UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

0501610434

PHYSICS **0625/23**

Paper 2 Core **October/November 2012**

1 hour 15 minutes

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 pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1 kg to be 10 N (i.e. acceleration of free fall = 10 m/s^2).

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	
5	
6	
7	
8	
9	
10	
11	
12	
Total	

This document consists of **19** printed pages and **1** blank page.

1 Two boys, X and Y, decide to measure the speed of some of the vehicles travelling along a road. The two boys stand 405 m apart beside the road, as shown in Fig. 1.1.

For Examiner's Use

Fig. 1.1 (not to scale)

Boy X has a stopwatch which he sets to zero. As a vehicle passes boy Y, boy Y drops his hand as a signal to boy X to start his stopwatch. Boy X then stops the stopwatch as the vehicle goes past him.

The appearance of the stopwatch is then as shown in Fig. 1.2.

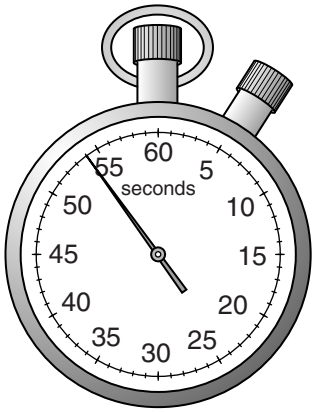

Fig. 1.2

(a) How long did it take for the vehicle to travel from Y to X?

time = ... s [1]

(b) Calculate the average speed of the vehicle as it travels from Y to X.

average speed = ... [4]

(c) The vehicle in **(a)** and **(b)** is accelerating as it travels from Y to X.

For Examiner's Use

(i) How does its speed at X compare with that at Y?

Tick one box.

greater than at Y	☐
same as that at Y	☐
less than that at Y	☐

(ii) How does its speed at X compare with the average speed calculated in **(b)**?

Tick one box.

greater than average speed	☐
same as average speed	☐
less than average speed	☐

[2]

[Total: 7]

2 Solids, liquids and gases have different properties. The list below gives some of them.

For Examiner's Use

shape
- completely fills the container
- fills the container from the bottom
- fixed shape

molecules
- move around, close together
- move around, far apart
- vibrate about a fixed position

Use descriptions from the list to complete the table. Any description may be used more than once if appropriate. Two spaces have been filled in to help you.

	shape	molecules
(a) solid		
(b) liquid		move around, close together
(c) gas	completely fills the container	

[2]

[1]

[1]

[Total: 4]

3 Here is a list of energy resources available to the world. Some of these are renewable and some are non-renewable.

For Examiner's Use

In the first blank column, put a tick by any **two** resources that are renewable.

In the second blank column, put a tick by any **two** resources that are non-renewable.

	renewable	non-renewable
coal		
hydroelectricity		
nuclear energy		
oil		
solar energy		
tidal energy		
wind energy		

[4]

[Total: 4]

4 An aluminium rod is cut into a longer section and a shorter section, as shown in Fig. 4.1.

Fig. 4.1

(a) The shorter section of the rod is placed into a measuring cylinder containing water.

Fig. 4.2 shows the appearance of the measuring cylinder before and after this is done.

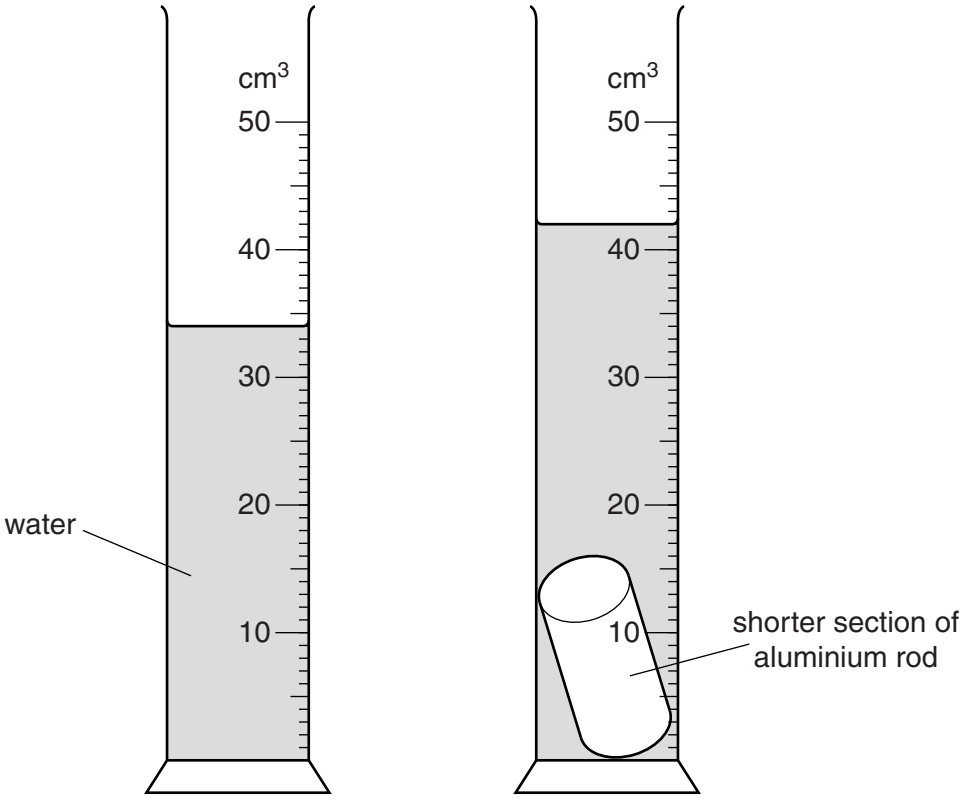

Fig. 4.2 (not full size)

(i) Calculate the volume of the shorter section of aluminium rod.

volume = ... cm^3 [3]

For Examiner's Use

(ii) The mass of this shorter section is measured as 21.2 g.

1. Name a laboratory instrument that might have been used to measure this mass.

.....[1]

2. Calculate the density of aluminium.

density = ...[4]

(b) (i) Name an instrument that could be used to measure the length of the longer section of aluminium rod.

.....[1]

(ii) Suggest a method, different from that in Fig. 4.2, that could be used to determine the volume of this longer section.

.....

.....

.....

.....[2]

[Total: 11]

5 **(a)** In Fig. 5.1, A and B are two parallel plane mirrors. A ray of light strikes mirror A at an angle of incidence of 45°. The ray then reflects, to strike mirror B.

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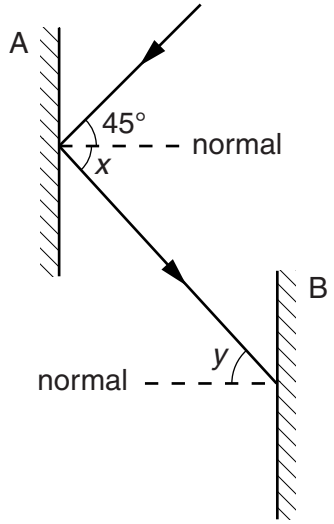


Fig. 5.1

(i) State the name given to the angle *x* shown on Fig. 5.1.

.....[1]

(ii) State the value of

1. angle *x*, ...

2. angle *y*. .....

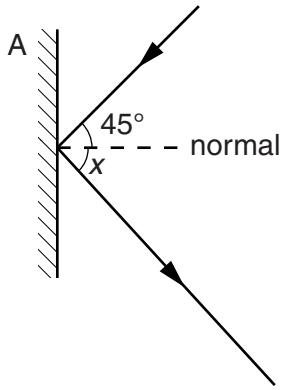
[2]

(iii) On Fig. 5.1, use your ruler to draw the path of the ray after it leaves the surface of B. [1]

(b) The mirror B is now rotated so that it reflects the ray of light back along its original path.

On Fig. 5.2, draw mirror B in the correct position to do this.

For Examiner's Use



[1]

Fig. 5.2

[Total: 5]

6 Some water in a glass beaker is heated from below, as shown in Fig. 6.1.

For Examiner's Use

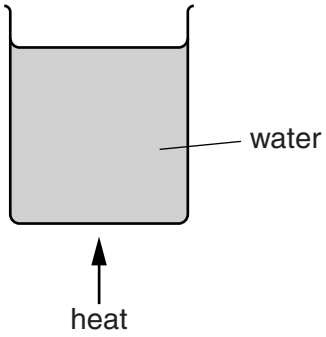


Fig. 6.1

(a) Name the process by which thermal energy is transferred

(i) through the glass, ...

(ii) throughout the water. .....
[2]

(b) As thermal energy is supplied, the temperature of the water begins to rise. Although the supply of energy remains constant, eventually the temperature becomes steady at about 80°C.

Suggest why this happens.

.....

.....

.....[1]

(c) The rate of energy supply is increased. The temperature of the water begins to rise again, but eventually becomes steady at a higher temperature. This time many bubbles are seen throughout the water.

(i) State what is now happening to the water.

.....[1]

(ii) What gas do the bubbles contain? Tick **one** box.

air	☐
hydrogen	☐
oxygen	☐
steam	☐

[1]

[Total: 5]

7 **(a)** State what is meant by the *echo* of a sound.

.....

.....

.....[2]

(b) Describe how the echo of a sound may be demonstrated. Include a diagram that shows approximate sizes and distances.

diagram

description of method .....

.....

.....

.....

.....

.....[3]

(c) The demonstration in **(b)** is used to find the speed of sound in air.

(i) Which two measurements should be made?

1. .....

2. .....
[2]

(ii) State how you would calculate the speed of sound from these measurements.

.....

.....

.....[2]

[Total: 9]

8 Fig. 8.1 represents the circuit that operates two of the lamps on a car.

For Examiner's Use

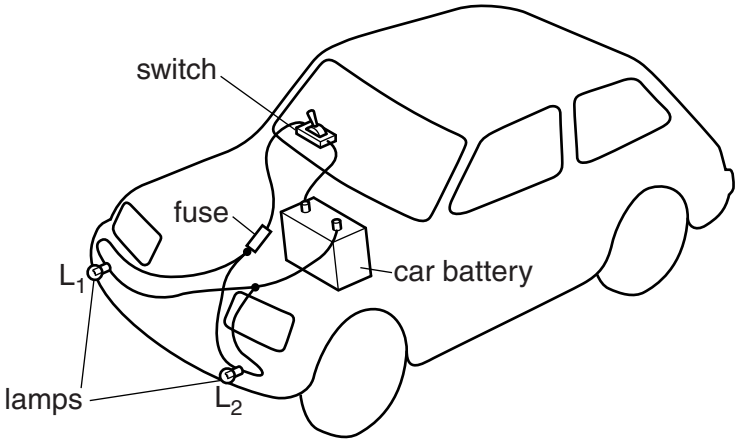


Fig. 8.1

(a) In the space below, draw the circuit diagram for this circuit, using conventional symbols.

[3]

(b) The car battery has an e.m.f. of 12V and, when the lamps are switched on, there is a current of 1.6A in each lamp.

Calculate the resistance of one of the lamps.

resistance = ...[4]

(c) When the switch is turned on, both lamps should light up. On one occasion when the driver operates the switch, lamp L_2 fails to light up.

For Examiner's Use

Suggest a reason for this.

.....

.....

.....[1]

(d) An amateur workman connects a length of wire across lamp L_2 and shorts it out.

When the switch is closed for the first time after this, what happens, if anything, to

(i) the fuse, ...

(ii) lamp L_1, ...

(iii) lamp L_2? .....

[3]

[Total: 11]

[Turn over

9 **(a)** Magnets A and B, shown in Fig. 9.1, attract each other.

Fig. 9.1

The S pole of magnet A has been marked.

On Fig. 9.1, mark the polarities of the other poles, using the letters N or S. [1]

(b) A soft-iron rod and a steel rod each have coils around them. Both rods are initially unmagnetised. The coils are attached to circuits, as shown in Fig. 9.2.

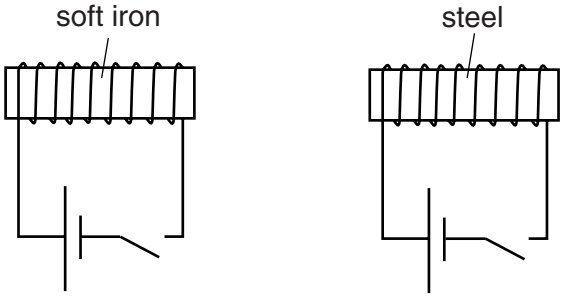


Fig. 9.2

(i) Use the following statements to complete the table referring to the soft-iron rod and the steel rod shown in Fig. 9.2.

magnetised **loses its magnetism** **keeps its magnetism**

	switch closed	switch open
soft iron		
steel		

[2]

(ii) Which words apply to the force between the rods when the switches are closed?

Tick one box.

no force ☐

attractive force ☐

repulsive force ☐ [1]

(iii) Which of the two arrangements in Fig. 9.2 would be used as the electromagnet on the crane in a scrap-metal yard?

For Examiner's Use

.....[1]

(iv) State one advantage that an electromagnet could have in comparison with a similar-sized permanent magnet.

.....

.....[1]

[Total: 6]

10 **(a)** Suggest how a plastic rod may be given an electrostatic charge.

.....

.....

.....

.....[2]

(b) A charged sphere is suspended on an insulating thread.

When a plastic rod with a positive charge is held near the suspended charged sphere, the sphere moves to the position shown in Fig. 10.1.

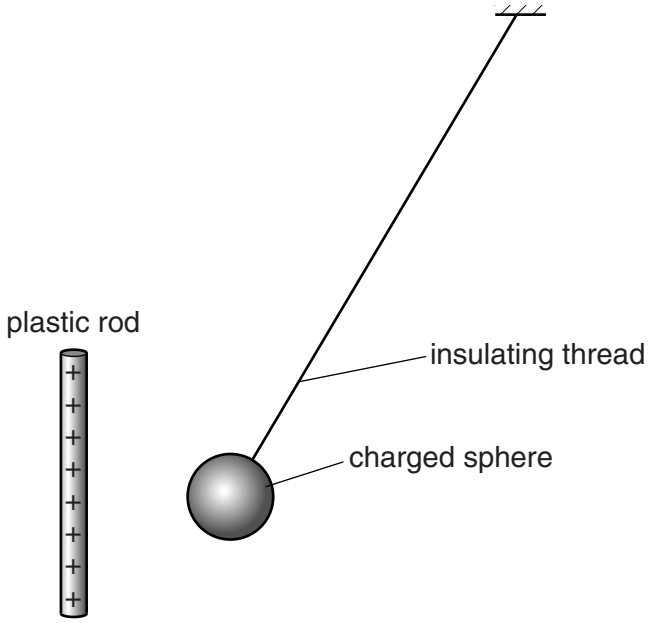


Fig. 10.1

(i) State the sign of the charge on the sphere. .....

(ii) Give the reason for your answer to **(b)(i)**.

.....

.....

.....

.....
[2]

(c) On Fig. 10.1, draw an arrow to show the electrostatic force on the sphere. [1]

(d) The positively-charged plastic rod is removed and replaced by a plastic rod with a negative charge.

For Examiner's Use

Describe the position that the suspended sphere now takes.

.....

.....

.....[1]

[Total: 6]

11 (a) The charges on the particles in an atom may be represented by

0 or +1 or –1.

The masses of the particles in an atom may be represented by

0 or m or 2000 m.

Using these choices, complete the table below.

particle	charge	mass
electron	–1	m
neutron		
proton		

[4]

(b) How many of each of these particles are there in a neutral atom of $^{238}_{92}U$?

number of electrons = ...

number of neutrons = ...

number of protons = ...

[3]

[Total: 7]

12 Fig. 12.1 shows the graph of the count rate from a radioactive source over a period of time. The readings have already had the background count rate subtracted.

For Examiner's Use

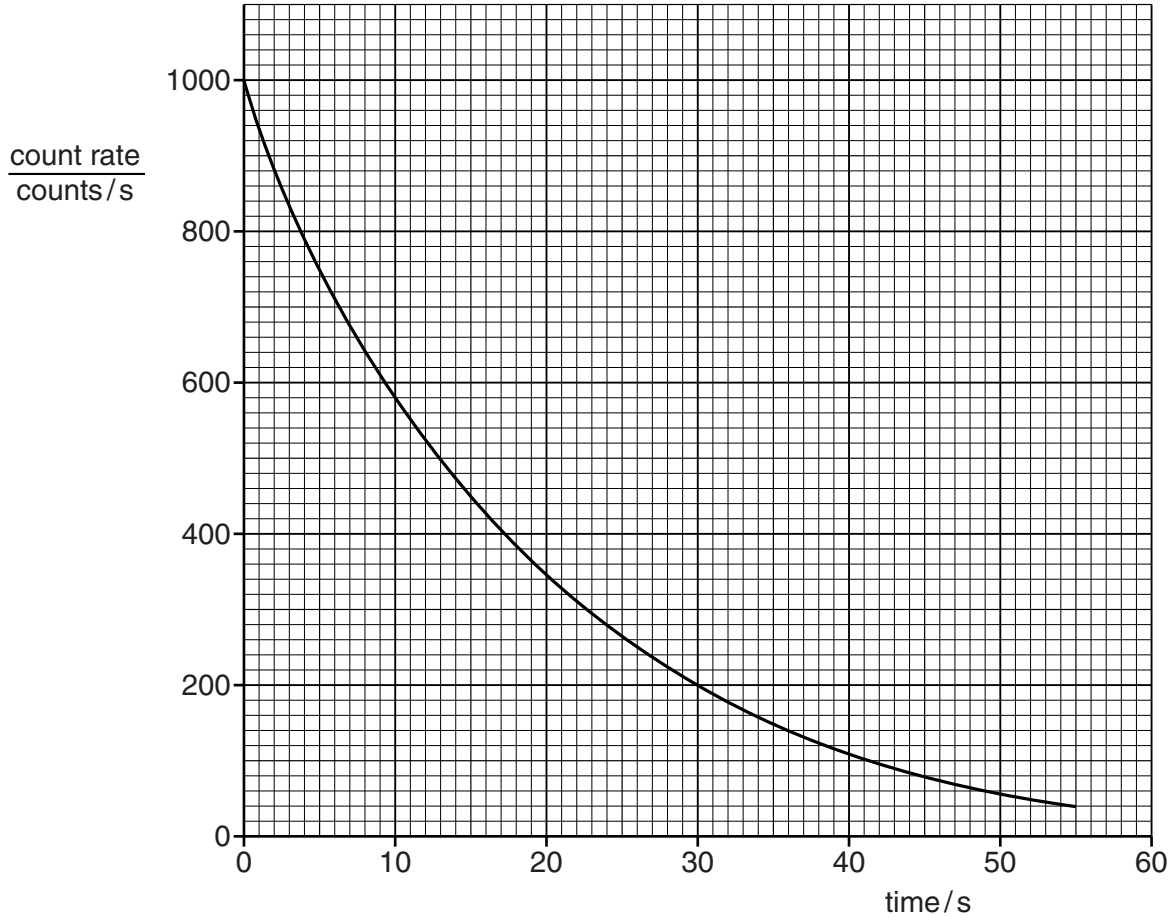


Fig. 12.1

(a) From Fig. 12.1, find the time taken for the count rate to decrease from 1000 counts / s to 125 counts / s.

time = ... s [1]

(b) How many half-lives of the radioactive material were there during the time interval in **(a)**?

number of half lives = ...[1]

(c) From your answers to **(a)** and **(b)**, calculate the half-life of the material.

half-life = ... s [2]

(d) On Fig. 12.1, sketch the curve that might have been plotted if the background count rate had **not** been subtracted. [1]

[Total: 5]

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