SCIENCE (PHYSICS, CHEMISTRY)   5116/01

Paper 1 Multiple Choice

October/November 2010

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, Centre number and index number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
A copy of the Data Sheet is printed on page **19**.
A copy of the Periodic Table is printed on page **20**.

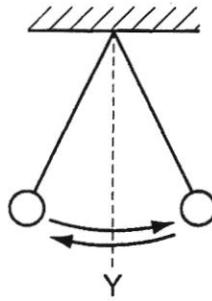This document consists of **17** printed pages and **3** blank pages.

1 A pendulum swings backwards and forwards passing through Y, the middle point of the oscillation.

The first time the pendulum passes through Y, a stopwatch is started. The twenty-first time the pendulum passes through Y, the stopwatch is stopped. The reading is T.

What is the period of the pendulum?

A $T/40$ **B** $T/21$ **C** $T/20$ **D** $T/10$

2 Which graph shows the motion of a heavy, steel ball falling from a height of 2 m?
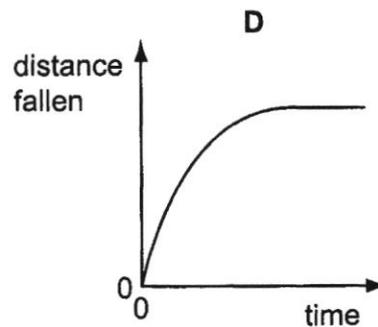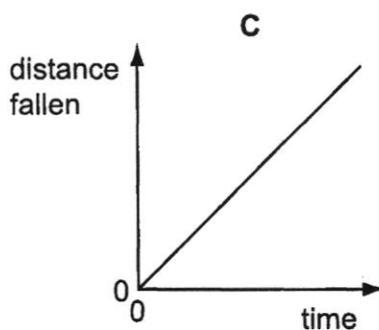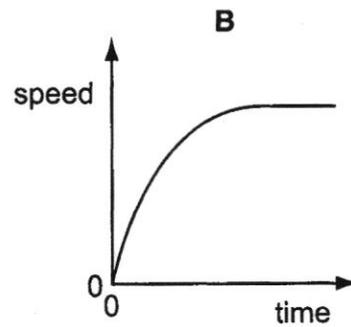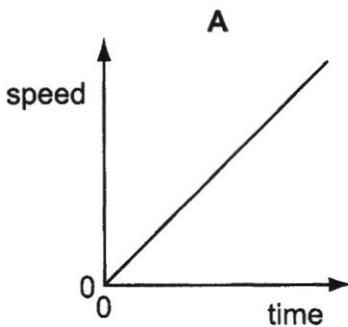
3   'The unit of force is the ......1...... . An object subjected to ......2...... forces will accelerate. Acceleration is a change of ......3...... .'

Which words correctly complete gaps 1, 2 and 3?

	1	2	3
A	kilogram	balanced	direction
B	kilogram	unbalanced	velocity
C	newton	unbalanced	velocity
D	newton	balanced	direction

4   Trolley X and trolley Y are joined by a stretched spring. Trolley X has twice the mass of trolley Y.
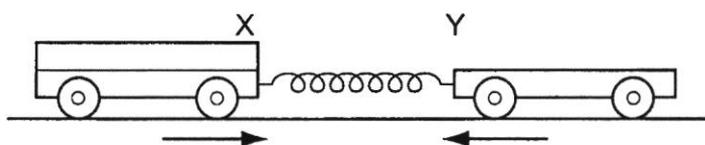

When the trolleys are released, the initial acceleration of X is $2\,m/s^2$ to the right.

What is the initial acceleration of trolley Y to the left?

A $1\,m/s^2$ B $2\,m/s^2$ C $3\,m/s^2$ D $4\,m/s^2$

5   What is the name of the property of a body that resists a change in its state of rest or motion?

A   acceleration

B   density

C   mass

D   velocity

6 A beam 40 cm long is pivoted at one end.

The weight of the beam is 4 N and acts at a point 20 cm from the pivot. A 2 N weight hangs 10 cm from the pivot.
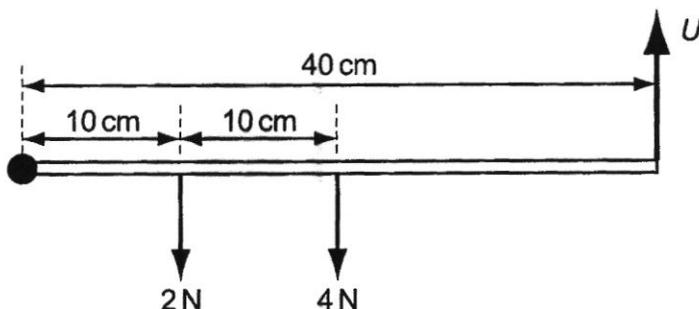
An upward force U is needed to keep the beam horizontal.

What is the value of this force?

A   0.5 N   B   1.5 N   C   2.5 N   D   6 N

7 A body moving with a speed of 30 m / s has a kinetic energy of 1800 J.

What is its mass?

A   2 kg   B   4 kg   C   60 kg   D   120 kg

8 The energy absorbed by a solar panel is used to charge a battery. During the day, the battery stores 1.6 J of energy each second. At night, the battery is used to light a 1.2 W lamp for 18 000 s.

What is the minimum time for which the battery must be charged during the day?

A   9375 s   B   13 500 s   C   24 000 s   D   34 560 s

9 The rate of energy transfer by heat radiation is affected by the colour and texture of a surface.

Which surface is the best absorber and best emitter of heat radiation?

	best absorber	best emitter
A	dull black	dull black
B	shiny black	dull black
C	dull white	shiny white
D	shiny white	shiny white

10 Some ice cubes are taken from a deep-freeze and placed in a metal container. The container is heated at a constant rate and readings of temperature and time are taken. The results are recorded on a graph.

Which temperature corresponds to 0 °C?
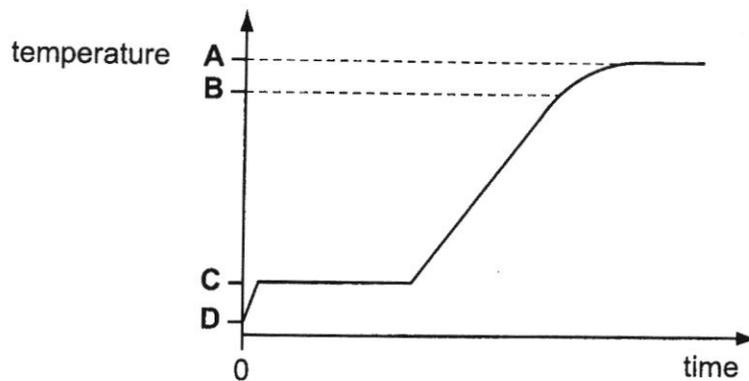
11 What is meant by the term *wavefront*?

   A   the distance between successive peaks of a wave

   B   the distance between the trough and the peak of a wave

   C   a line joining points along the peak of a wave

   D   a line joining the trough and the peak of a wave

12 Which distance is equal to the focal length of a lens?

   A   the distance between a distant object and its image

   B   the distance between the image of a close object and the centre of the lens

   C   the distance between the image of a distant object and the centre of the lens

   D   the distance between two principal foci

13 When sections of a large metal pipe have been welded together they are checked to discover whether there are any cracks in the joints.

Which part of the electromagnetic spectrum is used for this purpose?

   A   infra-red

   B   radiowaves

   C   ultra-violet

   D   X-rays

14 A student stands in front of a large wall and claps together two wooden blocks. On hearing the echo, the student claps the blocks again and continues doing so for each successive echo so that the claps and echoes coincide. It is found that 20 claps are completed in a time of 10 s.

The speed of sound is 320 m/s.

How far is the student standing from the wall?

A   80 m   B   160 m   C   320 m   D   640 m

15 An electric circuit contains a resistor in series with a battery.
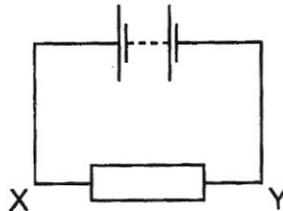
What are the directions of the conventional current flow and electron flow through the resistor?

	conventional current	electron flow
A	X to Y	X to Y
B	X to Y	Y to X
C	Y to X	X to Y
D	Y to X	Y to X

16 A wire has a resistance of 8 Ω. A second wire, made of the same material, has half the length and twice the cross-sectional area.

What is the resistance of the second wire?

A   1 Ω   B   2 Ω   C   8 Ω   D   16 Ω

17 The circuit diagram shows a 1 Ω resistor connected in series with a parallel arrangement of a 2 Ω resistor and a 5 Ω resistor. The current readings through the parallel arrangement are shown.
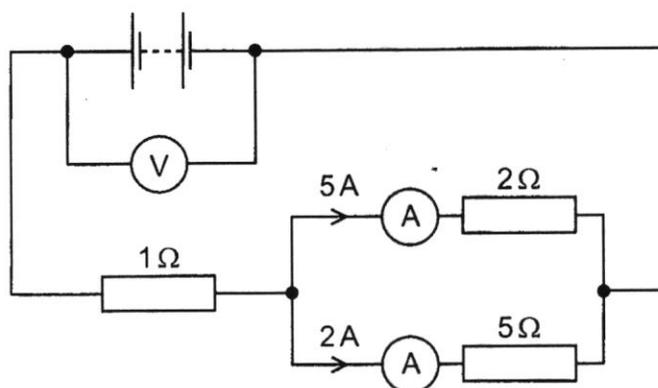
What is the reading on the voltmeter?

A 10 V **B** 12 V **C** 15 V **D** 17 V

18 An electric heater takes a current of 4 A from a 250 V supply when operating normally.

How long would it take the heater to convert 400 000 J of electrical energy?

A 400 s **B** 1000 s **C** 1600 s **D** 100 000 s

19 Which circuit shows the correct positions for the fuse and the switch in the lighting circuit of a house?
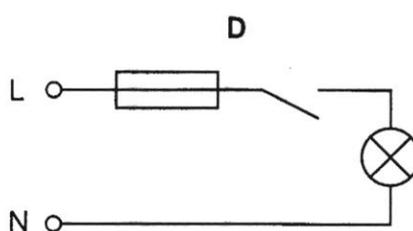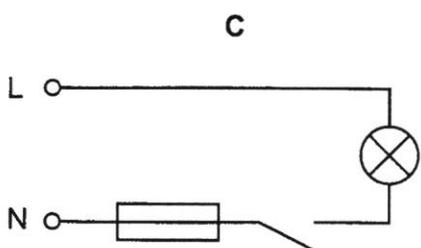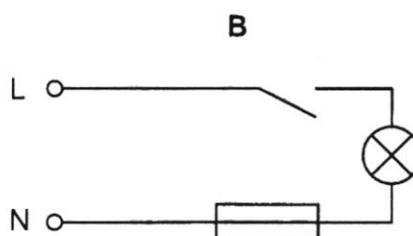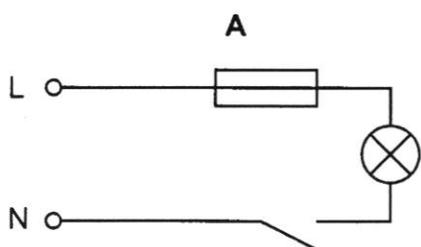
key

L = live wire
N = neutral wire

20 A current in a solenoid creates a magnetic field.
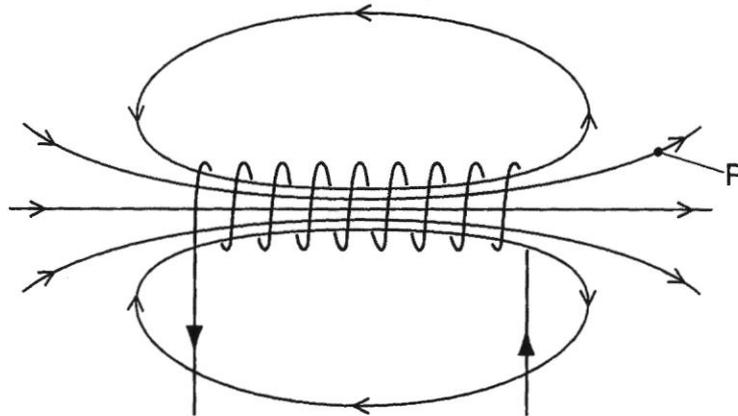
What is the effect on the magnetic field at the point P of using a larger current in the opposite direction?

	field strength	field direction
A	decreases	reverses
B	decreases	unchanged
C	increases	reverses
D	increases	unchanged
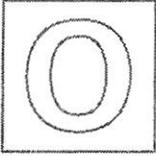
MINISTRY OF EDUCATION, SINGAPORE
in collaboration with
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE
General Certificate of Education Ordinary Level

CANDIDATE
NAME

CENTRE
NUMBER

S

INDEX
NUMBER

SCIENCE

Paper 2 Physics

5116/02

October/November 2010

1 hour 15 minutes

Candidates answer on the Question Paper

Additional Materials: Answer Paper

READ THESE INSTRUCTIONS FIRST

Write your Centre number, index number and name on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a soft pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B
Answer any **two** questions.
Write your answers on the lined paper provided and, if necessary, continue on separate answer paper.

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	
Section A	
Section B	
Total	

This document consists of **13** printed pages and **3** lined pages.

Section A

Answer **all** the questions.

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

For
Examiner's
Use

1 Complete the following sentences.

(a) 75 V is equal to .... kV.

(b) 1 km is equal to .... mm.

[2]

2 Fig. 2.1 shows how the pressure changes with time, at a person's ear, for two different sound waves **A** and **B**. The sounds are produced by two different sources.

wave **A**   wave **B**
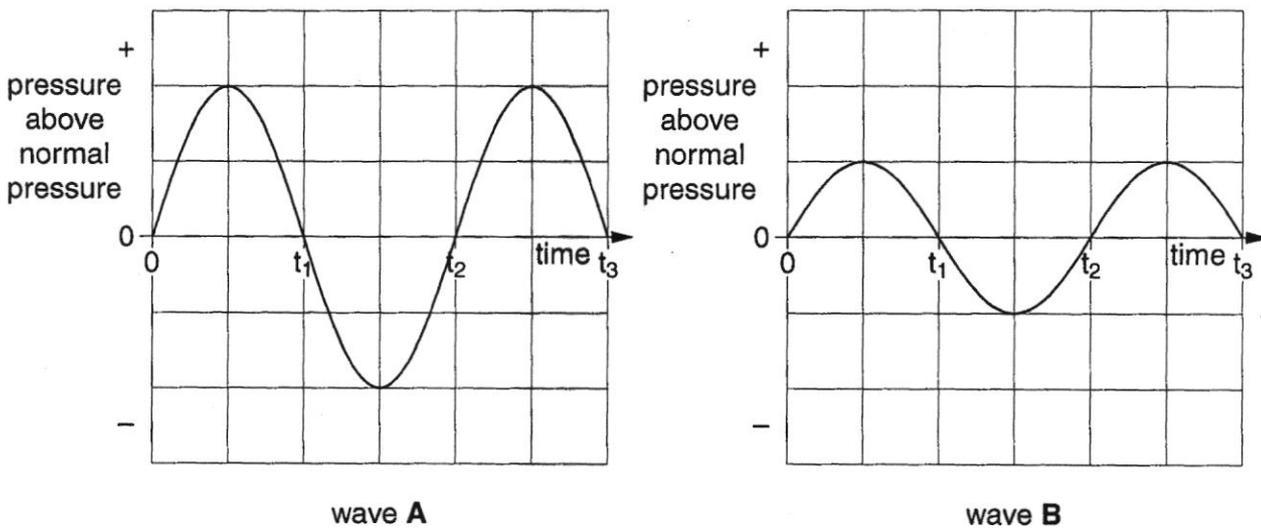
Fig. 2.1

(a) State one way in which the sounds that are heard are different. Explain your answer.

....

.... [2]

(b) State one way in which the sounds that are heard are similar. Explain your answer.

....

.... [2]

3   A car travels at 15 m/s for 2 minutes. It then accelerates uniformly to a speed of 30 m/s in 0.5 minutes. It travels at a uniform speed of 30 m/s for a further 9 minutes before decelerating non-uniformly to rest in 1.5 minutes.

(a)   On the grid of Fig. 3.1, plot a graph to show the variation with time of the speed of the car. [3]
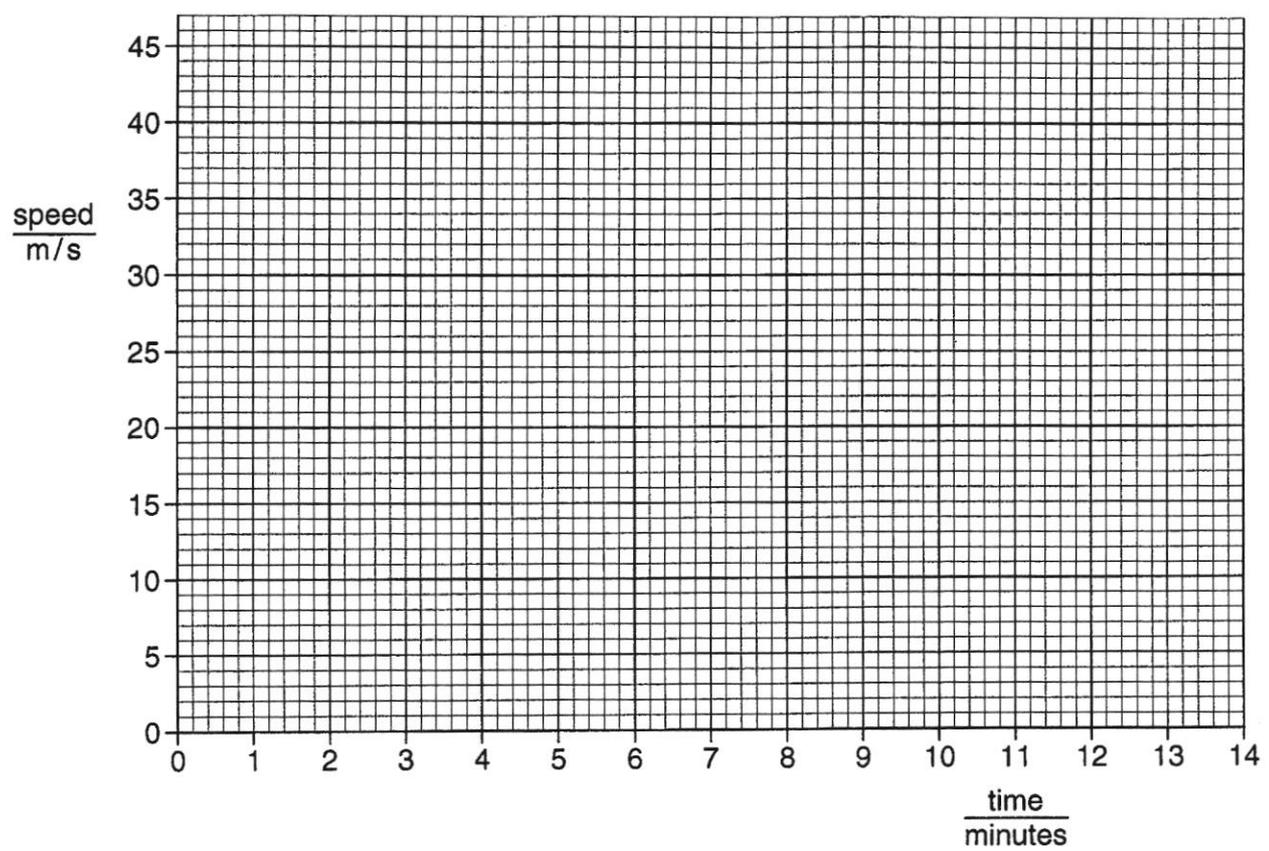
Fig. 3.1

(b) (i)   Calculate the acceleration of the car as it increased speed from 15 m/s to 30 m/s.

acceleration = ... m/s² [2]

(ii)   Calculate the distance moved by the car when it was travelling at 30 m/s.

distance = ... m [2]

4 Some toys are suspended by strings from some light rods as shown in Fig. 4.1. The diagram is not to scale.

Not to scale
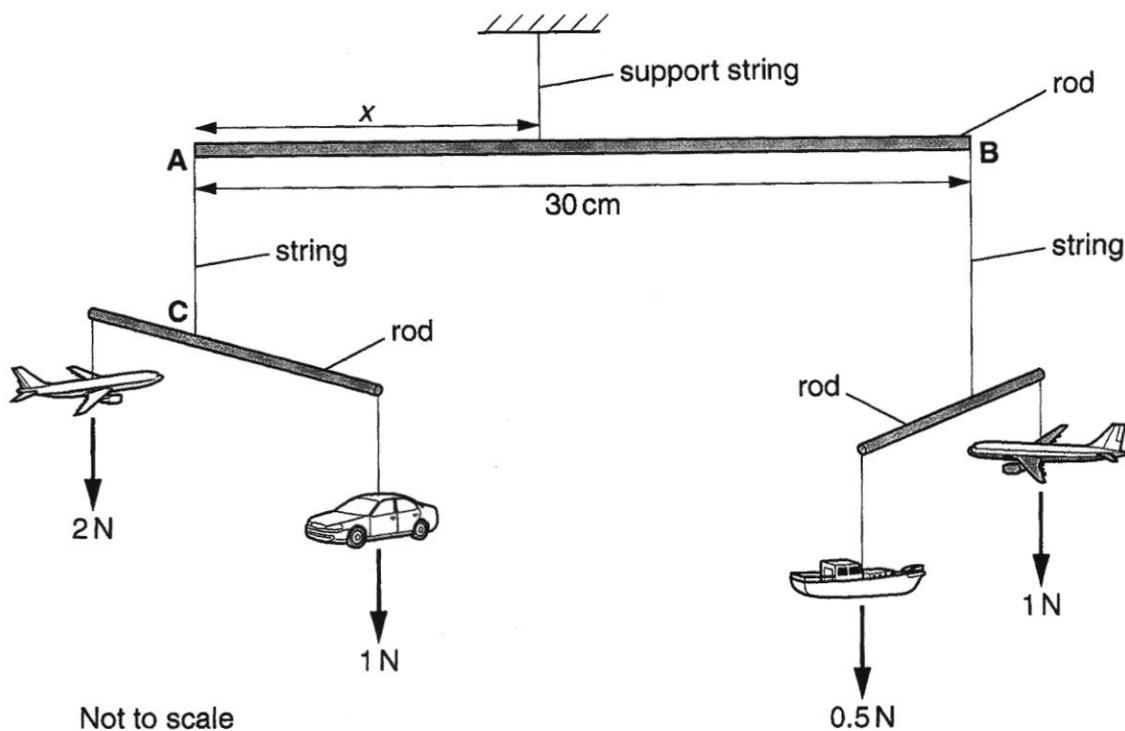
Fig. 4.1

The weight of each toy is shown on the diagram.

The rod **AB** is 30 cm long and is balanced horizontally.

(a) State the tension in the string **AC**.

tension = ... N [1]

(b) Calculate the distance x, of the support string, from the end **A** of the rod.

x = ... cm [3]

5 Two glass flasks contain air at room temperature. They are heated by an electrical heater as shown in Fig. 5.1.

glass tube ——

coloured liquid ——

bung ——

flask A
painted silver

electric heater

glass tube

—— coloured liquid

—— bung

flask B
painted dull black

Fig. 5.1

Flask **A** is painted silver and flask **B** is painted dull black.

Each flask is sealed, at room temperature, by means of a column of coloured liquid in a narrow tube (as shown in Fig. 5.1).

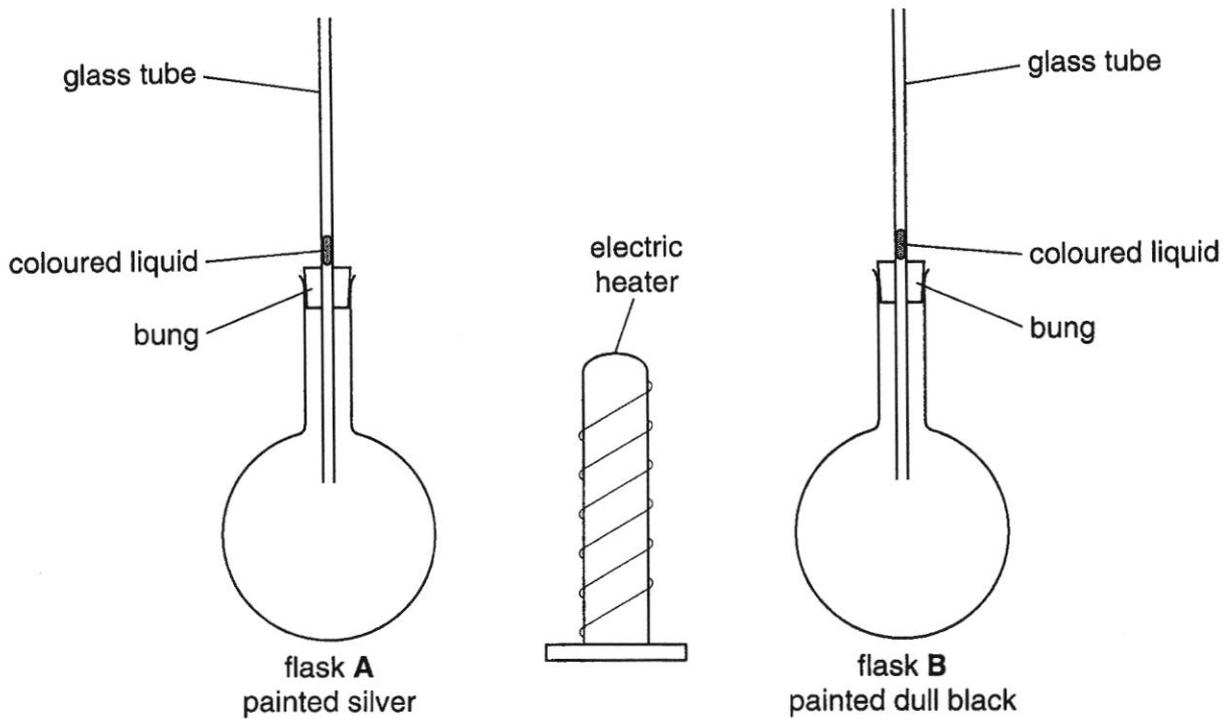The flasks are then heated by an electrical heater that is the same distance from each flask.

(a) State the name of the process by which thermal energy is transferred from the heater to the flasks.

.... [1]

(b) State and explain any change that occurs in the motion of the air molecules in each flask.

....

....

.... [2]

(c) Suggest and explain what will happen to the columns of coloured liquid in each flask.

....

....

.... [2]

5116/02/O/N/10 **[Turn over**

6 An electric fence which is used to keep animals in one part of a field is shown in Fig. 6.1.
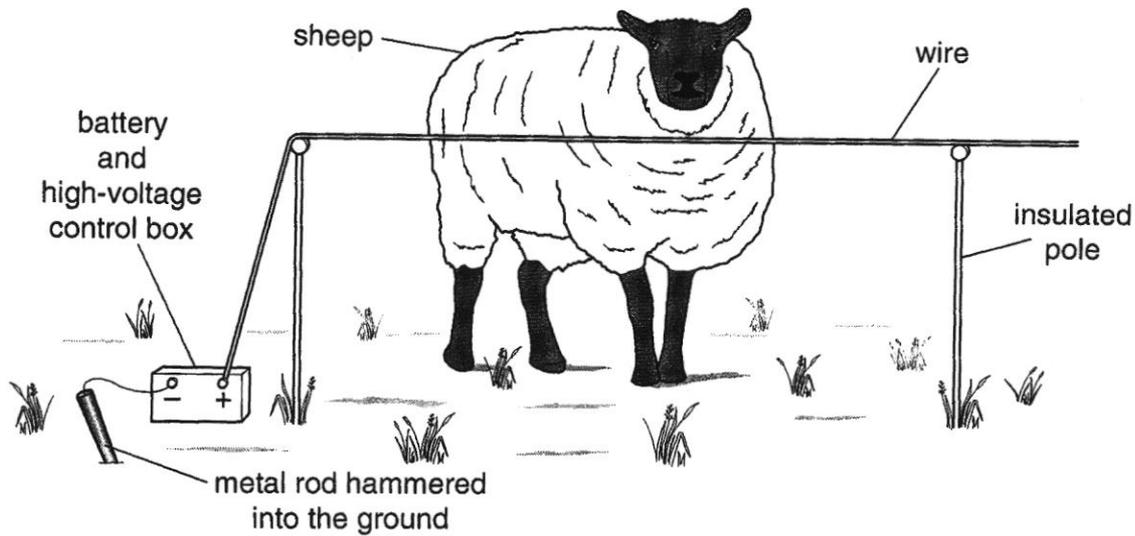
Fig. 6.1

One side of the high voltage control box is connected to a wire. The other side of the control box is connected to a metal rod that is hammered into the ground.

The control box gives out short high-voltage pulses that each last for 0.1 s.

When an animal touches the wire, a current of 12 mA passes through its body into the ground. This current is not enough to harm the animal but gives it an electric shock.

(a) Calculate the charge that passes through an animal when it receives a current of 12 mA for 0.1 seconds.
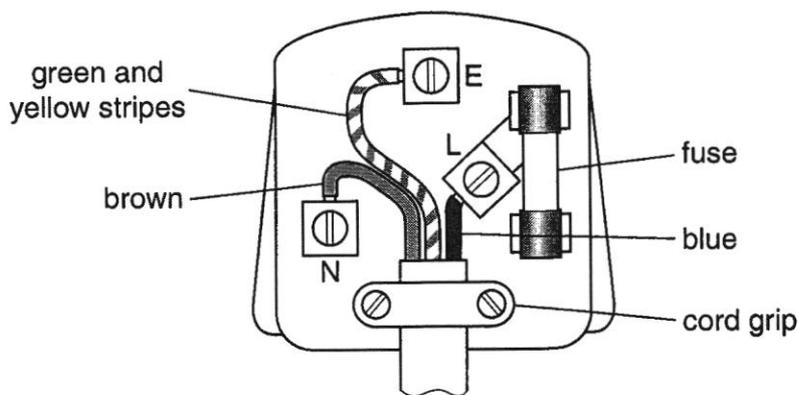
charge = ... C [3]

(b) The potential difference between the wire and the ground is 5000 V.

Calculate the energy contained in the high-voltage pulse.

energy = ... J [2]

7 The mains plug (for a toaster) as shown in Fig. 7.1 has been wired **wrongly and dangerously.**

Fig. 7.1

(a) State in what way the mains plug has been wired wrongly.

....

.... [1]

(b) State why the wiring in Fig. 7.1 causes a hazard even when the switch on the toaster is switched off.

....

.... [1]

8 A car of mass 1200 kg is travelling at a speed of 30 m/s. The brakes are applied to bring the car to rest.

(a) Calculate the amount of energy that is transferred in the brakes as the car decelerates to rest.

energy transferred = ... J [2]

(b) State what becomes of the energy that is transferred.

.... [1]

9 In satellite communications systems, microwaves are transmitted from Earth to a satellite as shown in Fig. 9.1. The satellite transmits the signals back to Earth.
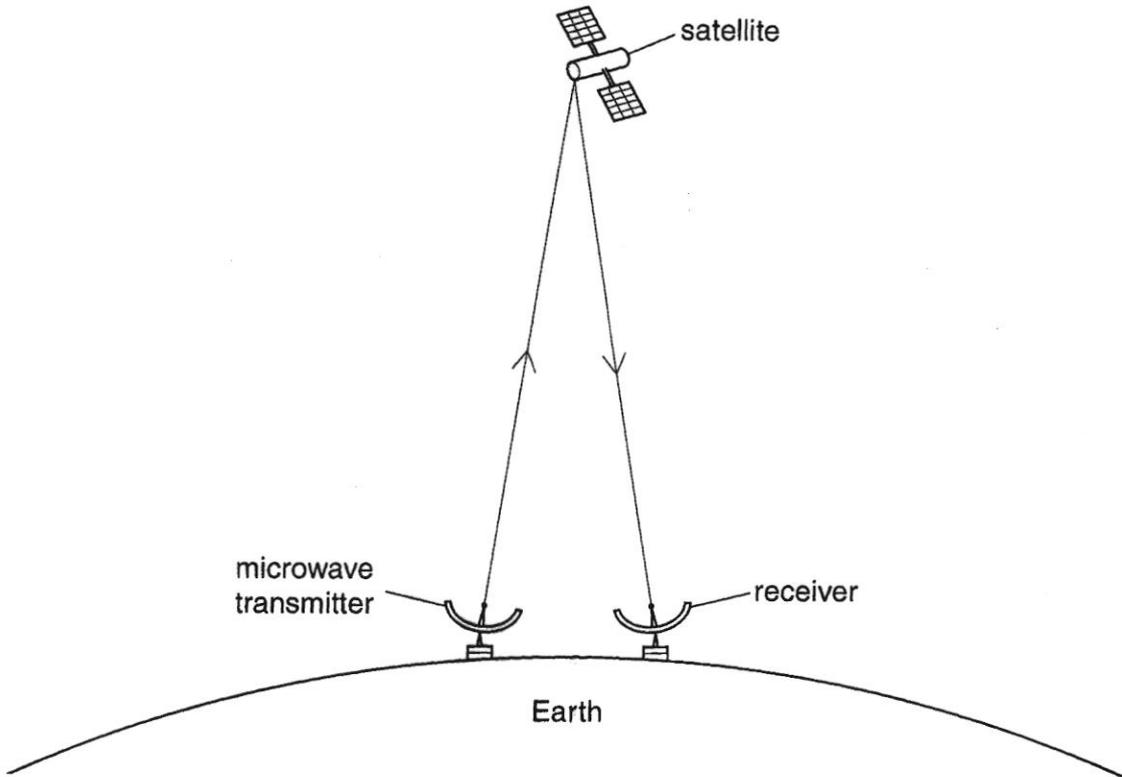
Fig. 9.1

The microwaves have a frequency of 6000 MHz and a wavelength of 0.05 m.

The satellite is 36 000 km above the Earth.

(a) Calculate the speed of the microwaves.

speed = ... m/s [2]

(b) Calculate the least time between the microwaves being transmitted and returning to Earth.

time = ... s [2]

5116/02/O/N/10

Oct/Nov 2010 Paper 2 (8)

10 An instrument to measure atmospheric pressure is shown in Fig. 10.1.
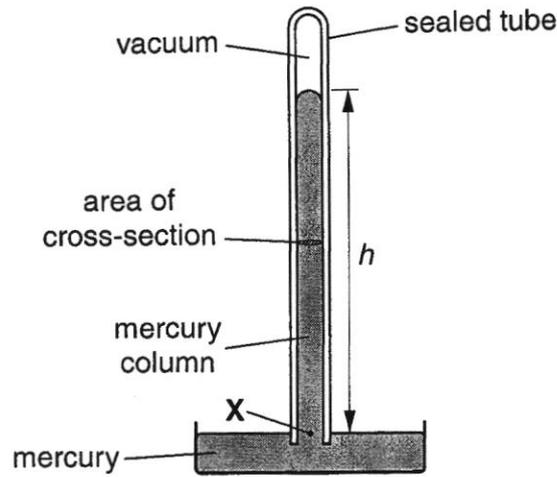
Fig. 10.1

The length h of the column of mercury above point **X** indicates the pressure of the atmosphere.

The mercury column has a cross-sectional area of $2.5 \, cm^2$. The length h of the column of mercury is $76 \, cm$. The density of mercury is $14 \, g/cm^3$. The gravitational field strength g is $10 \, N/kg$.

(a) Calculate, for the mercury column in the tube,

  (i) the mass,

  mass = ... g [3]

  (ii) the weight.

  weight = ... N [1]

(b) Calculate the pressure at point **X** due to the column of mercury.

pressure = ... N/cm² [2]

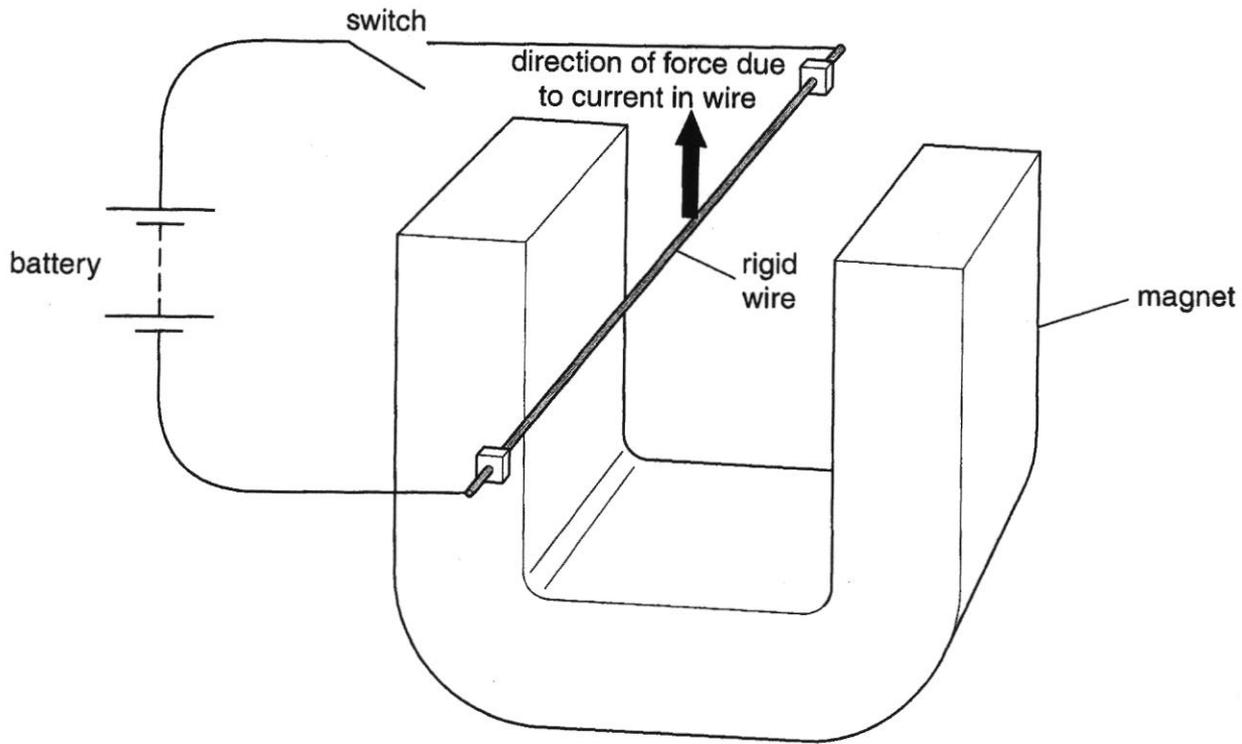**11** A rigid wire is held between the poles of a magnet, as shown in Fig. 11.1.

Fig. 11.1

When the current is switched on, there is a force on the wire in an upward direction as shown in Fig. 11.1.

(a) On Fig. 11.1,

    (i) draw an arrow to show the direction of the conventional current in the wire,

    (ii) label the north pole of the magnet with the letter N.

[1]

(b) State two changes that can be made separately to cause a downward force on the wire.

1. ....

2. .... [2]
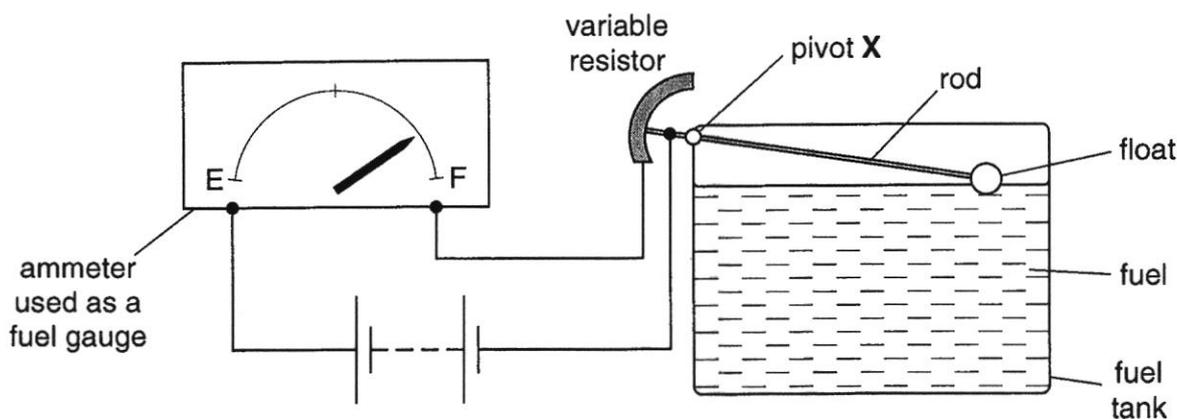
Answer any **two** questions.

Write your answers on the lined paper provided and, if necessary, continue on
separate answer paper.
Parts of questions 13 and 14 are to be answered on the question paper.

**12 (a)** A fuel gauge in a car is shown in Fig. 12.1.

Fig. 12.1

The float remains on the surface of the fuel. The rod attached to the float rotates about
the pivot **X** as the float moves up or down. The fuel gauge is an ammeter.

Explain why the reading on the fuel gauge decreases when the fuel level drops. [4]

(b) A device switches on a fan when the temperature changes. Part of the control circuit for
the device is shown in Fig. 12.2.
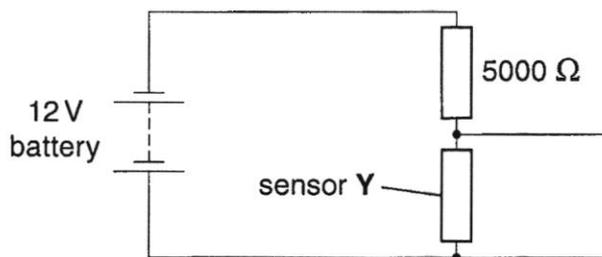
Fig. 12.2

The resistance of sensor **Y** changes with change in temperature. Sensor **Y**, the 5000 Ω
resistor and the 12 V battery are connected in series.

(i) At a particular temperature, the resistance of the sensor is 1000 Ω. Calculate the
potential difference (p.d.) across the sensor, **Y**. [3]

(ii) When the temperature increases, the resistance of sensor, **Y**, decreases.

Suggest and explain how the current in the circuit and p.d. across the 5000 Ω
resistor changes. [3]

13 An object is placed 6.0 cm in front of a thin converging lens as shown in Fig. 13.1. The image formed is real, inverted, the same size as the object and 6.0 cm from the lens.

object

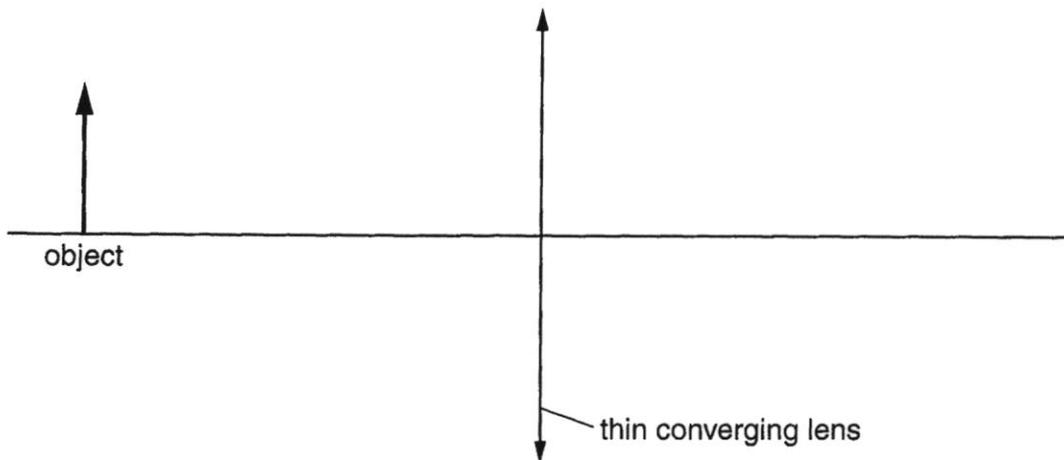thin converging lens

Fig. 13.1

(a) **On Fig. 13.1**, draw a ray diagram to determine the focal length of the lens. [3]

(b) Describe how the image changes as the object is moved slowly towards the lens until it is approximately 1 cm from the lens. [5]

(c) The speed of light in different materials is shown in Fig. 13.2.

material	air	water	glass
speed of light (m/s)	3.0×10^8	2.3×10^8	2.0×10^8

Fig. 13.2

Fig. 13.3 shows what happens to light as it passes from air into glass and from water into air due to the change in speed.
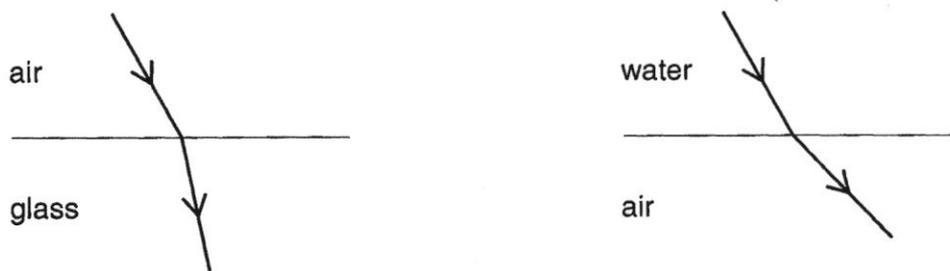
air

glass

water

air

Fig. 13.3

Suggest and explain what happens to light as it passes from water into glass. [2]

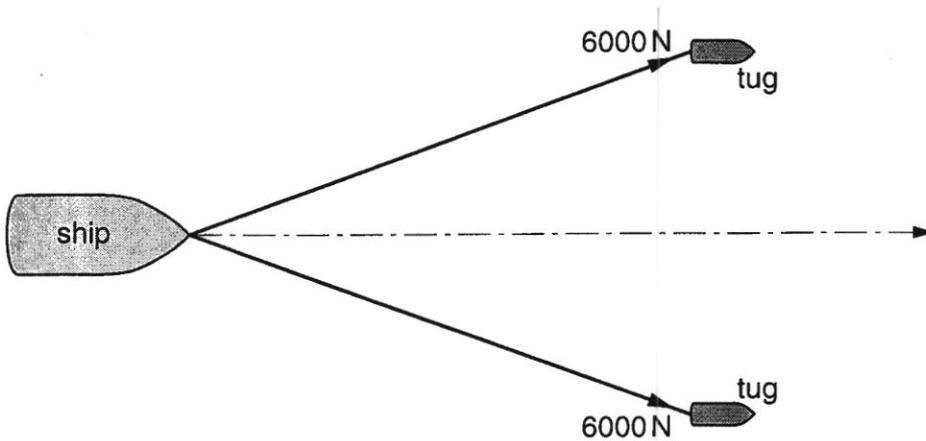**14** A ship is being pulled by two tugs as shown in Fig. 14.1.

6000 N

tug

ship

tug

6000 N

Fig. 14.1

The mass of the ship is 2×10^8 kg. The angle between the forces exerted by the two tugs is 40°. Each tug pulls with a horizontal force of 6000 N, in the directions as shown in the diagram.

(a) **On Fig. 14.1**, draw a scale diagram to determine the resultant force that the tugs exert on the ship.   [4]

(b) The ship travels at a constant speed of 4 m/s. When the force due to the tugs is removed, the ship slows down and comes to rest.

Explain why, initially, the ship travels at a constant speed and then why it comes to rest.
                                                                                                                                   [3]

(c) The distance a ship travels before it comes to rest depends on the mass of the cargo in the ship. Suggest and explain how the stopping distance depends on the mass.   [3]

BLANK PAGE