

Centre Number

[ ] [ ]

Candidate Name \_\_\_\_\_

**International General Certificate of Secondary Education  
CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**PHYSICS  
PAPER 3**

**0625/3**

**OCTOBER/NOVEMBER SESSION 2002**

1 hour 15 minutes

Candidates answer on the question paper.  
No additional materials are required.

**TIME** 1 hour 15 minutes

**INSTRUCTIONS TO CANDIDATES**

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

**INFORMATION FOR CANDIDATES**

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	
<b>TOTAL</b>	

**This question paper consists of 14 printed pages and 2 blank pages.**



- 1 Fig. 1.1 shows a smooth metal block about to slide down BD, along DE and up EF. BD and DE are friction-free surfaces, but EF is rough. The block stops at F.

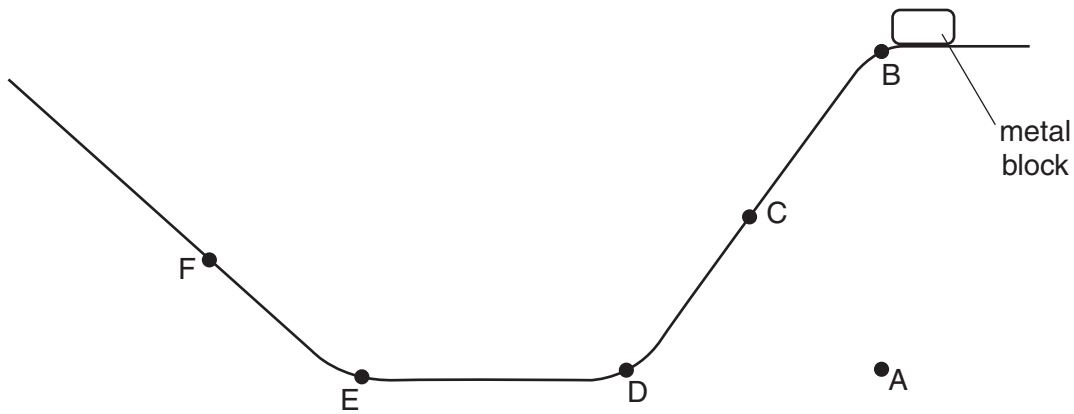


Fig. 1.1

- (a) On Fig. 1.2, sketch the speed-time graph for the journey from B to F. Label D, E and F on your graph.

[3]



Fig. 1.2

- (b) The mass of the block is 0.2 kg. The vertical height of B above A is 0.6 m. The acceleration due to gravity is  $10 \text{ m/s}^2$ .

- (i) Calculate the work done in lifting the block from A to B.

work done = .....

- (ii) At C, the block is moving at a speed of 2.5 m/s. Calculate its kinetic energy at C.

kinetic energy = .....

[5]

(c) As it passes D, the speed of the block remains almost constant but the velocity changes. Using the terms *vector* and *scalar*, explain this statement.

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

(d) F is the point where the kinetic energy of the block is zero. In terms of energy changes, explain why F is lower than B.

.....  
.....  
.....  
.....[3]

2 A student is given the following apparatus in order to find the density of a piece of rock.

- 100 g mass
- metre rule
- suitable pivot on which the rule will balance
- measuring cylinder that is big enough for the piece of rock to fit inside
- cotton
- water

The rock has a mass of approximately 90 g.

(a) (i) In the space below, draw a labelled diagram of apparatus from this list set up so that the student is able to find the mass of the piece of rock.

(ii) State the readings the student should take and how these would be used to find the mass of the rock.

.....

.....

.....

[5]

(b) Describe how the volume of the rock could be found.

.....

.....

.....[2]

(c) The mass of the rock is 88 g and its volume is 24 cm<sup>3</sup>. Calculate the density of the rock.

density of rock = ..... [2]

3 A thermocouple is used to measure the temperature of the inner wall of a pottery kiln.

(a) In the space below, draw a labelled diagram of a thermocouple that could be used for this purpose. [2]

(b) Describe

(i) how you would read the temperature of the wall from the thermocouple,

.....  
.....

(ii) how the thermocouple works.

.....  
.....  
.....

[2]

(c) State two conditions in which a thermocouple is very suitable for temperature measurement.

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

4 (a) In an experiment to find the specific latent heat of water, the following readings were taken.

$m_1$ mass of water at 100 °C, before boiling starts	120 g
$m_2$ mass of water at 100 °C, after boiling finishes	80 g
$V$ voltage across the heater	12 V
$I$ current through the heater	2.0 A
$t$ time that the heater was supplying energy	3750 s

(i) Using the symbols above, write down the equation that must be used to find the value of the specific latent heat  $L$  of water.

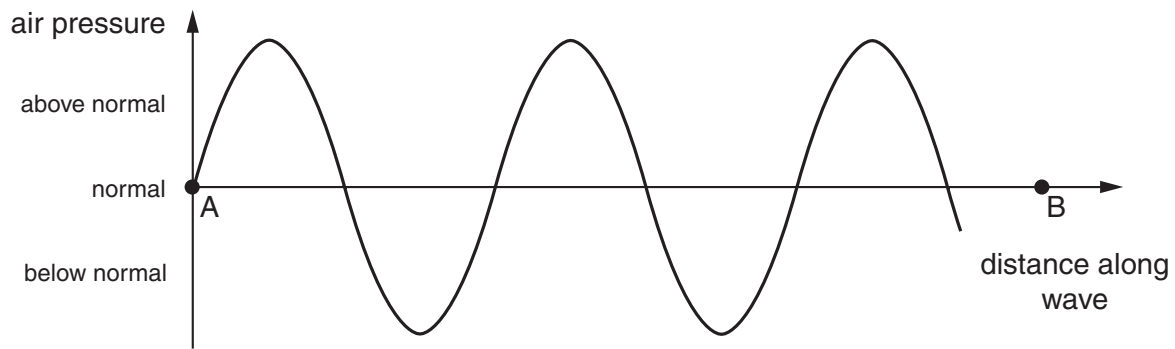
(ii) Use the equation to calculate the specific latent heat of water from the readings above.

specific latent heat = .....  
[4]

(b) Explain, in terms of the energy of molecules, why the specific latent heat of water has a high value.

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

- 5 (a) Fig. 5.1 shows the air pressure variation along a sound wave.



**Fig. 5.1**

- (i) On AB in Fig. 5.1, mark one point of compression with a dot and the letter C and the next point of rarefaction with a dot and the letter R.
- (ii) In terms of the wavelength, what is the distance along the wave between a compression and the next rarefaction?

..... [3]

- (b) A sound wave travels through air at a speed of 340 m/s. Calculate the frequency of a sound wave of wavelength 1.3 m.

frequency = ..... [2]

- 6 (a) Fig. 6.1 shows the results of an experiment to find the critical angle for light in a semi-circular glass block.

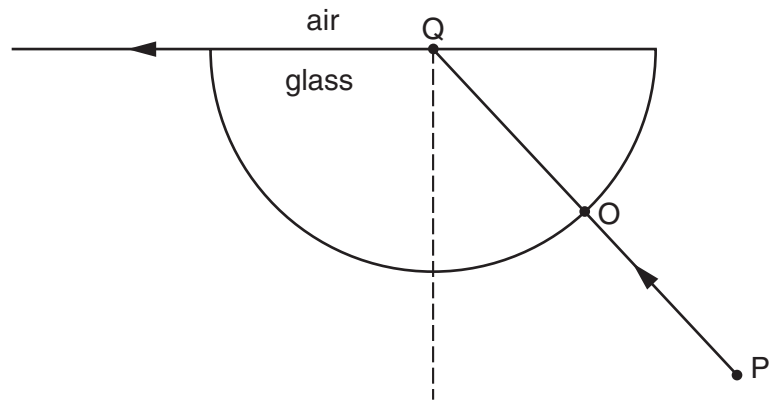


Fig. 6.1

The ray of light PO hits the glass at O at an angle of incidence of  $0^\circ$ .  
Q is the centre of the straight side of the block.

- (i) Measure the critical angle of the glass from Fig. 6.1.

critical angle = .....

- (ii) Explain what is meant by the *critical angle* of the light in the glass.

.....

.....

.....

[3]



- (b) Fig. 6.2 shows another ray passing through the same block.

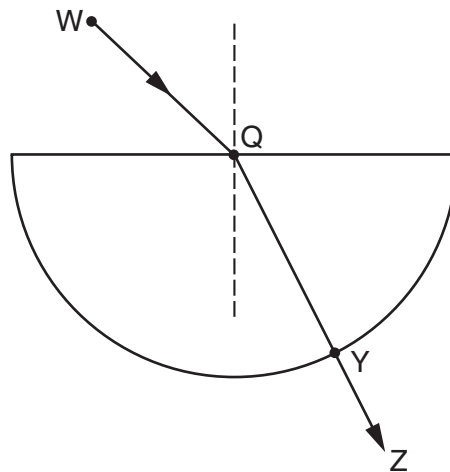


Fig. 6.2

The speed of the light between W and Q is  $3.0 \times 10^8$  m/s. The speed of the light between Q and Y is  $2.0 \times 10^8$  m/s.

- (i) State the speed of the light between Y and Z.

speed = .....

- (ii) Write down an expression, in terms of the speeds of the light, that may be used to find the refractive index of the glass. Determine the value of the refractive index.

refractive index = .....

- (iii) Explain why there is no change of direction of ray QY as it passes out of the glass.

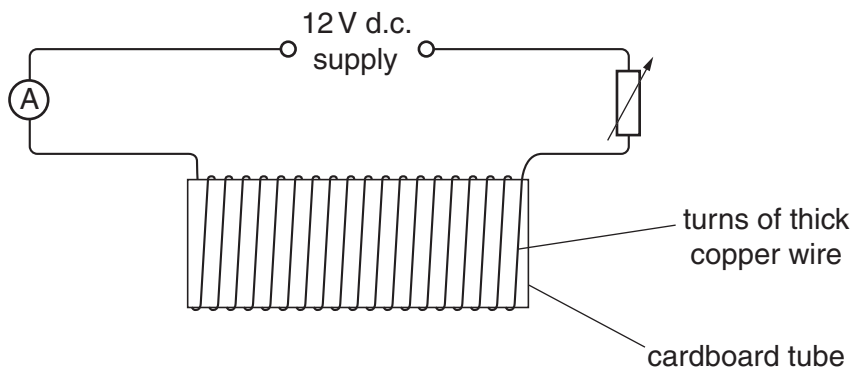
.....

- (iv) What happens to the wavelength of the light as it passes out of the glass?

.....

[5]

- 7 Fig. 7.1 shows an arrangement that could be used for making an electromagnet or a permanent magnet.



**Fig. 7.1**

Two bars of the same size are also available, one made of iron and the other of steel.

- (a) (i) State which bar should be used to make a permanent magnet.

.....

- (ii) Describe how the apparatus would be used to make a permanent magnet.

.....

.....

.....

- (iii) Suggest one reason why the circuit contains an ammeter and a variable resistor.

.....

.....

[3]

(b) During the making of a permanent magnet, the ammeter reads a steady current of 4.0 A throughout the 5.0 s that the current is switched on. The voltage of the supply is 12 V.

Calculate

(i) the total circuit resistance,

resistance = .....

(ii) the power of the supply,

power = .....

(iii) the energy supplied during the 5.0 s.

energy = .....

[6]

(c) The potential difference across the variable resistor is 7.0 V and that across the ammeter is zero.

(i) Calculate the potential difference across the magnetising coil.

potential difference = .....

(ii) State the general principle used in making this calculation.

.....

.....

[3]

- 8 Fig. 8.1 shows a long straight wire between the poles of a permanent magnet. It is connected through a switch to a battery so that, when the switch is closed, there is a steady current in the wire.

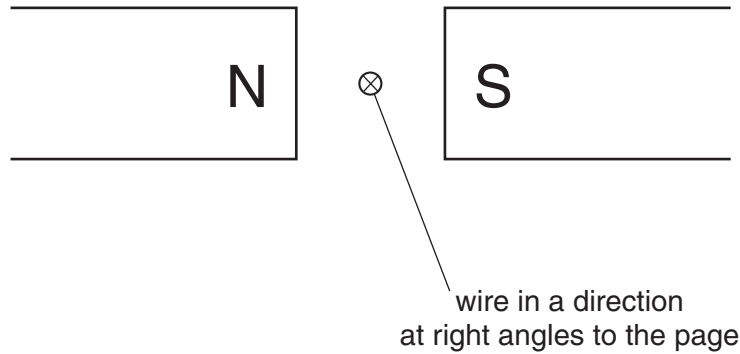
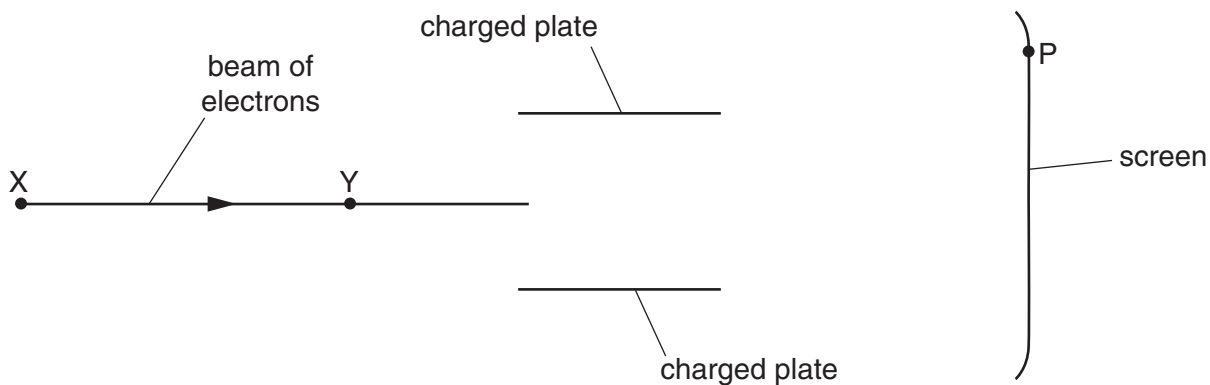


Fig. 8.1

- (a) State the direction of the magnetic field between the poles of the magnet.  
 .....[1]
- (b) The wire is free to move. The current is switched on so that its direction is into the page.
- (i) State the direction of movement of the wire.  
 .....  
 .....
- (ii) Explain how you reached your answer to (b)(i).  
 .....  
 .....  
 ..... [4]
- (c) This experiment is the basis of an electric motor. Describe two changes to the arrangement shown in Fig. 8.1 that would enable continuous rotation to take place.
- change 1 .....  
 .....
- change 2 ..... [2]

- 9 Fig. 9.1 shows a beam of electrons, two charged plates and a screen. These components are inside an electron tube, the outline of which is not shown.



**Fig. 9.1**

The beam of electrons hits the screen at the point P.

- (a) On Fig. 9.1,
- (i) complete the path of the electron beam,
  - (ii) mark the charges on both plates,
  - (iii) mark with an arrow and the letter C the direction of the conventional current in the electron beam.
- [4]
- (b) In this electron tube, the electrons are produced at X and are accelerated towards Y. In the space below, draw a labelled diagram of the components needed to produce and accelerate the electrons.
- [4]

10 Fig. 10.1 is part of the decay curve for a sample of a  $\beta$ -emitting isotope.

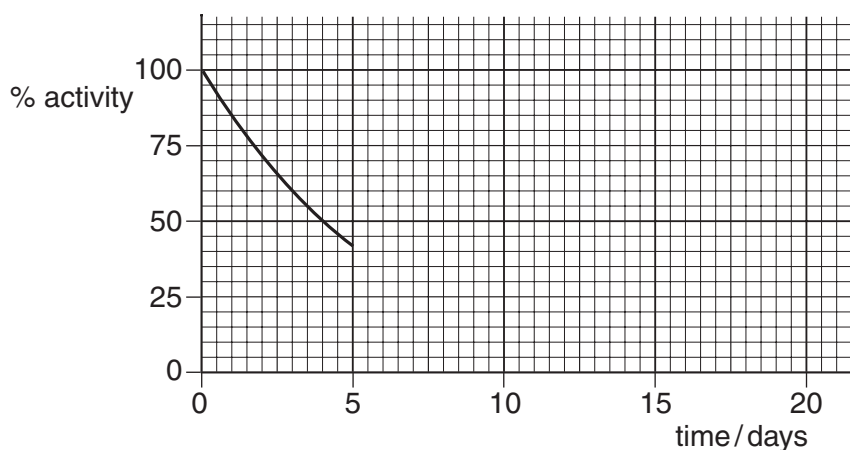


Fig. 10.1

(a) Use Fig. 10.1 to find the half-life of the isotope.

half-life = ..... [1]

(b) Complete Fig. 10.1 as far as time = 20 days, by working out the values of a number of points and plotting them. Show your working. [2]

(c) The decay product of the  $\beta$ -emitting isotope is not radioactive. Explain why the sample of the radioactive isotope will be safer after 20 days than after 1 day. Support your answer by reference to the graph.

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

(d) The isotope used for this decay curve may be represented by the symbol  ${}^A_ZX$ . Write down an equation, by filling in the gaps below, to show the  $\beta$ -decay of this isotope to a decay product that has the symbol Y.





