

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
GATEWAY SCIENCE
PHYSICS B**

B652/01

Unit 2 Modules P4 P5 P6
(Foundation Tier)

**Friday 19 June 2009
Morning**

Duration: 1 hour

Candidates answer on the question paper
A calculator may be used for this paper

OCR Supplied Materials:
None

Other Materials Required:

- Pencil
- Ruler (cm/mm)



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **60**.
- A list of physics equations is printed on page two.
- This document consists of **24** pages. Any blank pages are indicated.

2

EQUATIONS

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

$$v = u + at$$

$$s = \frac{(u + v)}{2} t$$

$$\text{momentum} = \text{mass} \times \text{velocity}$$

$$\frac{V_p}{V_s} = \frac{N_p}{N_s}$$

Answer **all** the questions.

Section A – Module P4

1 Darren combs his hair.

The comb becomes **charged**.



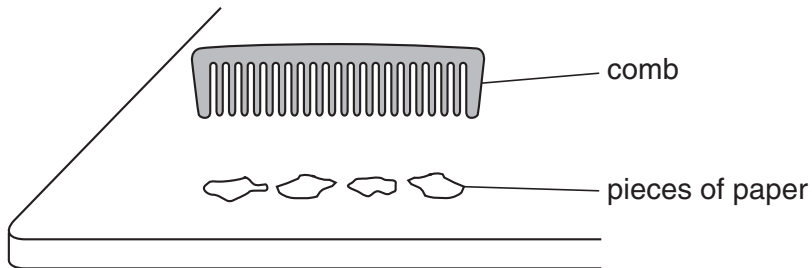
(a) There are two kinds of charge.

Complete this sentence.

The two kinds of charge are and [2]

(b) He puts the comb near to some small pieces of paper.

The pieces of paper are **uncharged**.



What happens to the pieces of paper?

..... [1]

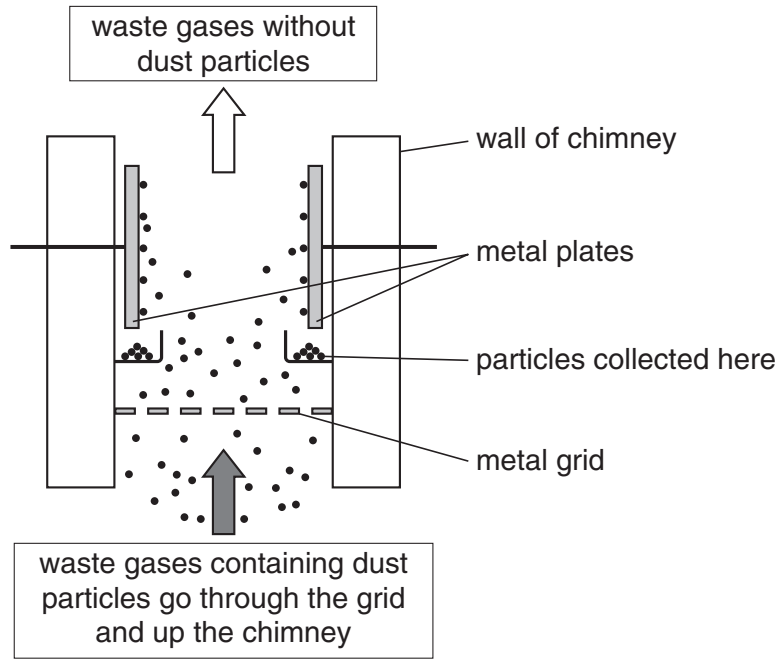
[Total: 3]

2 This question is about how static electricity can be useful.

(a) One use is removing dust (smoke) particles from chimneys.

This is done using an **electrostatic precipitator**.

The diagram shows an electrostatic precipitator.



Describe how the electrostatic precipitator removes dust particles from the waste gases.

In your answer, write about

- voltage (potential difference)
- charges
- how the dust particles are removed.

.....

.....

.....

..... [3]

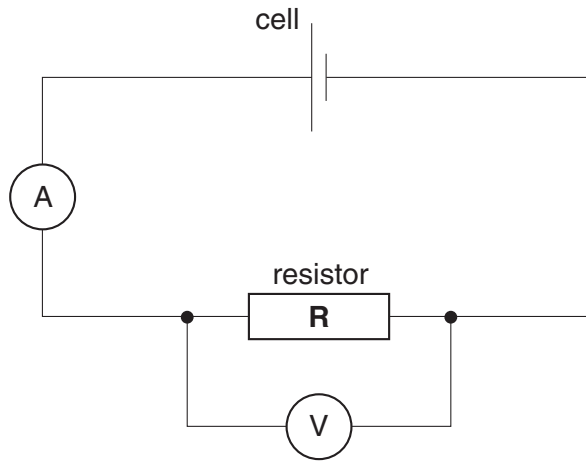
(b) Write down one **other** use of static electricity.

..... [1]

[Total: 4]

3 Lucy investigates electrical circuits.

She builds this circuit.



(a) Lucy measures

- the current flowing through the resistor **R**
- the voltage (potential difference) across the resistor.

Here are her results.

current = 1.5 amps (A)

voltage = 6.0 volts (V)

Calculate the **resistance** of the resistor **R**.

The equations on page 2 may help you.

.....

.....

.....

answer ohms (Ω) [2]

(b) Lucy adds another cell to her circuit.

This increases the current in the resistor.

What happens to the voltage (potential difference) across the resistor?

.....

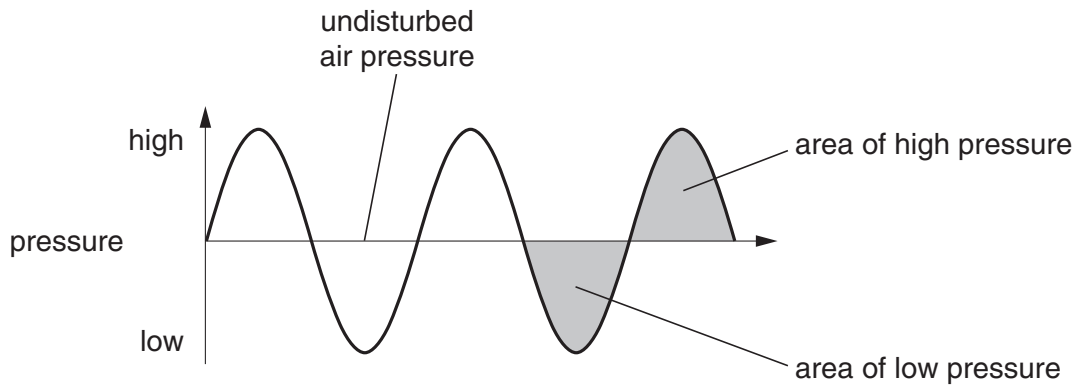
..... [1]

[Total: 3]

Turn over

4 Ultrasound is a sound wave with a very high frequency.

(a) Ultrasound waves can be shown by a wave diagram.



(i) What is the name given to the **higher** pressure parts of the wave?

Choose from:

- compression frequency rarefaction wavelength**

answer [1]

(ii) What is the name given to the **lower** pressure parts of the wave?

Choose from:

- compression frequency rarefaction wavelength**

answer [1]

(b) Ultrasound has many uses.

Write down **one** use of ultrasound.

..... [1]

[Total: 3]

5 Electricity is produced in a nuclear power station.

Energy is released from the nuclear fuel.

This takes place in a nuclear reactor.

Nuclear bombs also use a nuclear material.

Complete the following sentences about nuclear power.

Choose words from the list.

- | | | | | |
|--------------------|------------------|----------------|-----------------|--|
| | bomb | chain | chemical | |
| radioactive | renewable | uranium | water | |

Nuclear power stations use as a fuel.

Materials placed in a nuclear reactor can become

The decay of the nuclear fuel can be a reaction.

In a nuclear the reaction has gone out of control.

[3]

[Total: 3]

6 This question is about nuclear radiation.

Radioactive substances give out nuclear **radiation**.

Nuclear radiation is used in hospitals.



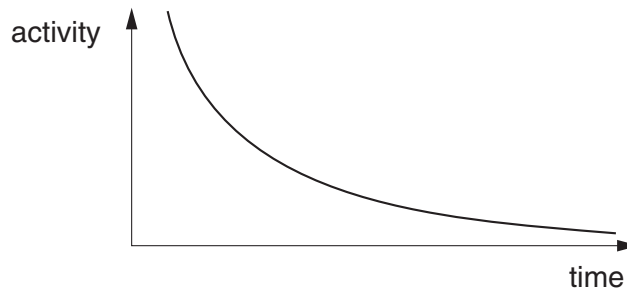
(a) One type of nuclear radiation is gamma rays.

Complete these two sentences about gamma rays.

Gamma rays and X-rays are both waves.

Gamma rays are used to treat patients who have [2]

(b) The **activity** of a radioactive substance decreases with time.



Complete the sentence about **how** the activity is measured.

The activity of a radioactive substance is measured by the number of decays emitted per [1]

(c) Another type of nuclear radiation is alpha radiation.

Write down one **use** of alpha radiation.

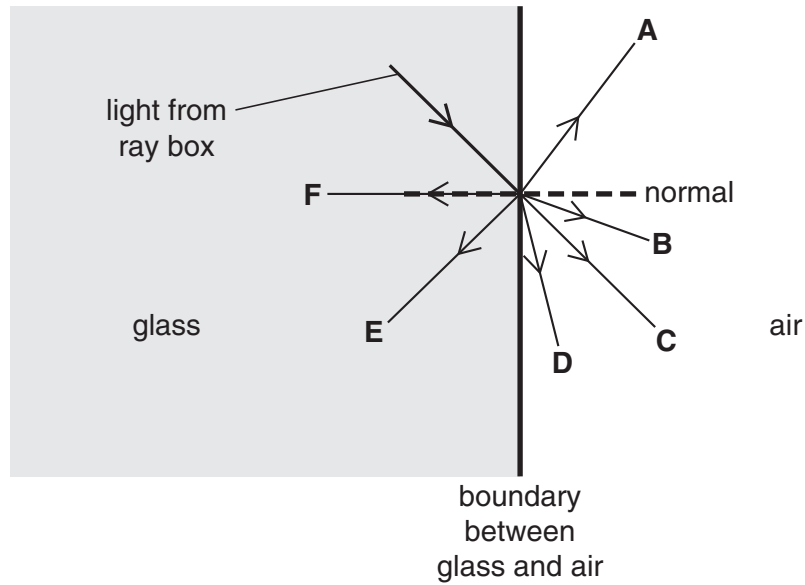
..... [1]

[Total: 4]

Section B – Module P5

7 (a) Danny shines a ray of light from a ray box through a glass block.

He looks at the paths of the light **after** it hits the boundary.



Which paths show the two rays he sees?

Choose **two** from: **A B C D E F**

answer and

[2]

(b) What happens to light that passes from glass **into air**?

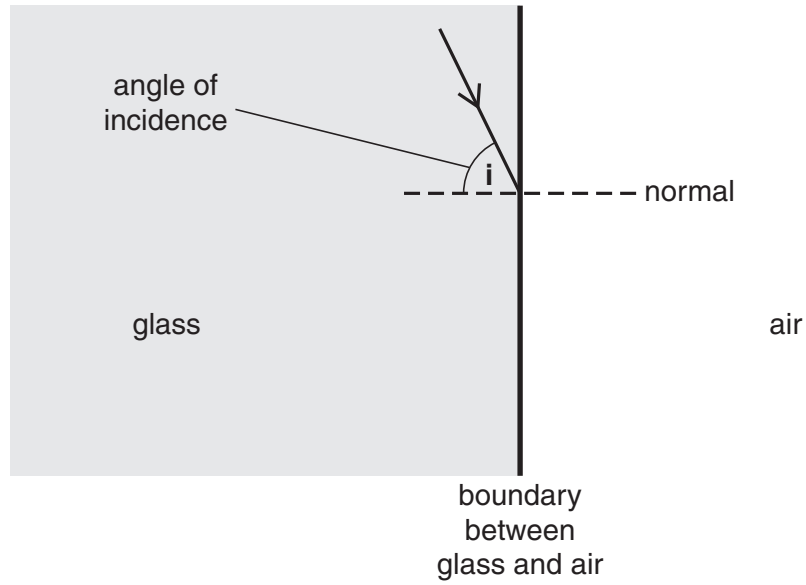
Put a tick (✓) in the box next to the correct answer.

- light is absorbed
- light is radiated
- light is reflected
- light is refracted

[1]

(c) Danny moves the ray box.

The angle of incidence, i , is larger than the critical angle.



Complete the diagram to show what happens to the ray of light.

[2]

[Total: 5]

8 Artificial satellites orbit the Earth.

This satellite photograph shows light pollution in Europe.



(a) Write down **two** other uses of artificial satellites.

- 1
- 2 [2]

(b) Satellites orbit at different heights above the Earth.

(i) A **geostationary** satellite orbits the Earth 36 000 km above the equator.

How long does it take for a geostationary satellite to orbit the Earth?

answer hours [1]

(ii) Another satellite orbits 20 000 km above the Earth.

How does this affect the time it takes for this satellite to orbit the Earth?

..... [1]

(c) Gravity keeps a satellite in a circular orbit.

What is the name of the force that keeps any object moving in a circle?

Put a **(ring)** around the correct answer.

centrifugal

centripetal

couple

orbital

[1]

[Total: 5]

9 Sarah drives a train.

The maximum **speed** of her train is 120 km/h.

(a) What does speed mean?

..... [1]

(b) She drives the train between two towns 150 km apart.

The maximum speed of the train in the journey is 120 km/h.

The journey takes 3 hours.

Why does it take so long?

.....
..... [1]

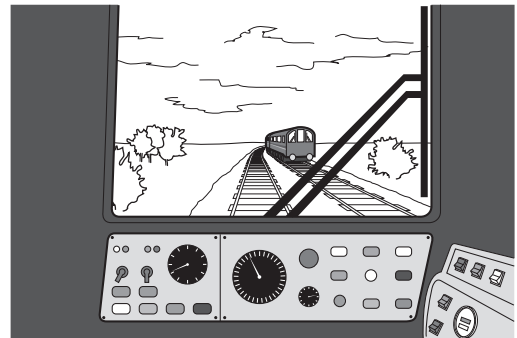
(c) Sarah's train is travelling at 80 km/h.

She sees another train coming towards her on the other track.

The other train is travelling at 60 km/h.

What is the **relative** speed of the two trains?

Put a **ring** around the correct answer.



20 km/h

60 km/h

70 km/h

80 km/h

140 km/h

[1]

(d) Speed is a **scalar** quantity. Velocity is a **vector** quantity.

What is the difference between a scalar quantity and a vector quantity?

.....
..... [1]

[Total: 4]

10 Bharat is listening to his radio. He can hear another radio station in the background.

The signals from the second radio station are **interfering** with signals from the one he is trying to listen to.

(a) What causes interference?

Put a tick (✓) in the box next to the best explanation.

The radio waves from the two stations are overlapping.

The second radio station has a more powerful transmitter.

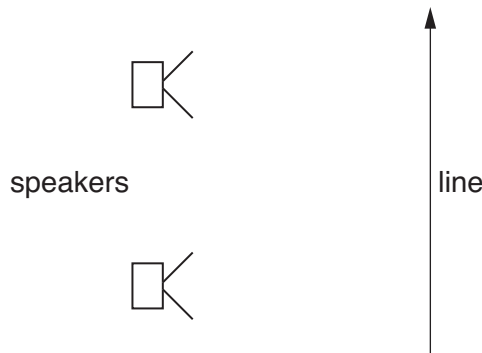
The two radio stations are only a few kilometres apart.

[1]

(b) Bharat's science teacher is explaining interference using two loudspeakers.

The loudspeakers are producing identical notes.

Bharat walks along a line in front of the speakers as shown.



What will Bharat hear as he walks along the line?

.....
..... [2]

[Total: 3]

11 A dish is needed to receive satellite television signals.



(a) What must a radio have to receive radio signals?

Put a **ring** around the correct answer.

aerial

commutator

loudspeaker

motor

[1]

(b) Finish the sentences by choosing the best words from this list.

absorbed

atmosphere

crust

diffracted

magnetic field

reflected

A radio transmitter broadcasts to a receiver that is over the horizon.

The radio waves reach the receiver because they are by
part of the Earth's

[2]

[Total: 3]

15
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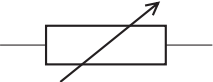
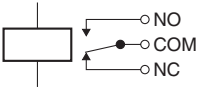


Question 12 starts on page 16.
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Section C – Module P6

12 This question is about electricity.

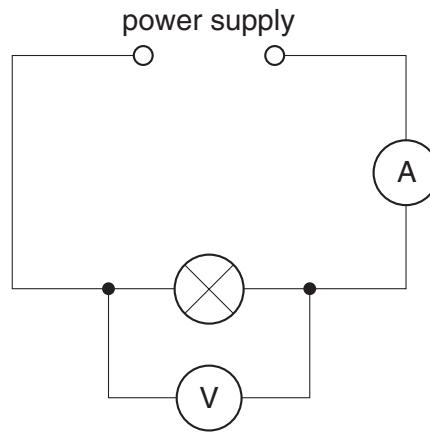
(a) Look at the list of electrical components and symbols.

Draw a straight line from each **component** to its correct **symbol**.

component	symbol
bulb	
battery	
relay	
variable resistor	
switch	

[2]

(b) Paula connects the following circuit.



She adjusts the power supply.

The bulb heats up and gets brighter.

What happens to the resistance of the **bulb** when it gets hot?

Put a ring around the correct answer.

decreases

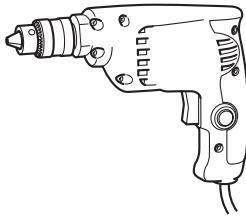
increases

stays the same

[1]

[Total: 3]

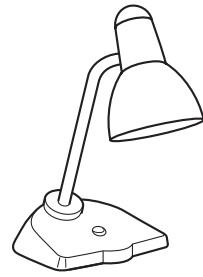
13 (a) Look at the pictures of household appliances.



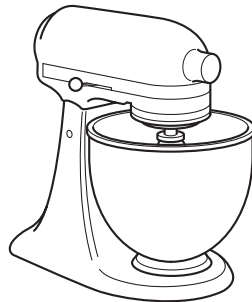
electric drill



electric kettle



lamp



electric mixer



sandwich toaster

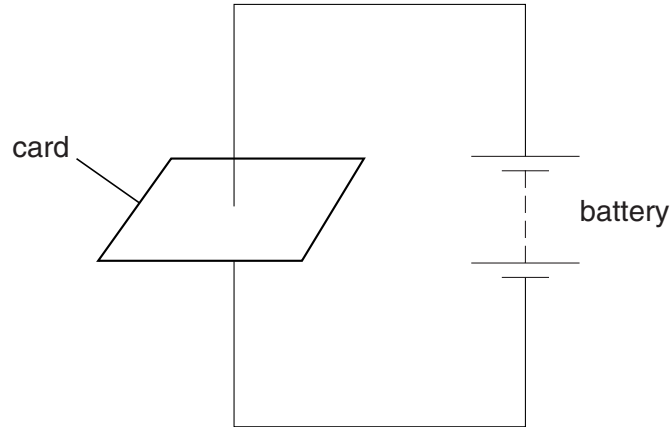
Which **two** appliances have a motor inside them?

answer and [2]

(b) John passes a wire through a card.

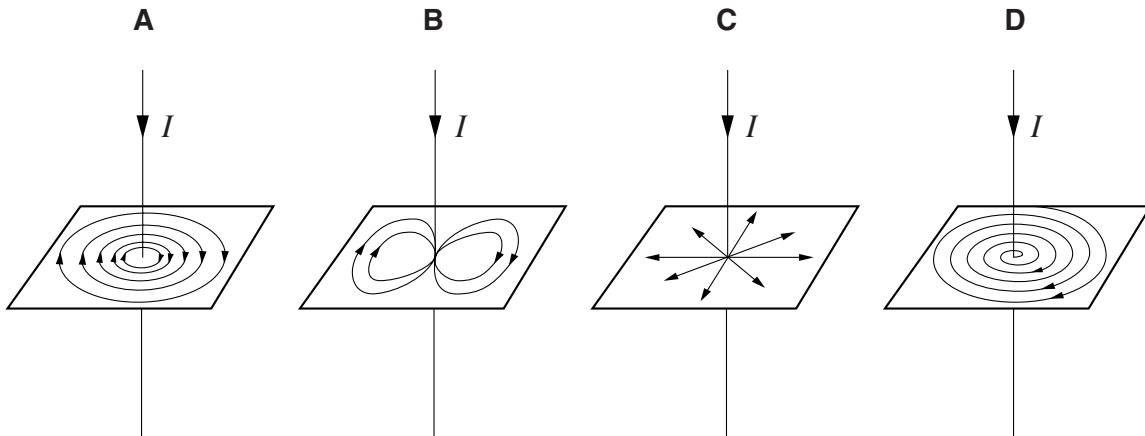
He connects the wire to a battery.

Look at the diagram.



He sprinkles iron filings onto the card to show the shape of the magnetic field.

Which is the shape of the magnetic field made by the wire?



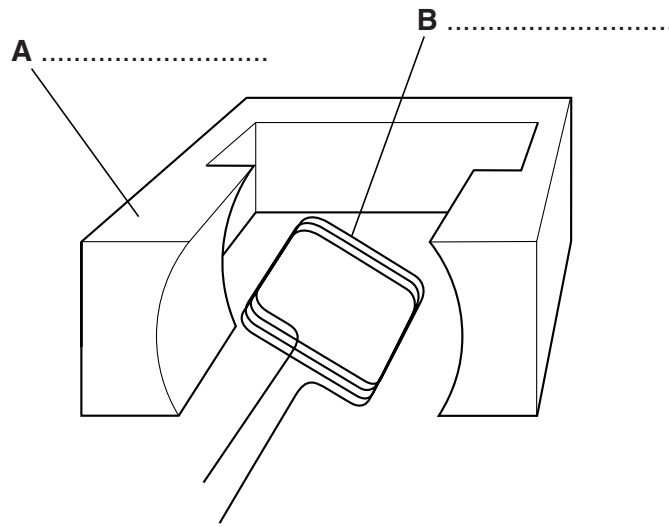
Choose from: **A B C D**

answer

[1]

(c) The diagram shows part of a DC generator.

Look at the diagram.



Complete the diagram by adding labels to parts **A** and **B**.

[2]

[Total: 5]

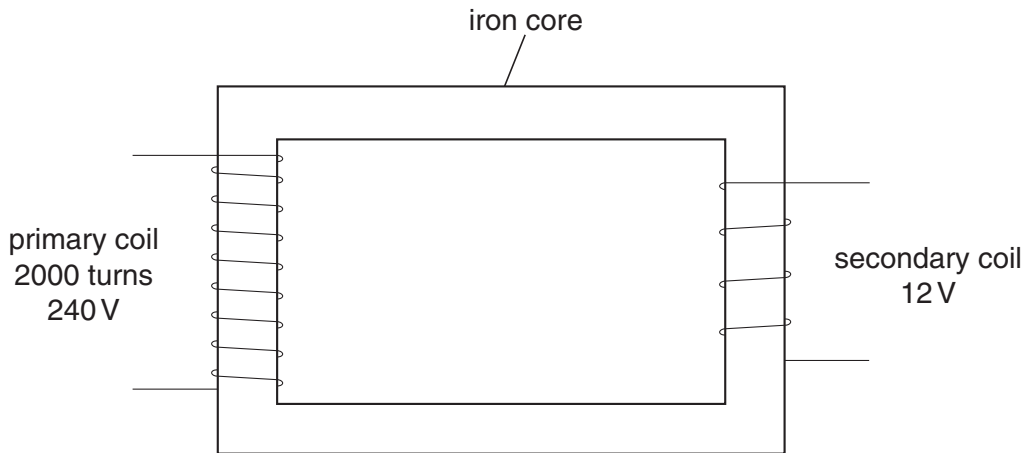
14 This question is about transformers.

(a) Batteries produce **direct** current.

What sort of current do transformers produce?

..... [1]

(b) (i) Look at the diagram of a transformer.



Jenny has a 12V lamp.

She wants to use it from the 240V mains.

The transformer she uses has 2000 turns on the primary coil.

Calculate the number of turns on the secondary coil.

The equations on page 2 may help you.

.....
.....
.....
.....

answer turns [2]

(ii) Jenny uses a step-down transformer for her lamp.

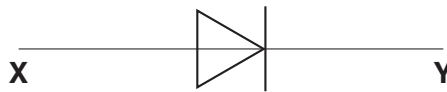
Write down one **other** use of **step-down** transformers.

.....
..... [1]

[Total: 4]

Turn over

15 (a) Look at the symbol for a diode.



Which one of the following statements is **true**?

- A Current can only flow from **X** to **Y**.
- B Current can only flow from **Y** to **X**.
- C Current can flow from **X** to **Y** and **Y** to **X**.
- D No current can flow from **X** to **Y** or **Y** to **X**.

Choose from: **A B C D**

answer

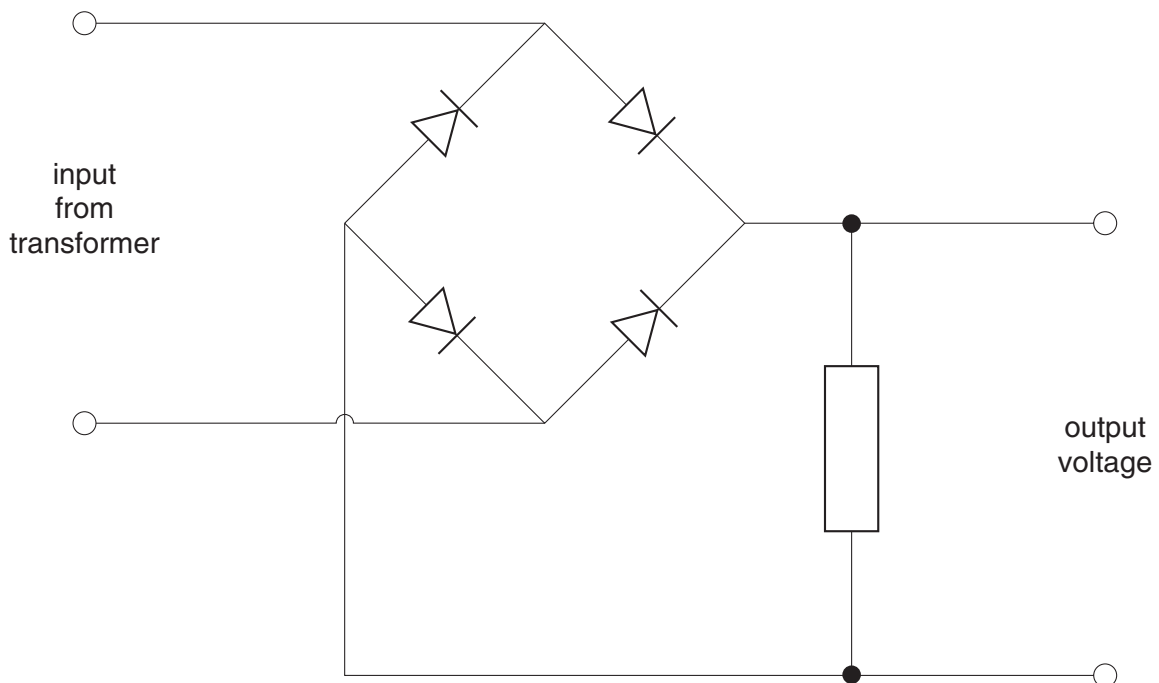
[1]

(b) Chris needs to change the output from a transformer to DC.

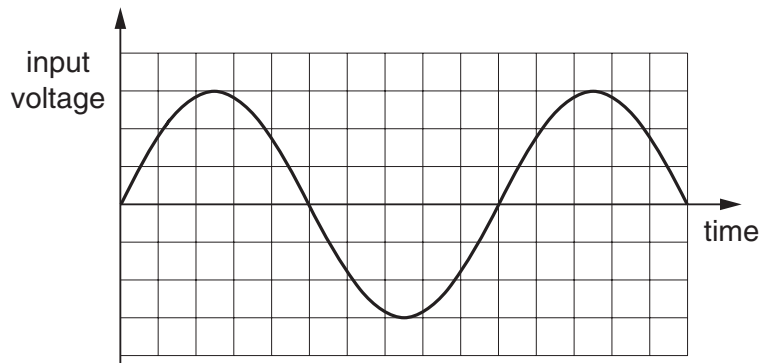
He uses four diodes.

They are connected in the following circuit.

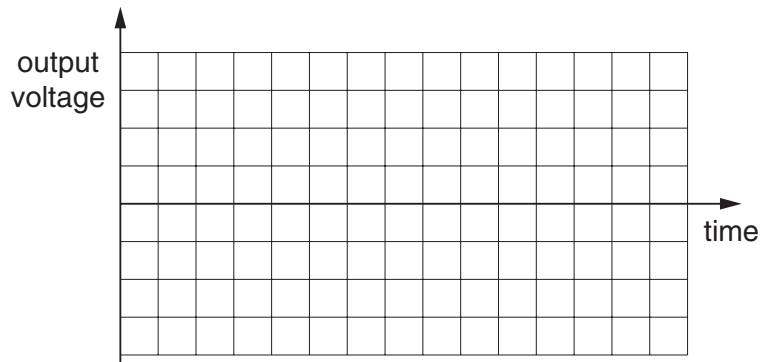
It is called a bridge rectifier circuit.



The graph shows the input to the bridge rectifier.



On the axis below, sketch the output that you would expect.



[2]

(c) In some circuits, scientists connect a **capacitor** to the output of the bridge rectifier.

Explain why.

In your answer write about

- what the capacitor does
- why it is used.

.....

.....

..... [2]

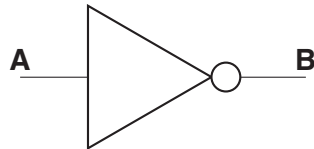
[Total: 5]

16 (a) Most electronic devices have logic gates in them.

Complete the following sentence.

The input for a logic gate can be either or [1]

(b) The diagram shows a NOT gate.



Complete the truth table for a NOT gate.

A	B

[1]

(c) The output current from a logic gate is small.

This current will not turn an electric motor.

Write down **one** device that a logic gate will operate.

..... [1]

[Total: 3]

END OF QUESTION PAPER

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