Cambridge IGCSE

**Cambridge Assessment International Education**
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

*9089743291*

**PHYSICS** **0625/31**

Paper 3 Theory (Core) **May/June 2019**

**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 an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (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 syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages.


© UCLES 2019

**1** **(a)** A student has a metal object.

**(i)** The student measures the mass of the object.

State the name of the equipment used to measure the mass.

..... [1]

**(ii)** The mass of the metal object is 1260 g. The volume of the metal is 150 $cm^3$.

Calculate the density of the metal. Include the unit.

density = ..... [4]

**(iii)** The mass of the metal object is given in grams. State the mass in kg.

mass = ..... kg [1]

**(b)** A vase is placed on a table. Forces X and Y act on the vase, as shown in Fig. 1.1.

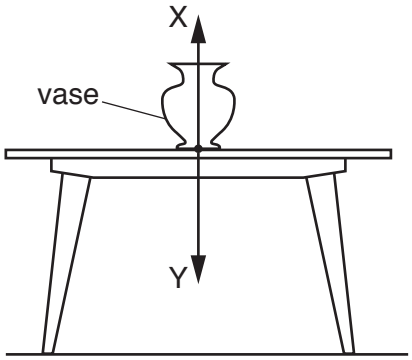



**Fig. 1.1**

The mass of the vase is 0.25 kg. The vase is not moving.

Calculate the value of force X and the value of force Y.

X .....

Y .....

[4]

[Total: 10]

© UCLES 2019

**2** Fig. 2.1 shows a man pushing down on a lever to lift one end of a heavy log.

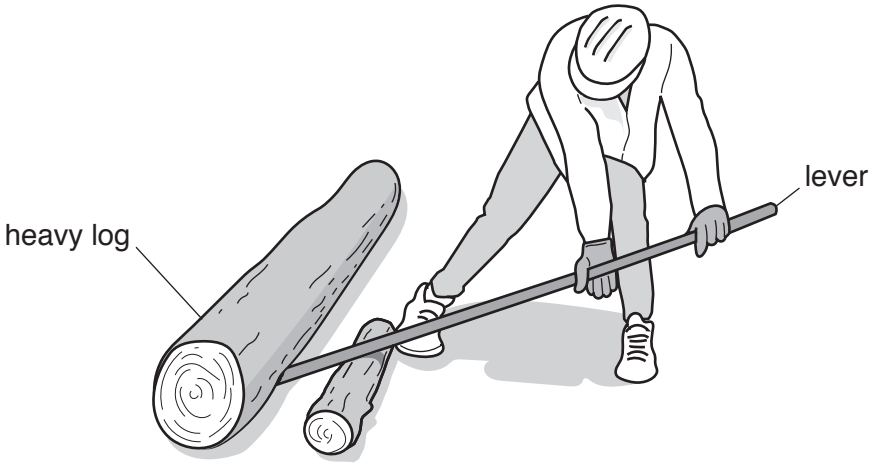



**Fig. 2.1**

**(a)** State the term used to describe the turning force exerted by the man.

..... [1]

**(b)** **(i)** Fig. 2.2 shows the forces acting as the man starts to lift the heavy log.

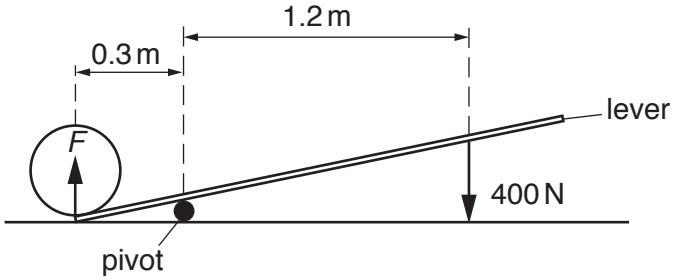



**Fig. 2.2**

Calculate the force *F*, exerted by the lever on the heavy log.

force *F* = ..... N [3]

**(ii)** Describe how the man can use a smaller force to lift the heavy log.

.....

..... [1]

[Total: 5]

**3** A teacher investigates the reaction time of five students. A 0.50 m ruler is held above the hand of a student before being allowed to fall. The arrangement is shown in Fig. 3.1.

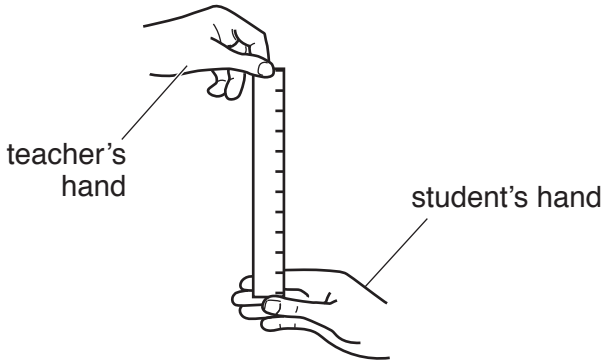



**Fig. 3.1**

As soon as the ruler falls the student closes their hand, catching the ruler. The further the ruler falls, the greater the reaction time of the student. The results obtained are shown in Fig. 3.2.

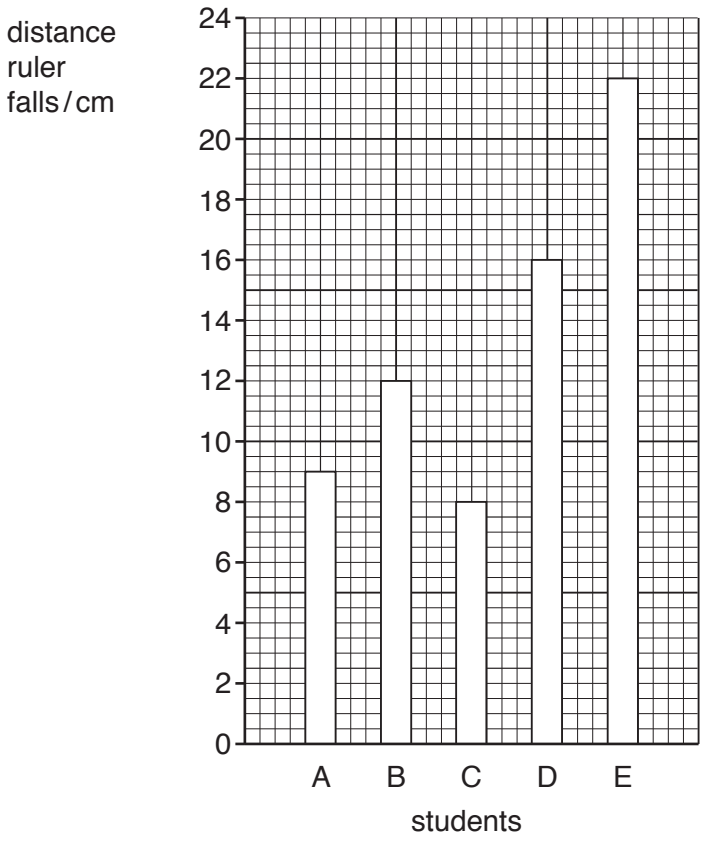



**Fig. 3.2**

**(a)** Using the results shown in Fig. 3.2, calculate the average distance that the ruler drops.

average distance = ..... cm [2]

**(b)** List the students in order of their reaction times, with the shortest reaction time at the top of the table. One has been done for you.

| order | student |
|---|---|
| 1st | |
| 2nd | |
| 3rd | B |
| 4th | |
| 5th | |

[2]

**(c)** In a similar investigation, a ruler drops a distance of 11.0 cm and has an average speed of 16 cm / s.

Calculate the reaction time.

reaction time = ..... s [3]

[Total: 7]

© UCLES 2019

**[Turn over**

**4** Fig. 4.1 shows a pin. Fig. 4.2 shows a person pushing the pin into a wall.

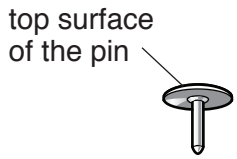



**Fig. 4.1**

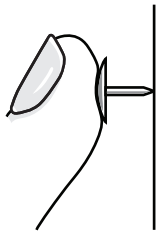


**Fig. 4.2**

**(a) (i)** The area of the top surface of the pin is 1.8 $cm^2$. The person applies a force of 50 N.

Calculate the pressure exerted on the top surface of the pin.

pressure = ..... $N/cm^2$ [3]

**(ii)** The area of the top surface of the pin is 500 times larger than the area of the point. Calculate the value of the pressure exerted by the point on the wall.

pressure = ..... $N/cm^2$ [1]

**(b)** Fig. 4.3 shows a simple device for measuring atmospheric pressure.

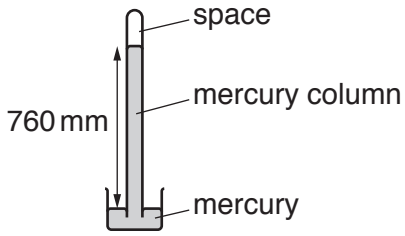



**Fig. 4.3**

**(i)** State the name given to the device shown in Fig. 4.3.

..... [1]

**(ii)** State what, if anything, is in the space at the top of the tube, above the mercury column.

..... [1]

**(iii)** Fig. 4.3 shows normal atmospheric pressure. Suggest a possible value for the height of the mercury column when atmospheric pressure decreases. Include the unit.

reading = ..... [1]

[Total: 7]

© UCLES 2019

**5** Coal is a non-renewable source of energy.

**(a) (i)** Explain what is meant by the term *non-renewable*.

.....

..... [1]

**(ii)** There are other non-renewable sources of energy.

Place a tick in the box by each non-renewable source of energy.

- ☐ nuclear
- ☐ oil
- ☐ solar
- ☐ wave
- ☐ wind

[1]

**(b)** State **two** advantages and **two** disadvantages of using natural gas as an energy source.

advantages

1. .....

.....

2. .....

.....

disadvantages

1. .....

.....

2. .....

.....

[4]

[Total: 6]

**6** A liquid-in-glass thermometer is placed in some ice made from pure water. The ice is heated. It changes to water and then to steam.

The graph in Fig. 6.1 shows how the temperature varies with time. The values of temperature are missing from the y-axis.

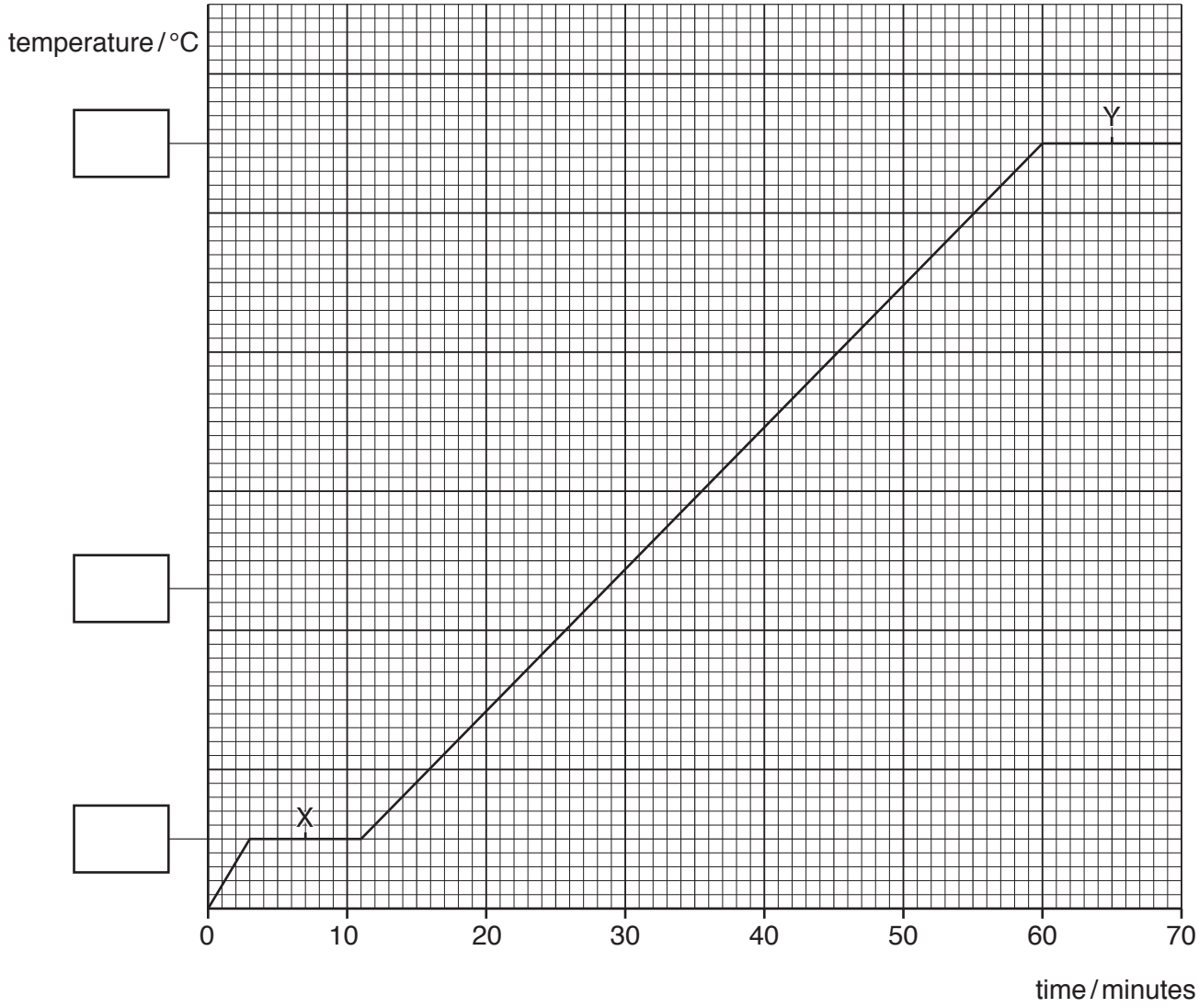



**Fig. 6.1**

**(a)** On Fig. 6.1, suggest a value for the temperature at each of the three points marked on the y-axis.

Write a value in each of the boxes. [2]

© UCLES 2019

**(b)** In both section X and section Y the line on the graph is horizontal.

For each section, state the name for the process taking place and explain what is happening to the molecules.

**(i)** section X

name .....

explanation .....

.....

.....

.....

[2]

**(ii)** section Y

name .....

explanation .....

.....

.....

.....

[2]

[Total: 6]

**7** **(a)** Fig. 7.1 shows some devices that each use one type of electromagnetic radiation.

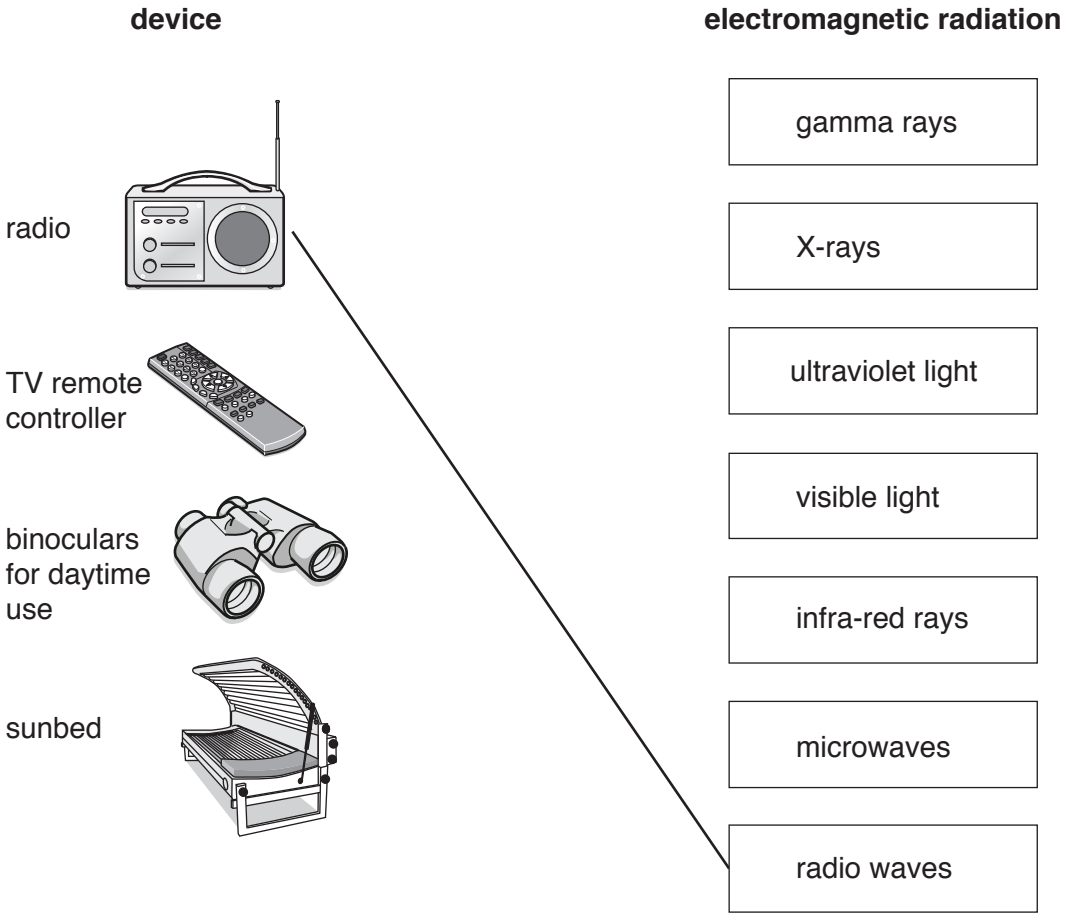



**Fig. 7.1**

Draw one line from each device to the correct type of electromagnetic radiation. One has been done for you. [3]

**(b)** **(i)** State the name of one type of radiation that has a longer wavelength than visible light.

..... [1]

**(ii)** Complete the sentence about electromagnetic radiation. Use a word from the box.

| amplitude | frequency | speed | wavelength |
|---|---|---|---|

All types of electromagnetic radiation travel through a vacuum with the same

..... [1]

[Total: 5]

© UCLES 2019

**8** **(a)** A student rubs a plastic rod with a dry cloth, as shown in Fig. 8.1. The rod becomes negatively charged.

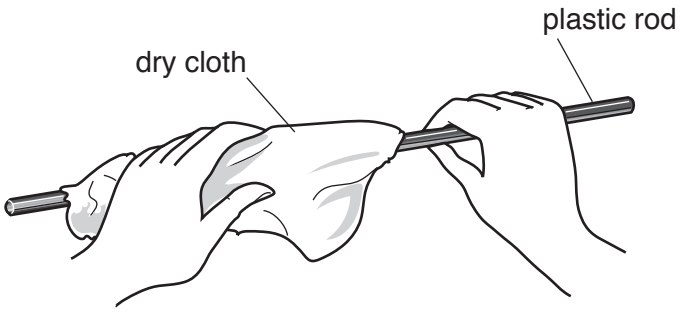



**Fig. 8.1**

**(i)** Use words from the box to complete the sentence.

| air | cloth | electrons | hand | neutrons | protons |
|---|---|---|---|---|---|

The rod becomes negatively charged because ..... move from the

..... to the rod.

[2]

**(ii)** The student moves the rod close to a suspended, charged rod. The two rods repel each other.

State the type of charge on the suspended rod.

..... [1]

**(iii)** Explain your answer to **(a)(ii)**.

.....

..... [1]

**(b)** A device has a metal case. Any charge on the case must be able to move to earth.

**(i)** Draw **one** ring around a material that is suitable for the connection to earth.

copper glass plastic rubber [1]

**(ii)** Explain your answer to **(b)(i)**.

.....

..... [1]

[Total: 6]

© UCLES 2019

**9** A student makes a circuit to switch on a 6.0 V lamp from two different switches X and Y.

Fig. 9.1 shows the circuit.

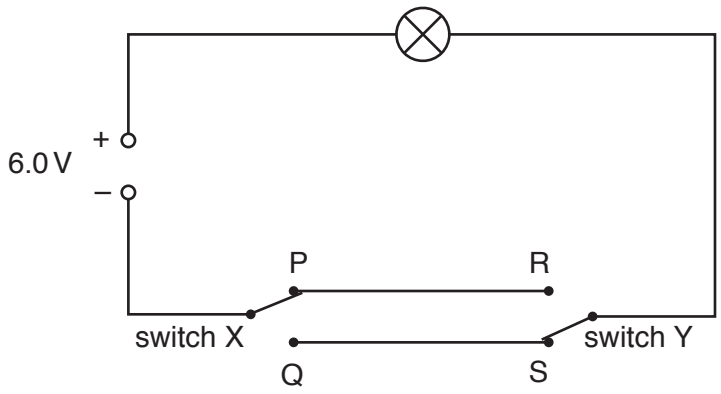



**Fig. 9.1**

**(a)** Switch X is in position P. State the position of switch Y for the lamp to be lit.

..... [1]

**(b)** The current in the lamp is 0.50 A when the potential difference (p.d.) across the lamp is 6.0 V. Calculate the resistance of the lamp. Include the unit.

resistance = ..... [4]

**(c)** The student connects another 6.0 V lamp in parallel with the first lamp, as shown in Fig. 9.2.

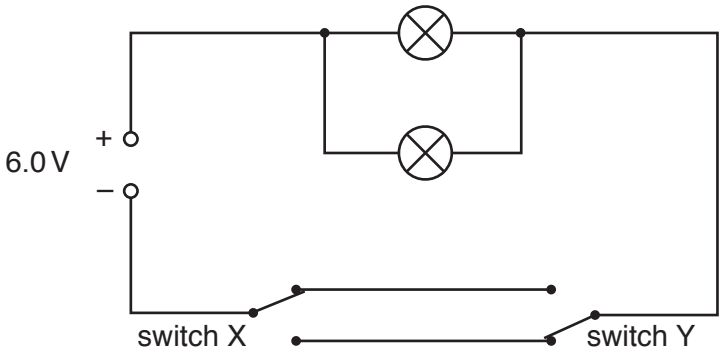



**Fig. 9.2**

Give **two** advantages of connecting the lamps in parallel.

.....

.....

..... [2]

[Total: 7]

© UCLES 2019

**10 (a)** A teacher demonstrates the action of a device. Fig. 10.1 shows the symbol for the device.

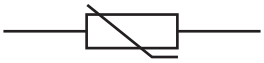


**Fig. 10.1**

State the name of this device.

..... [1]

**(b)** Fig. 10.2 shows another device being used in a circuit. The circuit contains a 6.0 V lamp.

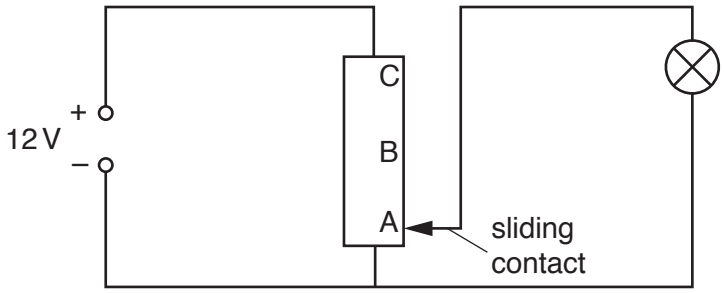



**Fig. 10.2**

**(i)** The sliding contact of this device is at position A, as shown in Fig. 10.2.

Describe and explain the brightness of the lamp when the sliding contact is in this position.

brightness of lamp .....

explanation .....
[2]

**(ii)** The teacher moves the sliding contact from position A to position B. Describe and explain what happens to the brightness of the lamp.

.....

..... [2]

**(iii)** The teacher moves the sliding contact from position B to position C. Suggest what happens to the lamp.

..... [1]

[Total: 6]

**11** **(a)** Fig. 11.1 shows in each of the diagrams a current-carrying conductor and a magnetic field pattern.

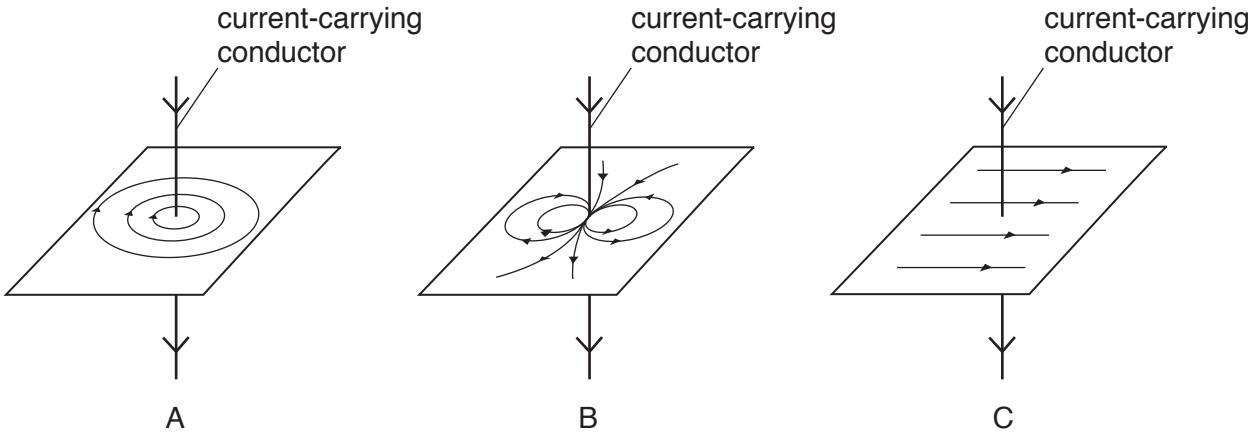
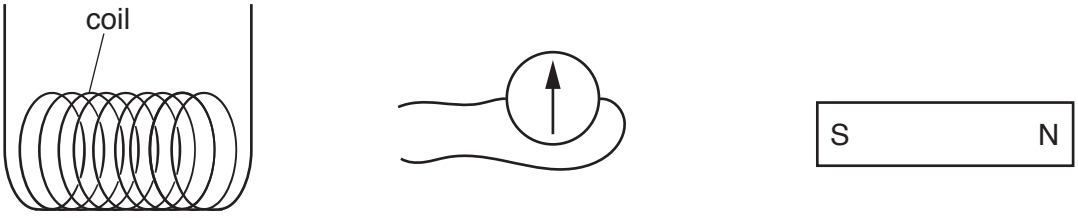



**Fig. 11.1**

State the diagram which correctly shows the magnetic field around a current-carrying conductor.

..... [1]

**(b)** Fig. 11.2 shows three pieces of equipment.




coil with 100 turns of wire

sensitive centre-zero meter

bar magnet

**Fig. 11.2**

**(i)** Describe how to generate and detect an electromotive force (e.m.f.) using the equipment in Fig. 11.2. You may draw a diagram.

.....

.....

.....

..... [3]

© UCLES 2019

**(ii)** Describe **two** changes that will generate a larger e.m.f. using similar equipment to that in Fig. 11.2.

.....

.....

.....

..... [2]

**(c)** A student connects a lamp and centre-zero galvanometer in series with a generator, as shown in Fig. 11.3.

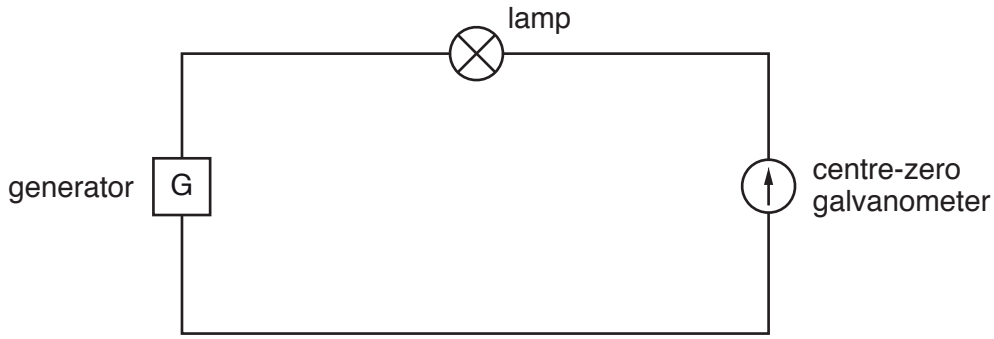



**Fig. 11.3**

The student observes the galvanometer needle moving from side-to-side repeatedly.

Explain why the needle moves in this way.

.....

.....

..... [1]

[Total: 7]

**12 (a)** Use words from the box to complete the sentences about the charges in an atom. Words can be used once, more than once or not at all.

| negative | neutral | positive |
|---|---|---|

The charge on the nucleus of an atom is .....

The charge on a proton is .....

The charge on electrons orbiting the nucleus is .....

[3]

**(b)** A nucleus of radium-226 has the nuclide notation shown.

$$^{226}_{88}Ra$$

**(i)** Determine the number of protons in a nucleus of radium-226.

..... [1]

**(ii)** Determine the number of neutrons in a nucleus of radium-226.

..... [1]

**(iii)** Radium has another isotope, radium-223.

Write the nuclide notation for radium-223 in the space.

[1]

**(c)** Radium-226 has a half-life of 1600 years.

A sample contains 8.0 mg of radium-226.

Calculate the time for the sample to decay until only 1.0 mg of radium-226 remains.

time = ..... years [2]

[Total: 8]

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

© UCLES 2019