

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

**PHYSICS**

Paper 3



**0625/03**

May/June 2005

**1 hour 15 minutes**

Candidates answer on the Question Paper.  
No Additional Materials are required.

Candidate  
Name

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Centre  
Number

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Candidate  
Number

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**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 in the spaces provided on the Question Paper.  
You may use a soft pencil for any diagrams, graphs or rough working.  
Do not use staples, paper clips, highlighters, glue or correction fluid.

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.

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<sup>2</sup>).

**DO NOT WRITE IN THE BARCODE.**

**DO NOT WRITE IN THE GREY AREAS BETWEEN THE PAGES.**

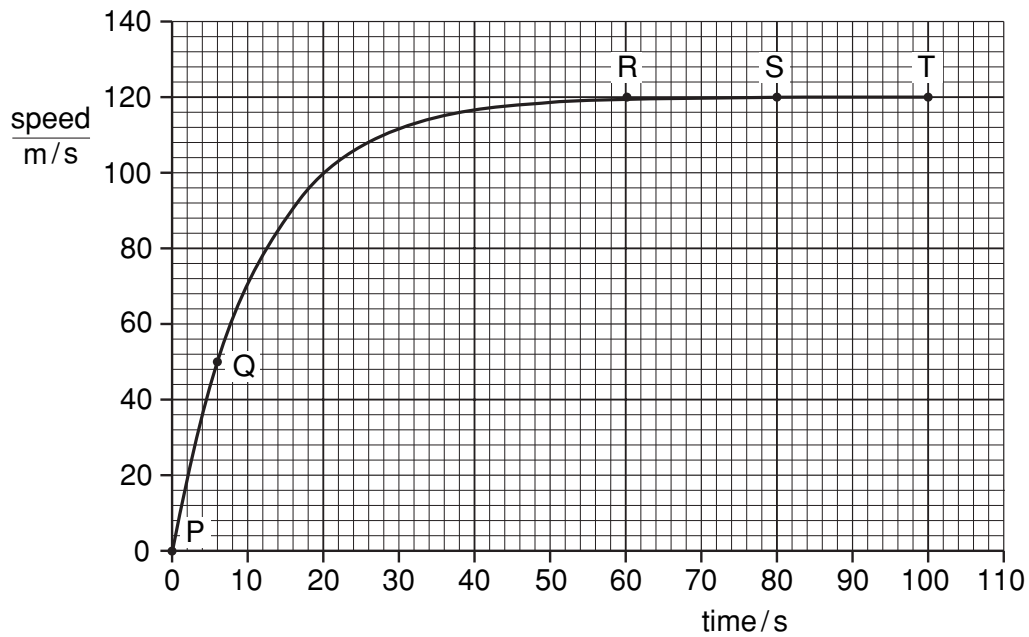
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Total	

This document consists of **15** printed pages and **1** blank page.



- 1 A solid plastic sphere falls towards the Earth.

Fig. 1.1 is the speed-time graph of the fall up to the point where the sphere hits the Earth's surface.



**Fig. 1.1**

- (a) Describe in detail the motion of the sphere shown by the graph.

.....

.....

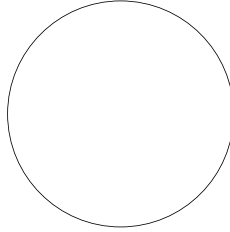
.....

.....

..... [3]

- (b) On Fig. 1.2, draw arrows to show the directions of the forces acting on the sphere when it is at the position shown by point S on the graph. Label your arrows with the names of the forces. [2]

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**Fig. 1.2**

- (c) Explain why the sphere is moving with constant speed at S.

.....

.....

..... [2]

- (d) Use the graph to calculate the approximate distance that the sphere falls

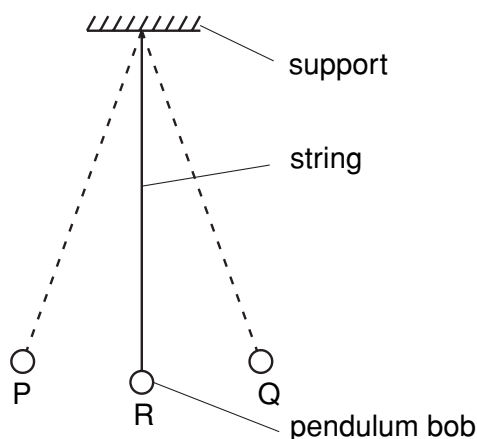
- (i) between R and T,

distance = ..... [2]

- (ii) between P and Q.

distance = ..... [2]

- 2 Fig. 2.1 shows a simple pendulum that swings backwards and forwards between P and Q.



**Fig. 2.1**

- (a) The time taken for the pendulum to swing from P to Q is approximately 0.5 s.

Describe how you would determine this time as accurately as possible.

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

- (b) (i) State the two vertical forces acting on the pendulum bob when it is at position R.

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

- (ii) The pendulum bob moves along the arc of a circle. State the direction of the resultant of the two forces in (i).

..... [1]

- (c) The mass of the bob is 0.2 kg. During the swing it moves so that P is 0.05 m higher than R.

Calculate the increase in potential energy of the pendulum bob between R and P.

potential energy = ..... [2]

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- 3** A mass of 3.0 kg accelerates at  $2.0 \text{ m/s}^2$  in a straight line.

**(a)** State why the velocity and the acceleration are both described as vector quantities.

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

**(b)** Calculate the force required to accelerate the mass.

force = ..... [2]

**(c)** The mass hits a wall.

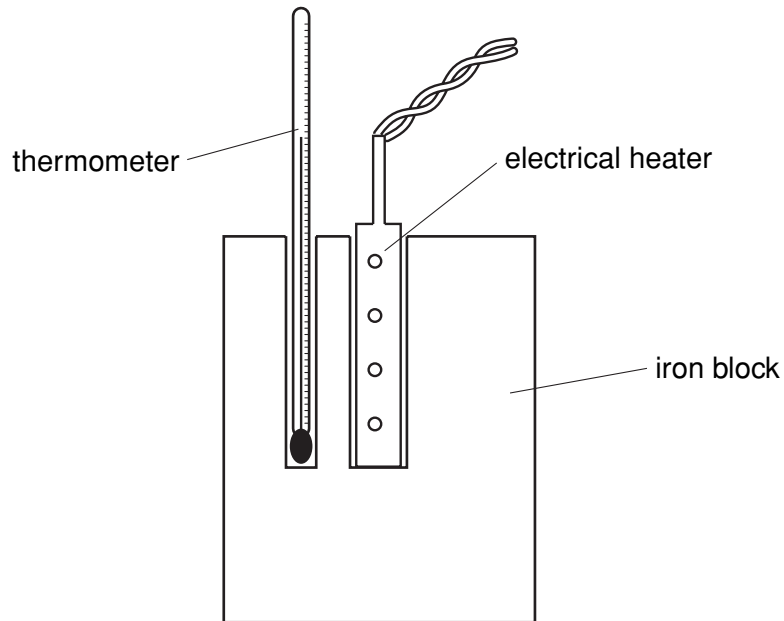
The average force exerted on the wall during the impact is 120 N.

The area of the mass in contact with the wall at impact is  $0.050 \text{ m}^2$ .

Calculate the average pressure that the mass exerts on the wall during the impact.

pressure = ..... [2]

- 4 Fig. 4.1 shows apparatus that a student uses to make an estimate of the specific heat capacity of iron.



**Fig. 4.1**

- (a) The power of the heater is known. State the four readings the student must take to find the specific heat capacity of iron.

1. ....
2. ....
3. ....
4. .... [3]

- (b) Write down an equation, in words or in symbols, that could be used to work out the specific heat capacity of iron from the readings in (a).

[2]

- (c) (i) Explain why the value obtained with this apparatus is higher than the actual value.

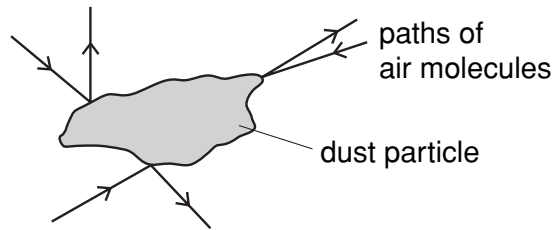
.....  
..... [1]

- (ii) State one addition to the apparatus that would help to improve the accuracy of the value obtained.

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

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- 5 (a) Fig. 5.1 shows the paths of a few air molecules and a single dust particle. The actual air molecules are too small to show on the diagram.



**Fig. 5.1**

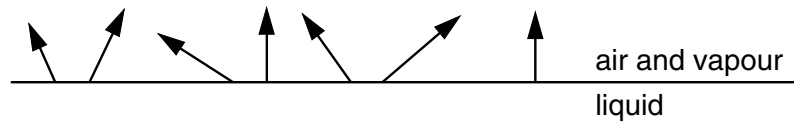
Explain why the dust particle undergoes small random movements.

.....

.....

..... [4]

- (b) Fig. 5.2 shows the paths of a few molecules leaving the surface of a liquid. The liquid is below its boiling point.



**Fig. 5.2**

- (i) State which liquid molecules are most likely to leave the surface.

.....

..... [1]

- (ii) Explain your answer to (i).

.....

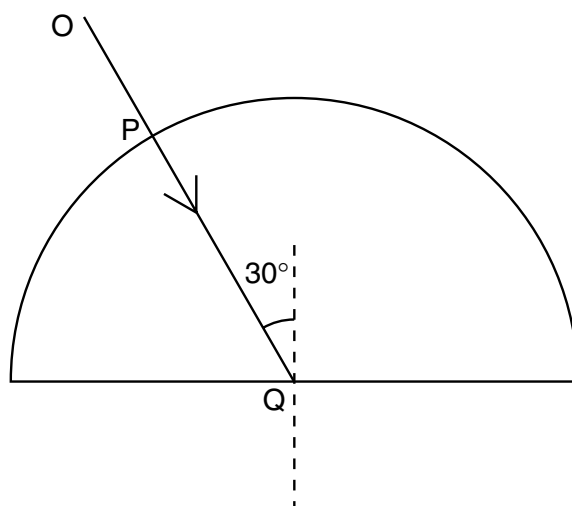
.....

..... [2]



- 6 Fig. 6.1 shows a ray of light OPQ passing through a semi-circular glass block.

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**Fig. 6.1**

- (a) Explain why there is no change in the direction of the ray at P.

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

- (b) State the changes, if any, that occur to the speed, wavelength and frequency of the light as it enters the glass block.

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

- (c) At Q some of the light in ray OPQ is reflected and some is refracted.

On Fig. 6.1, draw in the approximate positions of the reflected ray and the refracted ray. Label these rays. [2]

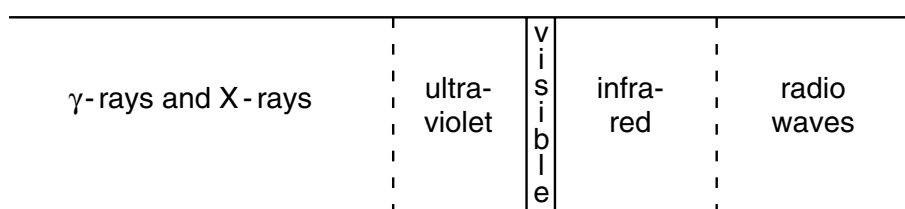
- (d) The refractive index for light passing from glass to air is 0.67.

Calculate the angle of refraction of the ray that is refracted at Q into air.

angle = ..... [3]

- 7 Fig. 7.1 shows the parts of the electromagnetic spectrum.

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**Fig. 7.1**

- (a) Name one type of radiation that has

- (i) a higher frequency than ultra-violet,

..... [1]

- (ii) a longer wavelength than visible light.

..... [1]

- (b) Some  $\gamma$ -rays emitted from a radioactive source have a speed in air of  $3.0 \times 10^8$  m/s and a wavelength of  $1.0 \times 10^{-12}$  m.

Calculate the frequency of the  $\gamma$ -rays.

frequency = ..... [2]

- (c) State the approximate speed of infra-red waves in air.

..... [1]

8 A student has a power supply, a resistor, a voltmeter, an ammeter and a variable resistor.

- (a) The student obtains five sets of readings from which he determines an average value for the resistance of the resistor.

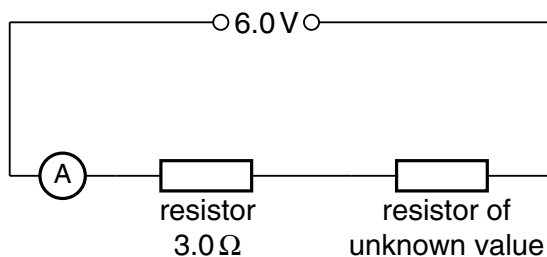
In the space below, draw a labelled diagram of a circuit that he could use.

[3]

- (b) Describe how the circuit should be used to obtain the five sets of readings.

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

- (c) Fig. 8.1 shows another circuit.



**Fig. 8.1**

When the circuit is switched on, the ammeter reads 0.50 A.

- (i) Calculate the value of the unknown resistor.

resistance = ..... [2]

- (ii) Calculate the charge passing through the  $3.0\ \Omega$  resistor in 120 s.

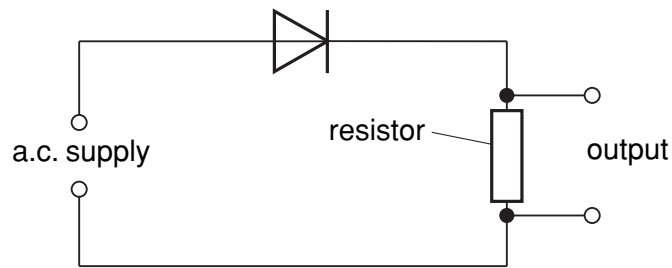
charge = ..... [1]

- (iii) Calculate the power dissipated in the  $3.0\ \Omega$  resistor.

power = ..... [2]

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- 9 (a) Fig. 9.1 shows an a.c. supply connected to a resistor and a diode.

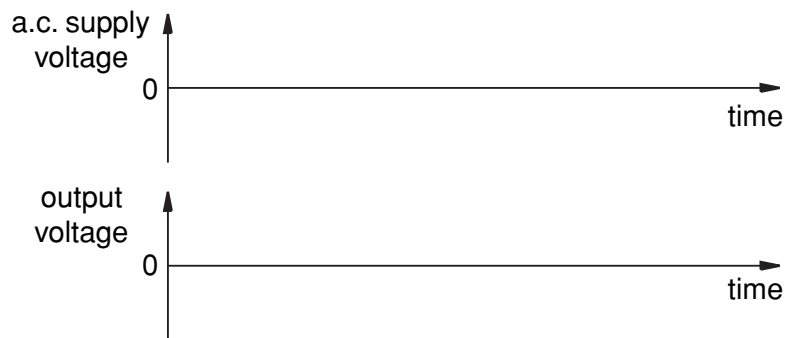


**Fig. 9.1**

- (i) State the effect of fitting the diode in the circuit.

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

- (ii) On Fig. 9.2, sketch graphs to show the variation of the a.c. supply voltage and the output voltage with time.



**Fig. 9.2**

[2]

- (b) (i) In the space below, draw the symbol for a NOT gate.

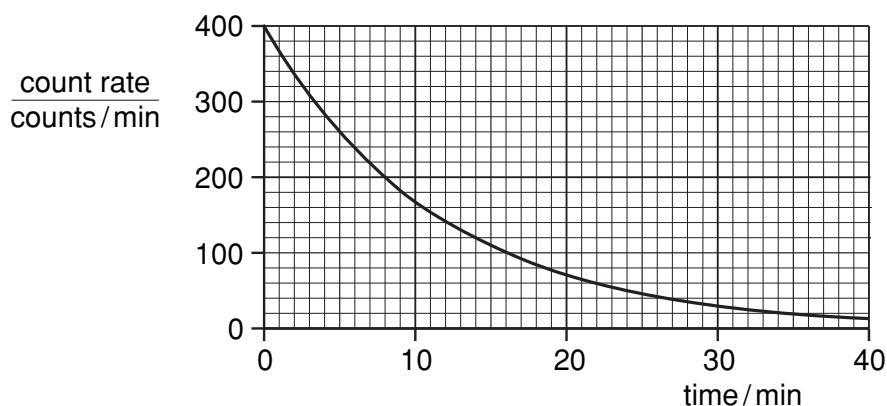
[1]

- (ii) State the action of a NOT gate.

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

- 10 (a) Fig. 10.1 is the decay curve for a radioactive isotope that emits only  $\beta$ -particles.

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Use



**Fig. 10.1**

Use the graph to find the value of the half-life of the isotope.

Indicate, on the graph, how you arrived at your value.

half-life ..... [2]

- (b) A student determines the percentage of  $\beta$ -particles absorbed by a thick aluminium sheet. He uses a source that is emitting only  $\beta$ -particles and that has a long half-life.
- (i) In the space below, draw a labelled diagram of the apparatus required, set up to make the determination.

[2]

- (ii) List the readings that the student needs to take.

.....

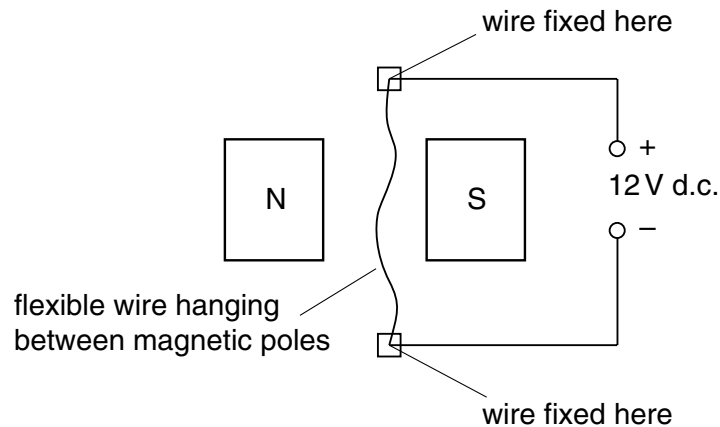
.....

.....

..... [3]

- 11 Fig. 11.1 shows a flexible wire hanging between two magnetic poles. The flexible wire is connected to a 12 V d.c. supply that is switched off.

For  
Examiner's  
Use



**Fig. 11.1**

- (a) Explain why the wire moves when the supply is switched on.

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

- (b) State the direction of the deflection of the wire.

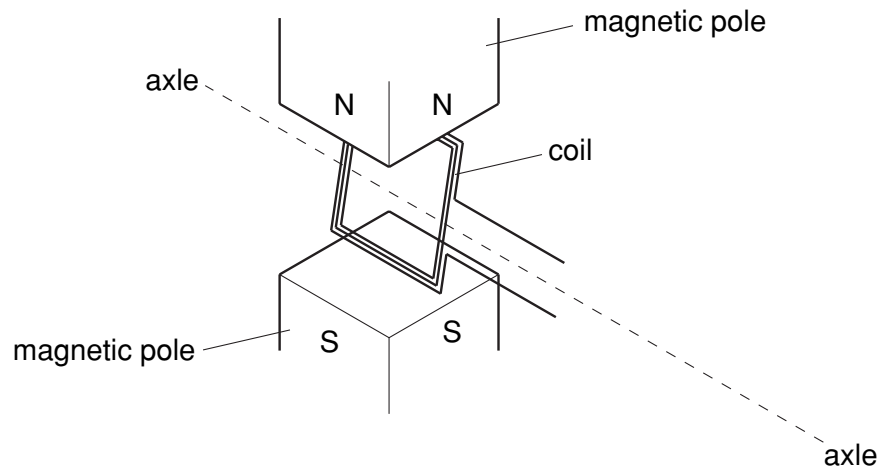
.....  
 ..... [2]

- (c) When the wire first moves, energy is changed from one form to another. State these two forms of energy.

from ..... to ..... [1]

- (d) Fig. 11.2 shows the flexible wire made into a rigid rectangular coil and mounted on an axle.

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**Fig. 11.2**

- (i) Add to the diagram an arrangement that will allow current to be fed into the coil whilst allowing the coil to turn continuously. Label the parts you have added. [1]
- (ii) Briefly explain how your arrangement works.

.....

..... [2]

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