UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

2344733865

PHYSICS **0625/23**

Paper 2 Core **May/June 2010**

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 **21** printed pages and **3** blank pages.

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UNIVERSITY *of* CAMBRIDGE
International Examinations

[Turn over

1 Five identical steel balls are measured with a rule graduated in cm, as shown in Fig. 1.1.

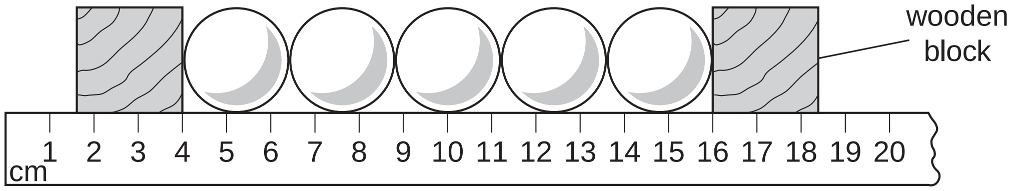

Fig. 1.1

(a) Use Fig. 1.1 to find the diameter of one ball.

diameter of ball = ... cm [2]

(b) What instrument would be used to measure the mass of a ball?

.... [1]

(c) Another ball has a volume of 9.0 cm^3 and a mass of 72 g.

Calculate the density of this ball.

density = ... [4]

[Total: 7]

For Examiner's Use

2 **(a)** Fig. 2.1 shows a space probe, far out into space, where there is no atmosphere. It is moving at a constant speed in the direction shown by the arrow.

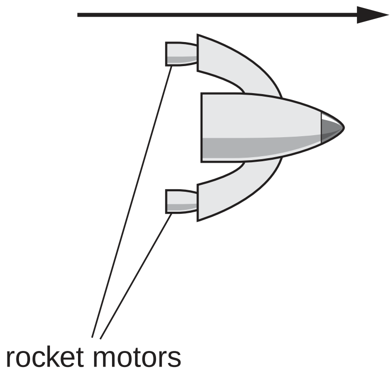

Fig. 2.1

Is a force necessary to keep the probe moving like this? Tick one box.

yes ☐

no ☐

If your answer is "yes", draw an arrow on the diagram to show this force. [1]

(b) Fig. 2.2 shows the space probe just after the rocket motors are fired.

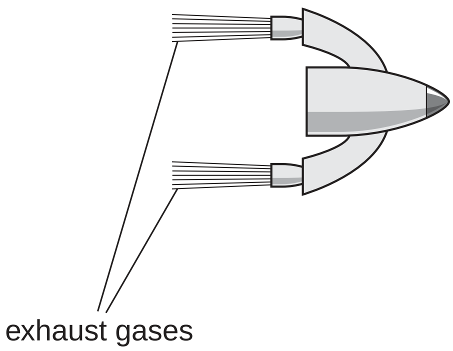

Fig. 2.2

State what effect this has on the space probe.

....

.... [2]

(c) Later into its mission, the space probe is brought back into the Earth's atmosphere again, with no rockets working.

For Examiner's Use

Suggest two effects that the atmosphere has on the space probe.

1. ....

2. .... [2]

[Total: 5]

3 **(a)** Here is a list of some energy resources which might be used to generate electricity.

Put a tick in the box alongside any of these which relies on a fuel being consumed.

oil ☐

hydroelectricity ☐

nuclear fission ☐

wind ☐

waves ☐

[2]

(b) Here is a list of devices which convert energy from one form to another.

battery, electric motor, gas lamp, gas fire, generator, loudspeaker, microphone

Which of these is designed to convert

(i) chemical energy into light energy,

....

(ii) electrical energy into mechanical energy,

....

(iii) sound energy into electrical energy?

....

[3]

[Total: 5]

4 **(a)** Fig. 4.1 shows end views of the walls built by two bricklayers.

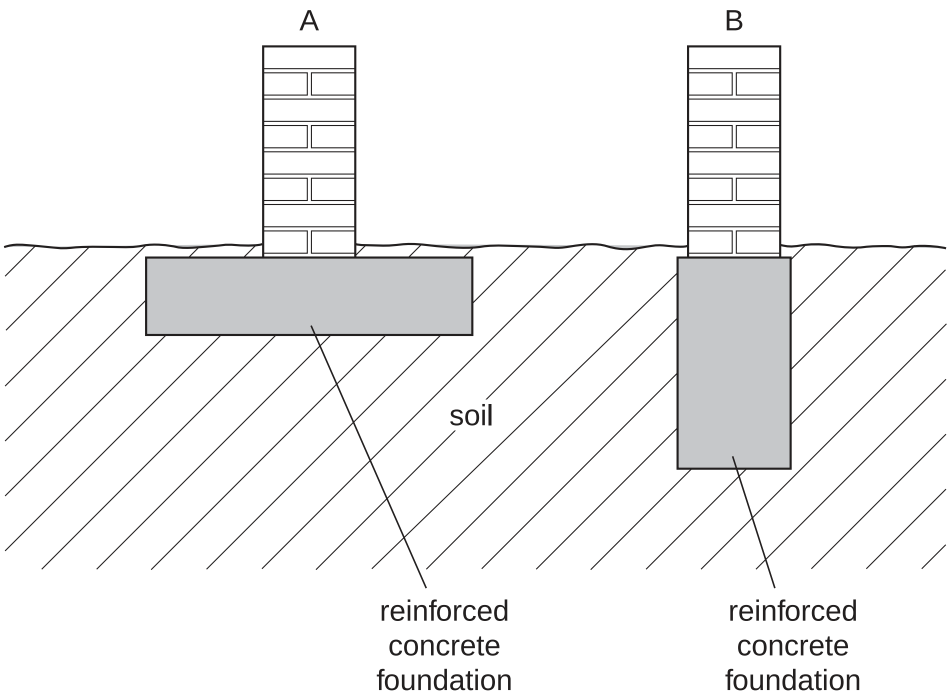

Fig. 4.1

Which wall is the least likely to sink into the soil, and why?

....

....

....

.... [2]

(b) Fig. 4.2 shows two horizontal squares P and Q.

Fig. 4.2

The atmosphere is pressing down on both P and Q.

(i) Name two quantities that would need to be known in order to calculate the atmospheric pressure on square P.

1. ....

2. .... [2]

For Examiner's Use

(ii) The area of P is four times that of Q.

Complete the following sentences.

1. The atmospheric pressure on P is ……………………………… the atmospheric pressure on Q.

2. The force of the atmosphere on P is ……………………………… the force of the atmosphere on Q. [3]

[Total: 7]

5 Fig. 5.1 shows a device called a thermostat, which is being used to control the temperature of the air in a room.

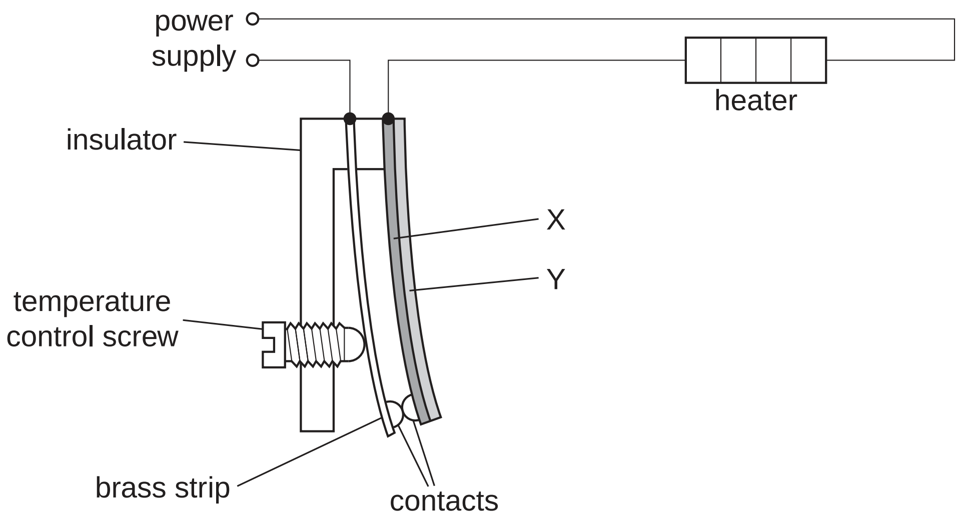

Fig. 5.1

X and Y are strips of two different metals, joined together along their length. Together they are called a bimetallic strip. X expands more than Y for the same temperature rise.

(a) The temperature rises and the bimetallic strip bends.

State

(i) which way the bimetallic strip bends,

.... [1]

(ii) what happens to the contacts,

.... [1]

(iii) what happens to the current in the circuit,

.... [1]

(iv) what adjustment could be made to this thermostat, in order to increase the temperature at which the thermostat operates.

....

.... [1]

For Examiner's Use

(b) Fig. 5.2 shows how the temperature of the water in a tank would rise if it were heated continuously, starting with water at a temperature of 0 °C.

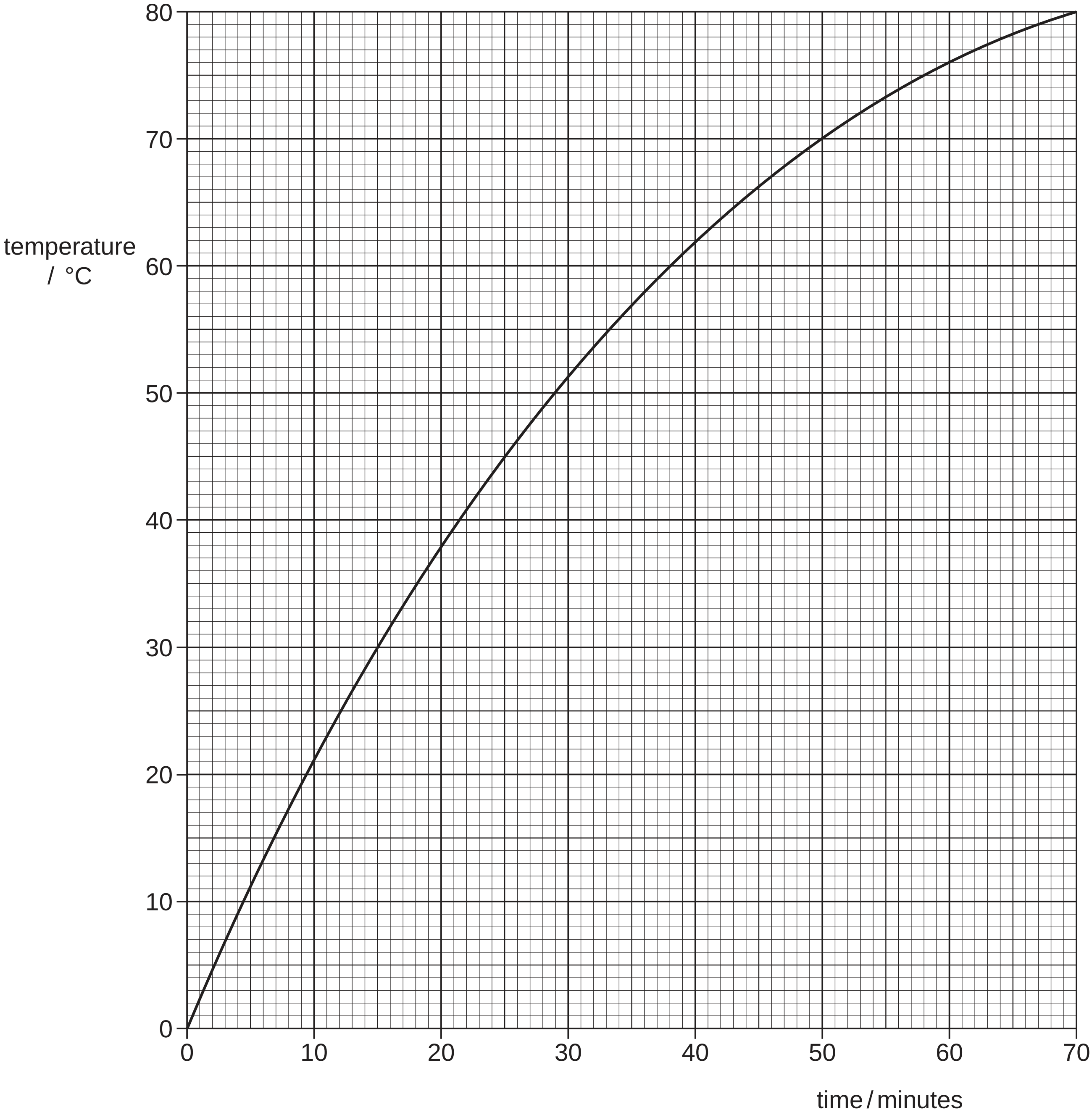

Fig. 5.2

The thermostat controlling the temperature of the water switches off the heater current when the temperature rises above 50 °C.

(i) Use Fig. 5.2 to determine how long the water is heated before the thermostat operates.

time = ... minutes [1]

(ii) The heater supplies energy at the rate of 2000 W.

Calculate how much thermal energy is supplied to the water before the thermostat switches off the heater.

For Examiner's Use

energy = ... J [3]

[Total: 8]

6 **(a)** Fig. 6.1 illustrates a sound wave travelling through the air.

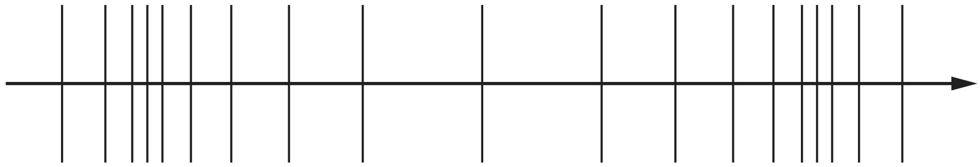

Fig. 6.1

(i) On Fig. 6.1, mark clearly the direction in which the air particles are moving. [1]

(ii) Use Fig. 6.1 to measure the wavelength of the sound wave.

wavelength = ... cm [1]

(iii) The pitch of the sound wave is raised.

State how the sound wave pattern would differ from that shown in Fig. 6.1.

....

.... [1]

(b) Fig. 6.2 shows a section through a series of waves on water.

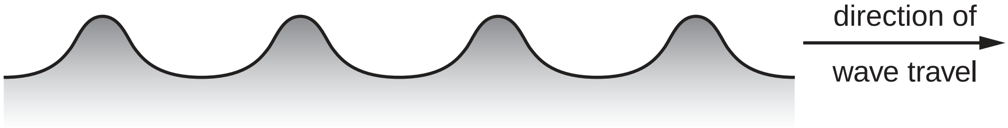

Fig. 6.2

(i) On Fig. 6.2, mark clearly the direction in which the water molecules are moving. [1]

(ii) From Fig. 6.2, measure the wavelength of the water wave.

wavelength = ... cm [1]

(iii) The amplitude of the water waves is increased.

State how the appearance of the water waves would differ from that shown in Fig. 6.2.

....

.... [1]

[Total: 6]

7 **(a)** A ray of light passes through one surface of a glass prism at right angles to the surface, as shown in Fig. 7.1.

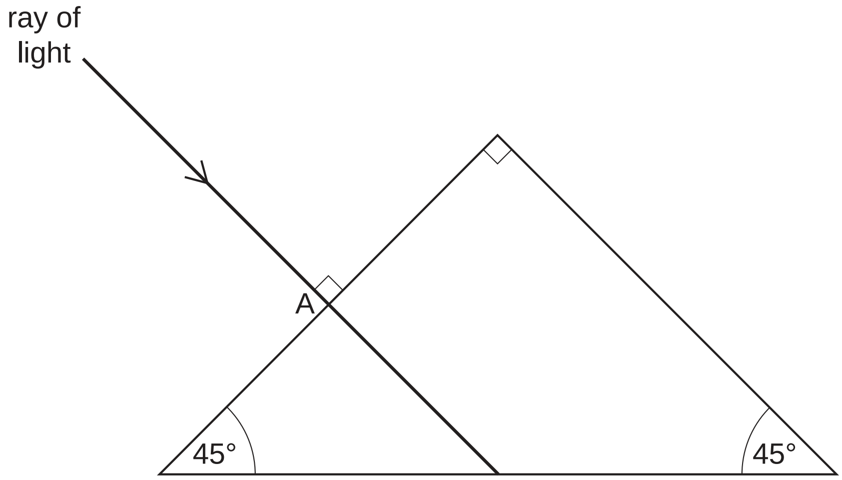

Fig. 7.1

(i) State why the ray is not deviated as it passes through the surface into the glass at A.

....

.... [1]

(ii) On Fig. 7.1, use a ruler to help you draw the rest of the path of the ray, until it has emerged again into the air. [3]

(b) Fig. 7.2 shows a periscope that uses two plane mirrors.

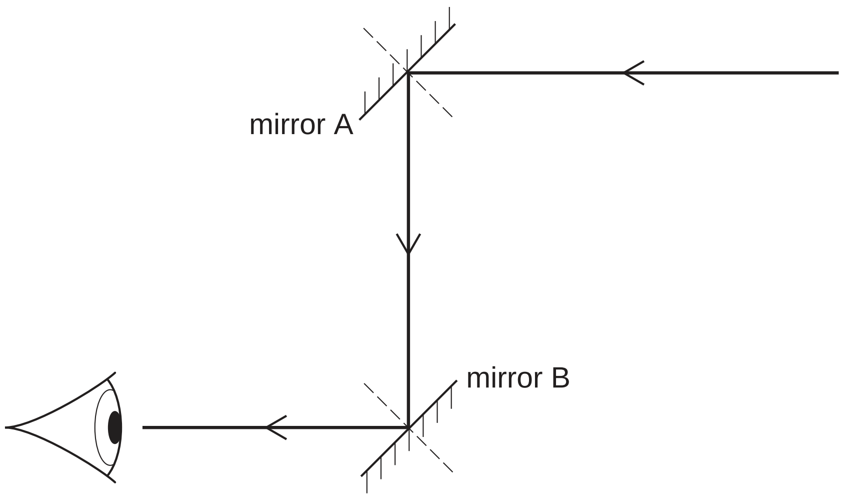

Fig. 7.2

(i) On Fig. 7.2, clearly mark the angle of incidence *i* and the angle of reflection *r* at mirror A. [1]

For Examiner's Use

(ii) State the equation linking *i* and *r*.

[1]

(iii) In the space below, use a ruler to redraw the periscope, but using prisms like that in Fig. 7.1 instead of mirrors at A and B.

[2]

[Total: 8]

8 **(a)** Fig. 8.1 shows a circuit containing a 6V lamp, two switches and a 6V motorcycle battery. The lamp has a resistance of 10Ω when it is glowing normally.

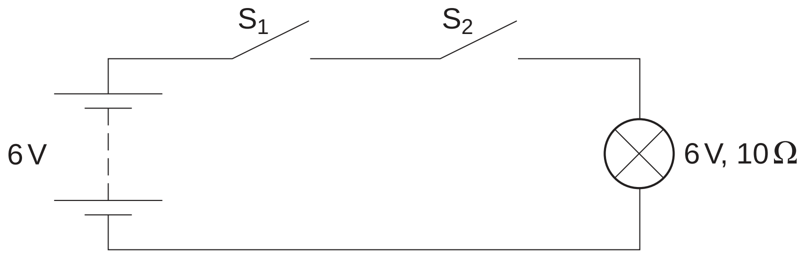

Fig. 8.1

How can the lamp be made to light up at normal brightness? Tick the box alongside any action which will do this.

close S_1 only ☐

close S_2 only ☐

close both S_1 and S_2 ☐

[1]

(b) Fig. 8.2 shows a similar circuit, but the switches are arranged in parallel.

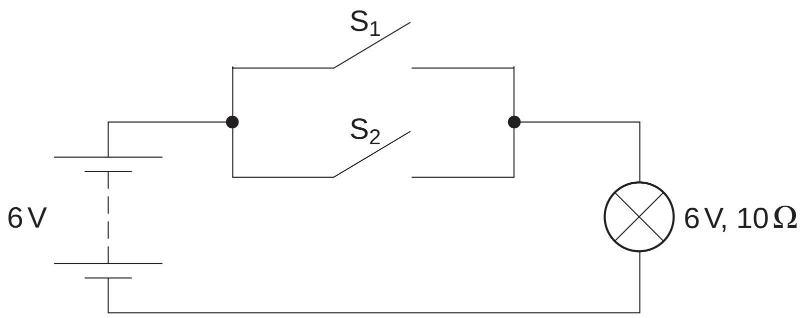

Fig. 8.2

How can the lamp be made to light up at normal brightness? Tick the box alongside any action which will do this.

close S_1 only ☐

close S_2 only ☐

close both S_1 and S_2 ☐

[2]

(c) The lamp is now connected to a 12V car battery, as shown in Fig. 8.3.

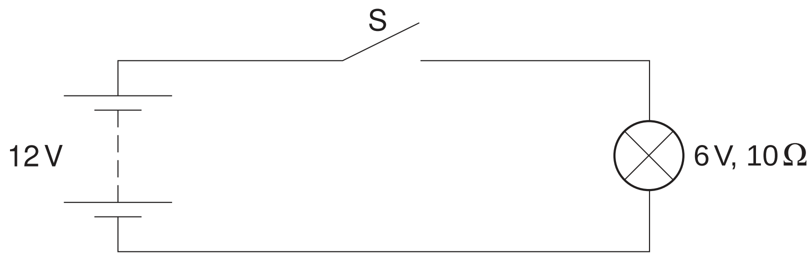

Fig. 8.3

State why it would not be wise to close switch S.

....

.... [1]

(d) Resistor R is connected in series with the lamp, as shown in Fig. 8.4.

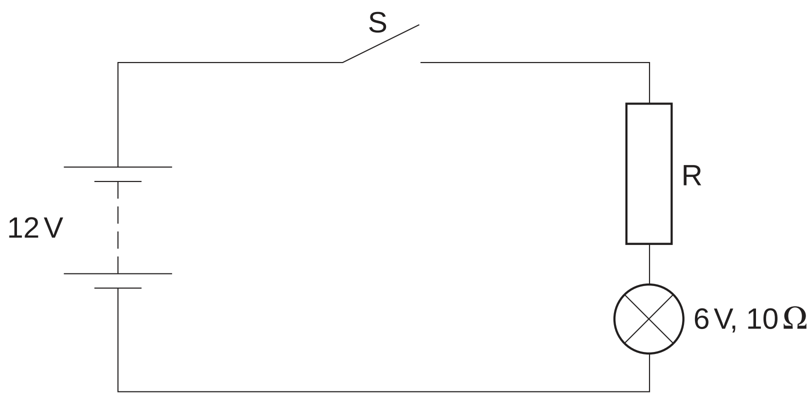

Fig. 8.4

(i) State what value R must have, in order to enable the lamp to have 6V across it when S is closed.

resistance = ... Ω [1]

(ii) With this resistor and the lamp in series, calculate the current in the circuit.

current = ... [4]

[Total: 9]

9 Fill in the gaps in the sentences below, using only appropriate words from the following list. Do not use any word more than once.

For Examiner's Use

charge, current, few, many, potential difference, resistance

Insulators are materials which possess very ……………………………… free electrons.

Because of this, when a ……………………………… is applied across an

insulator, the electric ……………………………… in it is very small.

The ……………………………… of a piece of insulator is likely to be very high. [3]

[Total: 3]

10 (a) (i) What is an *electromagnet*?

....

....

.... [1]

(ii) State one very useful property of an electromagnet.

....

.... [1]

(b) An iron bar has many turns of wire wrapped around it, as shown in Fig. 10.1. The wire is connected to an alternating current supply.

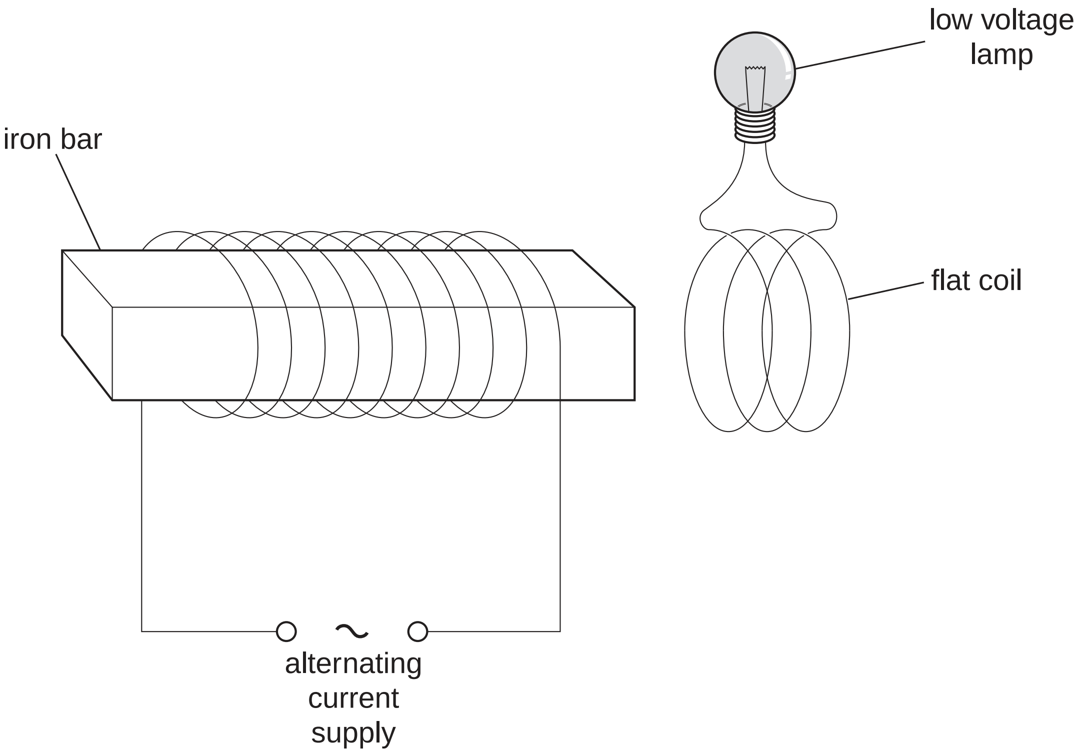

Fig. 10.1

Some more wire is made into a flat coil and connected across a low voltage lamp. When the flat coil is held close to the end of the iron bar, the lamp glows.

Explain why this happens.

....

....

....

....

.... [3]

For Examiner's Use

(c) Fig. 10.2 shows a relay being used to switch an electric motor M on and off.

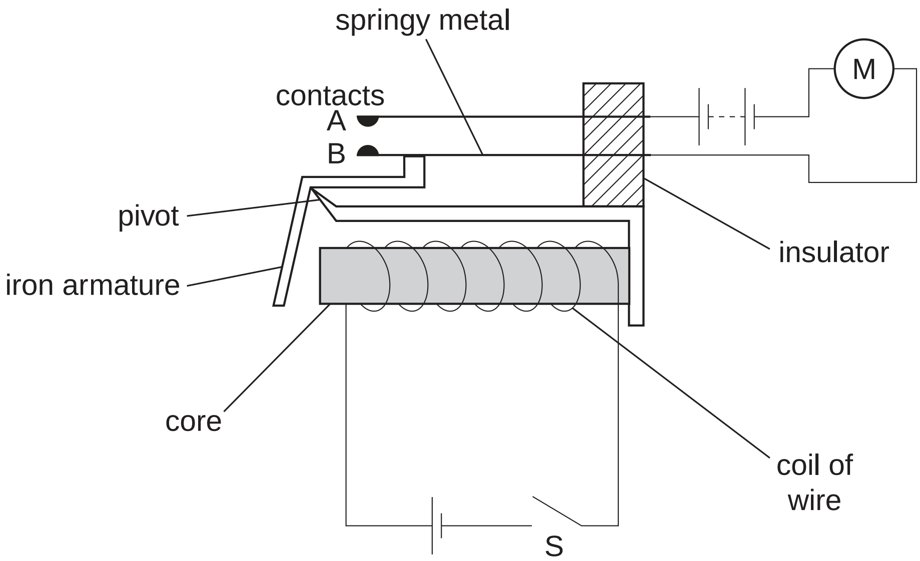

Fig. 10.2

Switch S is closed. State what happens to

(i) the core,

....

.... [1]

(ii) the iron armature,

....

.... [1]

(iii) the contacts A and B.

....

.... [1]

(d) A suggestion is made that the relay would work better if the armature were made of steel instead of iron.

Explain why this is **not** a good idea.

....

.... [2]

[Total: 10]

11 **(a)** State what is meant by *thermionic emission*.

....

.... [2]

(b) In Fig. 11.1, a beam of cathode rays is entering the space between two charged metal plates.

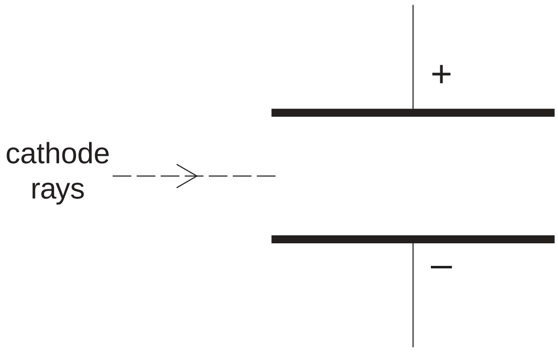

Fig. 11.1

(i) What sort of particles make up cathode rays? Tick one box.

α-particles	☐
electrons	☐
neutrons	☐
protons	☐

[1]

(ii) On Fig. 11.1, continue the dotted line to show the path of the cathode rays as they travel between the plates and into the space beyond the plates. [3]

[Total: 6]

For Examiner's Use

12 **(a)** Four students attempt to define the *half-life* of a sample of radioactive substance.

Student A Half-life is half the time for the activity of the sample to decrease to zero.

Student B Half-life is half the time taken for the activity of the sample to decrease to half its original value.

Student C Half-life is the time taken for the activity of the sample to decrease to half its original value.

Which student has given a correct definition? .... [1]

(b) Fig. 12.1 shows two samples of the same radioactive substance. The substance emits β-particles.

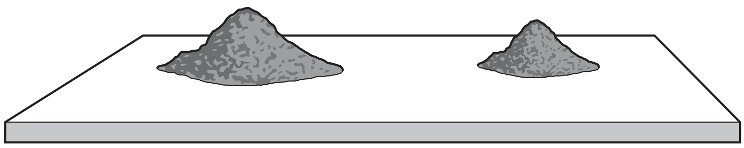

Fig. 12.1

Put a tick alongside any of the following quantities which is the same for both samples.

the half-life of the samples	☐
the mass of the samples	☐
the number of atoms decaying each second	☐
the number of β-particles emitted per second	☐

[1]

(c) A quantity of radioactive material has to be taken from a nuclear reactor to a factory some distance away. Fig. 12.2 shows the decay curve for the quantity of radioactive material.

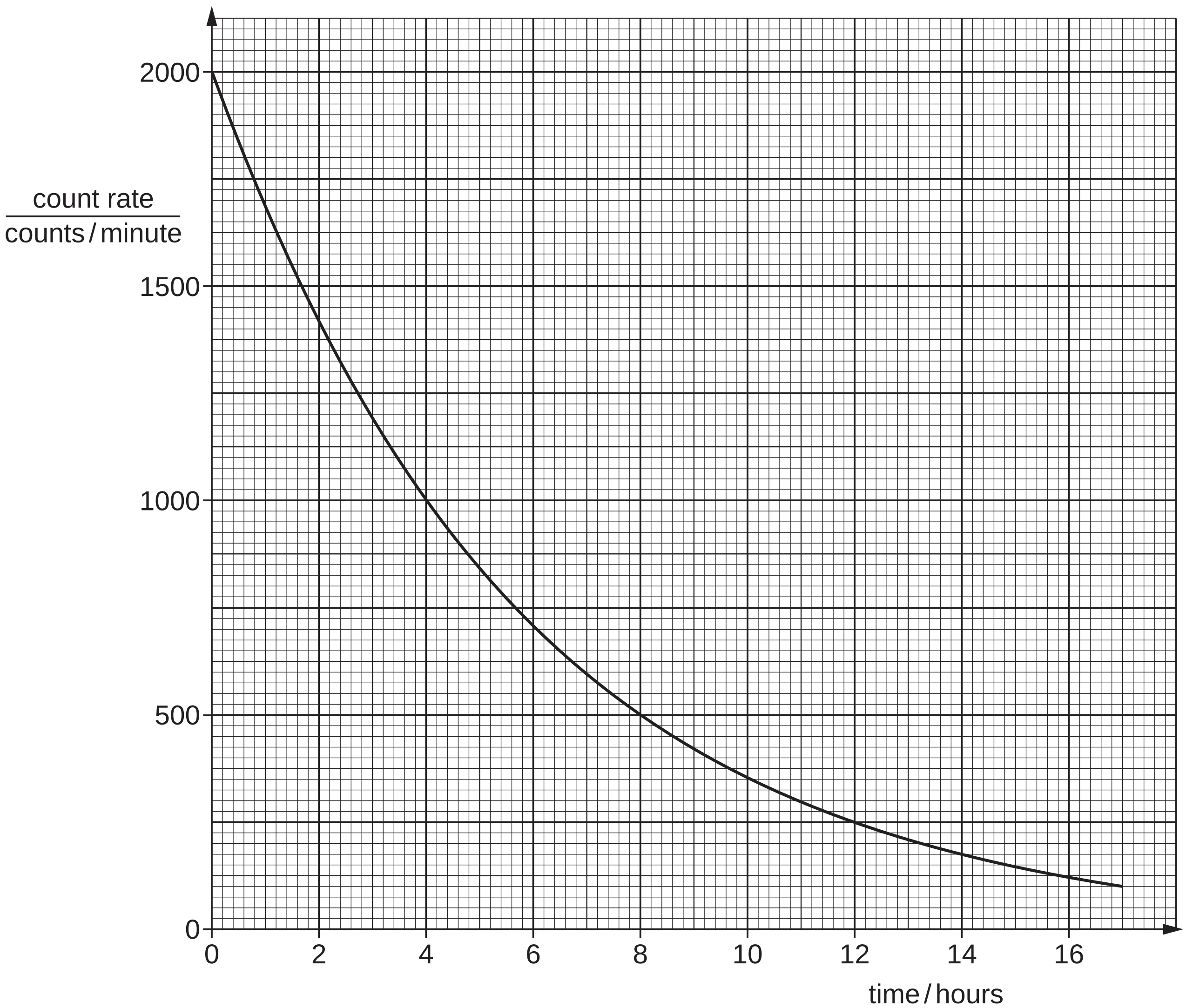

Fig. 12.2

Just before it leaves the nuclear reactor, the count-rate from the material is 2000 counts / minute. When it arrives at the factory, the count-rate is 1000 counts / minute.

(i) How long did the journey take? .... hours [1]

(ii) How many half-lives elapsed during the journey? .... [1]

(iii) The material is only useful to the factory if the activity is at least 100 counts / minute. Use Fig. 12.2 to determine how many hours of useful life the factory has from the radioactive material.

useful life = ... hours [2]

[Total: 6]

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