	Centre Number	Candidate Number
Candidate Name ______		

International General Certificate of Secondary Education
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

PHYSICS 0625/3

PAPER 3

OCTOBER/NOVEMBER SESSION 2001 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	
TOTAL	

This question paper consists of 16 printed pages.

SB (CW/KN) S10764/2

For Examiner's Use

1 Fig. 1.1 shows the motion of a train over a section of track which includes a sharp bend.

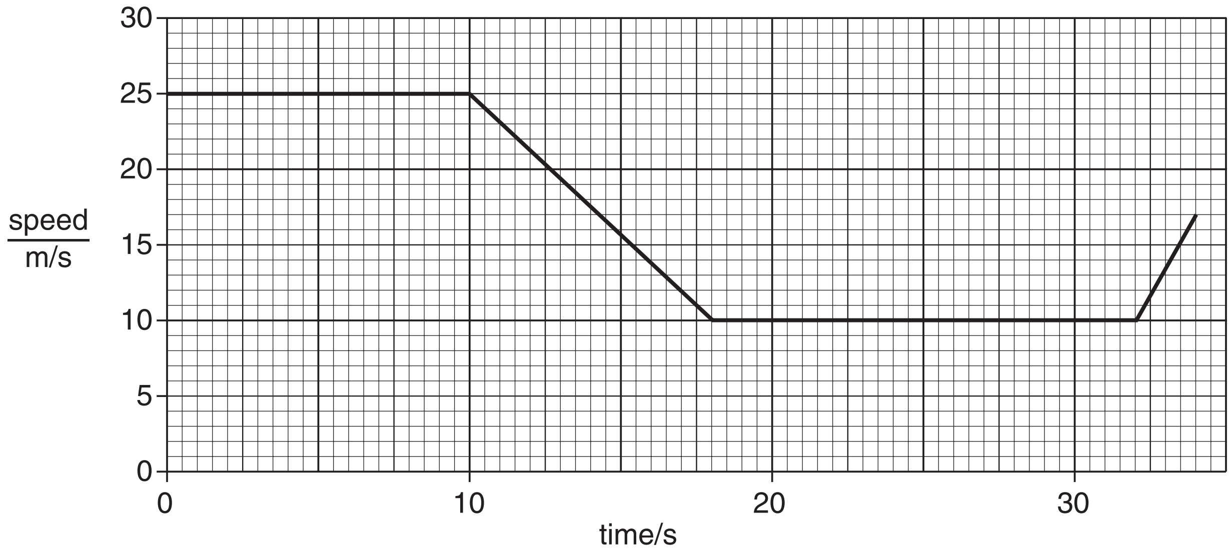

Fig. 1.1

(a) The section of the track with the sharp bend has a maximum speed restriction. The train decelerates approaching the bend so that at the start of the bend it has just reached the maximum speed allowed. The train is driven around the bend at the maximum speed allowed and accelerates immediately on leaving the bend.

(i) What is the maximum speed allowed round the bend in the track?

maximum speed = ...

(ii) How long does the train take to travel the bend of the track?

time taken = ...

(iii) Calculate the length of the bend.

length of bend = ...
[3]

(b) The train has to slow down to go round the bend. Calculate the deceleration.

deceleration = ...[2]

(c) As the train is driven round the bend, there is an extra force acting, called the centripetal force.

(i) On Fig. 1.2, draw an arrow to show the direction of this force.

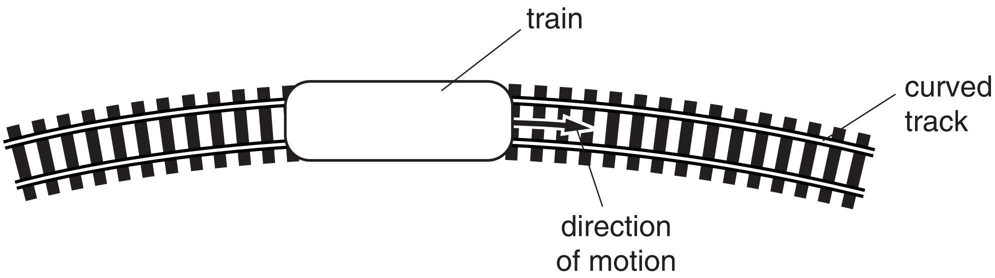

Fig. 1.2

(ii) State the effect that this force has on the motion.

....

....

(iii) State how this force is provided.

....

....

[3]

For Examiner's Use

2 Fig. 2.1 shows a car with a dummy driver before and after a collision test.

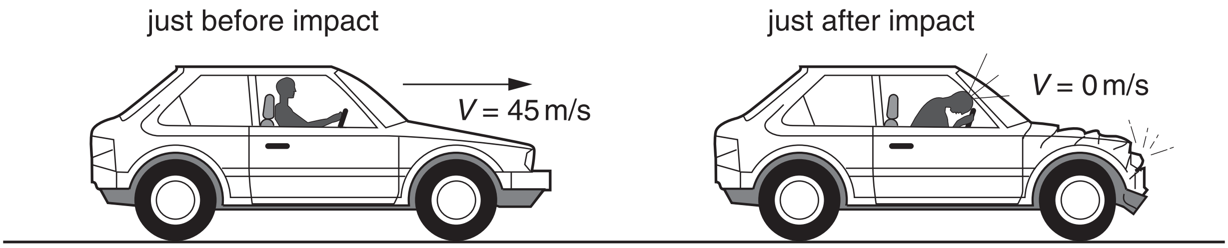

Fig. 2.1

The mass of the dummy driver is 90 kg. The impact time to reduce the dummy's speed from 45 m/s to zero is 1.2 s.

(a) Calculate

(i) the momentum of the dummy just before impact,

momentum = ...

(ii) the average force on the dummy during impact.

force = ...
[4]

(b) State the main energy transformation during the collision.

....[1]

(c) Calculate how much of the dummy's energy is transformed during the collision.

energy = ... [3]

3 A body is in equilibrium and is acted upon by two vertical downward forces in such a way that there is no net moment about a pivot. A student is asked to show this experimentally.
The student is provided with a suitable pivot, a metre rule with a hole drilled in the centre, two sets of masses and strong cotton.

(a) In the space below, draw a labelled diagram of the apparatus set up ready for use.

[2]

(b) Describe how two sets of readings are taken, explaining how equilibrium is achieved in each case.

....

....

....

....[2]

(c) Write down, in table form, two possible sets of values and use them to show that there is no net moment. [3]

For Examiner's Use

4 Fig. 4.1 shows the path that one molecule, M, in a gas might take.

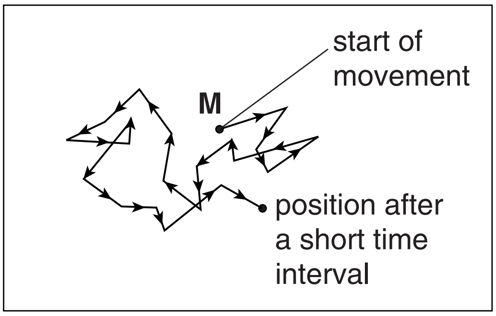

Fig. 4.1

(a) Explain why, in Fig. 4.1, the path of **M** has sudden, sharp changes of direction.

....

....

....

....[2]

(b) At the end of the short time interval, **M** is a short distance from its starting point. Use this observation to explain why a gas spreads slowly through air.

....

....

....[2]

5 **(a)** A student concludes that the results of his experiments show that it requires more energy to convert 1 g of water into steam at 100 °C than it does to raise the temperature of 1 g of water from 0 °C to 100 °C.
Use the student's data to confirm that this conclusion is correct and calculate the difference between the two amounts of energy.

experiment 1	*experiment 2*
mass of water used 250 g	mass of water evaporated at 100 °C 15 g
heat energy supplied 10 500 J	heat energy supplied 33 900 J
rise in temperature 10 °C	

energy difference = ...[5]

(b) Explain, in molecular terms, why considerable heat energy is needed to convert 1 g of water into 1 g of steam at 100 °C, without any change in temperature taking place.

....

....

....[2]

(c) The mercury-in-glass thermometer used in *experiment 1* above is said to have
– moderate sensitivity,
– a good range,
– a linear scale.

By reference to this thermometer, explain what is meant by

(i) *sensitivity*,

....

....

(ii) *range*,

....

....

(iii) *linear scale*.

....

....
[3]

For Examiner's Use

6 **(a)** Figs 6.1 and 6.2 show what happens to waves at two different types of boundary.

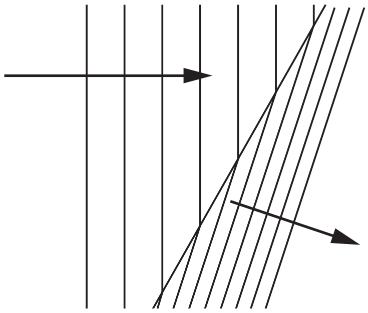

Fig. 6.1

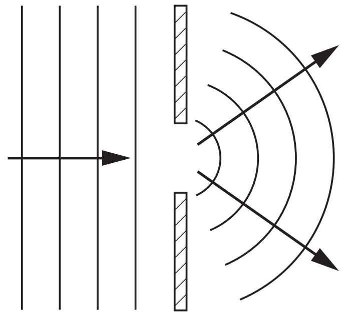

Fig. 6.2

Complete the table below.

	Fig. 6.1	Fig. 6.2
name of the effect shown		
wavelength change, if any		
frequency change, if any		

[4]

(b) Fig. 6.3 is drawn to full scale. The distance **CF** is the focal length of the lens.

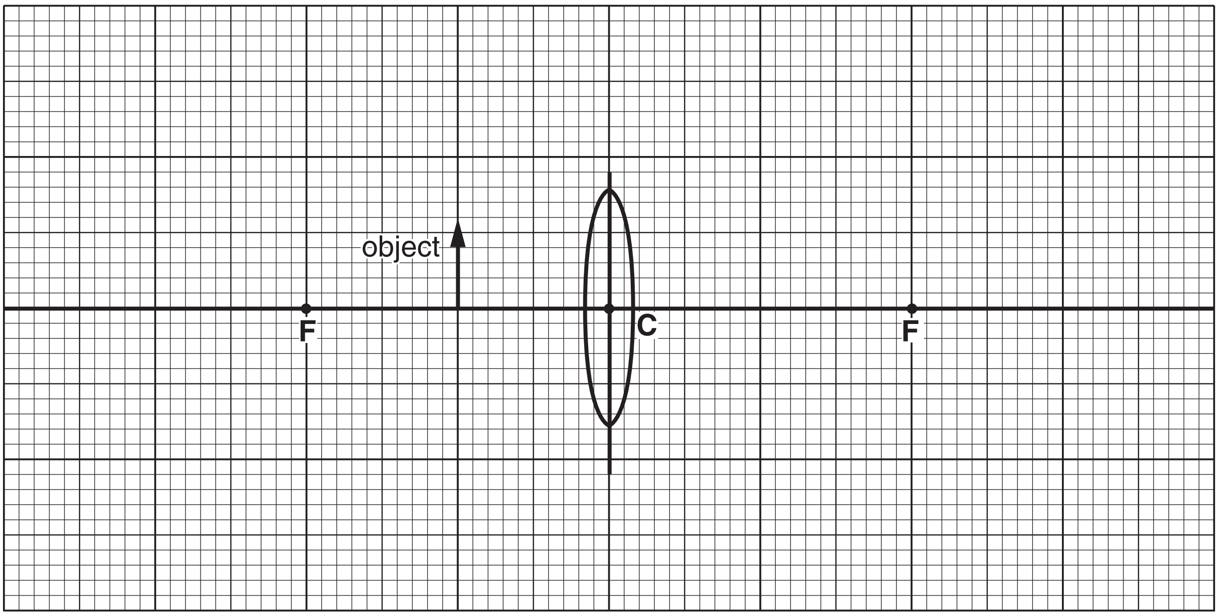

Fig. 6.3

(i) By drawing rays from the tip of the object, locate the position of the image. Hence work out how many times bigger the image is than the object.

number of times bigger = ...

(ii) 1. Draw an eye on Fig. 6.3 to show a suitable place to view the image.
2. Suggest a use for this lens arrangement.

....

[6]

7 **(a)** Fig. 7.1 shows a current-carrying solenoid and the position of a plotting compass.

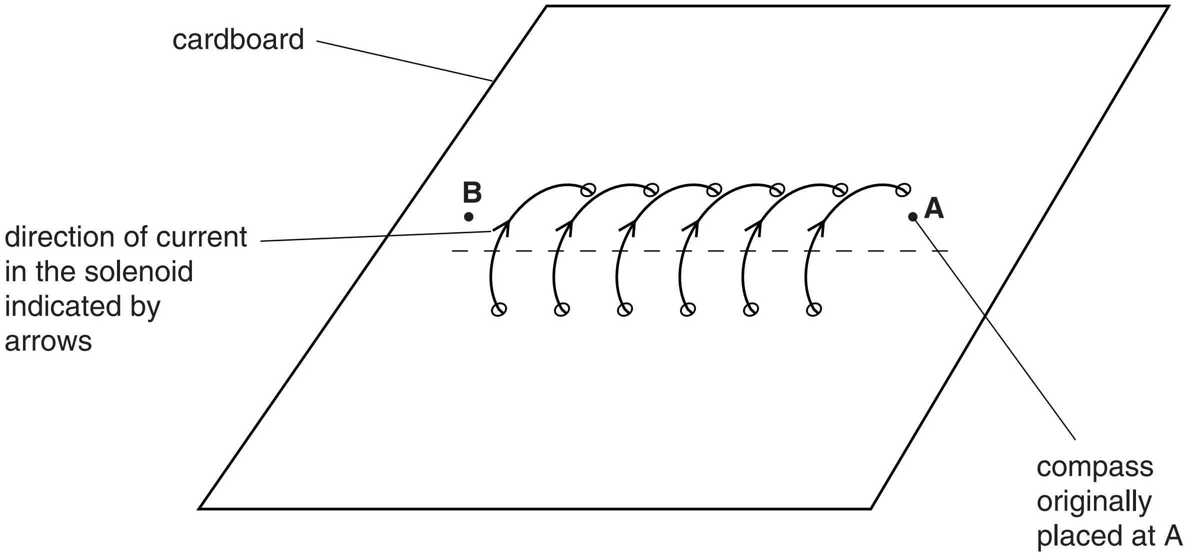

Fig. 7.1

The plotting compass is used to follow magnetic field lines.
On Fig. 7.1 draw in one magnetic field line which links **A** and **B**, both through the inside of the solenoid and round the outside of the solenoid.
Mark the direction of each part of the field line with an arrow. [3]

(b) Fig. 7.2 shows the result of a similar experiment with a current-carrying, straight wire.

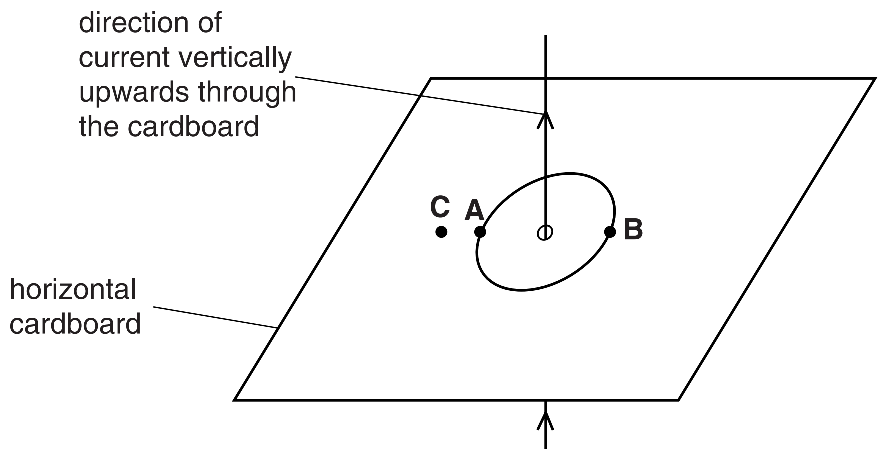

Fig. 7.2

(i) On Fig. 7.2, draw another magnetic field line starting at **C**. Mark its direction with an arrow.

(ii) Explain why the line from **C** could never pass through **B**.

....

....

(iii) What would be the effect on the strength and on the direction of the magnetic field of

1. reversing the current without changing its value,

   strength...................................... direction..

2. increasing the value of the current without changing its direction?

   strength...................................... direction..

[5]

[Turn over

For Examiner's Use

8 Fig. 8.1 shows how two security lamps are connected to a mains supply.

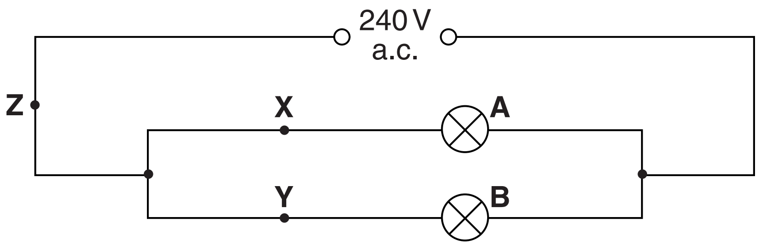

Fig. 8.1

Lamp **A** is labelled 240 V, 600 W and lamp **B** is labelled 240 V, 300 W.

(a) Calculate the currents at points **X**, **Y** and **Z** in Fig. 8.1.

current at **X** = ...

current at **Y** = ...

current at **Z** = ... [2]

(b) The resistance of lamp **A** is 96 Ω and the resistance of lamp **B** 192 Ω. Using these values, or by an alternative method, calculate the total circuit resistance. (Ignore the resistance of the circuit wiring.)

resistance = ... [3]

(c) Fig. 8.2 shows the same lamps connected differently.

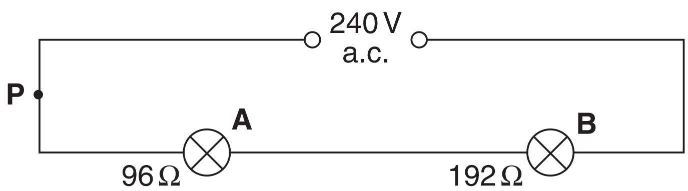

Fig. 8.2

(i) Calculate the current at **P**.

current at **P** = ...

(ii) Calculate the potential difference across **A** and across **B**.

potential difference across **A** = ...

potential difference across **B** = ...

[3]

For Examiner's Use

(d) (i) With reference to values already worked out, explain why the lamps should be connected as in Fig. 8.1 and not as in Fig. 8.2.

....

....

....

(ii) The two lamps are to be switched on and off independently. State and explain which circuit is better for this purpose when suitably placed switches are included.

....

....

....

....

[4]

For Examiner's Use

9 Fig. 9.1 shows a circuit and a cathode-ray oscilloscope (c.r.o.).

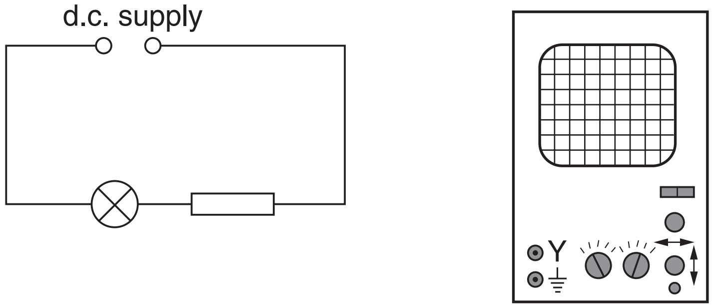

Fig. 9.1

(a) Complete the connections to show how you would use the c.r.o. to measure the potential difference across the lamp. [1]

(b) Fig. 9.2 shows the screen of the c.r.o. when measuring this potential difference.

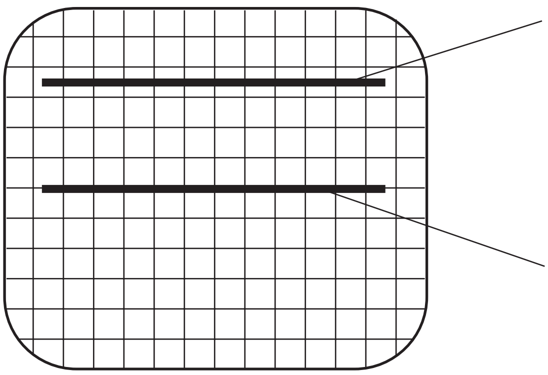

Fig. 9.2

When calibrated, each vertical division corresponds to a potential difference of 0.4 V. What is the potential difference across the lamp?

potential difference = ... [2]

(c) Suggest one advantage of using this method of measuring potential difference rather than using a standard voltmeter.

....

....[1]

For Examiner's Use

10 **(a)** Radioactive sodium has a nuclide represented by the symbol ${}^{24}_{11}\text{Na}$.
Complete the equation below to show how this nuclide decays with the emission of a β-particle.

$${}^{24}_{11}\text{Na} \longrightarrow \quad \text{Mg} \;+\; \quad \text{e}$$ [2]

(b) Fig. 10.1 shows a narrow beam of β-particles entering an electric field created by two charged plates.

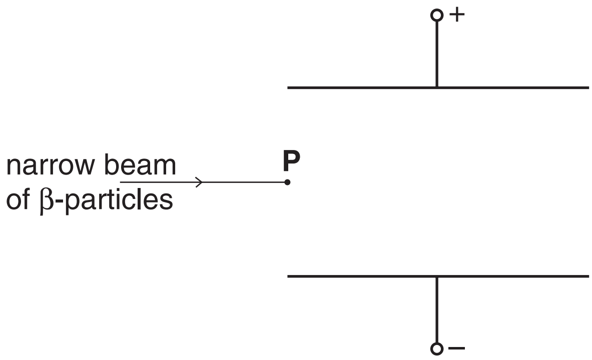

Fig 10.1

(i) Complete the path of the β-particles, starting from the point **P**.

(ii) Explain any change of direction which you have shown.

....

....

....
[3]

[Turn over

For Examiner's Use

(c) (i) In the space below, draw a labelled diagram of an arrangement, using a radioactive source which emits β-particles, for finding the variation in thickness of a sheet of paper.

(ii) State the readings which need to be taken and how they would be used to decide whether or not the thickness of the paper varies.

....

....

....

....

....[4]