Location Entry Codes

As part of CIE's continual commitment to maintaining best practice in assessment, CIE uses different variants of some question papers for our most popular assessments with large and widespread candidature. The question papers are closely related and the relationships between them have been thoroughly established using our assessment expertise. All versions of the paper give assessment of equal standard.

The content assessed by the examination papers and the type of questions is unchanged.

This change means that for this component there are now two variant Question Papers, Mark Schemes and Principal Examiner's Reports where previously there was only one. For any individual country, it is intended that only one variant is used. This document contains both variants which will give all Centres access to even more past examination material than is usually the case.

The diagram shows the relationship between the Question Papers, Mark Schemes and Principal Examiners' Reports that are available.

Question Paper	**Mark Scheme**	**Principal Examiner's Report**
Introduction	Introduction	Introduction
First variant Question Paper	First variant Mark Scheme	First variant Principal Examiner's Report
Second variant Question Paper	Second variant Mark Scheme	Second variant Principal Examiner's Report

Who can I contact for further information on these changes?
Please direct any questions about this to CIE's Customer Services team at:
international@cie.org.uk

The titles for the variant items should correspond with the table above, so that at the top of the first page of the relevant part of the document and on the header, it has the words:

- First variant Question Paper / Mark Scheme / Principal Examiner's Report

or

- Second variant Question Paper / Mark Scheme / Principal Examiner's Report

as appropriate.

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

5079794953

PHYSICS **0625/31**

Paper 3 Extended **May/June 2008**

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 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.
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.

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

SPA (SHW 00013 3/07) T49721/6

UNIVERSITY of CAMBRIDGE International Examinations

1 Fig. 1.1 shows the speed-time graphs for two falling balls.

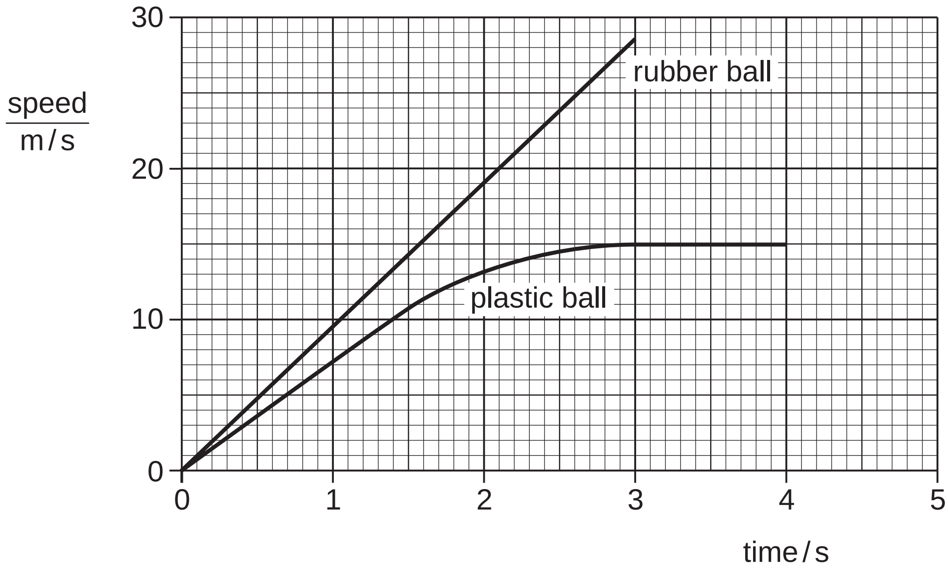

Fig. 1.1

Both balls fall from the same height above the ground.

(a) Use the graphs to find

(i) the average acceleration of the falling rubber ball during the first 3.0 s,

acceleration = ... [2]

(ii) the distance fallen by the rubber ball during the first 3.0 s,

distance = ... [2]

(iii) the terminal velocity of the plastic ball.

terminal velocity = ... [1]

(b) Both balls have the same mass but the volume of the plastic ball is much great that of the rubber ball. Explain, in terms of the forces acting on each ball, why the pl ball reaches a terminal velocity but the rubber ball does not.

....

....

....

....

....

.... [3]

(c) The rubber ball has a mass of 50 g. Calculate the gravitational force acting on the rubber ball.

force = ... [2]

[Total: 10]

2 **(a)** Name the process by which energy is released in the core of the Sun.

.... [1]

(b) Describe how energy from the Sun becomes stored energy in water behind a dam.

....

....

....

.... [3]

(c) Data for two small power stations is given in Table 2.1.

	input to power station	**output of power station**
gas-fired	100 MW	25 MW
hydroelectric	90 MW	30 MW

Table 2.1

(i) State what is meant by the *efficiency* of a power station.

....

....

....

.... [1]

(ii) Use the data in Table 2.1 to explain that the hydroelectric station is more efficient than the gas-fired power station.

....

....

.... [1]

[Total: 6]

3 A cyclist rides up and then back down the hill shown in Fig. 3.1.

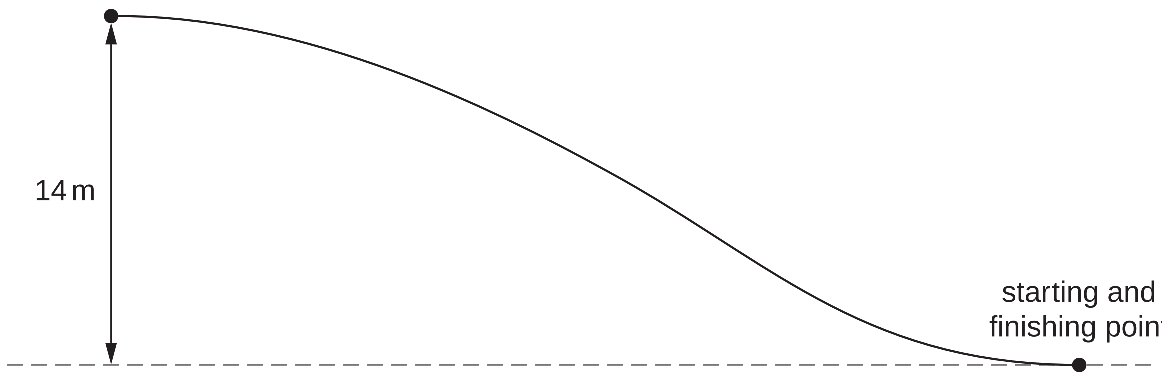

Fig. 3.1

The cyclist and her bicycle have a combined mass of 90 kg. She pedals up to the top and then stops. She turns around and rides back to the bottom without pedalling or using her brakes.

(a) Calculate the potential energy gained by the cyclist and her bicycle when she has reached the top of the hill.

potential energy = ... [2]

(b) Calculate the maximum speed she could have when she arrives back at the starting point.

speed = ... [3]

(c) Explain why her actual speed will be less than that calculated in **(b)**.

....

....

.... [1]

[Total: 6]

4 Fig. 4.1 is a design for remotely operating an electrical switch using air pressure.

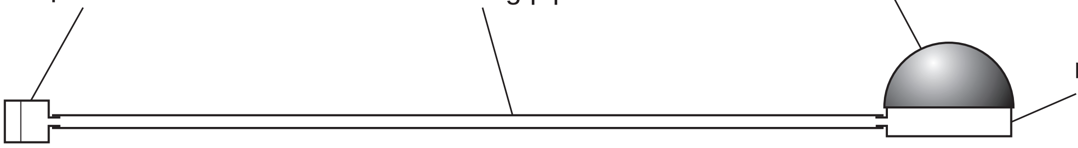

Fig. 4.1

The metal box and the pipe contain air at normal atmospheric pressure and the switch is off. When the pressure in the metal box and pipe is raised to 1.5 times atmospheric pressure by pressing down on the flexible rubber box cover, the switch comes on.

(a) Explain in terms of pressure and volume how the switch is made to come on.

....

....

....

.... [2]

(b) Normal atmospheric pressure is 1.0×10^5 Pa. At this pressure, the volume of the box and pipe is $60\,cm^3$.

Calculate the **reduction** in volume that must occur for the switch to be on.

reduction in volume = ... [3]

(c) Explain, in terms of air particles, why the switch may operate, without the rubber cover being squashed, when there is a large rise in temperature.

....

....

....

.... [2]

[Total: 7]

5 **(a)** Explain, in terms of molecules, how thermal expansion takes place in a solid and a gas.

solid ....

....

....

....

....

gas ....

....

....

....

.... [4]

(b) Complete Table 5.1 to show the relative expansion of equal volumes of liquids, gases and solids.

Choose words from

much less, **slightly less**, **slightly more** and **much more**. [2]

state of matter	expansion compared to solids, for the same temperature rise
liquids	
gases	

Table 5.1

(c) Alcohol is often used in thermometers.

State one property of alcohol that makes it suitable for use in thermometers.

....

.... [1]

[Total: 7]

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The two principal foci of the lens are F_1 and F_2.

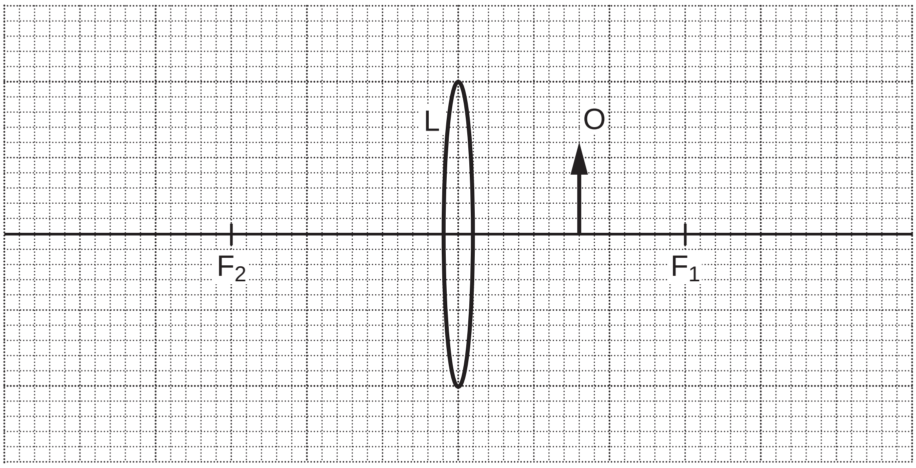

Fig. 6.1

(a) On Fig. 6.1, draw the paths of two rays from the tip of the object so that they pass through the lens and continue beyond.

Complete the diagram to locate the image of the tip of the object. Draw in the whole image and label it I. [3]

(b) Describe image I.

....

....

....

.... [3]

[Total: 6]

7 Fig. 7.1 and Fig. 7.2 show wavefronts of light approaching a plane mirror and a recta[ngular] glass block, respectively.

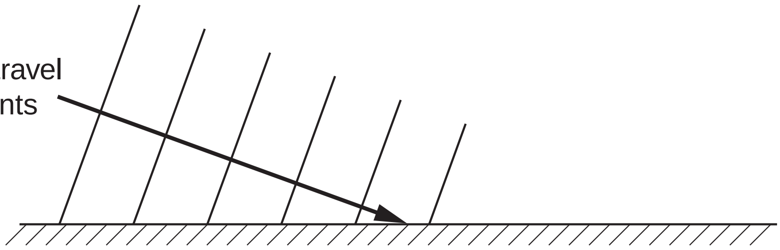

Fig. 7.1

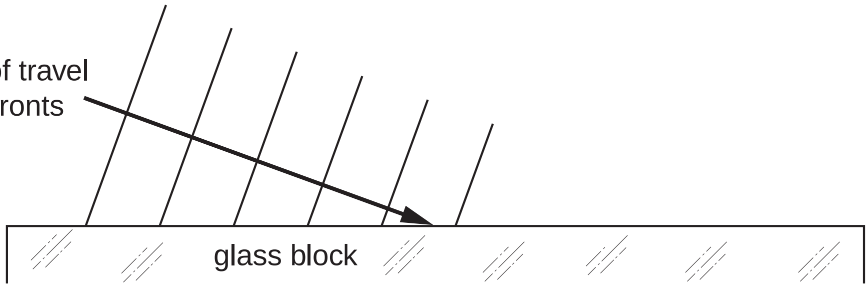

Fig. 7.2

(a) On Fig. 7.1 and on Fig. 7.2 draw wavefronts to show what happens after the waves strike the surface. [4]

(b) In Fig. 7.2, the waves approaching the block have a speed of 3.0×10^8 m/s and an angle of incidence of 70°. The refractive index of the glass of the block is 1.5.

(i) Calculate the speed of light waves in the block.

speed = ... [2]

(ii) Calculate the angle of refraction in the block.

angle = ... [2]

[Total: 8]

8 Fig. 8.1 is the plan of a small apartment that has four lamps as shown.

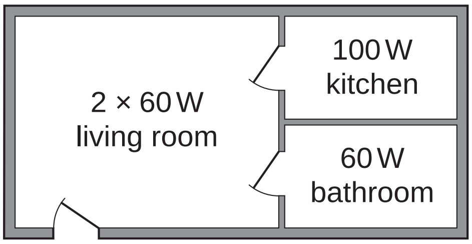

Fig. 8.1

Power for the lamps is supplied at 200 V a.c. and the lamps are all in parallel.

(a) In the space below, draw a lighting circuit diagram so that there is one switch for each room and one master switch that will turn off all the lamps. Label the lamps as 60 W or 100 W.

[3]

(b) The 100 W lamp is switched on. Calculate

(i) the current in the lamp,

current = ... [2]

(ii) the charge passing through the lamp in one minute.

charge = ... [2]

(c) The three 60W lamps are replaced by three energy-saving ones, that give the light output but are rated at only 15W each.

Calculate

(i) the total reduction in power,

reduction in power = ... [1]

(ii) the energy saved when the lamps are lit for one hour.

energy saved = ... [2]

[Total: 10]

9 Fig. 9.1 shows apparatus used to investigate electromagnetic effects around straight

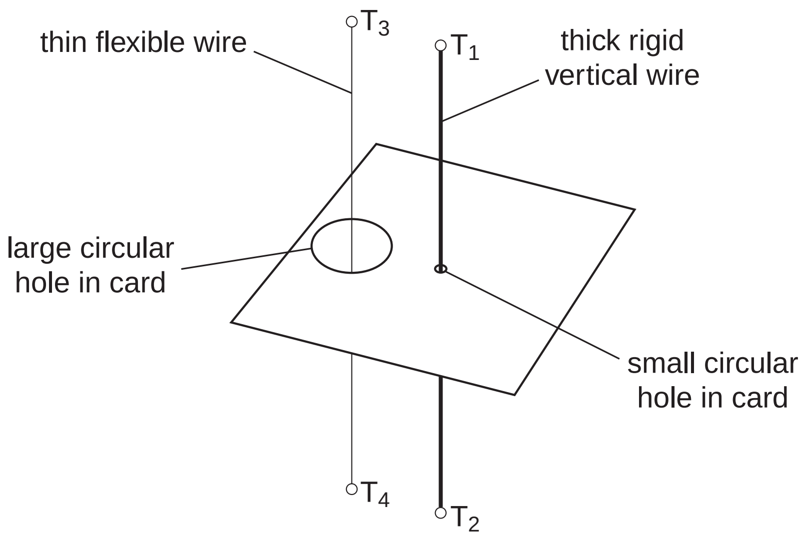

Fig. 9.1

Fig. 9.2 is a view looking down on the apparatus shown in Fig. 9.1.

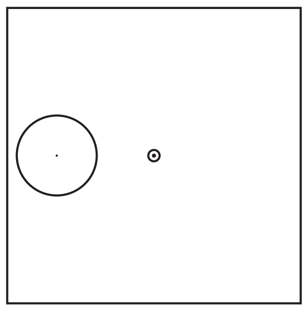

Fig. 9.2

(a) A battery is connected to T_1 and T_2 so that there is a current vertically down the thick wire.

On Fig. 9.2, draw three magnetic field lines and indicate, with arrows, the direction of all three. [2]

(b) Using a variable resistor, the p.d. between terminals T_1 and T_2 is gradually reduced.

State the effect, if any, that this will have on

(i) the strength of the magnetic field, ... [1]

(ii) the direction of the magnetic field. .... [1]

(c) The battery is now connected to terminals T_3 and T_4, as well as to terminals T_1 a
so that there is a current down both wires. This causes the flexible wire to move.

(i) Explain why the flexible wire moves.

....

....

....

.... [2]

(ii) State the direction of the movement of the flexible wire.

.... [1]

(iii) The battery is replaced by one that delivers a smaller current.

State the effect that this will have on the force acting on the flexible wire.

....

.... [1]

[Total: 8]

10 **(a)** In the space below, draw the symbol for a NOR gate.

[1]

(b) Describe the action of a NOR gate in terms of its inputs and output.

....

....

....

....

.... [2]

(c) A chemical process requires heating at low pressure to work correctly.

When the heater is working, the output of a temperature sensor is high.

When the pressure is low enough, a pressure sensor has a low output.

Both outputs are fed into a NOR gate. A high output from the gate switches on an indicator lamp.

(i) Explain why the indicator lamp is off when the process is working correctly.

....

....

.... [1]

(ii) State whether the lamp is on or off in the following situations.

1. The pressure is low enough, but the heater stops working. ....

2. The heater is working, but the pressure rises too high. .... [2]

[Total: 6]

11 **(a)** Chlorine has two isotopes, one of nucleon number 35 and one of nucleon num... The proton number of chlorine is 17.

Table 11.1 refers to neutral atoms of chlorine.

Complete Table 11.1.

	nucleon number 35	**nucleon number 37**
number of protons		
number of neutrons		
number of electrons		

[3]

Table 11.1

(b) Some isotopes are radioactive.

State the three types of radiation that may be emitted from radioactive isotopes.

1. ....

2. ....

3. .... [1]

(c) **(i)** State one practical use of a radioactive isotope.

....

.... [1]

(ii) Outline how it is used.

....

....

....

....

.... [1]

[Total: 6]

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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

2847911916

PHYSICS **0625/32**

Paper 3 Extended **May/June 2008**

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.
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The number of marks is given in brackets [ ] at the end of each question or part question.

SPA (SHW 00013 3/07) T49725/4

UNIVERSITY of CAMBRIDGE International Examinations

1 Fig. 1.1 shows the axes for a speed-time graph.

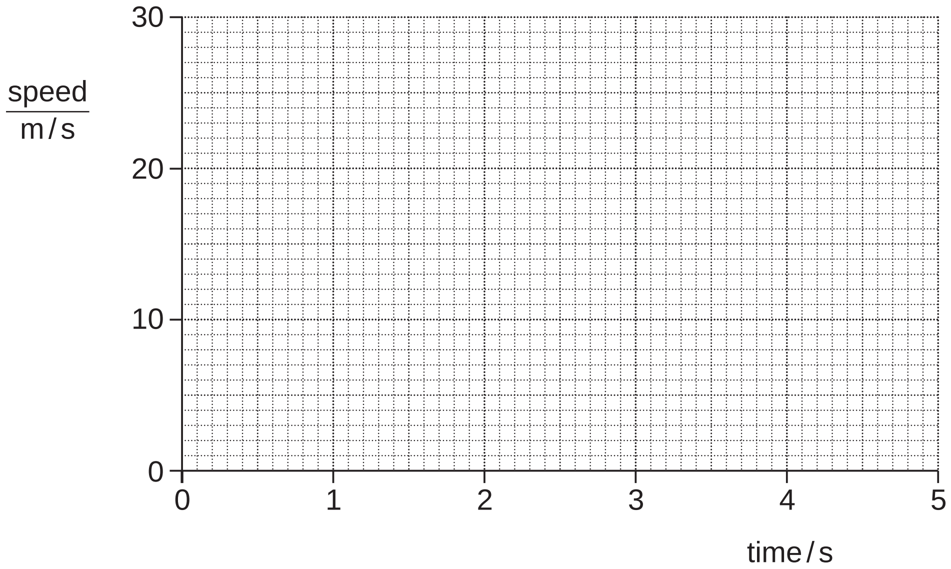

Fig. 1.1

(a) An object A falls freely from rest with the acceleration due to gravity (g = 10 m/s^2). It is not affected by air resistance.

On Fig. 1.1, draw the graph of the motion of object A. [1]

(b) Using your graph, or an alternative method, calculate the distance fallen in the first 2 s by object A in part **(a)**.

distance fallen = ... [2]

(c) A second object B falls through the air from rest, but is affected by air resistance. It reaches a terminal velocity of 14 m/s.

On Fig. 1.1, draw a possible graph for object B, including the region where it is travelling at terminal velocity. [1]

(d) **(i)** Suggest a possible difference between objects A and B that could lead to B re[...] a terminal velocity.

....

....

.... [1]

(ii) Explain, in terms of the forces on B, why B reaches a terminal velocity.

....

....

....

....

.... [2]

(e) Object A experiences a gravitational force of 2.0 N.

(i) State the value of the weight of A.

weight = ... [1]

(ii) Calculate the mass of A.

mass = ... [1]

(f) Object A is floating in equilibrium on a liquid.

State the value of the upward force of the liquid on A.

upward force = ... [1]

[Total: 10]

2 **(a)** Name the process by which energy is released in the core of the Sun.

[1]

(b) Describe how energy from the Sun becomes stored energy in water behind a dam.

[3]

(c) Data for two small power stations is given in Table 2.1.

	input to power station	**output of power station**
gas-fired	100 MW	25 MW
hydroelectric	90 MW	30 MW

Table 2.1

(i) State what is meant by the *efficiency* of a power station.

[1]

(ii) Use the data in Table 2.1 to explain that the hydroelectric station is more efficient than the gas-fired power station.

[1]

[Total: 6]

3 A cyclist rides up and then back down the hill shown in Fig. 3.1.

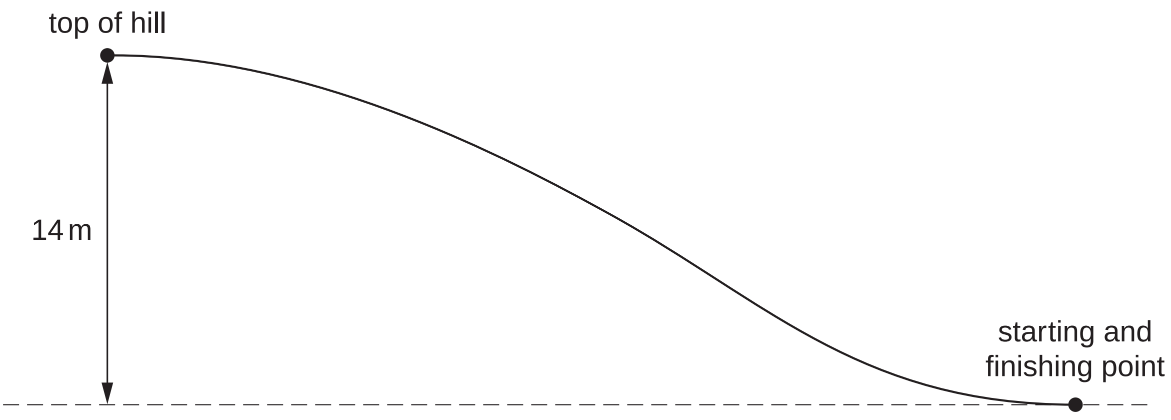

Fig. 3.1

The cyclist and her bicycle have a combined mass of 90 kg. She pedals up to the top and then stops. She turns around and rides back to the bottom without pedalling or using her brakes.

(a) Calculate the potential energy gained by the cyclist and her bicycle when she has reached the top of the hill.

potential energy = ... [2]

(b) Calculate the maximum speed she could have when she arrives back at the starting point.

speed = ... [3]

(c) Explain why her actual speed will be less than that calculated in **(b)**.

....

....

....

.... [1]

[Total: 6]

4 **(a)** One of the laws about the behaviour of gases states that

"For a fixed amount of gas at constant temperature, the pressure is inversely proportional to the volume".

In the space below, write an **equation** that represents this law.

[1]

(b) Table 4.1 gives a series of pressures and their corresponding volumes, obtained in an experiment with a fixed amount of gas. The gas obeys the law referred to in **(a)**.

pressure / kPa	100	200	400	500	1000
volume / cm^3	50.0	25.0	12.5	10.0	5.0

Table 4.1

How do these figures indicate that the temperature was constant throughout the experiment?

....

....

....

.... [2]

(c) Air is trapped by a piston in a cylinder. The pressure of the air is 1.2×10^5 Pa. The distance from the closed end of the cylinder to the piston is 75 mm.

The piston is pushed in until the pressure of the air has risen to 3.0×10^5 Pa.

Calculate how far the piston has moved.

distance moved = ... [4]

[Total: 7]

5 **(a)** Explain, in terms of molecules, how thermal expansion takes place in a solid a... gas.

solid ....

....

....

....

....

gas ....

....

....

....

.... [4]

(b) Complete Table 5.1 to show the relative expansion of equal volumes of liquids, gases and solids.

Choose words from

much less, **slightly less**, **slightly more** and **much more**. [2]

state of matter	expansion compared to solids, for the same temperature rise
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gases	

Table 5.1

(c) Alcohol is often used in thermometers.

State one property of alcohol that makes it suitable for use in thermometers.

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The two principal foci of the lens are F_1 and F_2.

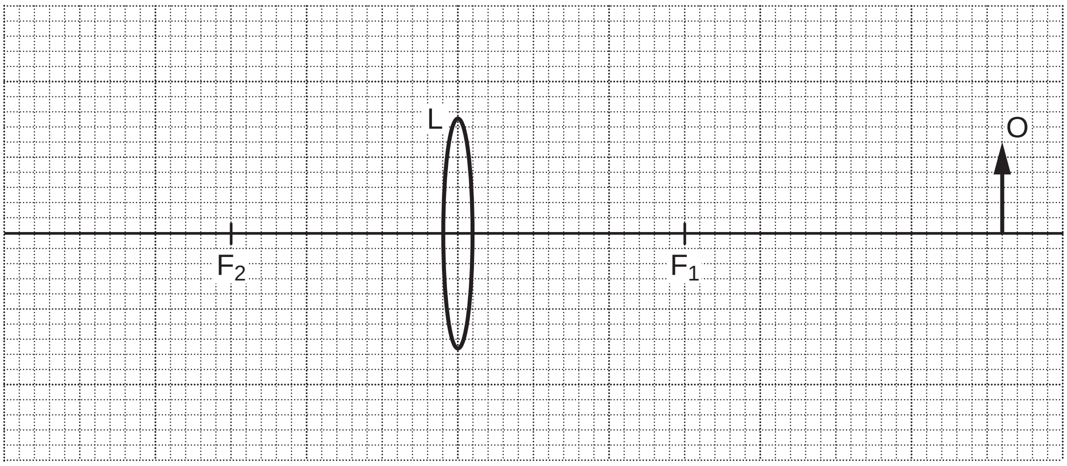

Fig. 6.1

(a) On Fig. 6.1, draw the paths of two rays from the tip of the object so that they pass through the lens and continue beyond.

Complete the diagram to locate the image of the tip of the object. Draw in the whole image and label it I. [2]

(b) State two changes to the image when the object is moved

(i) a small distance closer to the lens,

1. ....

2. .... [2]

(ii) to a position between F_1 and the lens.

1. ....

2. .... [2]

[Total: 6]

7 Fig. 7.1 and Fig. 7.2 show wavefronts of light approaching a plane mirror and a recta glass block, respectively.

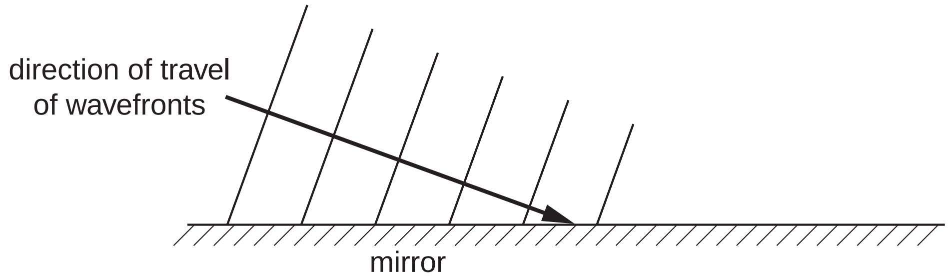

Fig. 7.1

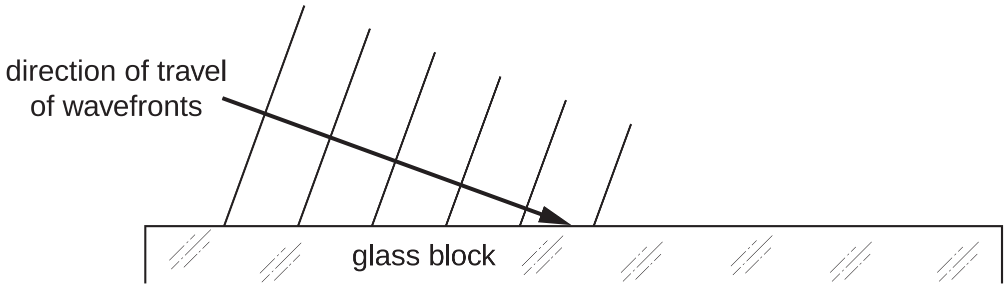

Fig. 7.2

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(b) In Fig. 7.2, the waves approaching the block have a speed of 3.0×10^8 m/s and an angle of incidence of 70°. The refractive index of the glass of the block is 1.5.

(i) Calculate the speed of light waves in the block.

speed = ... [2]

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angle = ... [2]

[Total: 8]

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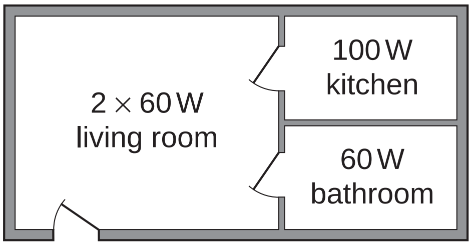

Fig. 8.1

Power for the lamps is supplied at 200 V a.c. and the lamps are all in parallel.

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[3]

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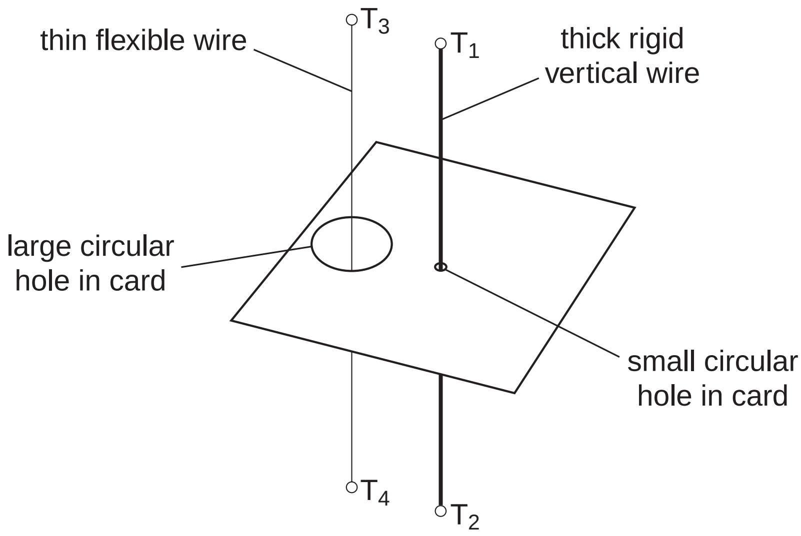

Fig. 9.1

Fig. 9.2 is a view looking down on the apparatus shown in Fig. 9.1.

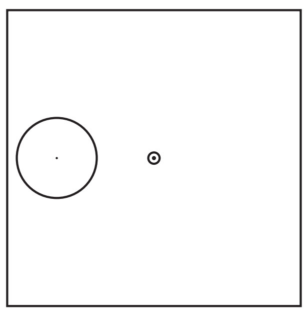

Fig. 9.2

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State the effect, if any, that this will have on

(i) the strength of the magnetic field, ... [1]

(ii) the direction of the magnetic field. .... [1]

(c) The battery is now connected to terminals T_3 and T_4, as well as to terminals T_1 … so that there is a current down both wires. This causes the flexible wire to move.

(i) Explain why the flexible wire moves.

....

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10 **(a)** In the space below, draw the symbol for a NOR gate.

[1]

(b) Describe the action of a NOR gate in terms of its inputs and output.

....

....

....

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.... [2]

(c) A chemical process requires heating at low pressure to work correctly.

When the heater is working, the output of a temperature sensor is high.

When the pressure is low enough, a pressure sensor has a low output.

Both outputs are fed into a NOR gate. A high output from the gate switches on an indicator lamp.

(i) Explain why the indicator lamp is off when the process is working correctly.

....

....

....

.... [1]

(ii) State whether the lamp is on or off in the following situations.

1. The pressure is low enough, but the heater stops working. ....
2. The heater is working, but the pressure rises too high. .... [2]

[Total: 6]

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The proton number of chlorine is 17.

Table 11.1 refers to neutral atoms of chlorine.

Complete Table 11.1.

	nucleon number 35	**nucleon number 37**
number of protons		
number of neutrons		
number of electrons		

[3]

Table 11.1

(b) Some isotopes are radioactive.

State the three types of radiation that may be emitted from radioactive isotopes.

1. ....

2. ....

3. .... [1]

(c) **(i)** State one practical use of a radioactive isotope.

....

.... [1]

(ii) Outline how it is used.

....

....

....

....

.... [1]

[Total: 6]