NOTICE TO CUSTOMER:

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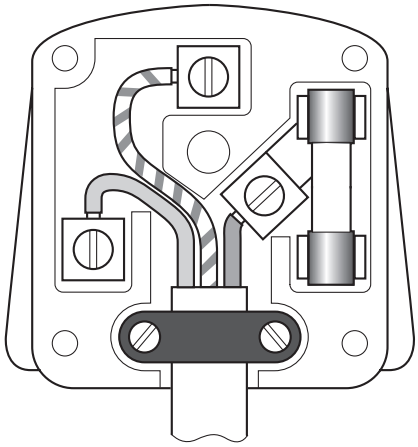
1 This question is about electricity.

(a) Look at the diagram of a plug.



(i) Which wire should be coloured **blue**?

Choose from: **earth** **live** **neutral**

answer ..... **[1]**

(ii) Which wire should be coloured green and yellow?

Choose from: **earth** **live** **neutral**

answer ..... **[1]**

(b) Sally's electric hairdryer is double insulated.

It has only two wires.

Which two wires are connected to the hairdryer?

Choose from the list.

live and earth

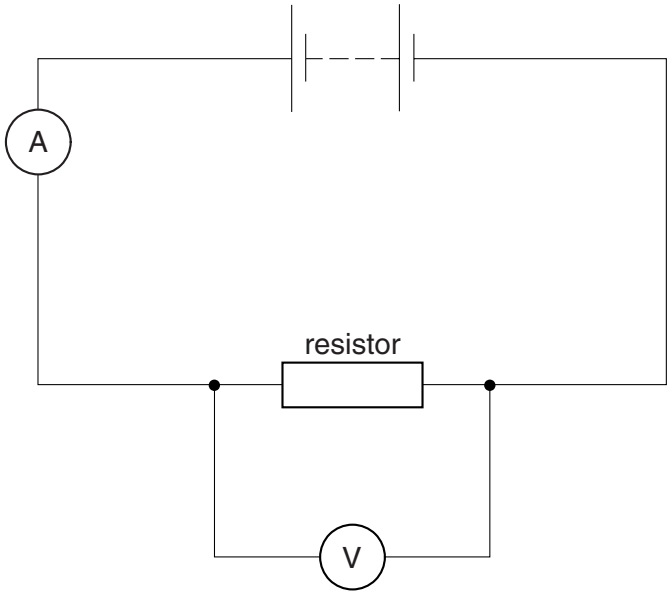
neutral and earth

live and neutral

answer ..... **[1]**

Turn over for remainder of question 1

(c) Phil makes the following circuit.



An electric current flows through the resistor.

The voltmeter reading is 10 V.

The ammeter reading is 3 A.

Calculate the **resistance** of the resistor.

The equations on page 2 may help you.

.....

.....

.....

answer ..... ohms **[2]**

[Total: 5]

2 **(a)** There are **two** types of wave.

Light is an example of a **transverse** wave.

Complete the sentence about ultrasound.

Ultrasound is an example of a ..... wave. **[1]**

(b) Ultrasound is used in medicine.

Write down two different uses of ultrasound in medicine.

1 .....

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

[Total: 3]

3 This question is about nuclear radiation.

(a) There is radiation in the environment.

This radiation is around us all the time.

Complete the sentence.

The radiation around us all the time is called ..... radiation. **[1]**

(b) There are three types of radiation.

These are alpha, beta and gamma radiation.

Which type of radiation is used in smoke detectors?

Choose from: **alpha** **beta** **gamma**

answer ..... **[1]**

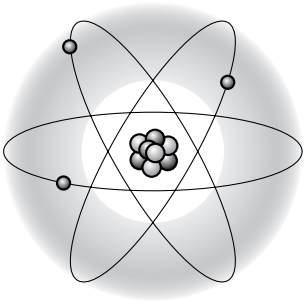
(c) Tom experiments with radioactive sources.

He checks the radioactivity of a source every year.

What will happen to the radioactivity of the source after a few years?

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

(d) Radiation comes from the centre of an atom.



What do we call the centre of an atom?

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

(e) Scientists can make substances radioactive.

Where do they put substances to make them radioactive?

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

[Total: 5]

4 Gamma radiation and X-rays are used in hospitals.

(a) What do we call the person in a hospital who takes X-ray photographs and uses gamma radiation?

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

(b) The person using X-rays and gamma radiation has to wear protective clothing.

The X-rays and gamma radiation can be dangerous.

How are these dangerous to humans?

.....

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

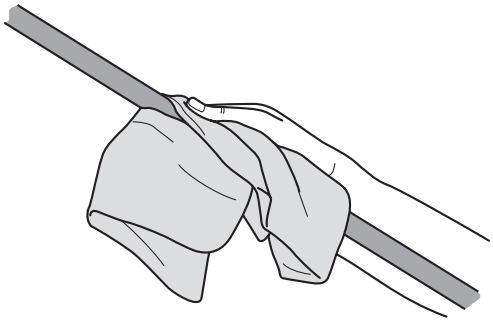
(c) Gamma rays can be used to treat cancer patients in hospital.

Write down one **other** use of gamma rays in hospitals.

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

[Total: 3]

5 **(a)** Nita rubs a rod with a duster.



The rod is made from an insulating material.

The rod becomes charged with a negative charge.

Which statement, **A**, **B**, **C** or **D**, is true?

A The rod has **gained neutrons** from the cloth.

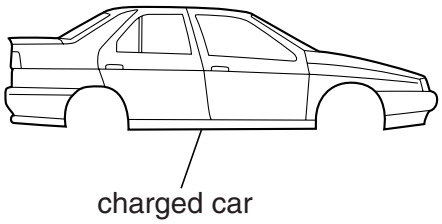
B The rod has **gained electrons** from the cloth.

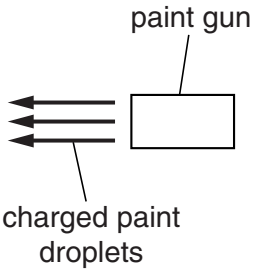
C The rod has **gained protons** from the cloth.

D The rod has **lost electrons** to the cloth.

answer ..... **[1]**

(b) Oliver uses electrostatics to help him spray paint a car.





Describe how electrostatics help him spray paint the car.

In your answer write about

- electrostatic charges
- the paint droplets
- the reasons for using electrostatics in paint spraying.

.....

.....

.....

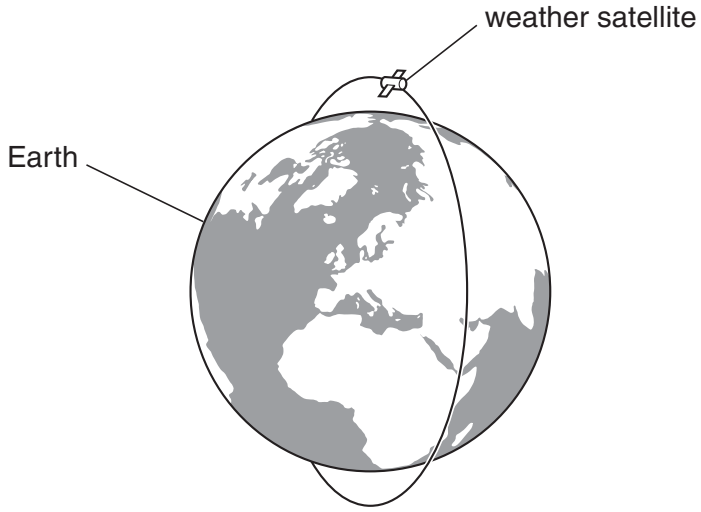
.....

..... **[3]**

[Total: 4]

6 This question is about satellites.

Look at the diagram.



A weather satellite is used for weather forecasting.

It is an example of an **artificial** satellite.

Complete these sentences about satellites.

Choose from the list.

height

Moon

military

placed

planet Mars

naturally

strength

The …… is a natural satellite of the Earth.

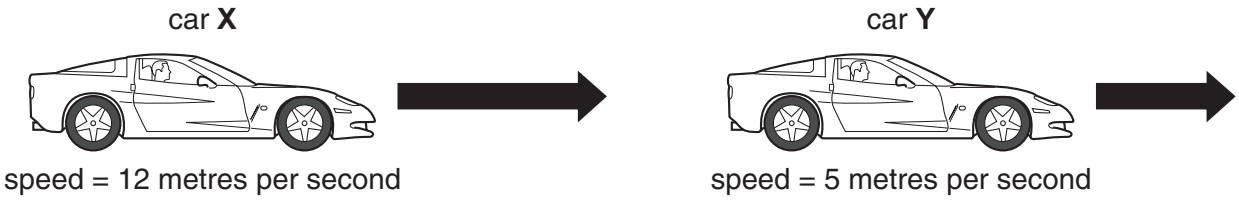
Artificial satellites are …… in orbit.

An example of this is for …… use.

The …… of the orbit determines the use of the artificial satellite. **[3]**

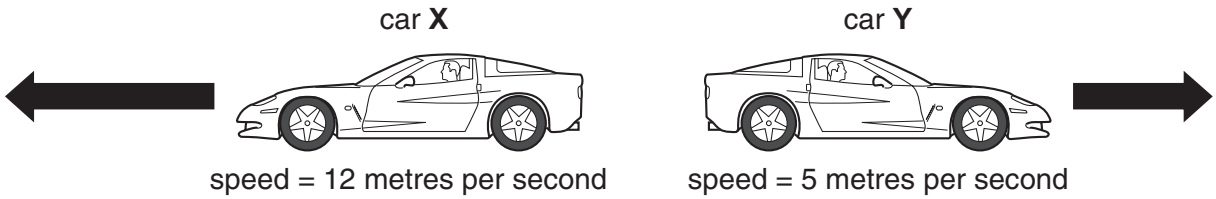
[Total: 3]

7 Look at the diagram of two cars. They are moving in the same direction.



(a) Car **X** then moves in the **opposite** direction.

Look at the diagram below.



What happens to the size of the **relative** speed of the cars?

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

(b) Car **Y** moves at a speed of 5 metres per second.

It accelerates uniformly to a new speed of 15 metres per second.

This takes 30 seconds.

Calculate the distance travelled in this time.

The equations on page 2 may help you.

.....

.....

.....

answer ..... metres **[2]**

(c) The driver of car **Y** drives the car very fast.

The car hits a crash barrier and stops very quickly.

Describe why the driver is injured.

.....

.....

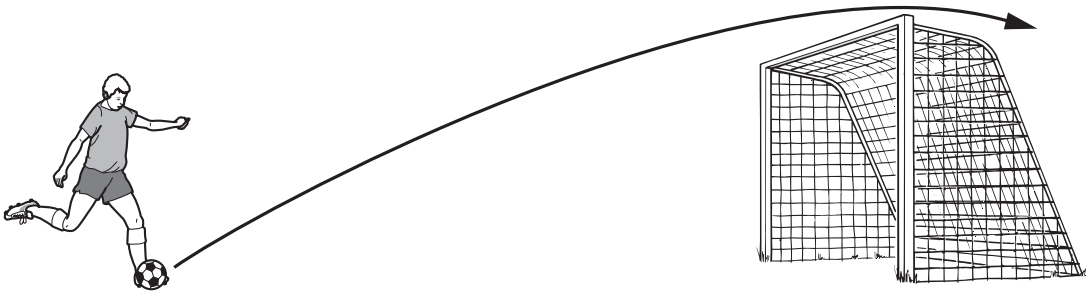
..... **[2]**

[Total: 5]

8 **(a)** James kicks the football in the air.

It travels in a curve.

Look at the diagram.



This is an example of a **projectile**.

Give two **other** examples of projectiles in **sport**.

1 .....

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

(b) Complete this sentence about James kicking the football.

His foot **strikes** the football.

This is an example of a ..... between two objects. **[1]**

(c) James kicks the football. It travels at a velocity of 20 metres per second.

The mass of the football is 0.5 kilograms.

Calculate the **momentum** of the football.

The equations on page 2 may help you.

.....

.....

.....

answer ..... kg m/s **[2]**

[Total: 5]

9 This question is about waves.

Look at the sentences about waves.

Put a tick (✓) in the box beside the sentence if the statement is **true**.

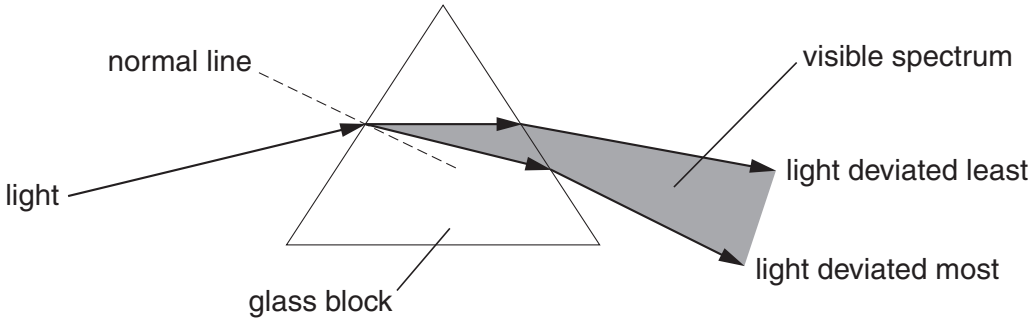
Put a cross (✗) in the box beside the sentence if the sentence is **false**.

	✓ or ✗
Light travels in straight lines.	
Interference of light produces loud and quiet areas.	
An aerial is used to pick up radio signals.	
A dish is needed to pick up satellite TV signals.	

[2]

[Total: 2]

10 This question is about deviation of light.



(a) When the light hits the glass block the light is deviated.

The light is split up into the colours of the visible spectrum.

(i) What name is given to the deviation of the light?

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

(ii) Which colour changes direction (is deviated) the most?

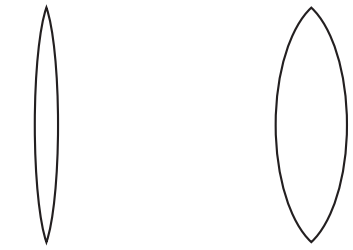
..... **[1]**

(iii) What do we call substances, like glass, that light can travel through?

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

(b) Lenses can be made from the same type of glass as the glass block.

The lenses below are **convex** lenses.



lens **A** lens **B**

Complete these sentences.

(i) Convex lenses are **also** known as ..... lenses. **[1]**

(ii) Lens **B** has a shorter .....length than lens **A**. **[1]**

[Total: 5]

11 Sally does some experiments with electricity.

(a) Look at the list of electrical components she uses.

capacitor

diode

generator

LDR

thermistor

transformer

variable resistor

Answer the questions.

Choose your answers from the list.

(i) Which component allows current to pass in **one direction** only?

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

(ii) Which component changes resistance when the **light level** changes?

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

(iii) Which component changes resistance when the **temperature** changes?

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

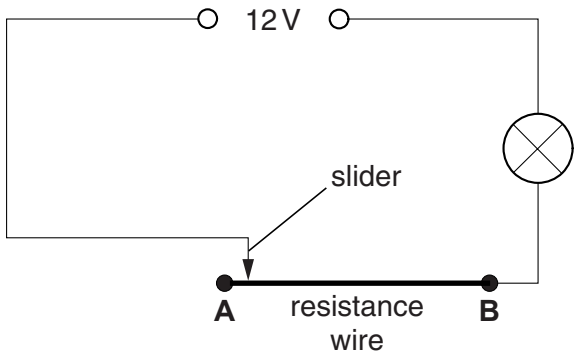
(iv) Which component can step-up or step-down **voltages**?

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

(v) Which component can **store charge** and discharge it later?

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

(b) Look at the diagram. The resistance wire is used to control the bulb.



Sally puts the slider at position **A**. The bulb lights up.

She moves the slider from position **A** to position **B**.

(i) What happens to the length of resistance wire **in the circuit**?

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

(ii) What happens to the **resistance** of the circuit?

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

(iii) What happens to the **brightness** of the bulb?

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

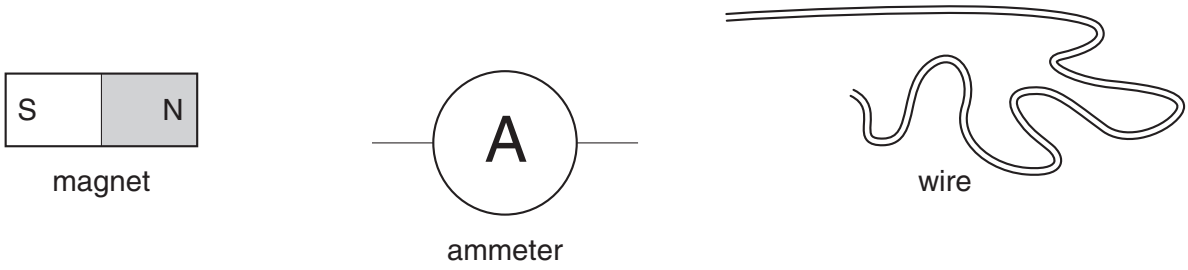
[Total: 8]

12 This question is about generating electricity.

(a) Dave has some scientific equipment.

He wants to generate electricity.

Look at the equipment.



Explain how he can use this equipment to generate electricity.

You may draw a diagram as part of your answer.

.....

.....

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

(b) Electricity is generated in power stations.

It is sent to homes through cables and transformers in the National Grid.

(i) What is the **frequency** of this electricity in the UK?

..... Hz **[1]**

(ii) Why is DC electricity **not** used with transformers?

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

[Total: 4]

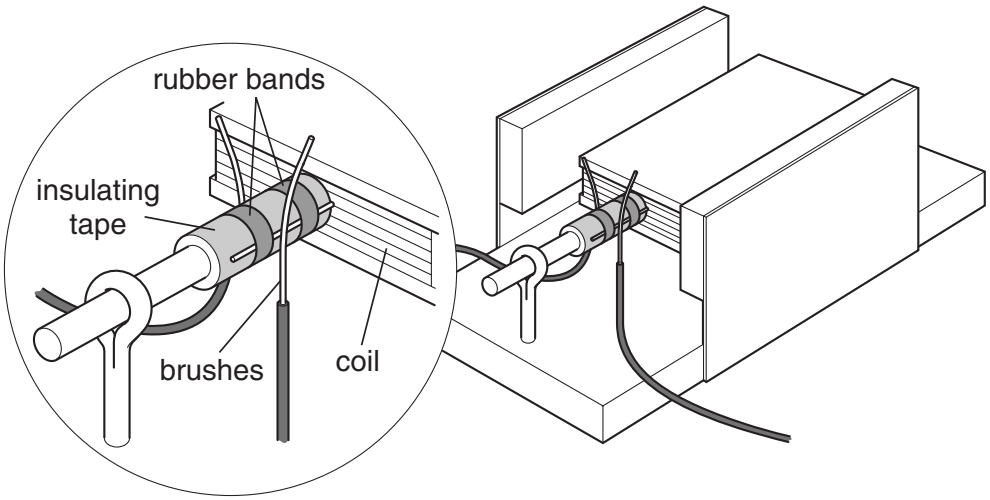
13 Declan has electrical appliances in his kitchen.

Some electrical appliances contain an electric motor.

(a) Name one kitchen appliance that contains an electric motor.

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

(b) Look at the diagram of an electric motor.



Declan connects the motor to the power supply. It spins round.

(i) Declan passes **more current** through the motor.

What happens to the motor?

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

(ii) He puts **stronger magnets** in the motor.

What happens to the motor?

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

(iii) Declan now uses a coil with **fewer turns**.

What happens to the motor?

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

(iv) He changes the direction of the **current**.

What happens to the motor?

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

[Total: 5]

14 Gates are used to control electronic devices.

(a) The input to a NOT gate is either 0 or 1.

(i) Complete the table for a **NOT** gate.

For each box use either 0 or 1.

input	output
0	
1	

[1]

(ii) What is meant by 0 and 1?

0 means .....

1 means ..... **[1]**

(b) The output from the NOT gate is too **small** to light a 12V bulb.

What else can we use to help the NOT gate control a bulb?

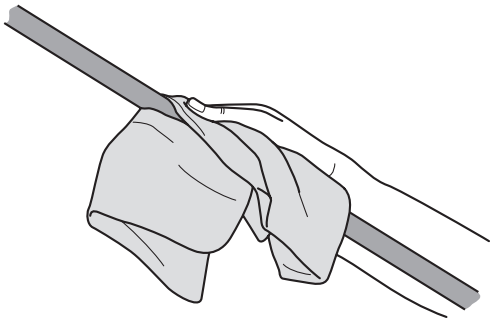
..... **[1]**

[Total: 3]

END OF QUESTION PAPER

mock papers 2-higher

1 **(a)** Nita rubs a rod with a duster.



The rod is made from an insulating material.

The rod becomes charged with a negative charge.

Which statement, **A**, **B**, **C** or **D**, is true?

A The rod has **gained neutrons** from the cloth.

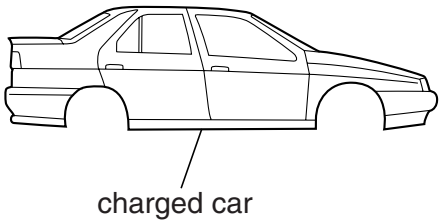
B The rod has **gained electrons** from the cloth.

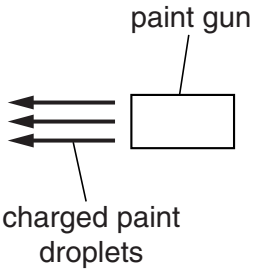
C The rod has **gained protons** from the cloth.

D The rod has **lost electrons** to the cloth.

answer ..... **[1]**

(b) Oliver uses electrostatics to help him spray paint a car.





Describe how electrostatics help him spray paint the car.

In your answer write about

- electrostatic charges
- the paint droplets
- the reasons for using electrostatics in paint spraying.

.....

.....

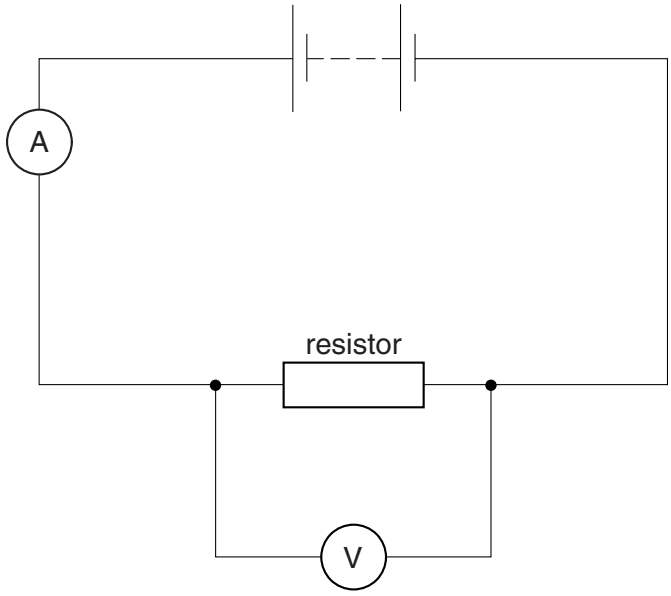
.....

.....

..... **[3]**

[Total: 4]

2 Phil makes the following circuit.



(a) An electric current flows through the resistor.

The voltmeter reading is 10 V.

The ammeter reading is 3 A.

Calculate the **resistance** of the resistor.

The equations on page 2 may help you.

.....

.....

.....

answer ..... ohms **[2]**

(b) Phil has a kettle and a hairdryer.

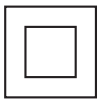
Both have a wire fuse in the plug.

Complete the following sentences.

If the ..... becomes too large the wire fuse ..... . This breaks the circuit. **[2]**

(c) The hairdryer does **not** have an earth wire.

It is **double insulated**.



Explain why a double insulated appliance does **not** need earthing.

.....

.....

.....

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

[Total: 6]

3 Ultrasound is a **longitudinal** wave.

(a) **P** is a particle in a longitudinal wave.

Look at the diagram.

How does **P** move in the longitudinal wave?

Put a (ring) around the correct answer.

[1]

(b) Ultrasound is sometimes used for scans rather than X-rays.

Give **two** reasons for using ultrasound rather than X-rays.

1 .....

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

[Total: 3]

4 Americium (Am) is a radioactive element.

It gives off an alpha particle ($^4_2\alpha$) when it decays.

A new element **X** is produced when americium decays.

(a) Complete the table for the new element **X**.

	americium	**new element X**
mass number	241	
atomic number	95	
number of neutrons	146	

[3]

(b) This simple equation represents the beta decay of carbon 14 into nitrogen (N).

$$^{14}_{6}\text{C} \rightarrow {}^{14}_{7}\text{N} + {}^{0}_{-1}\beta$$

Construct a simple equation to represent the alpha decay of americium into element **X**.

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

[Total: 4]

5 Energy is released in a nuclear reactor in a power station.

(a) Write down the name of the process that gives out energy in a nuclear reactor.

Choose from:

absorption

combustion

explosion

fission

fusion

answer ..... **[1]**

(b) A reaction takes place when a particle hits a uranium atom.

What is the name of this particle?

Choose from:

atom

electron

ion

neutron

proton

answer ..... **[1]**

(c) Nuclear reactions must be controlled in a reactor.

How do scientists control these reactions?

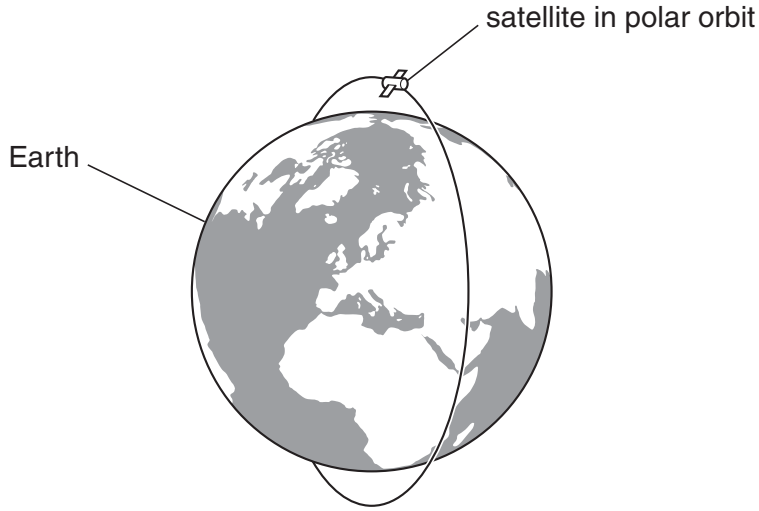
.....

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

[Total: 3]

6 This question is about satellites.

Look at the diagram.



This type of satellite is used for weather forecasting.

(a) Complete these sentences about this type of satellite.

Satellites used for weather forecasting orbit the Earth around the ……

in a …… polar orbit. They travel at …… speed.

The time to orbit the Earth is only a few …… . Eventually the satellites send back images of the entire Earth's surface. **[3]**

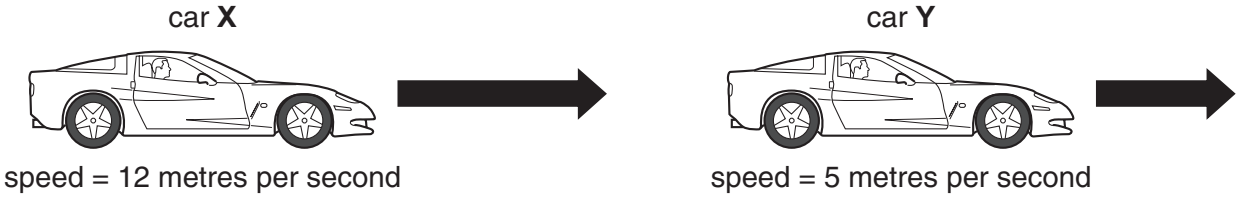
(b) The other type of artificial satellite is a **geostationary** satellite.

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

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

[Total: 4]

7 Look at the diagram of two cars. They are moving in the same direction.



(a) What is the **relative** speed of the cars?

.....

answer ..... metres per second **[1]**

(b) Car **Y** moves at a speed of 5 metres per second.

It accelerates uniformly to a new speed of 15 metres per second.

This takes 30 seconds.

Calculate the distance travelled in this time.

The equations on page 2 may help you.

.....

.....

.....

answer ..... metres **[2]**

(c) The driver of car **Y** drives the car very fast.

The car hits a crash barrier and stops very quickly.

Describe why the driver is injured.

.....

.....

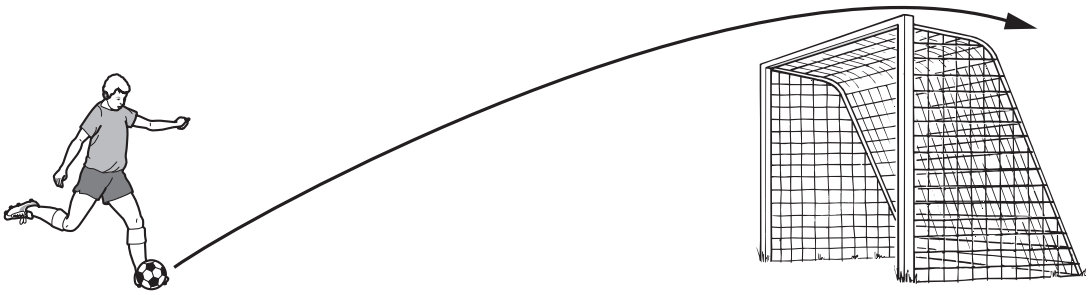
..... **[2]**

[Total: 5]

8 James kicks a football in the air.

It travels in a curve.

This is an example of a **projectile**.



(a) The football travels at a velocity of 20 metres per second.

The mass of the football is 0.5 kilograms.

Calculate the **momentum** of the football.

The equations on page 2 may help you.

.....

.....

.....

answer ..... kg m/s **[2]**

(b) The football travels in a curved path.

Explain why.

In your answer use ideas about

- the vertical velocity of the football
- the horizontal velocity of the football.

.....

.....

.....

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

[Total: 4]

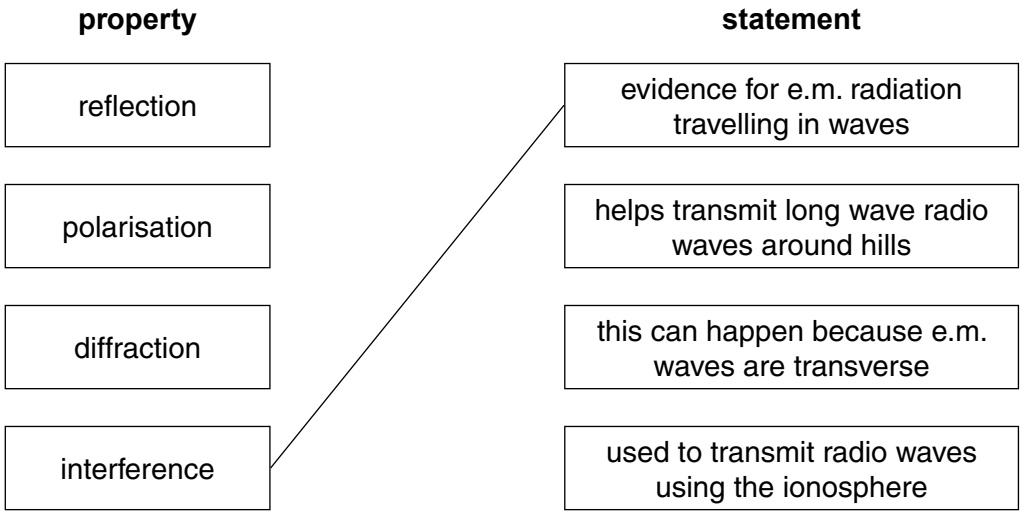
9 Four properties of electromagnetic (e.m.) waves are

- reflection
- polarisation
- diffraction
- interference.

Look at the boxes below.

Draw a line from each **property** to the correct **statement** about it.

One has been done for you.



[2]

[Total: 2]

10 This question is about waves.

Look at the sentences about waves.

Put a tick (✓) in the box beside the sentence if the sentence is **true**.

Put a cross (✗) in the box beside the sentence if the sentence is **false**.

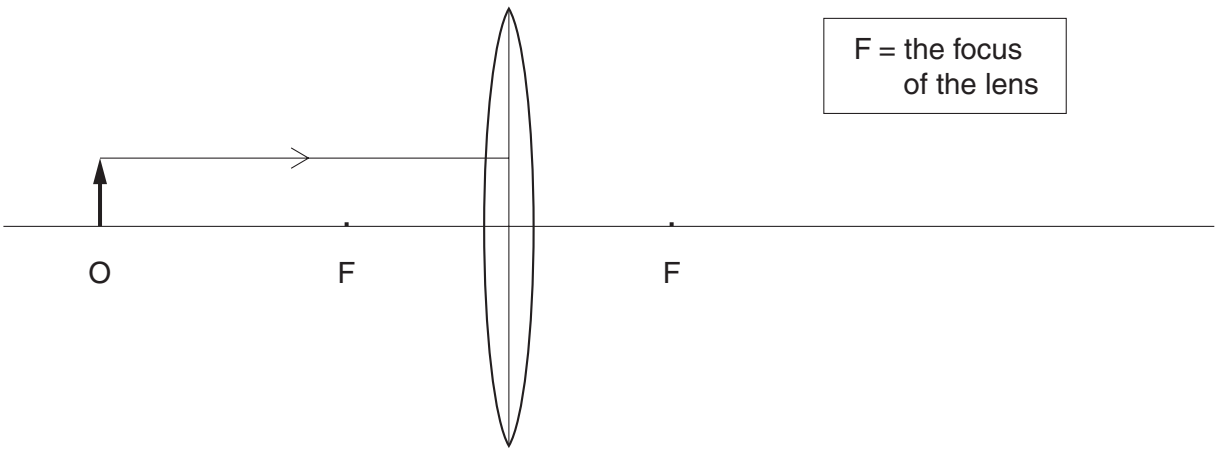
	✓ or ✗
Greatest diffraction happens when the gap size = the wavelength of the wave.	
Destructive interference happens when the path difference = an even number of half wavelengths.	
Light waves vibrating in any plane can pass through Polaroid sunglasses.	
Different colours of light travel at different speeds in glass causing dispersion.	

[2]

[Total: 2]

11 This question is about how a convex lens forms a **real** image.

(a) Look at the ray diagram. It is incomplete.



Complete the path of the ray shown in the diagram.

Draw one **other** ray from the object to show how the image is produced.

Label the image. **[2]**

(b) How can you **show** that the image produced is a real image?

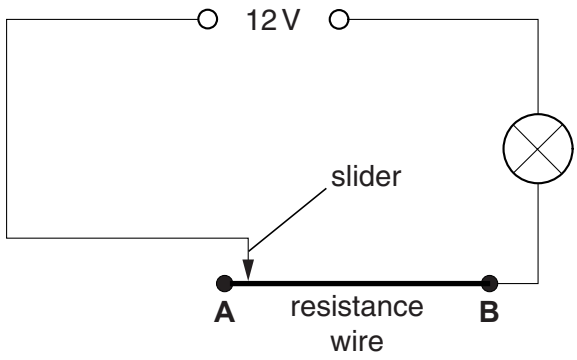
.....

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

[Total: 3]

12 Sally does some experiments with electricity.

(a) Look at the diagram. It shows a variable resistor controlling a bulb.



Sally puts the slider at position **A**. The bulb lights up.

She moves the slider from position **A** to position **B**.

(i) What happens to the **resistance** of the circuit?

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

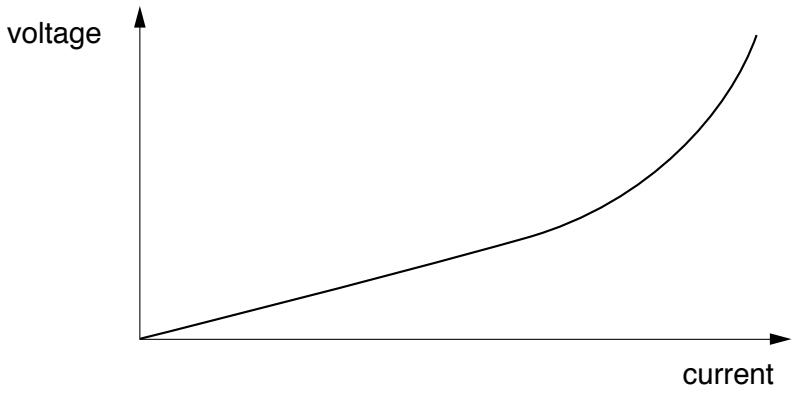
(ii) What happens to the **brightness** of the bulb?

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

(b) Sally increases the voltage of the power supply.

This changes the current in the bulb.

Look at the graph of her results.



She expects a straight line graph.

The graph is curved.

Suggest a reason why.

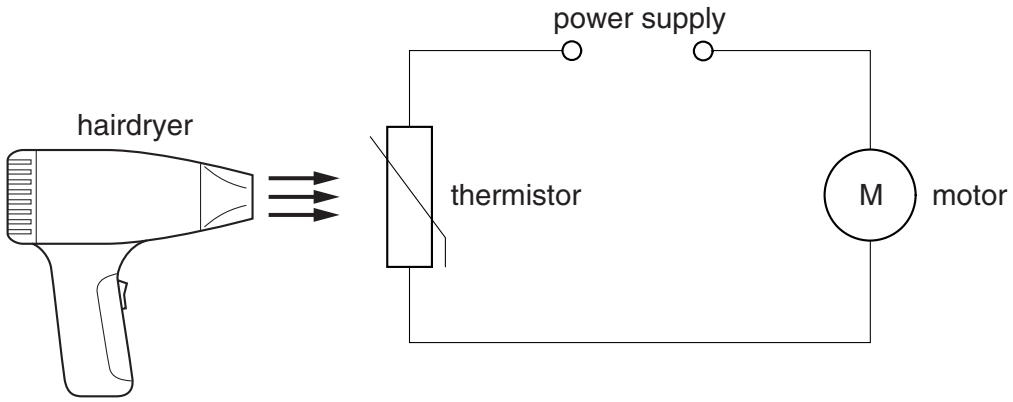
..... **[1]**

[Total: 3]

13 Dan builds some circuits.

(a) He builds a circuit using a **thermistor**.

Look at the diagram.



He uses a hair dryer to heat up the thermistor.

(i) What happens to the **resistance** of the thermistor?

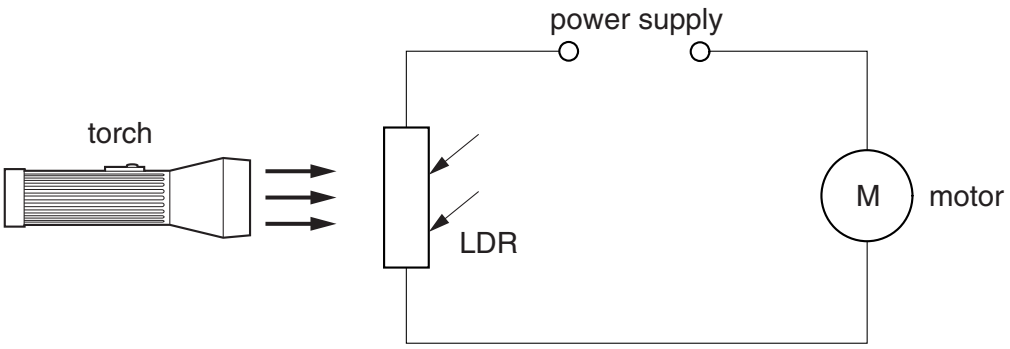
..... **[1]**

(ii) What happens to the **speed** of the motor in the circuit?

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

(b) Dan builds another circuit using an **LDR**.

Look at the diagram.



He uses a torch.

The torch shines **more light** onto the LDR.

(i) What happens to the **resistance** of the LDR?

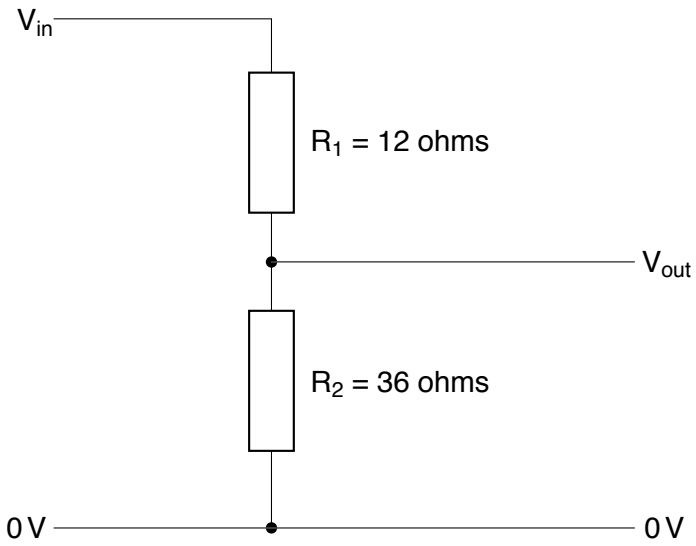
..... **[1]**

(ii) What happens to the **speed** of the motor?

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

(c) Dan uses a potential divider in a circuit.

Look at the information in the diagram.



The input voltage, V_{in} is 5 V.

Calculate the output voltage.

The equations on page 2 may help you.

.....

.....

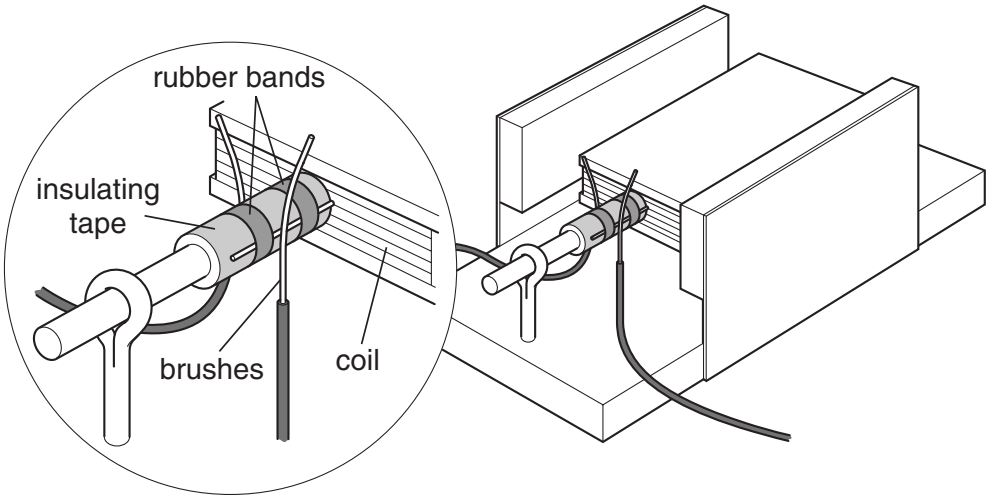
.....

answer ..... V **[2]**

[Total: 6]

14 Declan has some electrical appliances in his house.

(a) Look at the diagram of an electric motor.



Declan connects the motor to the power supply. It spins round.

(i) Declan passes **more current** through the motor.

What happens to the motor?

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

(ii) He puts **stronger magnets** in the motor.

What happens to the motor?

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

(iii) Declan now uses a coil with **fewer turns**.

What happens to the motor?

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

(iv) He changes the direction of the **current**.

What happens to the motor?

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

(b) Declan has an electric razor.

He plugs it into a special socket in the bathroom.

This socket contains an **isolating transformer**.

(i) Why does he use an isolating transformer?

.....

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

(ii) Transformers have a primary coil and a secondary coil.

What is special about the primary and secondary **coils** in an isolating transformer?

.....

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

[Total: 6]

15 Bill has a programmable washing machine.

The control circuit is electronic and uses logic gates.

A logic gate switches on the washing machine.

The washing machine runs on 230V mains electricity.

Explain how the logic gate can switch on a mains circuit.

In your answer write about

- the name of the device used
- why this device is needed.

.....

.....

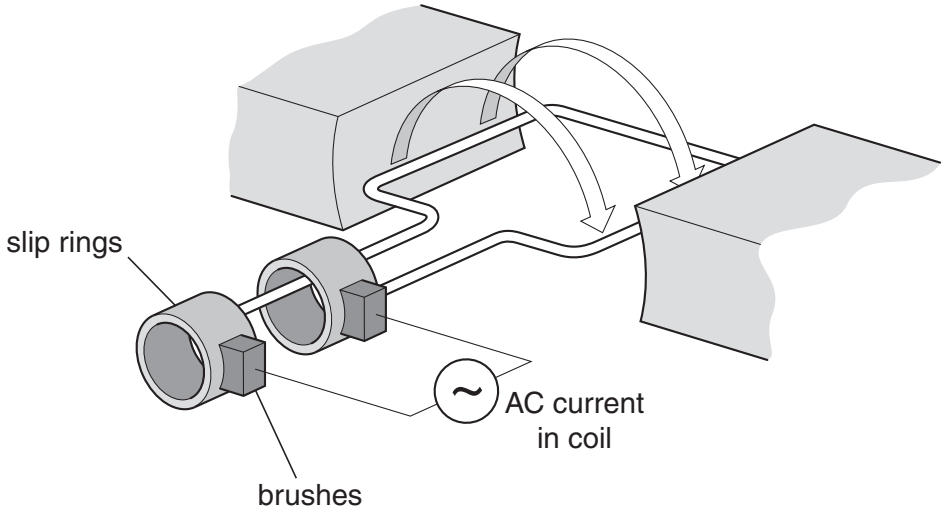
.....

.....

..... **[3]**

[Total: 3]

16 Look at the diagram of an AC generator.



The coil spins and cuts the magnetic field. This produces an AC current.

Explain what the brushes and slip rings do.

Complete the sentences.

The brushes .....

.....

The slip rings .....

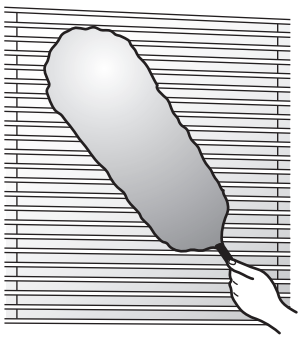
..... **[2]**

[Total: 2]

END OF QUESTION PAPER

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

(a) Russell is dusting his window blinds.



The duster has an electrostatic charge.

Russell moves the duster over the blinds.

(i) What happens to dust particles on the blinds?

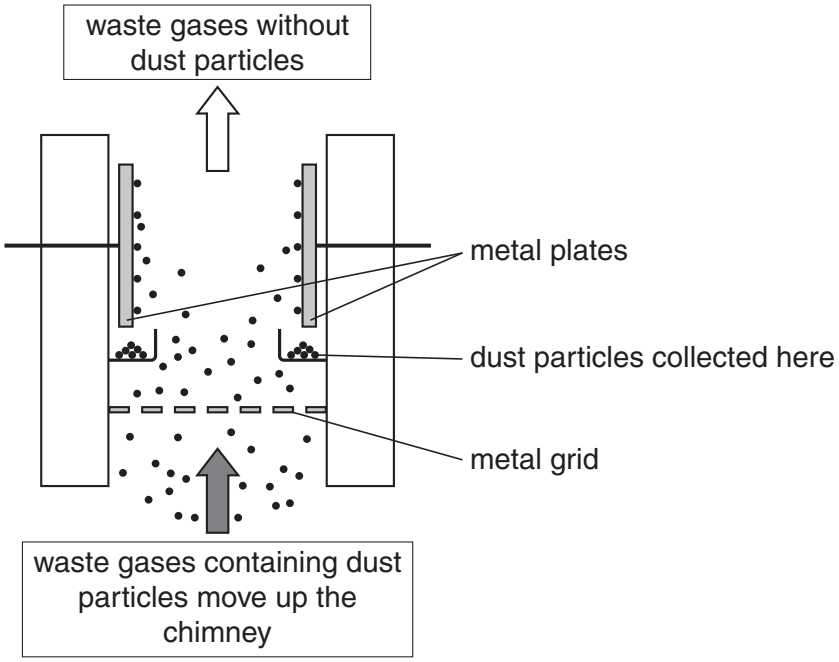
..... **[1]**

(ii) What are the **two** kinds of electrostatic charge?

..... and ..... **[1]**

(b) Dust particles can be removed from a chimney using an **electrostatic precipitator**.

The diagram shows an electrostatic precipitator.



Complete the following sentences to explain how the electrostatic precipitator works.

Choose words from the list.

Each word can be used once, more than once or not at all.

attracted **charged** **conducted** **direct** **knocked**

negative **neutral** **positive**

The metal grid has a …… charge.

The metal plates have a …… charge.

The dust is charged by the metal grid.

Then the dust is …… to the plates.

The plates are …… so the dust falls down and is collected. **[3]**

(c) Static electricity can also be dangerous.

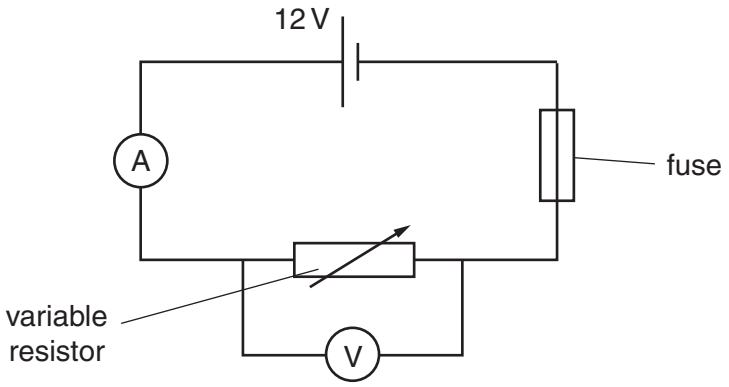
How can static electricity be **dangerous**?

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

[Total: 6]

2 Harry is investigating electrical circuits.

He sets up the circuit shown in the diagram.



(a) Harry investigates how the fuse works.

He adjusts the variable resistor.

The current increases to 1.5 A (amps).

The fuse blows.

Describe what happens to the circuit when the fuse blows.

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

(b) Harry measures the current and voltage for the variable resistor just before the fuse blows.

Look at his results.

current = 1.5 A

voltage = 12 V

Calculate the value of the **resistance**.

The equations on page 2 may help you.

.....

.....

.....

answer ..... Ω **[2]**

[Total: 3]

3 Daniel finds out about uses of physics in hospitals.

(a) Ultrasound is a high frequency longitudinal wave.

It is used in hospitals.

Daniel finds a picture of a doctor using ultrasound for a particular test.

Write about **three** uses of ultrasound in hospitals.

.....

.....

.....

.....

..... **[3]**

(b) Daniel also finds out that **nuclear** radiation is used in hospitals.

Gamma rays are one type of nuclear radiation.

Look at the table.

Put **ticks** (✓) in the boxes to show if each statement is true or false.

Two have been done for you.

statement	true	false
nuclear radiation is used to break up kidney stones		
nuclear radiation does **not** harm cells in the human body		
gamma rays are longitudinal waves		✓
nuclear radiation can be used to sterilise surgical instruments		
the name of the person who uses nuclear radiation in a hospital is a radiographer	✓	
nuclear radiation can be used to treat cancer		

[3]

(c) Daniel learns that radiographers use radioisotopes in some tests.

The radioisotope is put into patients and followed around the body.

(i) Complete the sentence.

When a radioisotope is followed around the body it is being used as a

…… . **[1]**

(ii) The radioisotopes are radioactive.

What happens to their radioactivity over time?

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

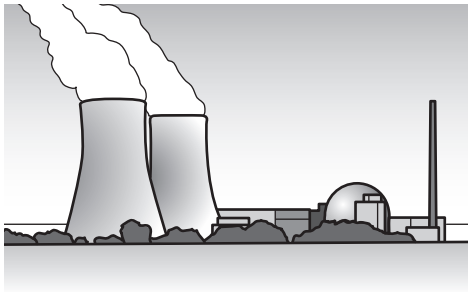
(iii) Nuclear radiation comes from inside an unstable atom.

What **part** of the atom does all nuclear radiation come from?

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

[Total: 9]

4 Nuclear power stations produce electricity.



(a) Nuclear power stations use a nuclear fuel as a source of energy.

Write down the name of this nuclear fuel.

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

(b) The diagram shows the three main stages in the production of electricity from a nuclear fuel.

Complete the sentence in the middle box.

stage 1	stage 2	stage 3
The nuclear fuel produces heat.	The heat is used to	The electricity is produced in the generator.

[1]

[Total: 2]

5 This question is about natural and artificial satellites.

(a) The Moon is the Earth's only natural satellite.

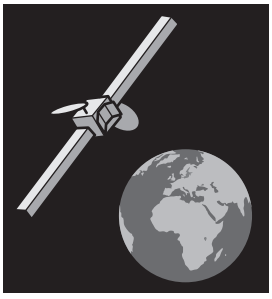
not to scale

A force keeps the Moon in orbit.

Write down the name of this force.

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

(b) Artificial satellites are put into orbit by rockets.



not to scale

Write down two **different** uses of artificial satellites.

1 .....

.....

2 .....

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

(c) Waves are transmitted from Earth up to satellites.

The satellites then transmit these waves back to Earth.

What type of wave is used?

Choose from

infrared **microwave** **radio** **ultraviolet**

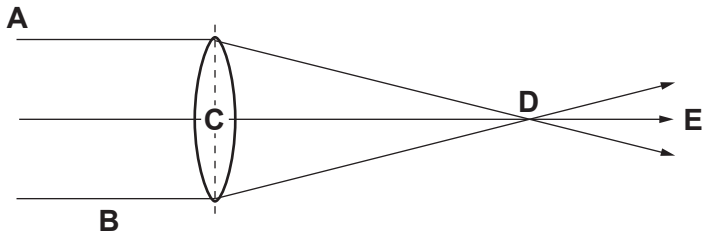
answer ..... **[1]**

[Total: 4]

Turn over

6 Convex lenses converge parallel light rays.

Look at the diagram.



(a) (i) The lens has a focal point.

Which letter shows the focal point?

Choose from **A B C D E**

answer..... **[1]**

(ii) The focal length is between letters …… and …… . **[1]**

(b) The lens is changed for a **fatter** one.

What happens to the focal length?

Choose from

decreases increases stays the same

answer ..... **[1]**

(c) Convex lenses are used in different optical instruments.

Write down two uses of a convex lens.

1 .....

.....

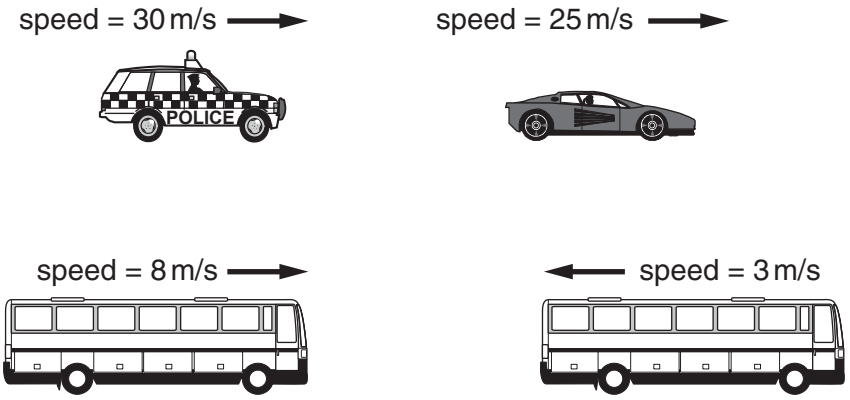
2 .....

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

[Total: 5]

7 Vehicles can travel at different speeds.

Look at the diagrams.



The cars and buses all travel at different speeds.

(a) What is the **fastest** speed in the diagrams?

..... m/s **[1]**

(b) The buses have a higher **relative** speed than the cars.

Use the information in the diagram to explain why.

.....

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

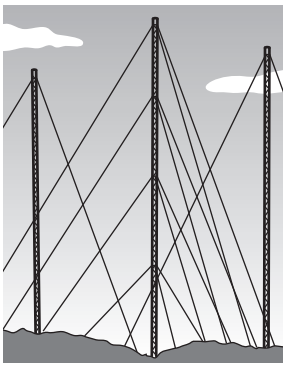
[Total: 2]

8 Radio waves carry radio signals.

(a) What part of the radio receives these waves?

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

(b) Radio waves are transmitted from radio masts.



These radio waves travel to radios in people's homes.

Some people live close to hills.

Others live near tall buildings.

They can still receive the radio signals.

Explain how they can receive these signals.

In your answer write about

- the wavelength of radio waves
- why hills and buildings do **not** block the signal.

.....

.....

.....

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

(c) Radio waves can be transmitted long distances using the Earth's upper atmosphere.

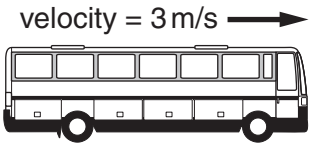
What happens to the waves when they hit the upper atmosphere?

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

[Total: 4]

9 This question is about velocity and momentum.

(a) A bus moves along the road. Look at the diagram.



(i) The mass of the bus is 7000 kg. Its velocity is 3 m/s.

Calculate the momentum of the bus.

The equations on page 2 may help you.

.....

.....

answer ..... kg m/s **[2]**

(ii) More passengers get on the bus.

The mass of the bus increases.

It moves again at 3 m/s.

How will this extra mass affect its momentum?

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

(b) A car accelerates. Look at the diagram.

The car accelerates at 1.5 m/s^2.

It takes 12 seconds to reach its final velocity.

Calculate the final velocity of the car.

The equations on page 2 may help you.

.....

.....

answer ..... m/s **[2]**

[Total: 5]

Turn over

10 This question is about current, voltage and resistance.

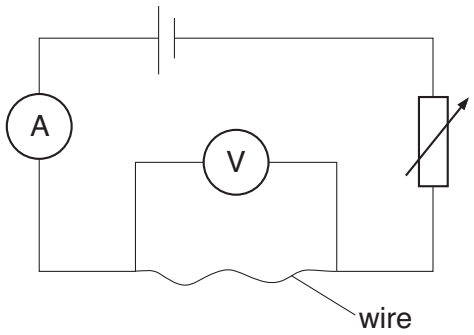
(a) Look at the list of electrical quantities and units.

Draw a straight line from each **quantity** to its correct **unit**.

quantity	unit
current	ohms
voltage	amps
resistance	volts

[2]

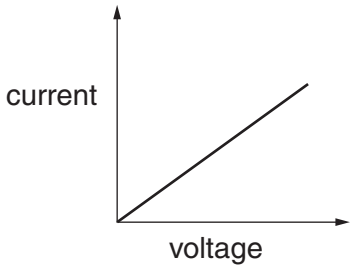
(b) Katy connects the following circuit.



She measures the voltage and current.

She draws a graph of her results.

Look at the graph.



Explain how she **uses the graph** to find the resistance of the wire.

.....

.....

.....

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

[Total: 4]

11 This question is about electrical components.

(a) Look at the list of components.

fixed resistor

fuse

LDR

motor

switch

thermistor

(i) Which component responds to a change in the brightness of **light**?

Choose from the list.

answer ..... **[1]**

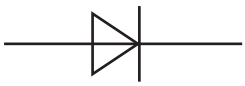
(ii) Which component responds to a change in **temperature**?

Choose from the list.

answer ..... **[1]**

(b) Scientists use symbols for electrical components.

Write the correct name of the components in the box next to their symbol.

symbol	name
	.....
	.....

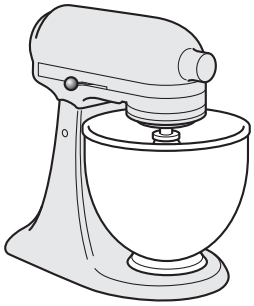
[2]

[Total: 4]

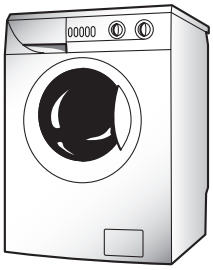
12 (a) Look at the pictures of household appliances.

kettle

lamp



food mixer



washing machine

cd player

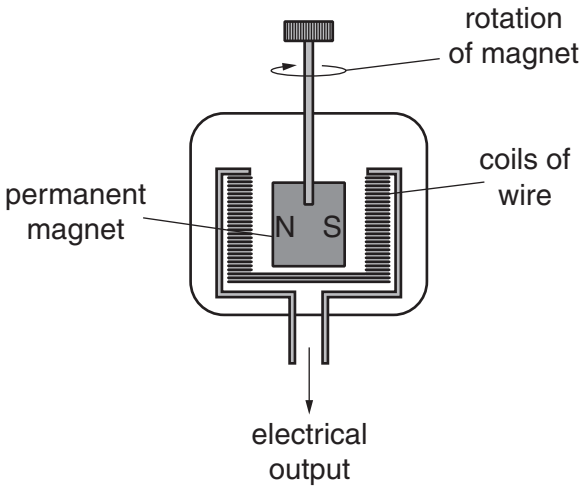
Some of the appliances have electric motors inside them.

How many?

Choose from **1 2 3 4 5**

answer ..... **[1]**

(b) In a power station a magnet rotates inside a coil of wire.



An alternating current (AC) is produced.

(i) The magnet spins faster.

Complete the sentence.

When the magnet spins faster, the size of the AC produced ……

and the frequency of the output …… . **[1]**

(ii) A stronger magnet is used.

Complete the sentence.

When the stronger magnet is used, the size of the AC produced ……

and the frequency of the output …… . **[1]**

[Total: 3]

13 This question is about transformers.

(a) Batteries produce direct current (DC).

Fred connects a battery to the input of a transformer.

What is the output from the transformer?

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

(b) Some transformers **reduce** the voltage.

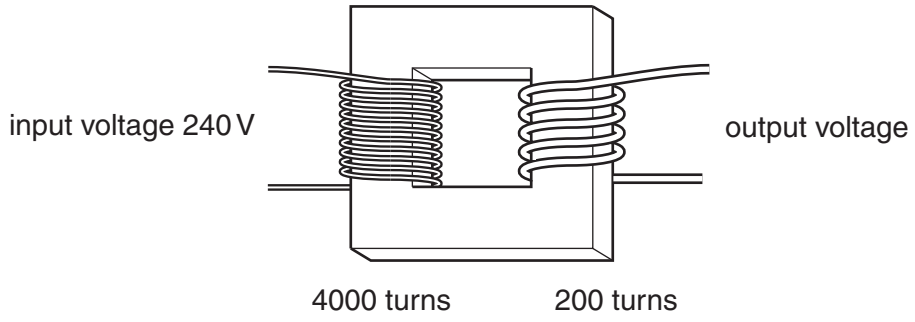
(i) Write down the **name** of these transformers.

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

(ii) Write down one **use** of a transformer that reduces the voltage.

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

(c) The diagram shows a transformer.



The primary coil has 4000 turns.

The secondary coil has 200 turns.

The input voltage is 240 V.

Calculate the output voltage.

The equations on page 2 may help you.

.....

.....

.....

answer ..... V **[2]**

[Total: 5]

14 This question is about logic gates

(a) The input for a logic gate can be either **high** or **low**.

Complete the table for a NOT gate.

input	output
high	
low	

[1]

(b) Logic gates are sometimes connected in combination.

Car alarms have a combination of logic gates called a latch.

The latch is needed to make sure that the alarm works properly.

Explain why.

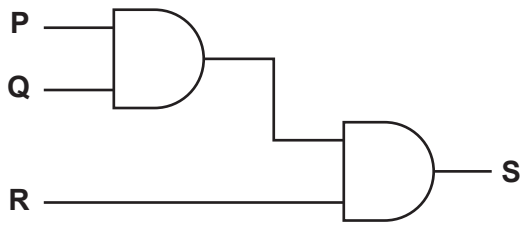
.....

.....

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

(c) Look at the diagram.

It shows two logic gates (a combination) being used together.



Which letter shows the **output** from the combination of gates?

Choose from **P** **Q** **R** **S**

answer ..... **[1]**

[Total: 4]

END OF QUESTION PAPER

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

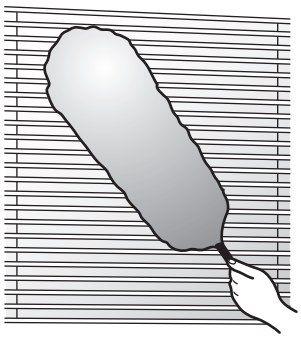
(a) Russell's window blinds are dusty.

Before he starts dusting, Russell rubs the duster with a plastic bag.

The duster becomes negatively charged.

Russell dusts the window blinds by moving the duster over the blinds.

Dust particles are attracted to the duster.



Explain how the duster gained a negative charge and why it attracts the dust.

.....

.....

.....

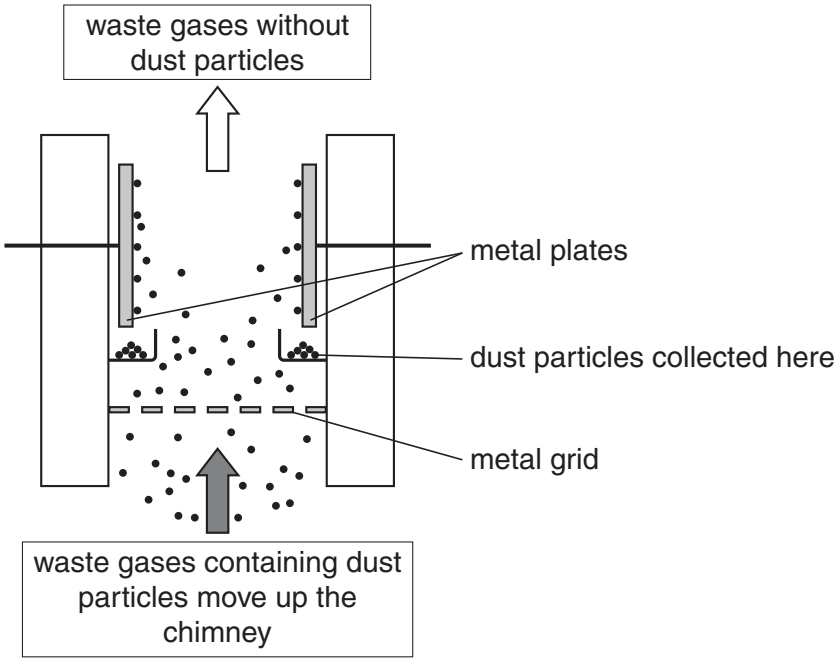
.....

..... **[3]**

Turn over for the remainder of question 1

(b) Dust particles can be removed from chimneys using an **electrostatic precipitator**.

The diagram shows an electrostatic precipitator.



Complete the following sentences explaining how the precipitator works.

Choose words from the list.

Each word can be used once, more than once or not at all.

attracted **charged** **conducted** **direct** **knocked**

negative **neutral** **positive**

The metal grid has a …… charge.

The metal plates have a …… charge.

The dust is charged by the metal grid.

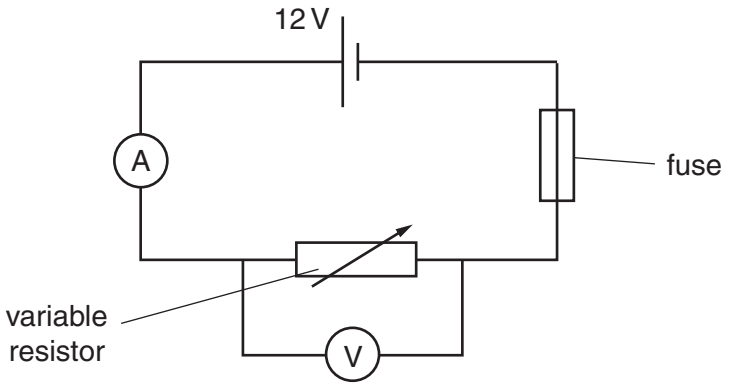
Then the dust is …… to the plates.

The plates are …… so the dust falls down and is collected. **[3]**

[Total: 6]

2 Harry is investigating electrical circuits.

He sets up the circuit shown in the diagram.



(a) Harry is investigating how the fuse works.

He adjusts the variable resistor.

The current increases to 1.5 A (amps).

The fuse blows.

Describe what happens to the circuit when the fuse blows.

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

(b) Harry measures the current and voltage for the variable resistor just before the fuse blows.

Look at his results.

current = 1.5 A

voltage = 12 V

Calculate the value of the **resistance**.

The equations on page 2 may help you.

.....

.....

.....

answer ..... Ω **[2]**

[Total: 3]

3 Daniel finds out about uses of physics in hospitals.

(a) Ultrasound is a longitudinal wave and is used in hospitals.

Daniel finds a picture of a doctor using ultrasound to treat a patient with kidney stones.

Complete the following sentences about the treatment.

The doctor sends ultrasound waves into the patient.

Ultrasound has a very high …… .

The waves cause the particles in the kidney stone to …… .

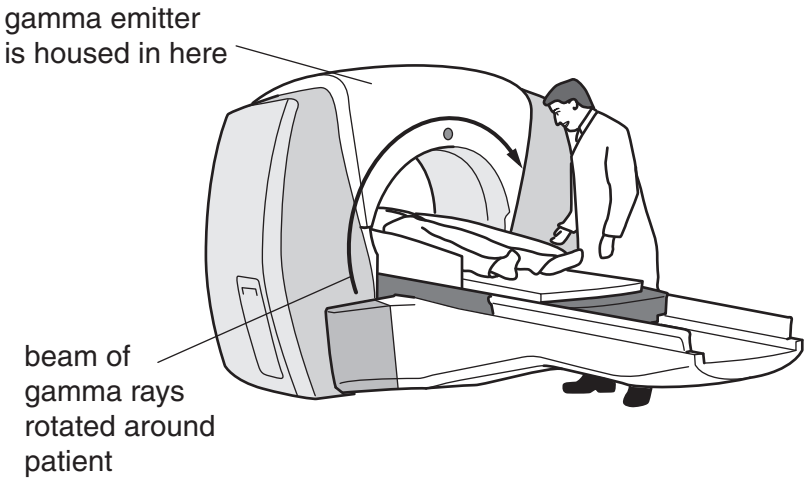
This causes the kidney stone to …… . **[3]**

(b) Daniel finds out that nuclear radiation is used in hospitals.

Gamma rays are one type of nuclear radiation.

Gamma rays are used to treat people who have a cancerous tumour.

Look at the diagram. It shows a patient about to be given treatment using a gamma emitter.



Daniel has made some notes about the treatment.

Complete the three sentences to explain the treatment.

1 The gamma rays are …… on the tumour.

2 The beam of gamma rays is rotated so that

…… .

3 This means that healthy tissue is not damaged

because ……

…… .

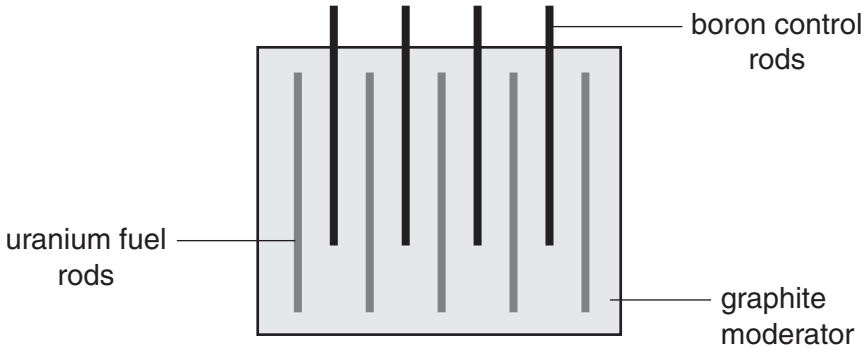
[2]

[Total: 5]

4 Nuclear power stations produce electricity.

Inside the power station a controlled nuclear chain reaction takes place in the **reactor**.

Look at the diagram of a nuclear reactor.



(a) Complete the flow diagram to show how the energy is released in a chain reaction.

A uranium ..... is hit by a	→	This causes the uranium ..... to split.	→	Energy is released.

[2]

(b) How do the control rods stop the nuclear chain reaction going out of control?

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

(c) What is the name of the process that gives out energy in this nuclear reactor?

Choose from

decay **fission** **fusion** **ionisation**

answer ..... **[1]**

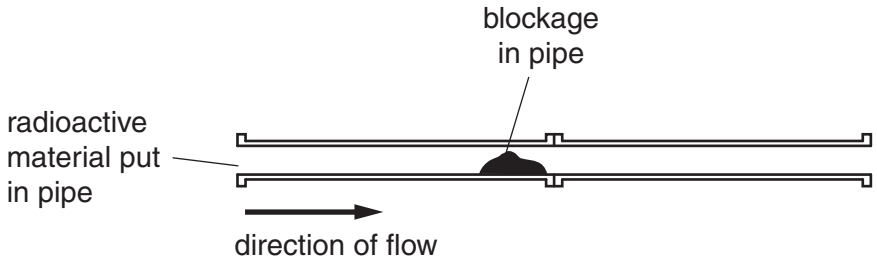
[Total: 4]

5 Engineers sometimes put radioactive materials into **underground** pipes carrying oil.

A gamma source is put into the pipe.

The gamma rays are detected at the surface using a Geiger counter.

The radiation is tracked so a blockage in the pipe can be found.



(a) Alpha and beta radiations are **not** used.

Why is gamma radiation used?

.....

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

(b) How do the engineers know where the blockage is?

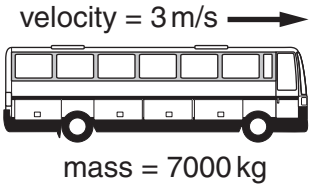
.....

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

[Total: 2]

6 This question is about velocity and momentum.

(a) A bus moves along the road. Look at the diagram.



(i) The mass of the bus is 7000 kg. Its velocity is 3 m/s.

Calculate the momentum of the bus.

The equations on page 2 may help you.

.....

.....

answer ..... kg m/s **[2]**

(ii) More passengers get on the bus.

The mass of the bus increases.

It moves again at 3 m/s.

How will this extra mass affect its momentum?

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

(b) A car accelerates. Look at the diagram.

The car accelerates at 1.5 m/s^2.

It takes 12 seconds to reach its final velocity.

Calculate the final velocity of the car.

The equations on page 2 may help you.

.....

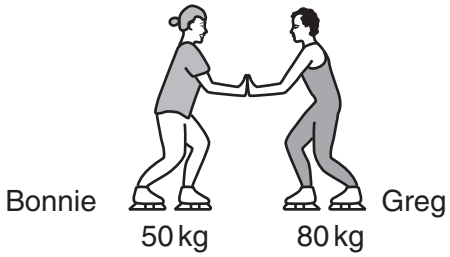
.....

answer ..... m/s **[2]**

(c) Bonnie and Greg are two ice skaters.

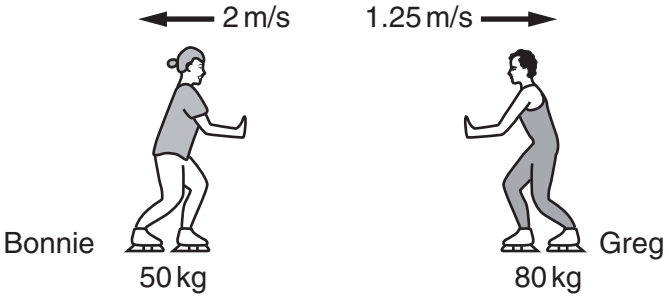
They are both stationary on the ice.

Look at the diagram.



Greg pushes Bonnie away from him.

Look at the diagram.



They both move in **opposite** directions at **different** speeds.

Explain why.

In your answer, use ideas about **momentum**.

The equations on page 2 may help you.

.....

.....

.....

.....

.....

..... **[4]**

[Total: 9]

7 This question is about natural and artificial satellites.

(a) The Moon is the Earth's only **natural** satellite.

Gravity provides the force that keeps the Moon in orbit.

Complete the sentence.

Choose from

centrifugal

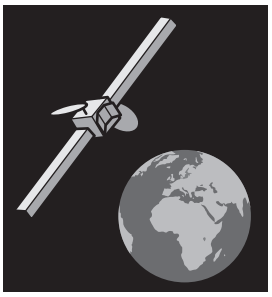
centripetal

magnetic

nuclear

The type of force that gravity provides is a ..... force. **[1]**

(b) Artificial satellites are put into orbit by rockets.


not to scale

One type of satellite has a **geostationary** orbit.

(i) Write down two reasons why a geostationary orbit is special.

1 .....

.....

2 .....

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

(ii) Geostationary satellites are useful for **satellite navigation** (SATNAV).

Why are geostationary satellites used for this?

.....

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

(c) Another type of satellite is a **polar orbiter**.

These low polar satellites travel at higher speeds than geostationary satellites.

Why do they need to travel at such high speeds?

.....

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

(d) Waves are transmitted from Earth up to satellites.

The satellites then transmit these waves back to Earth.

What type of wave is used?

Choose from

infrared **microwave** **radio** **ultraviolet**

answer ..... **[1]**

[Total: 6]

8 **Polarising** sunglasses are used by skiers.

Light waves are **transverse**.

Some of the light waves reflected from snow surfaces cause glare.

Skiers wear polarising glasses to reduce the glare.

These glasses are **vertically** polarised.

Explain why.

.....

.....

.....

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

[Total: 2]

9 This question is about using waves for communication.

(a) Radio waves carry radio and TV signals.

Long wave radio waves can reach aerials behind hills.

Describe how they do this.

.....

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

(b) **Microwave** communications are sent as a thin beam.

Explain why.

.....

.....

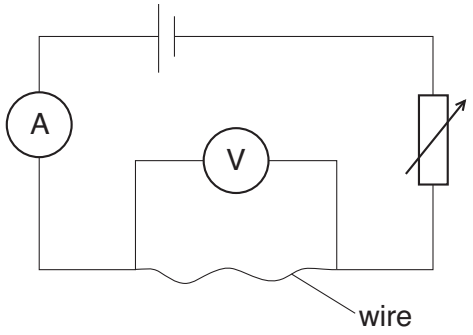
.....

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

[Total: 3]

10 This question is about current, voltage and resistance.

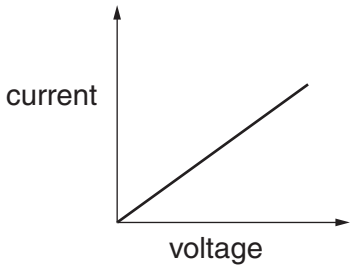
(a) Katy connects the following circuit.



She measures the voltage and current.

She draws a graph of her results.

Look at the graph.



Explain how she **uses the graph** to find the resistance of the wire.

.....

.....

.....

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

(b) Andrew builds a potential divider circuit using two **fixed** resistors.

Show how he sets up the circuit.

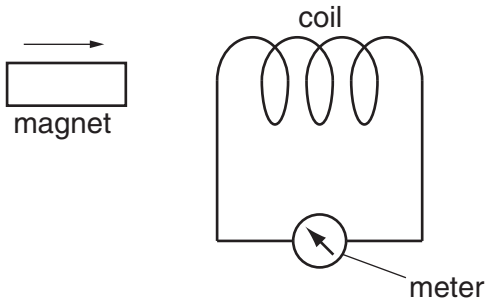
Your answer should include

- a diagram
- labels on the input terminals
- labels on the output terminals.

[2]

[Total: 4]

11 (a) Linda connects the following circuit.



She moves the magnet towards the coil.

The pointer on the meter moves to the **left**.

It shows the direction and size of the current.

Linda wants to change the direction of the current.

This would make the pointer move to the **right**.

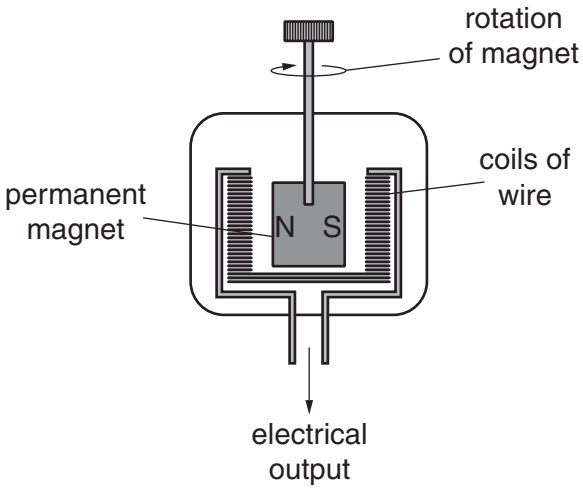
Describe how she could do this.

.....

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

Turn over for the remainder of question 11

(b) In a power station a magnet rotates inside a coil of wire.



An alternating current (AC) is produced.

(i) The magnet spins faster.

Complete the sentence.

When the magnet spins faster, the size of the AC produced ……

and the frequency of the output …… . **[1]**

(ii) A stronger magnet is used.

Complete the sentence.

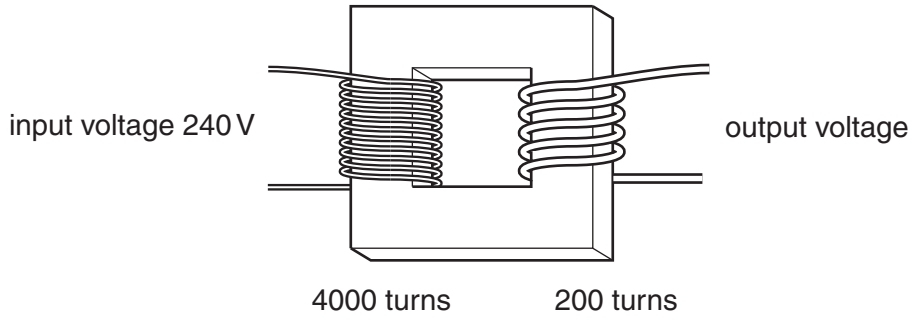
When the stronger magnet is used, the size of the AC produced ……

and the frequency of the output …… . **[1]**

[Total: 3]

12 This question is about transformers.

(a) The diagram shows a transformer.



The primary coil has 4000 turns.

The secondary coil has 200 turns.

The input voltage is 240 V.

Calculate the output voltage.

The equations on page 2 may help you.

.....

.....

.....

answer ..... V **[2]**

(b) Transformers will only work using alternating current (AC).

Explain why the supply must be AC and **not** DC.

In you answer write about

- magnetic fields
- electromagnetic induction.

.....

.....

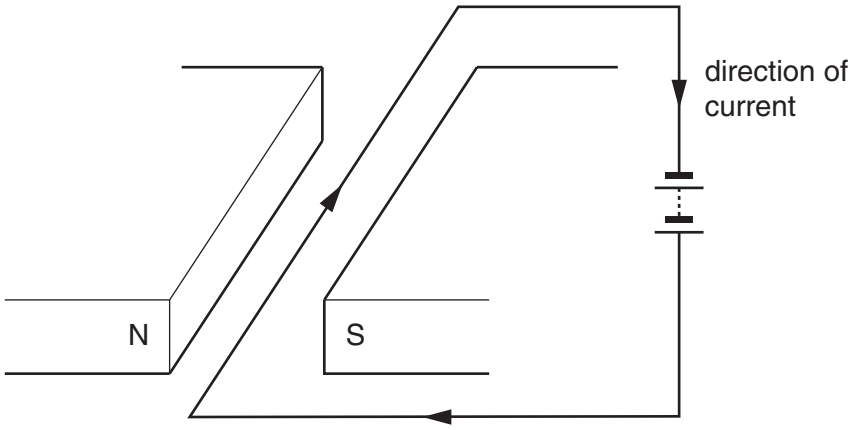
.....

.....

..... **[3]**

[Total: 5]

13 Look at the diagram of a wire passing through a magnetic field.



(a) When a current flows there is a force on the wire.

Use Fleming's Left Hand Rule to work out the direction of the force on the wire.

Choose from

downwards

towards N

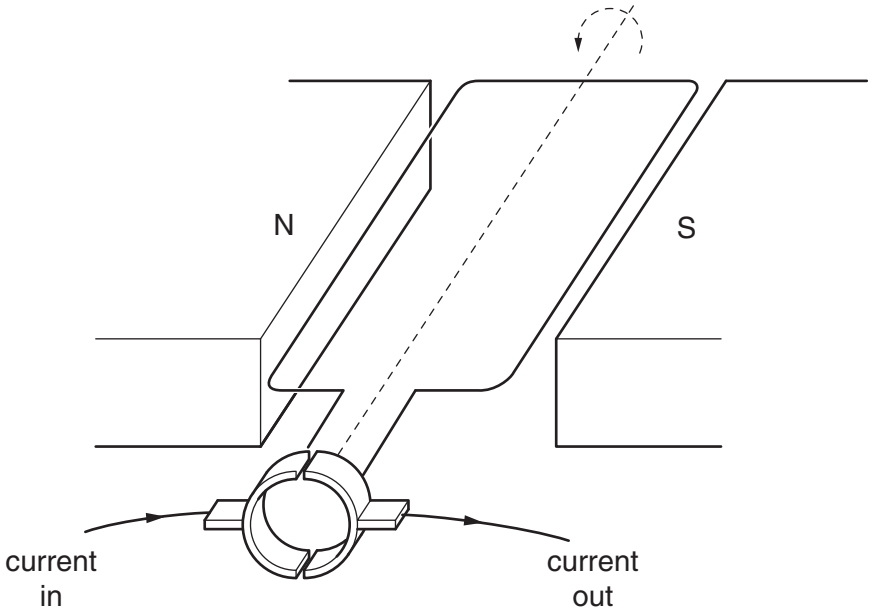
towards S

upwards

answer ..... **[1]**

(b) In an electric motor a coil is placed in a magnetic field.

To keep an electric motor turning the force on the coil of wire must be in the same direction.



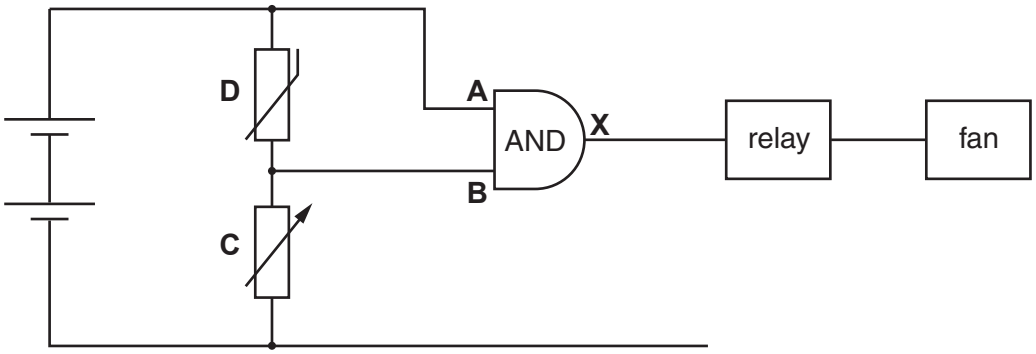
Which part of the motor keeps the force in the same direction?

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

[Total: 2]

14 This question is about using logic gates to control temperature.

Look at the circuit.



(a) Complete the truth table for the AND gate.

A	B	X
0	0	
0	1	
1	0	
1	1	

[1]

(b) The circuit controls a fan.

The logic gate cannot operate the fan directly.

It needs a connection through a relay.

Explain why.

.....

.....

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

(c) When the temperature increases, the fan switches on.

(i) Describe how the resistance of **D** changes as the temperature increases.

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

(ii) What happens to the input at **B** when the temperature increases?

.....

.....

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

(iii) Explain why a **variable** resistor **(C)** is used in this circuit.

.....

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

[Total: 6]

END OF QUESTION PAPER

mock papers 5-foundation

1 This question is about nuclear radiation.

(a) Look at the list of words.

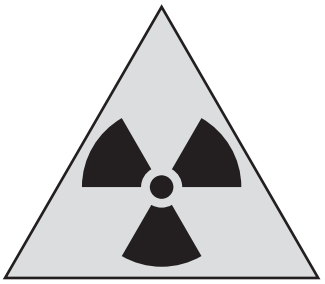
A alpha particles

B background

C steel

D radioisotope

E uranium



(i) What is the name of the radiation that is **always** present in the atmosphere?

Choose from the list.

A B C D E

answer ..... **[1]**

(ii) Which type of radiation is used in **smoke detectors**?

Choose from the list.

A B C D E

answer ..... **[1]**

(iii) What is the name of a **fuel** used in nuclear power stations?

Choose from the list.

A B C D E

answer ..... **[1]**

(iv) Which one can be **made** radioactive in a nuclear reactor?

Choose from the list.

A B C D E

answer ..... **[1]**

(v) Which one is used for **tracers** in hospitals?

Choose from the list.

A B C D E

answer ..... **[1]**

Turn over for the remainder of question 1

(b) Nuclear radiation is given out by the nucleus of an unstable atom.

Two types of nuclear radiation are alpha particles and beta particles.

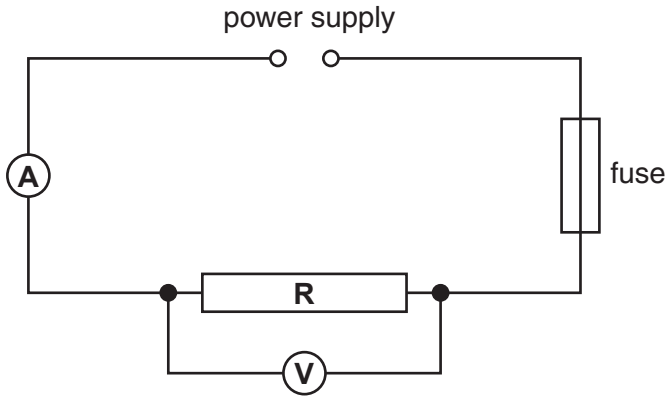
Complete the sentences.

(i) An alpha particle is a ..... nucleus. **[1]**

(ii) A beta particle is a fast moving ..... . **[1]**

[Total: 7]

2 Raphael sets up a circuit.



(a) He measures the current in the resistor, **R**, and the voltage across it.

Look at his results.

current = 0.5 amps

voltage = 6 volts

Calculate the resistance of **R**.

The equations on page 2 may help you.

.....

.....

.....

answer ..... Ω **[2]**

(b) Raphael has a **fuse** in his circuit.

Complete the sentence.

If the current becomes too large, the fuse ……. the circuit. **[1]**

[Total: 3]

3 Katie is shopping.

She walks on a vinyl (a type of **plastic**) floor.

She then touches a metal object and gets an **electrostatic shock**.

Describe how she gets a shock.

In your answer write about

- how the charge is produced
- the materials involved
- what happens to the charge.

.....

.....

.....

.....

..... **[3]**

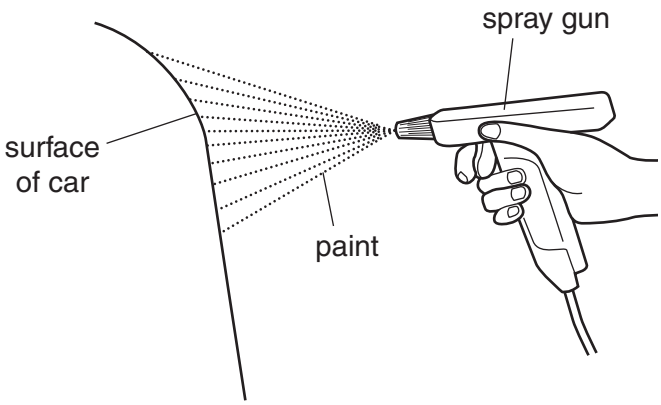
[Total: 3]

4 This question is about a **use** of electrostatics.

Cars are spray painted. The paint particles are all positively charged (+).

Spray painting

- gives an **even** coat of paint
- paints **all** parts of the car
- wastes **less** paint.



Complete the sentences to describe how static electricity is useful for spray painting.

The paint particles are all positively charged.

This causes the paint particles to ..... each other and produce a ..... spray.

The surface of the car has ..... electrostatic charge so the paint is ..... to it. **[2]**

[Total: 2]

5 Samuel learns about using **nuclear radiation** in **hospitals**.

His teacher tells him to get information about this from the internet.

Samuel writes a summary of what he finds out.

Finish the sentences to complete Samuel's findings.

1 Nuclear radiation can damage ..... in a patient's body.

2 Nuclear radiation is used to ..... hospital equipment.

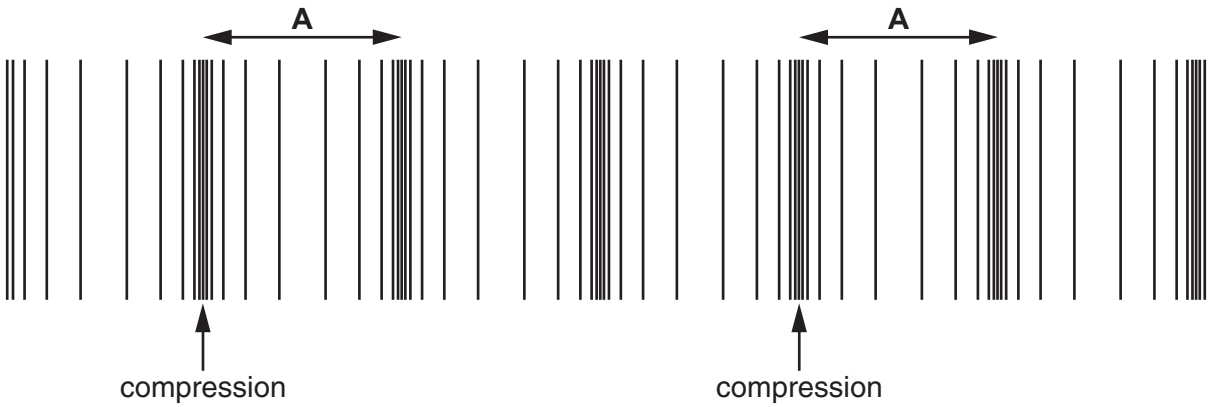
3 Gamma rays are used to treat patients with ..... .

[3]

[Total: 3]

6 Ultrasound is a longitudinal wave.

Look at the diagram of a longitudinal wave.



Complete the sentences.

(a) On the diagram, the letter **A** shows the distance from one compression to the next.

This distance is called the ..... . **[1]**

(b) An ultrasound wave travels by air molecules moving backwards and forwards.

A place where the air molecules are **closest** is called a **compression**.

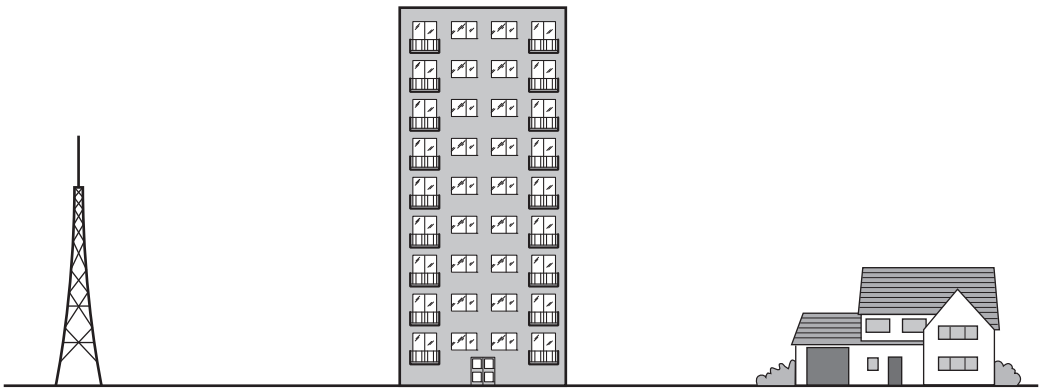
A place where the air molecules are **furthest apart** is called a ..... . **[1]**

[Total: 2]

7 This question is about communicating with waves.

Radio waves are emitted from a transmitter.

Look at the diagram.



(a) The house has a radio.

The radio needs a piece of equipment to receive the radio signals.

Write down the **name** of this piece of equipment.

answer ..... **[1]**

(b) The radio signals cannot get through the block of flats.

The radio waves still reach the house.

Describe two ways they do this.

1 .....

.....

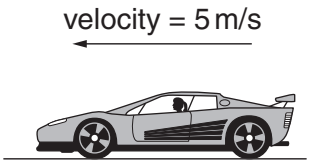
2 .....

..... **[3]**

[Total: 4]

8 This question is about **velocity** and **speed**.

Look at the diagram of the car.



(a) How is speed different to velocity?

.....

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

(b) Look at the diagram of the car accelerating.

(i) The car is travelling with a velocity of 5 m / s.

It then accelerates at 0.5 m / s^2.

Calculate the final velocity after 12 s.

The equations on page 2 may help you.

.....

.....

answer ..... m/s **[2]**

(ii) What happens to the **momentum** of the car when it accelerates?

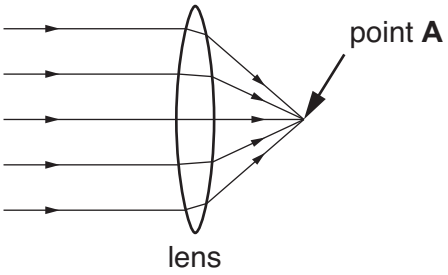
..... **[1]**

[Total: 4]

9 This question is about using light.

Lenses are used to change the direction of light.

Look at the diagram.



(a) The light changes direction as it passes through the lens.

What is this process called?

Choose from

diffraction **interference** **reflection** **refraction**

answer ..... **[1]**

(b) Complete the following sentences about this lens.

Choose the **best** words from the list.

Each word may be used **once**, **more than once** or **not at all**.

concave **convex** **focal** **long** **parallel** **short**

Converging lenses are also called ..... lenses.

This lens converges ..... rays of light to pass through point **A**.

Point **A** is called the ..... point.

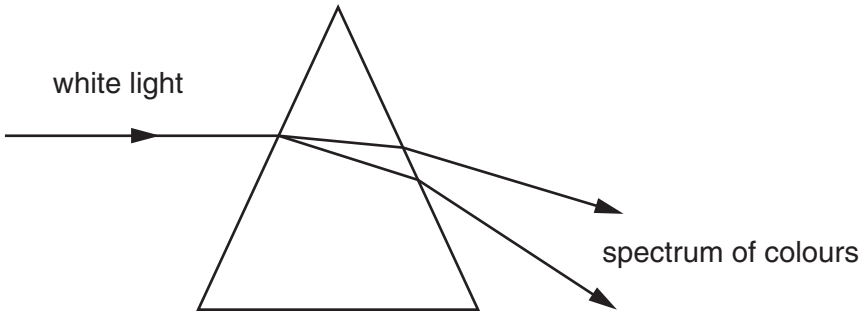
The distance between the lens and point **A** is called the ..... length.

A projector uses a ..... lens. **[4]**

Turn over for the remainder of question 9

(c) A prism can be used to split up white light into a spectrum of colours.

Look at the diagram.



(i) The white light splits into different colours.

What is the name of this process?

answer ..... **[1]**

(ii) Two of the colours are red and blue.

Blue light passing through the prism behaves differently to red light.

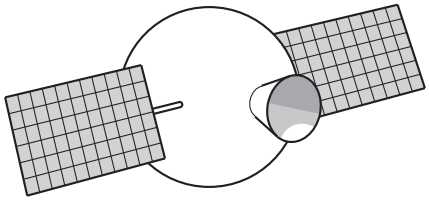
Describe this difference.

.....

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

[Total: 7]

10 Artificial satellites orbit Earth.



(a) Write down **two** things artificial satellites can be used for.

1 .....

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

(b) Geostationary satellites orbit Earth.

To maintain circular motion these satellites need a centripetal force.

(i) What provides the centripetal force for these satellites?

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

(ii) What is meant by a satellite in **geostationary** orbit?

.....

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

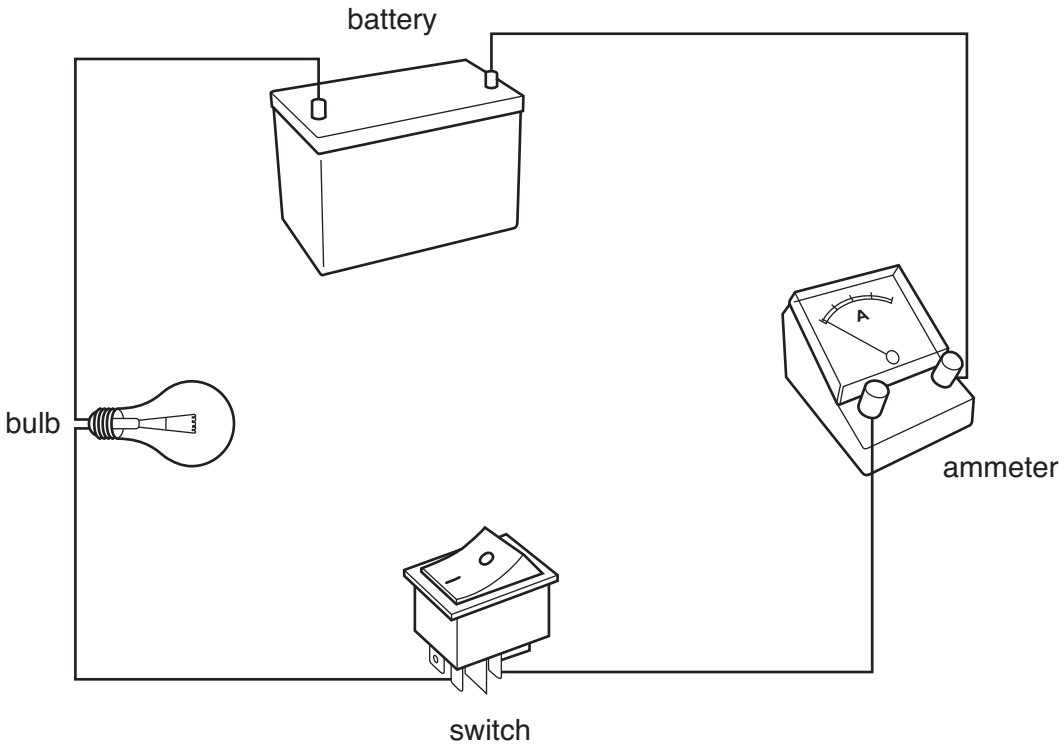
(iii) How long does it take a geostationary satellite to orbit the Earth?

answer ..... hours **[1]**

[Total: 5]

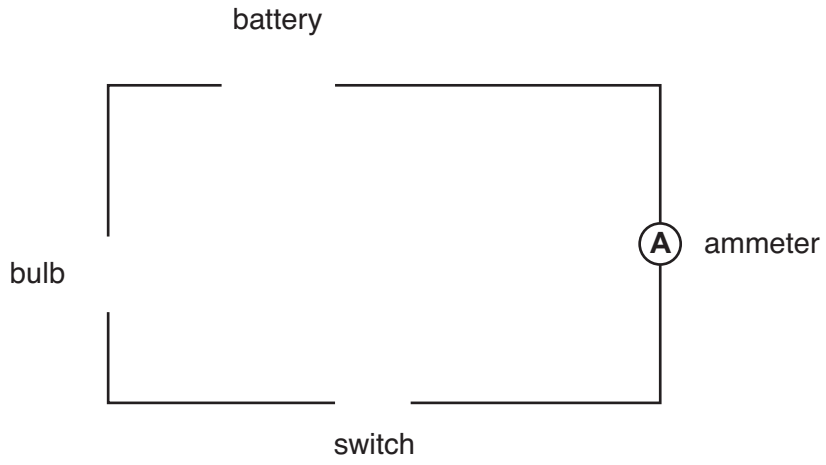
11 This is a question about circuits and circuit symbols.

(a) Freya connects this circuit.



Complete the diagram of this circuit. Use the correct circuit symbols for the components.

The ammeter has been done for you.



[3]

(b) Freya wants to vary the brightness of the bulb.

What **other** component must she connect to the circuit?

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

(c) Freya closes the switch. The bulb becomes very hot and lights up.

What happens to the **resistance** of the bulb as it gets hotter?

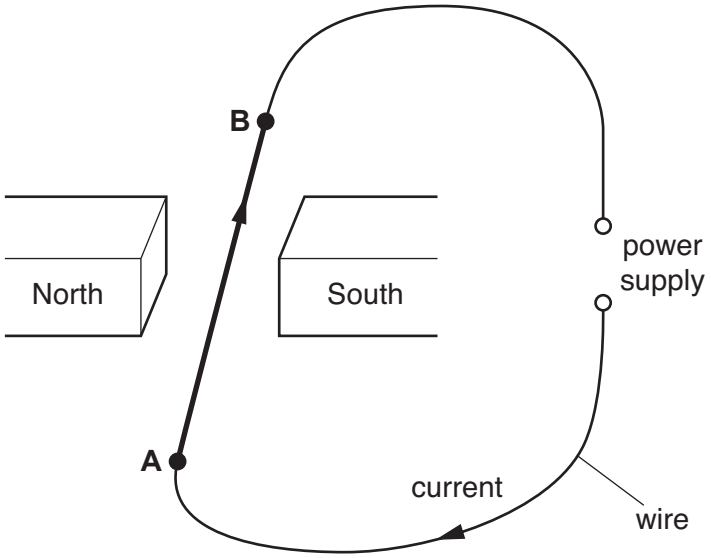
Choose from

decreases **increases** **stays the same**

answer ..... **[1]**

[Total: 5]

12 **(a)** Look at the diagram of a wire in a magnetic field.



The current flows in the direction shown in the diagram.

The wire moves **downwards**.

(i) The current is reversed. It now flows from **B** to **A**.

The magnet has not changed.

In which direction will the wire now move?

Choose from

upwards

downwards

to North pole of magnet

to South pole of magnet

towards A

towards B

answer ..... **[1]**

(ii) The current now flows in its original direction from **A** to **B**.

The magnetic field is reversed.

In which direction will the wire now move?

Choose from

upwards

downwards

to North pole of magnet

to South pole of magnet

towards A

towards B

answer ..... **[1]**

(b) Electric motors have magnets in them.

Some household appliances contain electric motors.

Write down the name of **one** household appliance that contains an electric motor.

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

[Total: 3]

13 Many electronic devices are used around the home.

(a) Glynn needs an electronic device to **switch on** his outside light when it gets dark.

What component should he use?

Choose from

capacitor **LED** **LDR** **solar cell**

answer ..... **[1]**

(b) Glynn's house has temperature controls. These contain thermistors.

Look at the table.

temperature in °C	current in mA
15	6.5
20	6.9
25	7.3
30	7.6

The table shows how the temperature affects the current in the thermistor.

The voltage across the thermistor is constant.

Use the table to complete the sentence.

As the temperature increases the resistance of the thermistor ..... . **[1]**

[Total: 2]

14 Electricity is generated when an electromagnet rotates inside a coil of wire.

Describe **three** ways this generator can be changed to produce a **higher** voltage.

.....

.....

.....

.....

..... **[3]**

[Total: 3]

15 This question is about using different types of transformer.

Complete the table to show the type of transformer required for each use.

Put a tick (✓) in the correct box for each use.

The first one has been done for you.

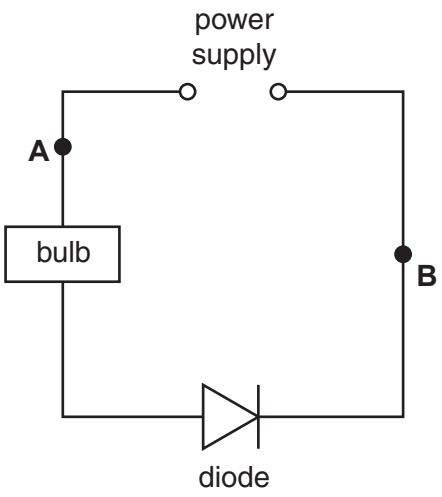
use	step up transformer	step down transformer	isolating transformer
to light a 12V lamp from the mains		✓	
output from a power station			
bathroom shaver socket			
mobile phone charger from the mains			
electrical substation to a school			

[2]

[Total: 2]

16 Some electrical circuits use diodes.

(a) Look at the circuit.



The bulb lights up.

(i) Put arrows (→) on the circuit at **A** and **B** to show the current direction. **[1]**

(ii) What is the job of a diode?

.....

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

(b) Some circuits use a capacitor.

What is the job of a capacitor?

.....

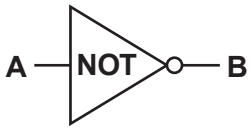
..... **[1]**

[Total: 3]

17 This question is about logic circuits.

Different circuits use different types of logic gates and components.

(a) One type of logic gate is called a **NOT** gate.



Complete the truth table for a **NOT** gate.

A	B
0	
1	

[1]

(b) Some logic circuits use more than one logic gate.

A latch is a combination of logic gates. Latches are used in burglar alarms and car alarms.

Suggest why these alarm circuits use a latch.

.....

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

[Total: 2]

END OF QUESTION PAPER