Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

PHYSICS **0625/31**

Paper 3 Theory (Core) **October/November 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 **20** printed pages.

© UCLES 2019

1 Fig. 1.1 shows a plastic water barrel. The barrel is full of water.

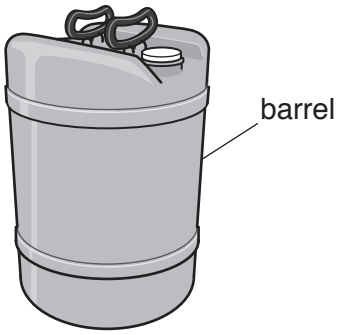

Fig. 1.1

(a) The water barrel contains 0.050 m^3 of pure water. The density of pure water is 1000 kg/m^3.

Calculate the mass of pure water in the barrel.

View solution

mass of water = ... kg [3]

(b) The density of sea water is 1030 kg/m^3. The density of the plastic is 1000 kg/m^3. Use this information and the information in **(a)** to state and explain whether the full barrel will float in sea water.

statement .....

explanation .....

.....

.....

[2]

[Total: 5]

View solution

© UCLES 2019

2 Four students P, Q, R and S each attempt to measure the time period (the time for one complete oscillation) of a pendulum. The arrows in Fig. 2.1 show the movements of the pendulum that each student times.

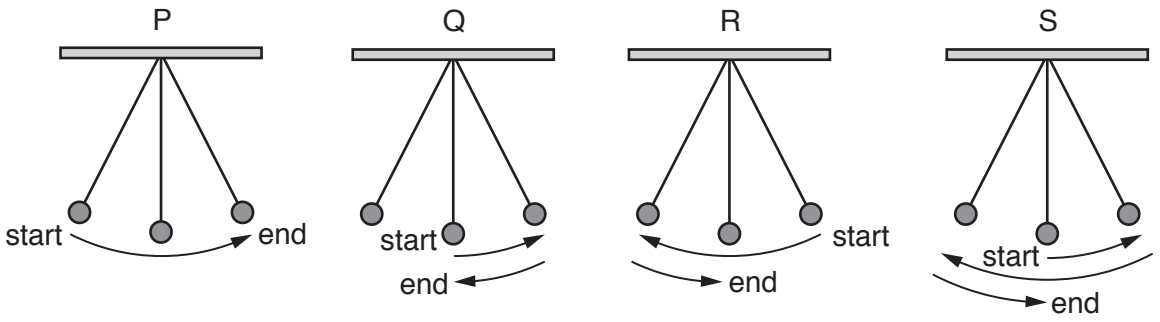

Fig. 2.1

View solution

(a) State the student who has chosen the correct movement for one period of a pendulum.

student ..... [1]

(b) Another student uses a stopwatch to measure the time taken for 50 periods of a pendulum. Fig. 2.2 shows the time taken on the stopwatch.

View solution



Fig. 2.2

Calculate the time for one period of the pendulum. Give your answer to 3 significant figures.

time for one period = ... s [3]

(c) The student measures the displacement of the pendulum bob from its rest position. The displacement is 16.5 cm, as shown in Fig. 2.3.

View solution

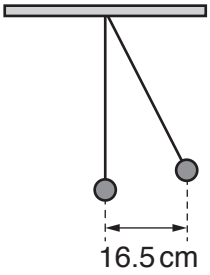

Fig. 2.3

State the displacement in millimetres.

displacement = ... mm [1]

[Total: 5]

© UCLES 2019

3 Fig. 3.1 shows a spring with no load attached. Fig. 3.2 shows the same spring with a load attached.

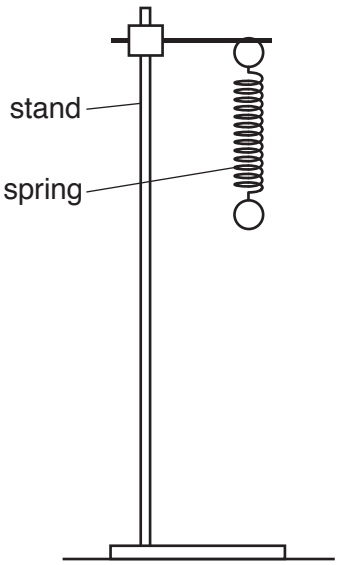

Fig. 3.1

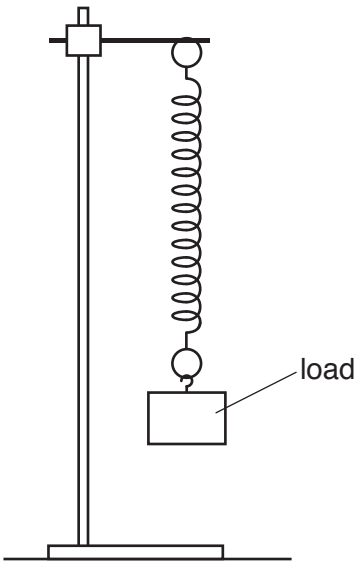

Fig. 3.2

(a) Describe how a student can determine the extension of the spring. You may draw on Fig. 3.1 and Fig. 3.2 as part of your answer.

.....

.....

.....

.....

..... [3]

View solution

(b) The student plots a graph of load against extension, as shown in Fig. 3.3.

View solution

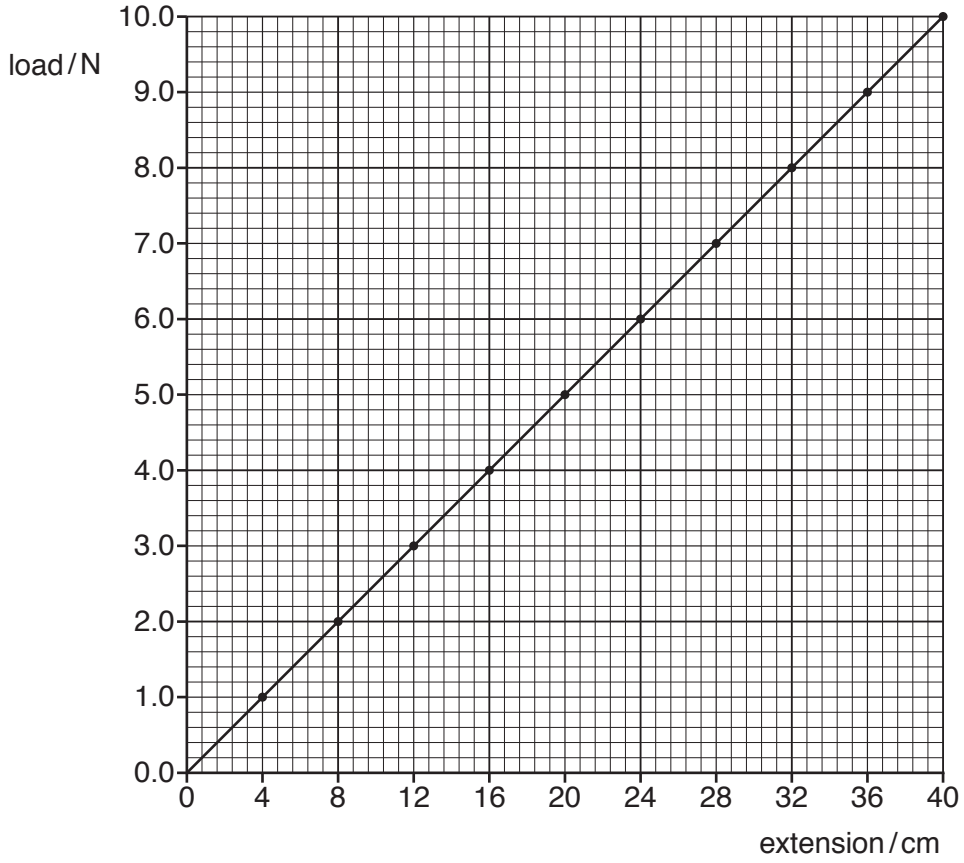

Fig. 3.3

(i) Determine the extension produced by a load of 7.5 N.

extension = ... cm [1]

(ii) Determine the load that would produce an extension of 10.0 cm.

View solution

load = ... N [1]

(c) Calculate the mass that has a weight of 6.0 N.

View solution

mass = ... kg [3]

[Total: 8]

© UCLES 2019

4 Fig. 4.1 shows a tractor fitted with a device for breaking up soil in a field.



Fig. 4.1

(a) (i) The tractor has a heavy weight at the front. Explain why the heavy weight is needed.

View solution

.....

..... [1]

(ii) Fig. 4.2 represents the weight of the device and its distance from the pivot.

View solution

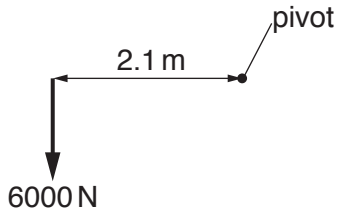

Fig. 4.2

Calculate the moment of the weight of the device about the pivot. State the unit.

moment = ... [4]

(b) Fig. 4.3 shows a tractor fitted with narrow tyres and the same tractor fitted with wide tyres.

View solution

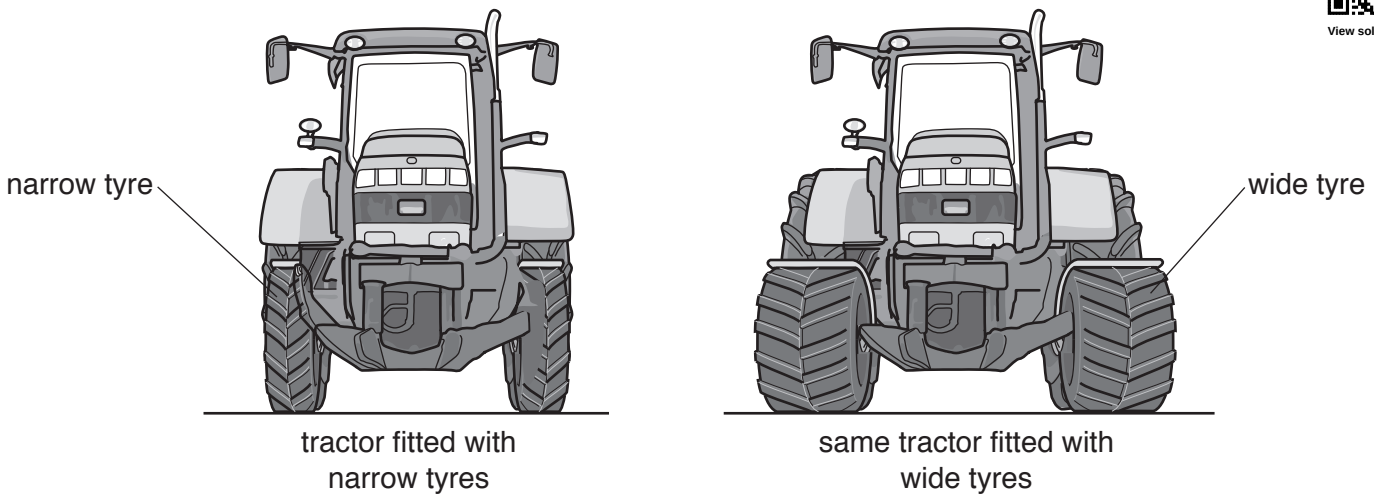

Fig. 4.3 (view from the front)

Explain why wide tyres are more suitable for the tractor on soft soil.

.....

.....

.....

..... [3]

[Total: 8]

5 Here are some statements about energy and energy resources.

View solution

Some statements are correct. Put a tick (✓) in the box alongside each of these.

- ☐ Building hydroelectric power stations has an impact on the environment.
- ☐ Burning fossil fuels produces atmospheric pollution.
- ☐ Wind turbines are turned using gravitational potential energy.
- ☐ Coal and crude oil are sources of renewable energy.
- ☐ Geothermal energy is obtained from hot rocks below the ground.

[3]

[Total: 3]

6 Fig. 6.1 shows a mirror periscope. The periscope is used to view a golfer over the heads of other people. The periscope has two plane mirrors each at an angle of 45° to the vertical.

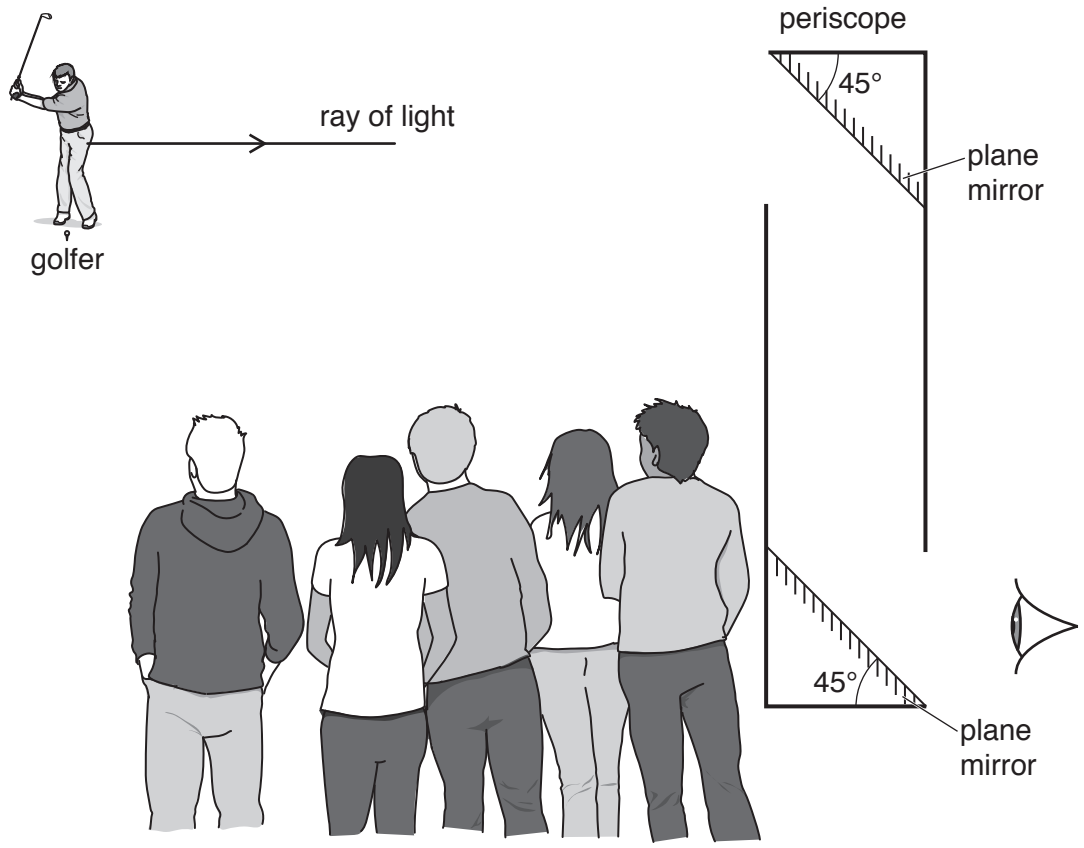

Fig. 6.1 (not to scale)

View solution

(a) (i) On Fig. 6.1:

1. Continue the ray of light from the golfer towards the upper mirror of the periscope

2. Draw and label the normal at the point where the ray strikes the mirror.

[1]

(ii) On Fig. 6.1, continue the ray of light after reflection at the upper mirror until it leaves the periscope. [1]

(iii) State the law of reflection used to deduce the position of the ray of light after striking the mirrors.

..... [1]

© UCLES 2019

(b) Fig. 6.2 shows three rays of red light each entering a semi-circular glass block.

View solution

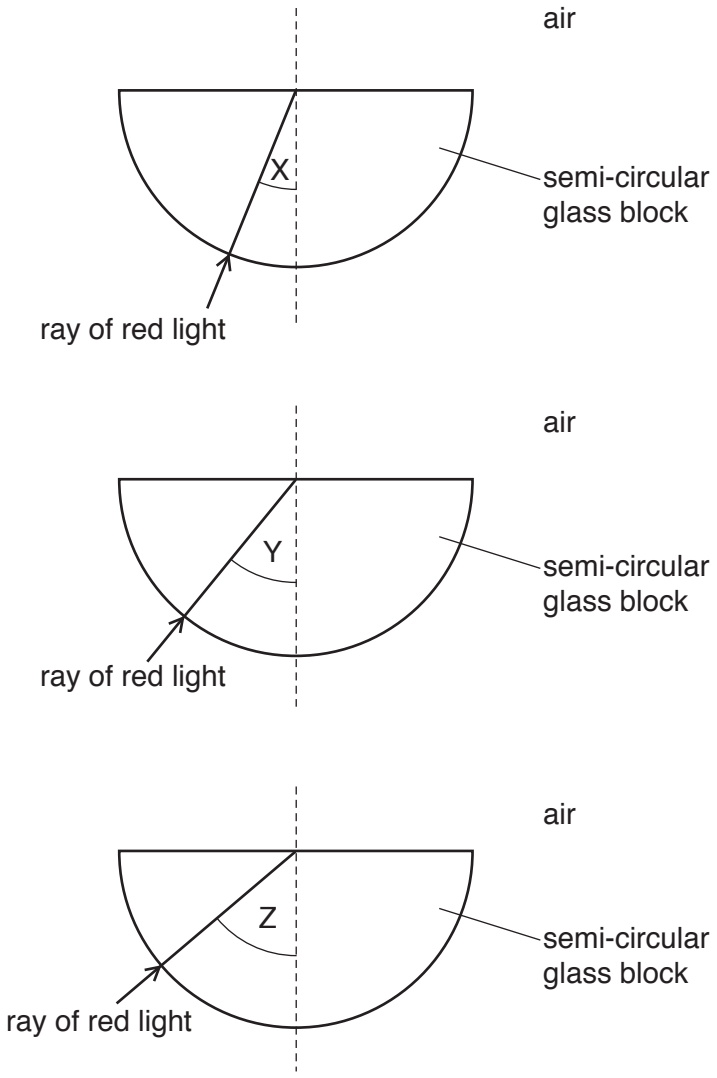

Fig. 6.2

Table 6.1

angle of incidence	description
X	less than the critical angle
Y	equal to the critical angle
Z	greater than the critical angle

Using the information in Table 6.1, draw on Fig. 6.2 to complete the path of each ray of red light. [3]

[Total: 6]

© UCLES 2019

7 An object, OX, is placed in front of a converging lens.

Fig. 7.1 shows a ray of light from the object passing through the lens.

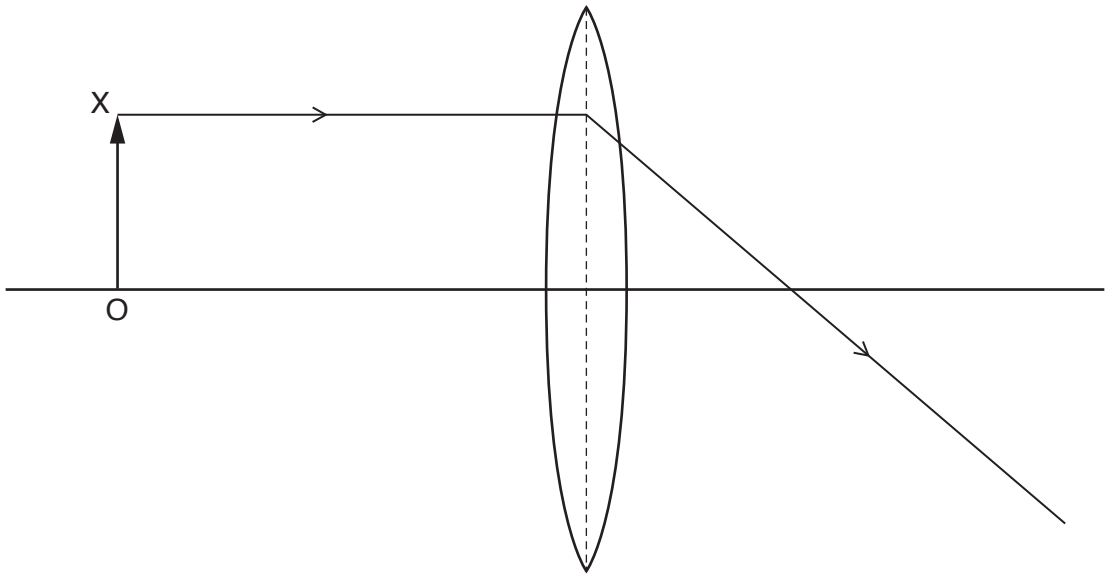

Fig. 7.1

View solution

(a) (i) The lens forms an image of object OX.

On Fig. 7.1, draw another ray from X to locate the position of the image. [1]

(ii) On Fig. 7.1, draw an arrow to represent the image of OX and label it I. [1]

(iii) On Fig. 7.1, mark a principal focus for the lens and label it F. [1]

(iv) On Fig. 7.1, measure and record the focal length of the lens.

focal length = ... cm [1]

View solution

(b) Describe the image I.

Choose words from the list. Tick (✓) **two** boxes.

- ☐ enlarged
- ☐ diminished
- ☐ same size
- ☐ inverted
- ☐ upright

[2]

[Total: 6]

© UCLES 2019

8 **(a)** Fig. 8.1 shows a student listening to the sound produced by a tuning fork.

View solution



Fig. 8.1

(i) State how the tuning fork produces the sound.

..... [1]

(ii) Complete the following sentence. Choose a word from the box.

View solution

electromagnetic	longitudinal	transverse

A sound wave is ..... [1]

(iii) A loudspeaker produces a sound with a frequency of 25 kHz.

View solution

A student with healthy ears cannot hear this sound. Explain why.

.....

..... [2]

(b) Fig. 8.2 represents a sound wave travelling in air.

View solution



Fig. 8.2 (drawn full size)

(i) The air particles are moving. On Fig. 8.2, draw **two** arrows in opposite directions to show the movement of the air particles. [1]

(ii) Use Fig. 8.2 to determine the wavelength of the sound wave.

View solution

wavelength = ... cm [1]

(c) Describe a method of using water waves to demonstrate refraction.

View solution

.....

.....

.....

.....

.....

..... [4]

[Total: 10]

© UCLES 2019

9 A student is experimenting with magnets and electric charges.

(a) The student places a bar magnet on a piece of paper, as shown in Fig. 9.1.

View solution

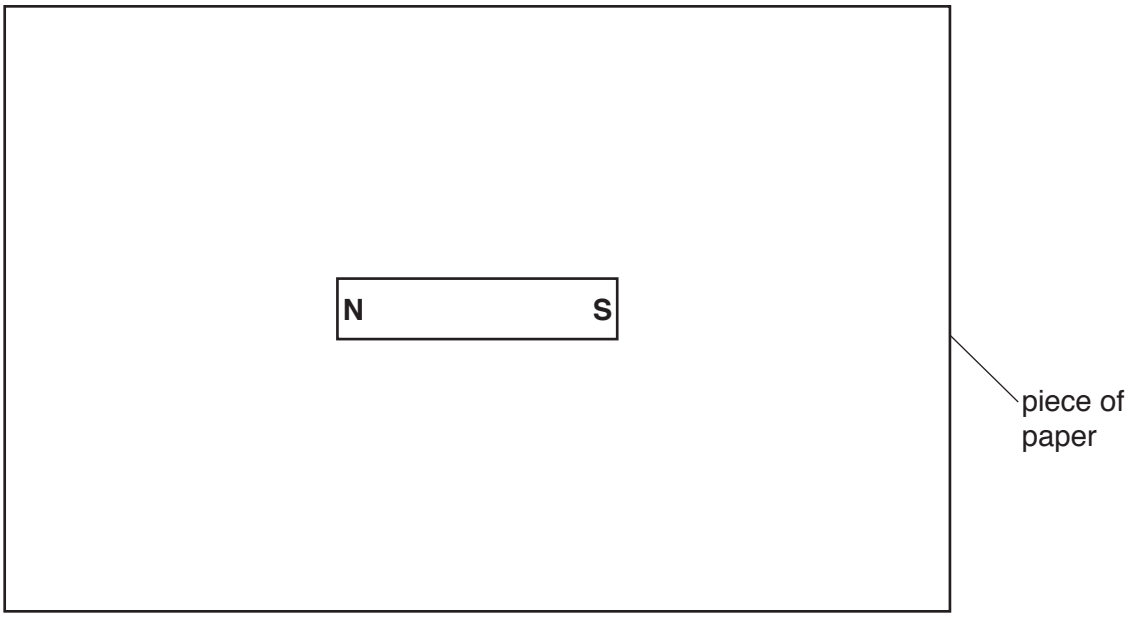

Fig. 9.1

Show the pattern of magnetic field lines around the bar magnet.

Draw **two** lines above the magnet and **two** lines below the magnet. Start and finish each line at a pole. Include **one** arrow to show the direction of the magnetic field. [3]

(b) The student rubs a plastic rod with a dry cloth. The plastic rod becomes positively charged.

Explain why the friction between the plastic and the cloth causes the plastic to become positively charged.

.....

.....

.....

..... [2]

View solution

(c) The student investigates the forces between two pairs of objects.

View solution

Fig. 9.2 and Fig. 9.3 show the pairs of objects.

State whether there is a force of attraction, a force of repulsion, or no force between the pairs of objects. Draw a **ring** around **one** phrase for each pair of objects.

1. two positively charged spheres

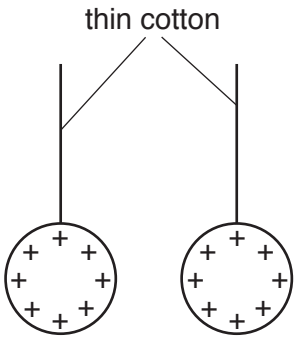

Fig. 9.2

force of attraction **force of repulsion** **no force**

2. a bar magnet and a bar of copper metal



Fig. 9.3

force of attraction **force of repulsion** **no force**

[2]

[Total: 7]

© UCLES 2019

10 A teacher is investigating the resistance of a lamp.

Fig. 10.1 shows part of the circuit she uses. The circuit is incomplete.

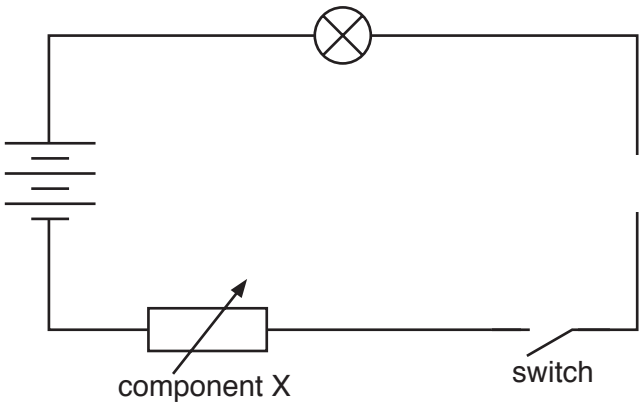

Fig. 10.1

View solution

(a) (i) To determine the resistance of the lamp, the teacher adds two meters to her circuit.

On Fig. 10.1, draw circuit symbols to show each meter correctly connected in the circuit. [3]

(ii) When the current in the lamp is 0.25 A, the potential difference (p.d.) across the lamp is 4.5 V. Calculate the resistance of the lamp.

View solution

resistance = ... Ω [3]

(b) (i) State the name of component X.

View solution

..... [1]

(ii) Describe and explain how the teacher uses component X to investigate the resistance of the lamp.

.....

.....

.....

..... [2]

[Total: 9]

11 A student is experimenting with electromagnetic effects.

(a) Describe an experiment, using any standard laboratory equipment, to demonstrate electromagnetic induction. You may draw a diagram.

View solution

.....

.....

.....

..... [3]

(b) Fig. 11.1 shows a transformer connected to an input voltage of 12 V a.c.

View solution

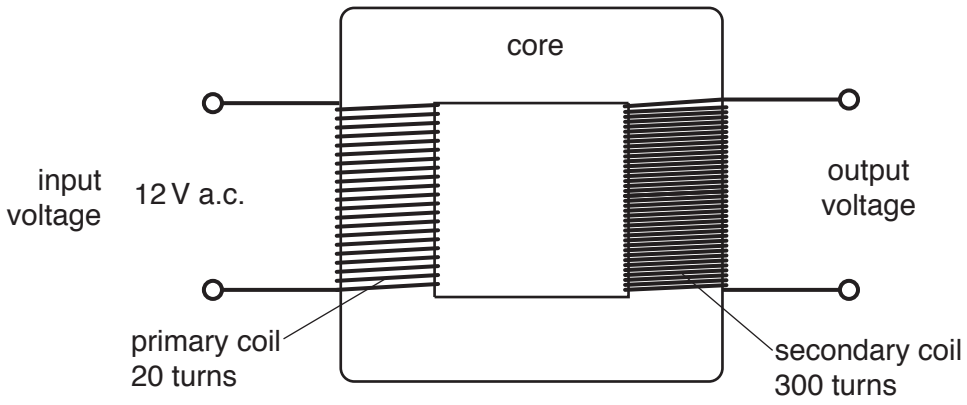

Fig. 11.1

(i) State the name of a suitable material for the core of the transformer.

..... [1]

(ii) Explain how the diagram in Fig. 11.1 shows a step-up transformer.

View solution

.....

..... [1]

(iii) Using the information in Fig. 11.1, calculate the output voltage of the transformer.

View solution

output voltage = ...V [3]

[Total: 8]

© UCLES 2019

12 A teacher carries out two experiments at the same time.

(a) In the first experiment the count rate for a sample of a radioactive isotope is measured every 30 seconds for 6 minutes.

The results are shown in Table 12.1.

View solution

Table 12.1

time / minutes	count rate / counts / second
0.0	1246
0.5	1036
1.0	941
1.5	810
2.0	686
2.5	621
3.0	550
3.5	468
4.0	421
4.5	368
5.0	318
5.5	280
6.0	242

Estimate the half-life of the radioactive isotope. Use the information in the table.

half-life = ... minutes [1]

(b) In the second experiment the teacher repeats the procedure with another sample of the same radioactive isotope. The mass of the second sample is greater than that of the first sample.

Suggest a value for the count rate for this sample at the start of the experiment.

View solution

count rate = ...counts / second [1]

(c) One type of particle emitted during radioactive decay is an α-particle (alpha particle).

View solution

Describe:

(i) the nature of an α-particle

..... [1]

(ii) the ionising ability of an α-particle

View solution

..... [1]

(iii) the penetrating ability of an α-particle.

..... [1]

[Total: 5]

View solution

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