts.

Calculate  $d$ , giving your answer to 2 significant figures.

$d = \dots\dots\dots$  mm [2]

- (e) Suggest a suitable measuring instrument to check your value for the diameter of the wire.

$\dots\dots\dots$  [1]





**BLANK PAGE**

---

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

University of Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.