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mock papers 1-foundation

1   Dan goes to buy a newspaper for his granddad in the morning. He walks in a straight line to the shop and back.

(a) The graph shows the distance Dan is from home and the time it takes.
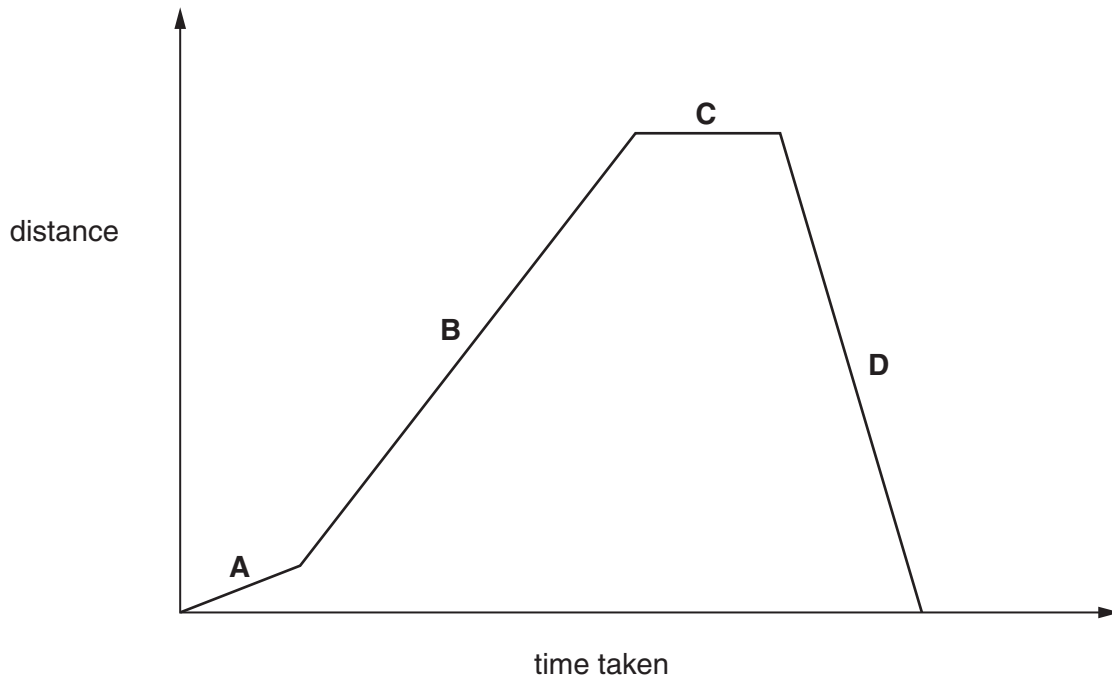
Complete the table below.

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

what Dan is doing	part of the graph (**A**, **B**, **C** or **D**)
standing still	
walking at his fastest speed	
at the shop buying the newspaper	
walking with a negative velocity	

[4]

[Turn over

(b) Dan is walking, so he has momentum.

The equation linking momentum, mass and velocity is:

momentum = mass × velocity

Dan has a mass of 60 kg.

At one time his velocity is 2 m/s.

Which of the following is his momentum?
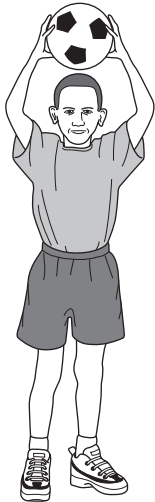
Put a (ring) around the correct answer.

30	**58**	**62**	**120**

[1]

[Total: 5]

2   Bobby is playing with a ball.

Complete the following sentences.

Choose words from this list.

distance

kinetic

mass

potential

weight

Bobby lifts the ball up from the ground above his head.

To calculate the work done you must multiply the force by the ……………………………… .

When Bobby holds the ball above his head it has more gravitational ……………………………… energy.

Bobby lets the ball fall to the ground.

The ball speeds up and gains ……………………………… energy.

The ball is pulled down by its ……………………………… .   [4]

[Total: 4]

[Turn over

3 A driver in a car experiences forces in different directions as he drives forwards.
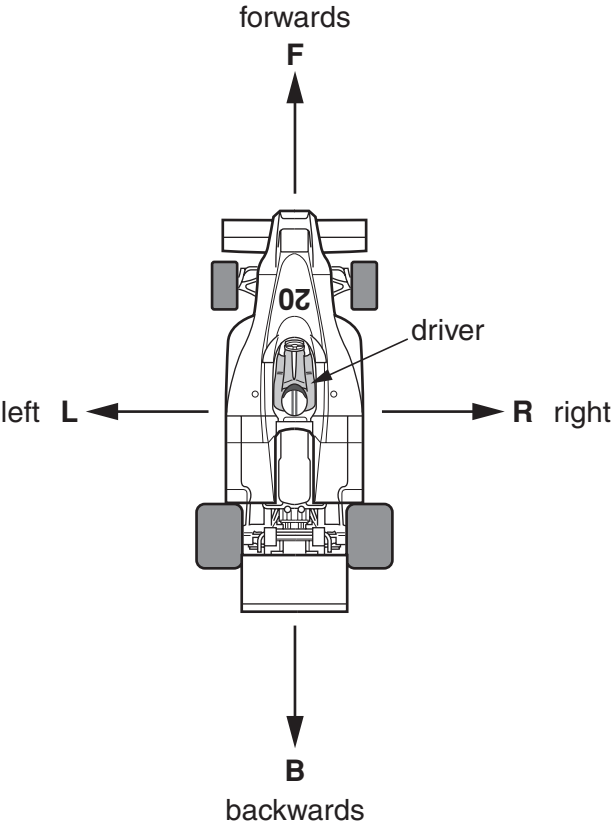
forwards
F

driver

left **L** ← → **R** right

B
backwards

(a) (i) The car speeds up in a straight line.

Which force, **F**, **R**, **L** or **B**, does the car exert **on the driver**?

answer .... [1]

(ii) The car slows down **and** turns left.

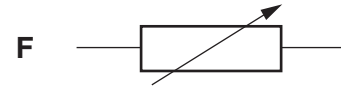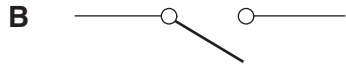Which two forces, **F**, **R**, **L** or **B**, does the car exert **on the driver**?

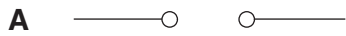............................. and .... [2]

(b) The car speeds up in a straight line.

Which force, **F**, **R**, **L** or **B**, does the driver exert **on the car**?

answer .... [1]
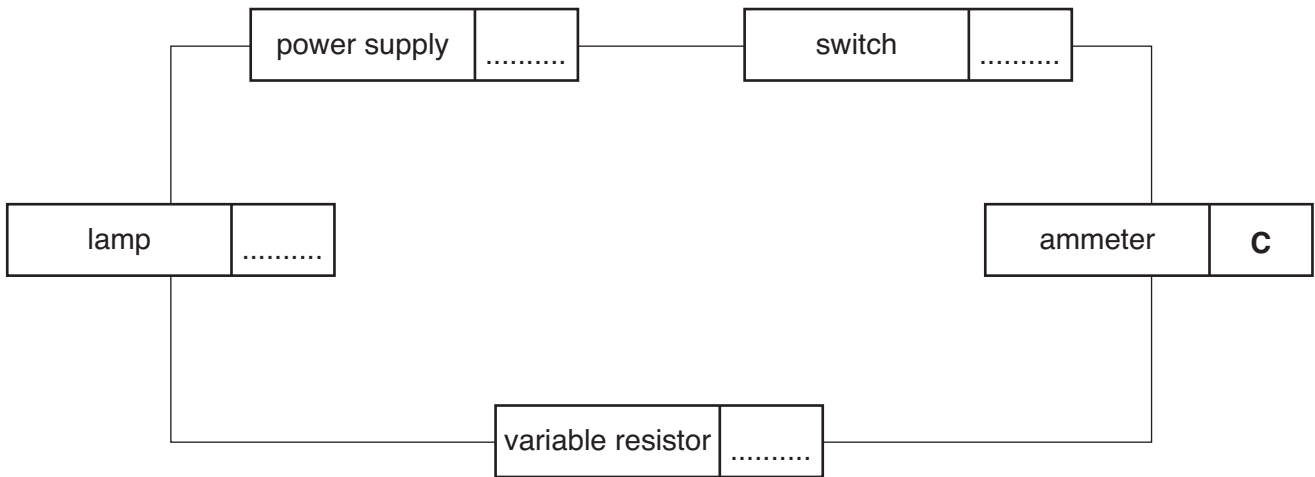
[Total: 4]

4   Here are some circuit symbols for electrical components.

A ───○ ○───   D ───▭───

B ───○╱ ○───   E ───⊗───

C ───(A)───   F ───▱⟋───

This circuit uses some of the components.

Write the **letter** for each component symbol in the correct box in the circuit.

One has been done for you.

power supply	....		switch	....
lamp	....
variable resistor	....
ammeter	C

[4]

[Total: 4]

[Turn over

5 The most commonly used model of electric circuits uses ideas about current and electrons.

Complete the sentences. Choose statements from this list.

a flow of charge

a repulsive force

a continuous loop

an attractive force

a negative charge

(a) An electron has ………………………………………… .

(b) In a circuit the electrons move in ………………………………………………… .

(c) Electric current is ………………………………………… .

(d) Two negative charges are pushed apart by ……………………………………………… .

[4]

[Total: 4]

6 This question is about making measurements in an electric circuit.
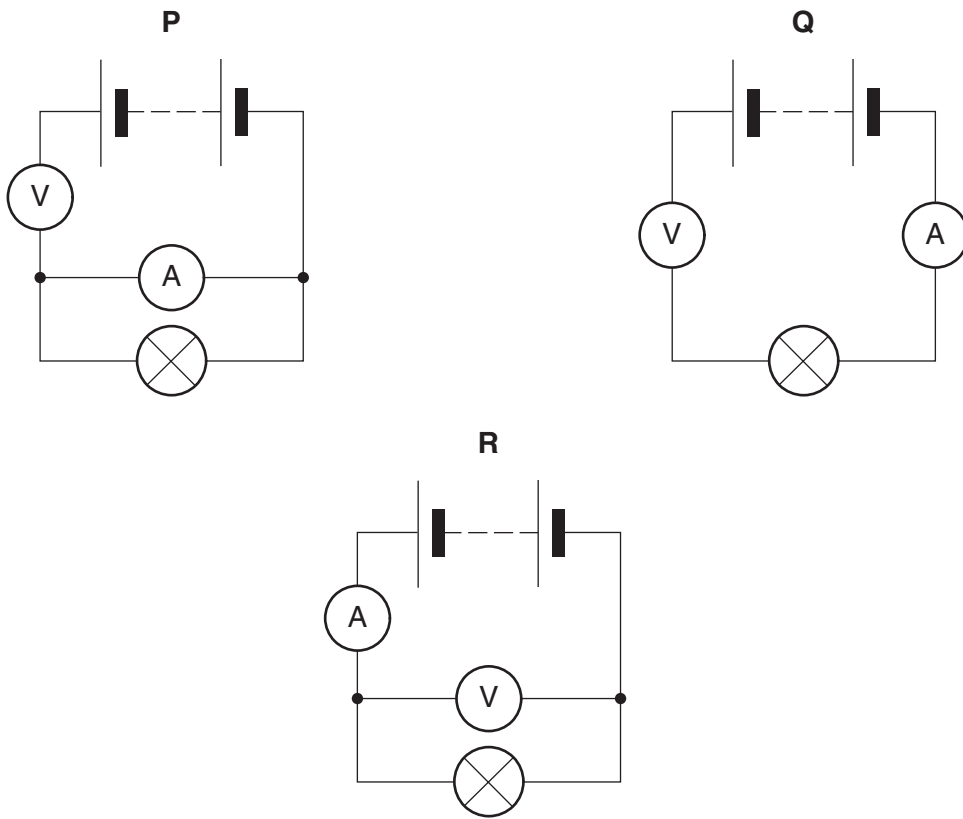
(a) Which circuit, **P**, **Q** or **R**, is correct for measuring the current through the lamp and the voltage across the lamp?

answer .... [1]

(b) Put a (ring) around the word which means the same as potential difference.

charge   **current**   **power**   **voltage**
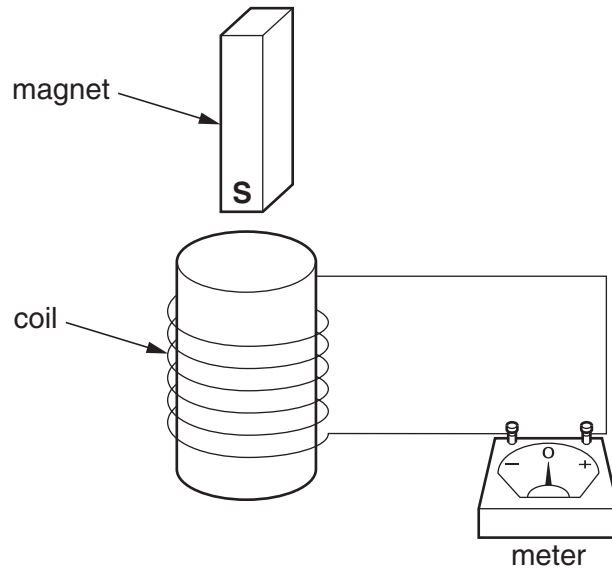
[1]

[Total: 2]

[Turn over

7 Electricity can be generated by moving a magnet in a coil of wire.

The diagram shows a magnet held above a coil of wire.

Experiments with this apparatus can show how the electricity is generated.

(a) Draw a straight line from each **experiment** to **what happens on the meter**.

The first line has been done for you.

experiment   **what happens on the meter**

push the South end of the magnet into the coil

needle flicks to right

pull the South end of the magnet out of the coil

needle does not move

push the North end of the magnet into the coil

needle flicks to left

hold the magnet still in the coil

[3]

(b) What is the name for this method of producing a voltage?

Put a (ring) around the correct answer.

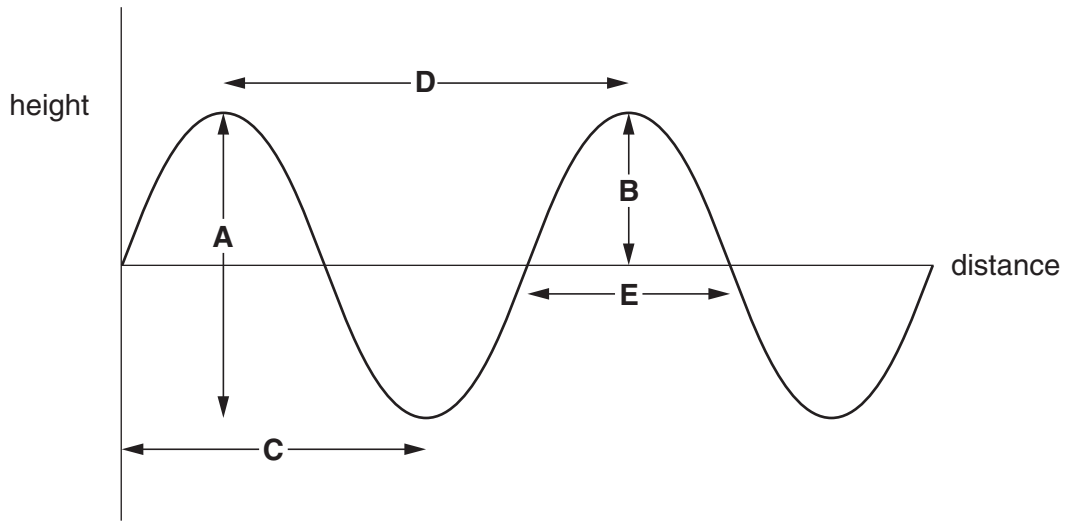**deduction   induction   reduction   transformation**

[1]

[Total: 4]

[Turn over

8   Water waves and sound waves are different.

(a) This is a diagram of a water wave.

(i)   Which letter, **A**, **B**, **C**, **D** or **E**, shows the amplitude of the wave?

answer ....

(ii)   Which letter, **A**, **B**, **C**, **D** or **E**, shows the wavelength of the wave?

answer ....
[2]

(b) Sound waves are shown differently.
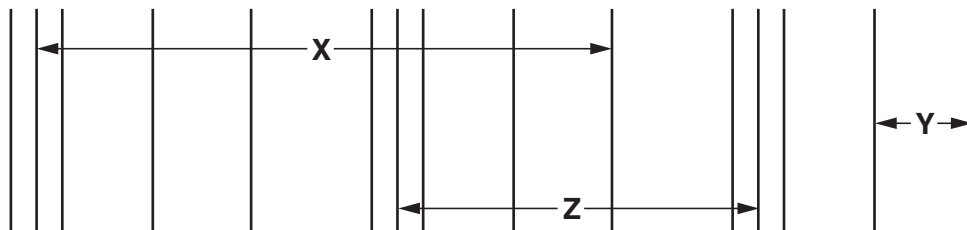
Which letter, **X**, **Y** or **Z**, shows a wavelength?

answer .... [1]

(c) Draw a straight line from each **name** to its **wave type** and

draw another straight line from each **name** to its **description**.

wave type	**name**	**description**

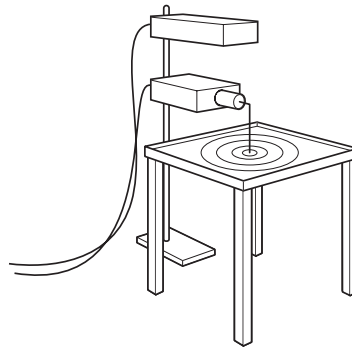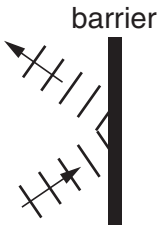| | | particles move at right angles to wave direction |
transverse	sound wave	
		particles move in same direction as wave
longitudinal	water wave	
		particles do not move at all

[2]

[Total: 5]
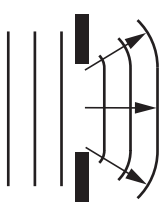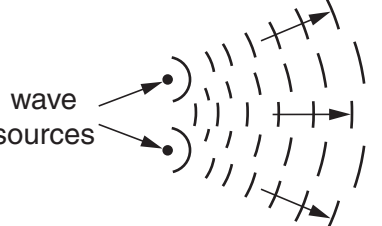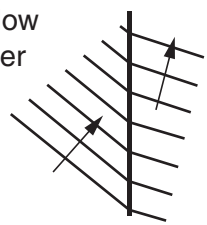
9 Susan is experimenting with water waves in a ripple tank.

She draws some diagrams to show different wave properties.

Draw a straight line from each **diagram** to the **wave property** it shows.

diagram	**wave property**

refraction

interference

reflection

diffraction

[3]

[Total: 3]

10 Information can be sent using analogue or digital signals. Here are four different signals.

A ∿∿∿∿∿∿∿

B ⊓⊓⊔⊓⊔⊔⊓⊓

C ∿∿∿

D ∿∿∿∿∿∿∿
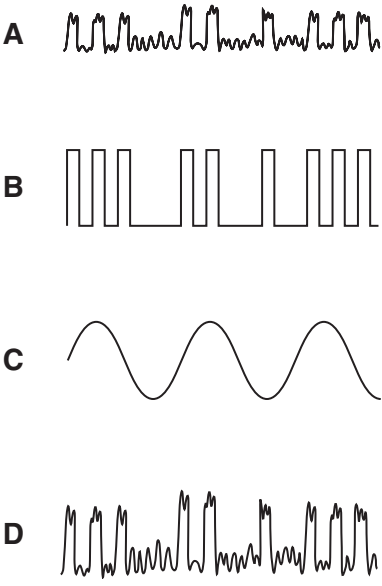
(a) Which diagram, **A**, **B**, **C** or **D**, shows an analogue signal?

answer .... [1]

(b) Which diagram, **A**, **B**, **C** or **D**, shows a digital signal with no noise?

answer .... [1]

(c) Signal **D** is the **output** from an amplifier. Which diagram, **A**, **B** or **C**, shows the input signal to the amplifier?

answer .... [1]

[Total: 3]

[Turn over

11 Here are different parts of the electromagnetic spectrum.

gamma radiation

infrared

microwaves

radio waves

ultraviolet

visible light

X-rays

(a) Put the parts of the electromagnetic spectrum in order of **increasing wavelength**.

The first one has been done for you.

shortest wavelength	**gamma radiation**
longest wavelength	

[3]
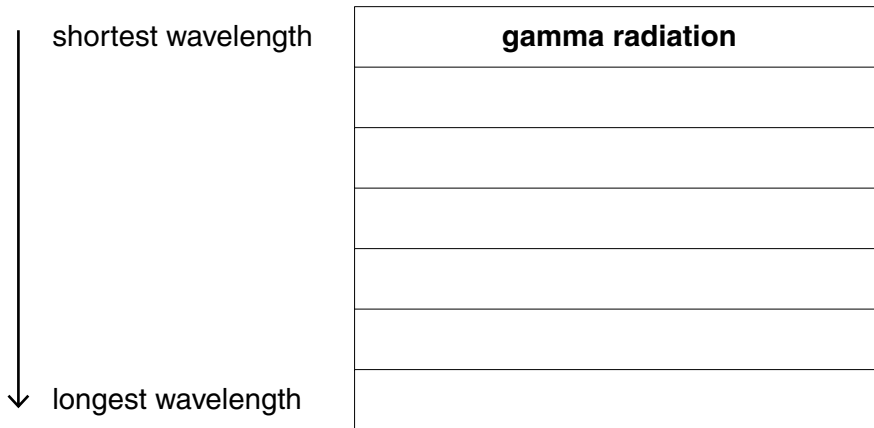
(b) Photons with the highest frequency have the most energy.

Write down the name of the part of the spectrum that has photons with the most energy.

answer .... [1]

[Total: 4]

END OF QUESTION PAPER

1 A driver in a car experiences forces in different directions as he drives forwards.
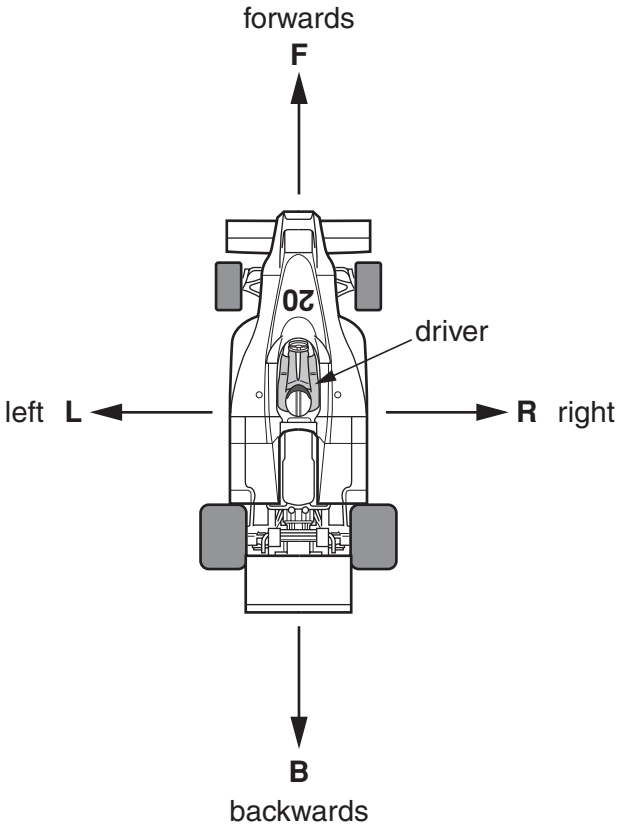
(a) (i) The car speeds up in a straight line.

Which force, **F**, **R**, **L** or **B**, does the car exert **on the driver**?

answer .... [1]

(ii) The car slows down **and** turns left.

Which two forces, **F**, **R**, **L** or **B**, does the car exert **on the driver**?

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

(b) The car speeds up in a straight line.

Which force, **F**, **R**, **L** or **B**, does the driver exert **on the car**?

answer .... [1]

[Total: 4]

[Turn over

2 Bobby throws a ball vertically in the air.

(a) The ball weighs 10 N.

(i) How much gravitational potential energy is gained by the ball when it goes up 2.5 m?

Put a (ring) around the correct answer.

0.04 J   **2.5 J**   **4 J**   **25 J**   **40 J**   **250 J**

[1]

(ii) At the top of the throw the ball is stationary.

As the ball falls it loses gravitational potential energy, transferring it to kinetic energy.

Which equation correctly shows the velocity of the ball when all the energy has transferred to kinetic energy?

Put a tick (✓) in the correct box.

$\text{velocity} = \sqrt{\dfrac{2 \times \text{energy}}{\text{mass}}}$ ☐

$\text{velocity} = \dfrac{\text{energy}}{\text{mass}}$ ☐

$\text{velocity} = \sqrt{\text{energy} \times \text{mass}}$ ☐

$\text{velocity} = \sqrt{\dfrac{2 \times \text{energy}^2}{\text{mass}}}$ ☐

[1]

(iii) The velocity is actually less than that calculated by the equation in part **(ii)**.

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

The mass increases as it falls.   ☐

The air resistance increases as it falls.   ☐

The momentum increases as it falls.   ☐

The energy increases as it falls.   ☐

[1]

(b) Gravity is the force pulling the ball down as it falls towards the ground.
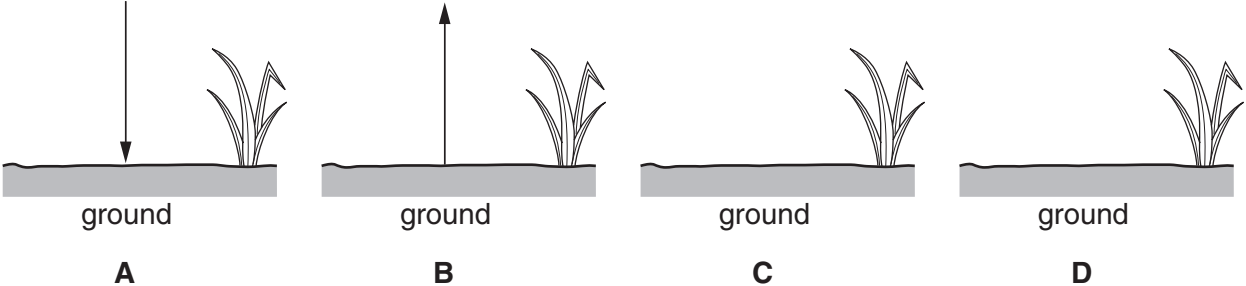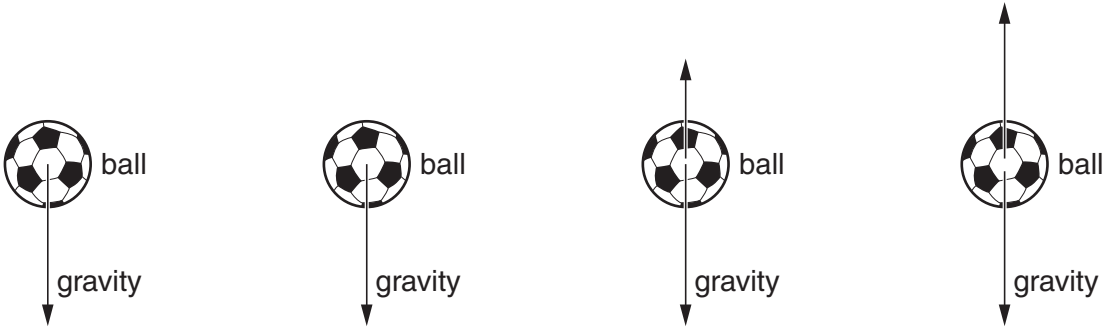
The gravity force is one half of an interaction pair.

Which of these diagrams, **A**, **B**, **C** or **D**, correctly shows both forces of the interaction pair?

answer .... [1]

[Total: 4]

[Turn over

3
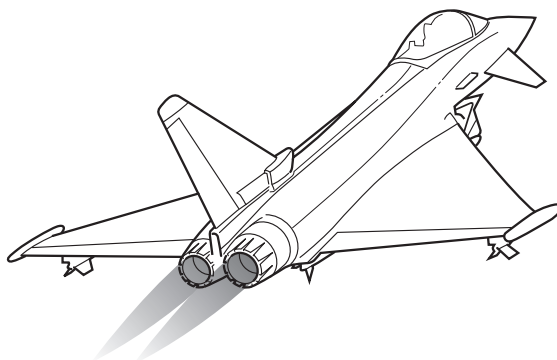
A jet plane works by firing a stream of hot exhaust gas particles backwards.

(a) Some of the following statements are true and some are false. Complete the table with either **true** or **false**.

	true or **false**
The force on each gas particle equals the momentum of the jet plane.	
The change in momentum of the exhaust gas particles equals the change in momentum of the plane, ignoring air resistance.	
The force on one gas particle equals the total force on the jet plane.	
The change in momentum of the gas particles equals the force on the plane multiplied by the time for which it acts.	

[2]

(b) Which of the following would be needed to calculate the momentum of the **exhaust gases**?

Put a tick (✓) in each correct box.

mass of a single exhaust gas particle ☐

weight of jet engine ☐

number of exhaust gas particles ☐

velocity of exhaust gas particles ☐

force due to gravity ☐

temperature of jet engine ☐

[3]

[Total: 5]

4 Electricity can be generated by moving a magnet in a coil of wire.

The diagram shows a magnet held above a coil of wire.

Experiments with this apparatus can show how the electricity is generated.

(a) Draw a straight line from each **experiment** to **what happens on the meter**.

The first line has been done for you.

experiment   **what happens on the meter**

| push the South end of the magnet into the coil |
| pull the South end of the magnet out of the coil |
| push the North end of the magnet into the coil |
| hold the magnet still in the coil |

| needle flicks to right |
| needle does not move |
| needle flicks to left |

[3]

[Turn over

(b) What is the name for this method of producing a voltage?

Put a (ring) around the correct answer.

deduction   **induction**   **reduction**   **transformation**

[1]

[Total: 4]

5

Thomas Edison was the first person to set up a company to provide electricity to houses. He used a direct current (d.c.) supply.

(a) We now use an alternating current (a.c.) electricity supply.

Explain why we use a.c. and not d.c.

Put ticks (✓) in the boxes next to the **two** correct explanations.

d.c. is old fashioned ☐

it is easier to generate a.c. ☐

Thomas Edison was unpopular so people would not buy his d.c. electricity ☐

a.c. can be distributed more efficiently ☐

d.c. is more expensive because it can only travel in straight lines ☐

[2]

(b) The main advantage of Thomas Edison's d.c. system was that it used low voltages.

He thought this was safer than a.c.

What is the voltage used for the mains supply to homes in the United Kingdom?

Put a (ring) around the correct answer.

12V   120V   230V   11 000V   33 000V

[1]

[Total: 3]

[Turn over

6 This question is about resistors in a series circuit.
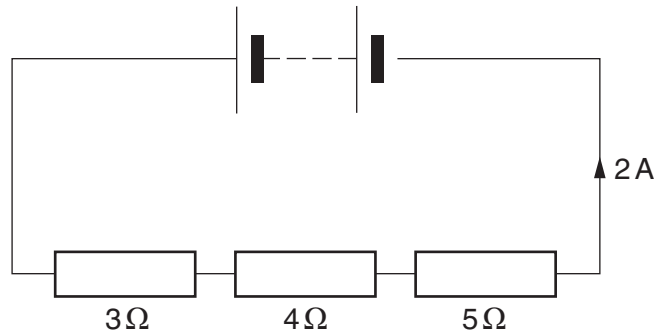
(a) What is the voltage across the 3Ω resistor?

voltage = ... V [1]

(b) Which resistor will have the highest voltage across it?

Put a (ring) around the correct answer.

3Ω   **4Ω**   **5Ω**   **all the same**

[1]

(c) Which statements describe how to find the voltage across the battery?

Put a tick (✓) in each of the **two** correct boxes.

find the total resistance and divide by the current ☐

add the voltage across each of the resistors together ☐

multiply the voltage across each resistor by its resistance ☐

multiply the current by the total resistance ☐

divide each resistance by the current and add the answers together ☐

[2]

[Total: 4]

7 Sarah has been doing various electrical tests.

Unfortunately she forgot to label the axes (*x* and *y*) on her graphs.

A

B

C

D

E
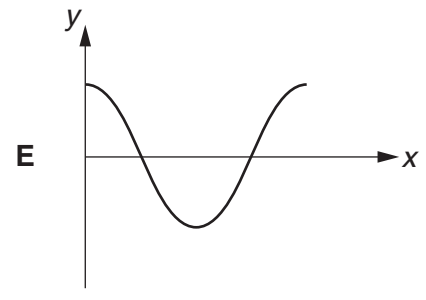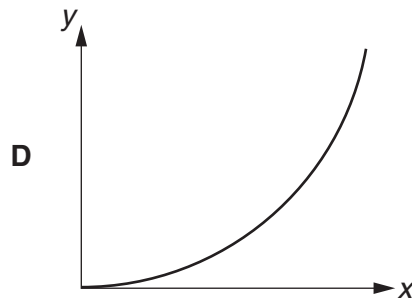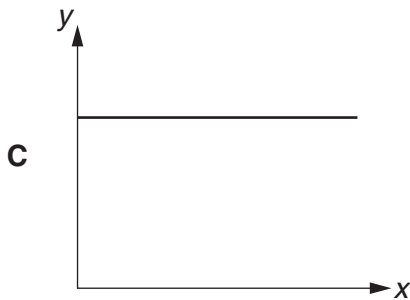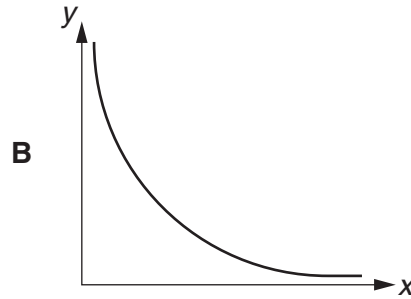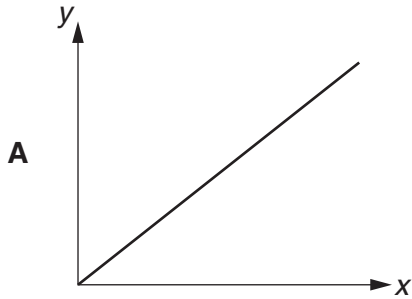
Write down the letter, **A**, **B**, **C**, **D** or **E**, of the graph that best fits each experiment.

Graphs may be used once, more than once or not at all.

(a) How the resistance of an LDR (*y*) changes with light intensity (*x*).

answer .... [1]

(b) How the current (*y*) varies with the voltage (*x*) when the resistance does not change.

answer .... [1]

(c) How the voltage across the coil of an a.c. generator (*y*) changes with time (*x*).

answer .... [1]

(d) How the resistance of a thermistor (*y*) changes with temperature (*x*).

answer .... [1]

(e) The brightness of a lamp (*y*) connected to a battery as the length of the connecting wires (*x*) is decreased.

answer .... [1]

[Total: 5]

[Turn over

8   Here are different parts of the electromagnetic spectrum.

gamma radiation

infrared

microwaves

radio waves

ultraviolet

visible light

X-rays

(a) Put the parts of the electromagnetic spectrum in order of **increasing wavelength**.

The first one has been done for you.

shortest wavelength →	**gamma radiation**
longest wavelength →	

[3]
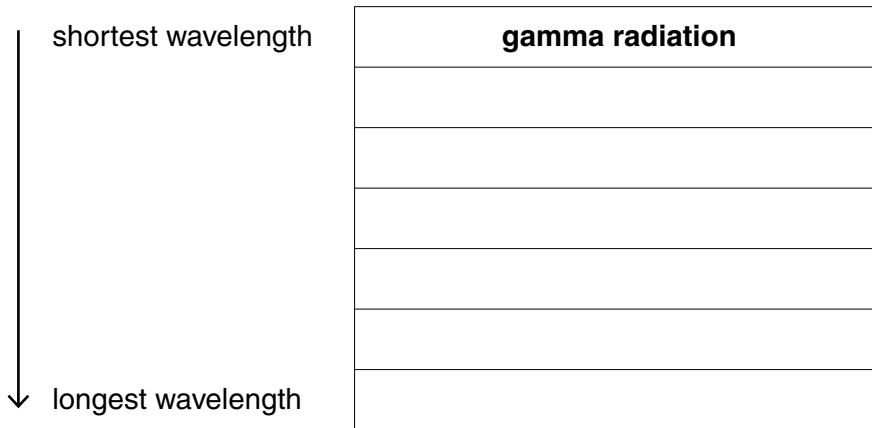
(b) Photons with the highest frequency have the most energy.

Write down the name of the part of the spectrum that has photons with the most energy.

answer .... [1]

[Total: 4]

9   Waves can refract, diffract and interfere.

Each of the observations below can be explained by one of these processes.

Use straight lines to connect each **observation** to its correct **process** and each **process** to its correct **explanation**.

observation	process	explanation

TV signals received from behind a hill	refraction	waves add as they pass through each other
	diffraction	waves spread out from the edge of a barrier
spectrum formed by a prism	interference	waves change speed at a boundary

[4]

[Total: 4]

[Turn over

10 Hermione reads a passage about transmitting information. The diagrams of waves are missing from the passage.

Choose the **best** wave diagram to use for each missing diagram in the passage.

Write down the letter, **A**, **B**, **C**, **D**, **E** or **F**, for each diagram.

Diagrams may be used once, more than once or not at all.

The last one has been done for you.

A **D**

B **E**

C **F**
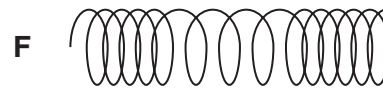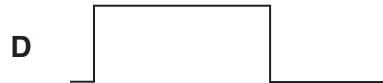
A sound wave is an analogue wave.

diagram ……………   [1]

The sound wave is converted into a digital code.

The digital signal is sent as a series of short pulses.

diagram ……………   [1]

Digital signals can be transmitted with higher quality than analogue signals.

As the signal is transmitted, it decreases in intensity and picks up noise.

diagram ……………   [1]

When the signal is received it is amplified.

diagram ……………   [1]

The signal is cleaned up to remove the noise.

diagram ……………   [1]

The digital signal is then decoded to reproduce the original sound wave.

diagram ……*C*……

[Total: 5]

END OF QUESTION PAPER

mock papers 3-foundation

1. The photograph shows a crashed car.
    A car crash is often caused because the driver cannot stop in a short enough distance.

    (a) Which of these increases the stopping distance of a car?
         Tick (✓) the **three** correct conditions.

condition	increases stopping distance?
car full of passengers	
driving slower	
good brakes	
icy roads	
worn tyres	

    (3)

    (b) What happens to the reaction time of a driver as he gets tired?

    ....
    (1)   Q1

    (Total 4 marks)

Turn over

2. Emilio is discussing climate change with his grandmother

'I think the power stations are to blame'

'Not the nuclear ones, Gran. They make clean energy!'

'How can nuclear power stations be clean? They are so dangerous.'

(a) Complete the sentence below by putting a cross (☒) in the correct box.

To produce energy, nuclear fuel is

bombarded ☒

burned ☒ with neutrons.

heated ☒

(1)

(b) A nuclear power station uses fuel and produces energy.
Draw one straight line from each box on the left to the correct box on the right.

The fuel used is	heat.
The energy produced is	oil.
	uranium.

(2)

(c) Complete the sentence below by putting a cross (☒) in the correct box.
The energy produced is changed into electrical energy.

transformer. ☒

This is done using a   turbine and a generator. ☒

turbine and a motor. ☒

(1)

(d) Suggest a reason why nuclear power stations are dangerous.

....

....
(1)

(e) Suggest why nuclear power stations produce clean energy.

....

....
(1)

(f) It is important to dispose of the waste from a nuclear power station safely.
Explain how this can be done.

....

....
(1)   **Q2**

(Total 7 marks)

Turn over

3. The diagram shows how a radioactive source is used in a smoke alarm.

smoke detector
radioactive source
electrode
electrode
shielding
1 cm gap
current
current
connections to alarm
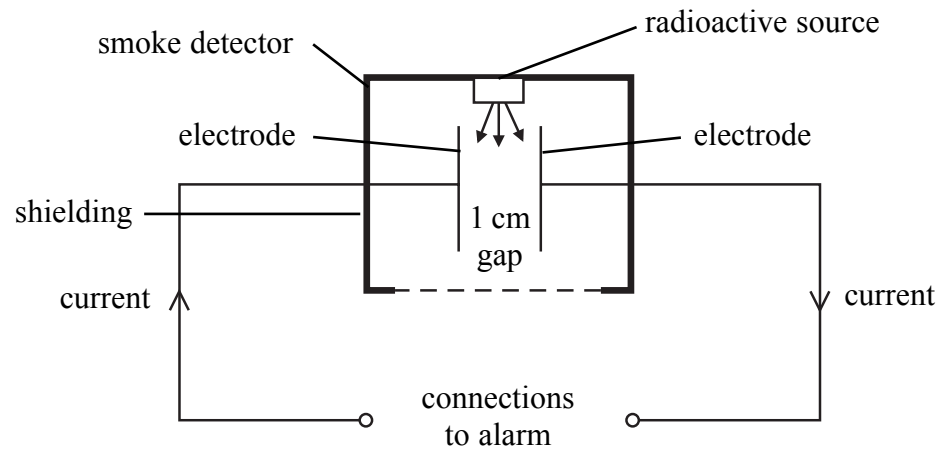
(a) Complete each sentence to explain how a smoke alarm works.
Put a cross (☒) in each correct box.

electrolyses the air. ☒

(i) The radiation emitted by the source   ionises the air. ☒

neutralises the air. ☒

(1)

(ii) As a result, charge flows across the gap and there is a current in the circuit.

bigger. ☒

When there is a fire, the smoke makes this current   smaller. ☒

the same. ☒

(1)

alpha particles. ☒

(iii) The source used in a smoke alarm emits   beta particles. ☒

gamma rays. ☒

(1)

(b) The smoke alarm only needs thin shielding.
Explain why.

....

....

(1)   **Q3**

(Total 4 marks)

Turn over

4.

Shelley Woods is a champion wheelchair athlete.

In 2007 she won the 400 m race in Pratteln, Switzerland for Great Britain.

The graph shows how her speed changed during the race.
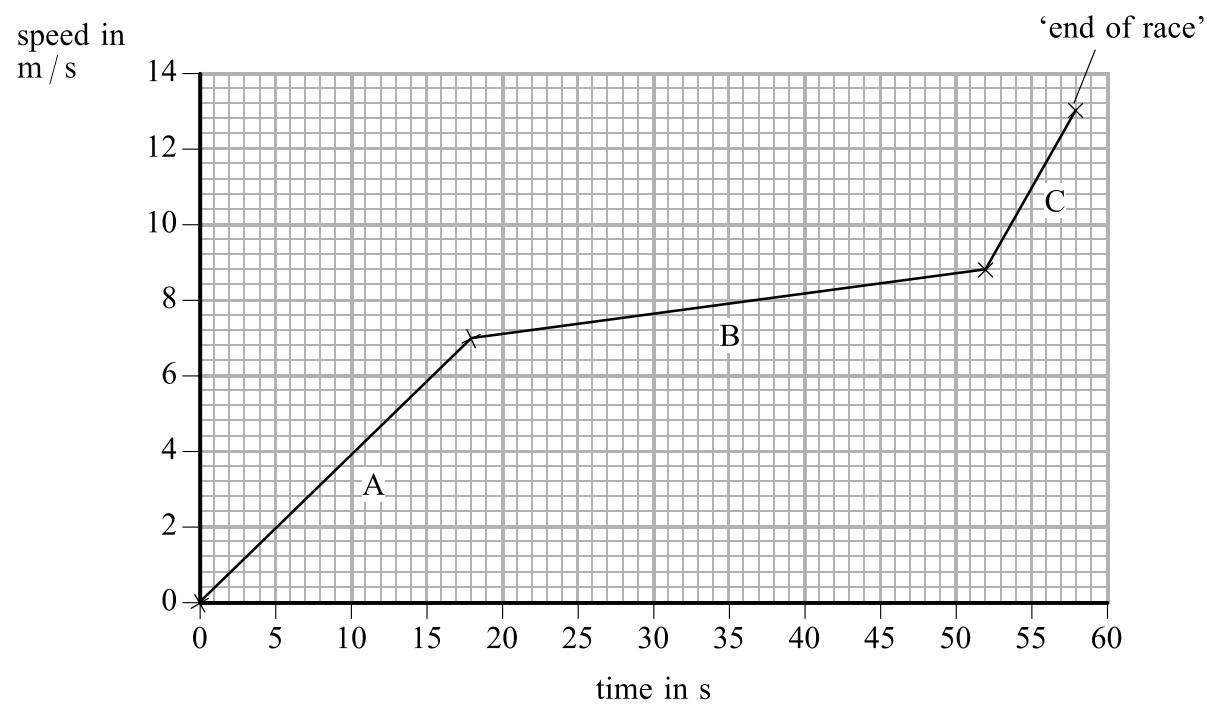
(a) How long did Shelley take to complete the race?

time = ...s

(1)

(b) Calculate Shelley's average speed in m/s.

average speed = ... m/s

(2)

(c) In which section, A, B or C, did Shelley have the greatest acceleration?

....

(1)

(d) Shelley and her wheelchair have a combined mass of 80 kg.
Calculate their maximum kinetic energy during the race.

kinetic energy = ...J

(2)   Q4

(Total 6 marks)

Turn over

5. The photograph shows Mposi using a flexible hose to refuel an aircraft.
The hose is made of an insulator.
The fuel is also an insulator.

(a) After a while the hose becomes negatively charged.

Explain how.

....

....

....

(2)

(b) Explain why this could be dangerous.

....

....

(1)

(c) Mposi overcomes this danger by connecting wires to the hose and the plane.

Explain what now happens to the charge.

....

....

....

....

(2)

Q5

(Total 5 marks)

6. Fifty years ago, many shoe shops had X-ray machines.
The photograph shows one of these.

- They were used to check how well shoes fitted.

- Customers stood with their feet in the bottom and viewed the fluoroscope screen at the top.

- The fluoroscope screen emitted light where it was hit by the X-rays.

- Customers could then see an image of their toes move inside the shoes.

(a) Many children would stay on the machine as long as they could.
Suggest why parents allowed children to stay on the machine.

....

....

(1)

(b) X-ray fluoroscopes are now banned for use in shoe shops.
Suggest why.

....

....

(1)

(c) Modern X-ray fluoroscopes are used by doctors to diagnose and treat some illnesses.

(i) Suggest why doctors are allowed to use X-ray fluoroscopes.

....

....

(1)

(ii) Suggest an advantage of using an X-ray fluoroscope instead of a normal X-ray machine.

....

....

(1) **Q6**

(Total 4 marks)

TOTAL FOR PAPER: 30 MARKS

END

mock papers 4-higher

1.

The photograph shows Mposi using a flexible hose to refuel an aircraft. The hose is made of an insulator. The fuel is also an insulator.

(a) After a while the hose becomes negatively charged.
Explain how.

....

....

....

(2)

(b) Explain why this could be dangerous.

....

....

(1)

(c) Mposi overcomes this danger by connecting wires to the hose and the plane.

Explain what now happens to the charge.

....

....

....

....

(2)

Q1

(Total 5 marks)

Turn over

2. Fifty years ago, many shoe shops had X-ray machines.
The photograph shows one of these.

- They were used to check how well shoes fitted.

- Customers stood with their feet in the bottom and viewed the fluoroscope screen at the top.

- The fluoroscope screen emitted light where it was hit by the X-rays.

- Customers could then see an image of their toes move inside the shoes.

(a) Many children would stay on the machine as long as they could.
Suggest why parents allowed children to stay on the machine.

....

....

(1)

(b) X-ray fluoroscopes are now banned from use in shoe shops.
Suggest why.

....

....

(1)

(c) Modern X-ray fluoroscopes are used by doctors to diagnose and treat some illnesses.

(i) Suggest why doctors are allowed to use X-ray fluoroscopes.

....

....

(1)

(ii) Suggest an advantage of using an X-ray fluoroscope instead of a normal X-ray machine.

....

....

(1) Q2

(Total 4 marks)

3. Headrests are used in cars to prevent whiplash injuries.
They are tested using crash dummies. The headrests can be moved vertically and horizontally.
Here are some results.
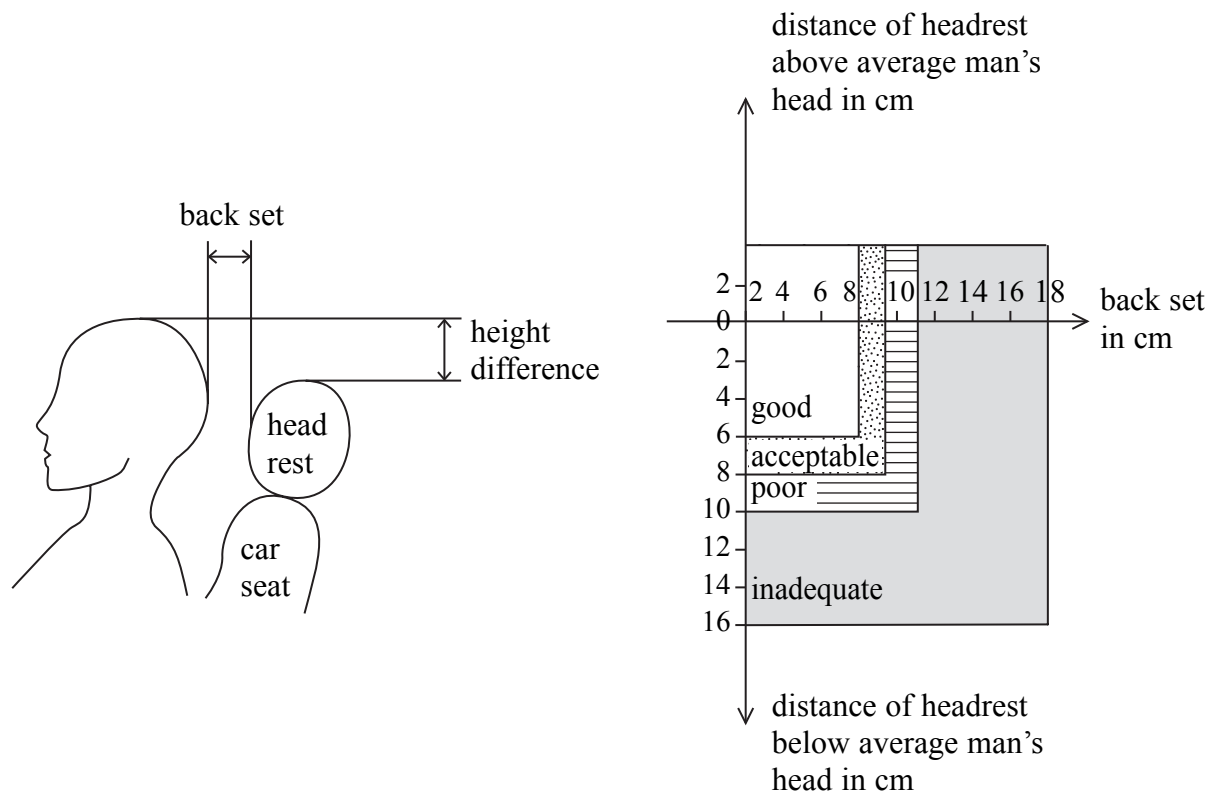
(a) (i) State **two** ways which the headrest should be adjusted for a tall person.

1 ....

....

2 ....

....

(2)

(ii) Explain why.

....

....

(1)

(b) Recent research suggests that when a driver gets a new safety feature such as ABS brakes he drives **less** carefully.
Suggest a reason why.

....

....

....

....

(1)

(c) With reference to momentum, explain how the crumple zone in a car protects the driver in a crash.

....

....

....

....

....

(2) Q3

(Total 6 marks)

Turn over

4. Tritium $_{1}^{3}$H is an isotope of hydrogen (hydrogen-3).

(a) (i) Explain what is meant by an isotope.

....

....

....

(1)

(ii) Tritium decays by emitting beta particles.
Explain why tritium cannot emit alpha particles.

....

....

....

(1)

(b) The photograph shows a glow stick key ring.

- It consists of a sealed, thick glass tube containing tritium gas.

- The inside of the tube is coated with a phosphor.

- The phosphor emits light when beta particles hit it.

Explain why these key rings are safe to handle.

....

....

....

(1)

(c) The graph shows how the activity of the tritium in the glow stick varies with time.
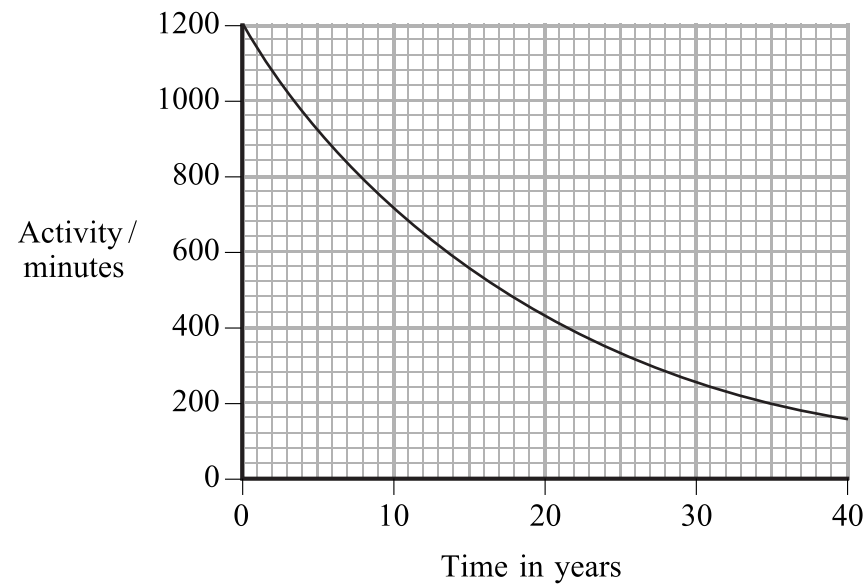
(i) Explain what is meant by half-life.

....

....

(1)

(ii) Use the graph to estimate the half-life of tritium.
Show your working clearly.

half life = ...

(2)

(d) The manufacturers claim that the glow sticks will remain useful for more than 20 years.
The minimum activity required for the glow sticks to work is 400 counts per minute.
Evaluate the reliability of this claim.

....

....

....

(1)   Q4

(Total 7 marks)

Turn over

5. The diagram shows Frank and Simon playing with a flat sledge on an ice rink.
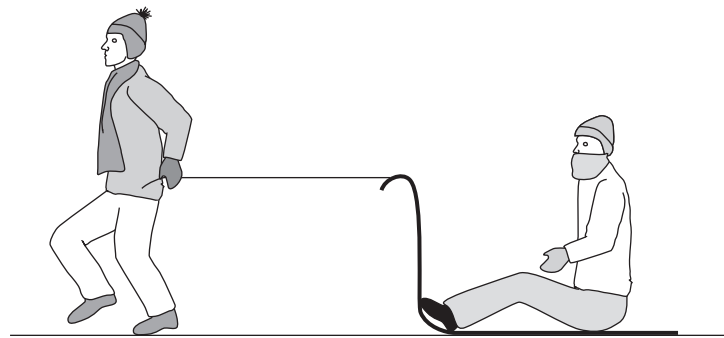
(a) At first, Simon pulls Frank at a constant speed of 1.2 m/s for 6 m with a horizontal force of 35 N.

(i) Calculate the momentum of Frank and the sledge if their combined mass is 38 kg.
State the unit.

momentum =..
(3)

(ii) Calculate how much useful work Simon has done.

work done =..J
(2)

(b) Simon pulls Frank quickly round in a circle.
The diagram below shows 'bird's eye view' snapshots of the sledge as Simon pulls it round.

path taken by sledge
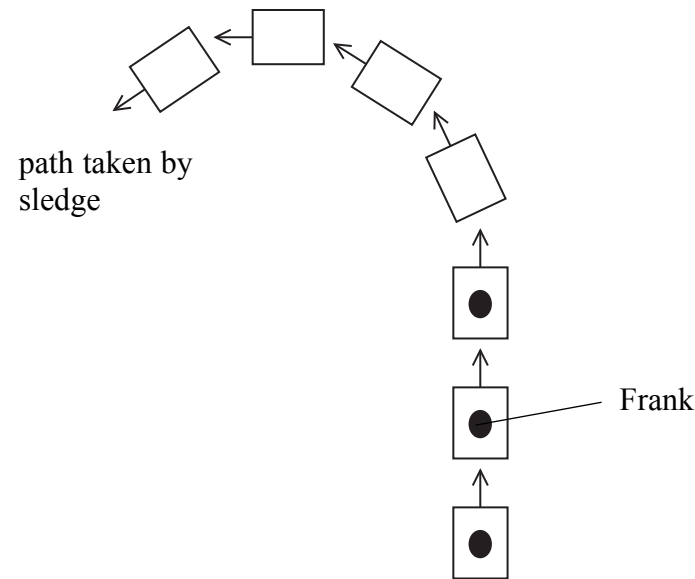
Frank

(i) State and explain what happens to Frank as the sledge moves quickly around in a circle.
You may add to the diagram if this makes your answer clearer.

....

....

....

(2)

(ii) When it is Simon's turn, he sits inside a large empty cardboard box instead of on the flat sledge.
The box is pulled quickly around in a circle by Frank.
What happens to Simon?

....

....

(1)

Q5

(Total 8 marks)

TOTAL FOR PAPER: 30 MARKS

END

1 An aeroplane in flight has four forces, **A**, **B**, **C** and **D**, acting on it.
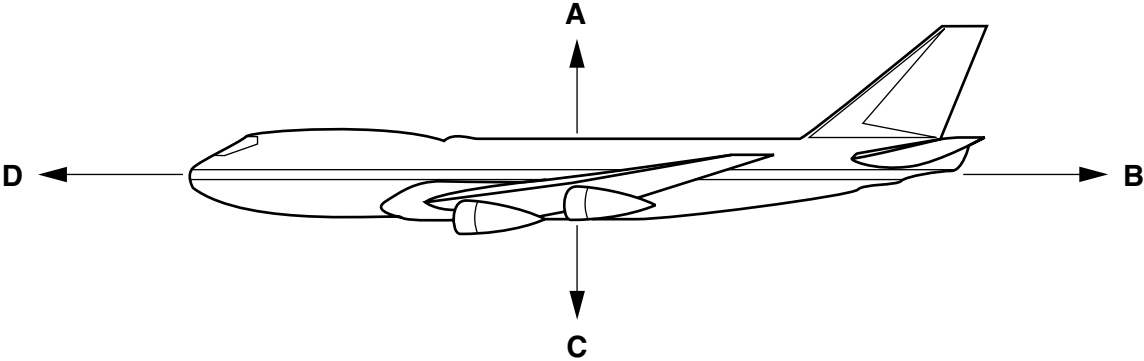
(a) For each of the following put a (ring) around the correct force **A**, **B**, **C** or **D**.

    (i) Which force is gravity?   **A**   **B**   **C**   **D**

    (ii) Which force is the driving force?   **A**   **B**   **C**   **D**

    (iii) Which force is air resistance?   **A**   **B**   **C**   **D**

[3]

(b) The plane flies at a steady speed and height.

Which two pairs of forces will be equal in size?

Put ticks (✓) in the boxes next to the **two** correct answers.

A and **B** ☐

A and **C** ☐

A and **D** ☐

B and **C** ☐

B and **D** ☐

C and **D** ☐

[2]

(c) When the plane comes into land it gets slower and drops toward the ground.

Complete the following sentence by writing the letter of the missing force.

Force **D** must be smaller than force ....

[1]

(d) Choose words from this list to answer the following questions.

<div align="center">

electrical

gravitational potential

heat

kinetic

light

</div>

   (i) The plane has energy because it is moving.

      What is this energy called? .... [1]

   (ii) As the plane descends towards the ground at a steady speed it loses energy.

      What type of energy is lost? .... [1]

(e) The plane travels 600 miles in 3 hours.

What is its average speed?

Put a (ring) around the correct answer.

    200 mph   **603 mph**   **597 mph**   **1800 mph**

[1]

[Total: 9]

Turn over

2 A sprinter runs a 100 m race.
The graph shows how his speed changed during the race.

(a) The highest speed of the sprinter was 12 m/s.

Which two of the following statements together explain why the average speed was less than 12 m/s.

Put ticks (✓) in the **two** boxes next to the correct answers.

The sprinter's speed was 12 m/s only for the last part of the race. ☐

The sprinter gets tired at the end of the race. ☐

The sprinter increases his speed at the beginning of the race. ☐

The sprinter moves at a constant speed of 10 m/s. ☐

[2]

(b) Which of the following is the best meaning of instantaneous speed?

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

A very quick speed. ☐

An average speed over a very short time. ☐

A constant speed. ☐

[1]

(c) Which of the following graphs **A**, **B**, **C** and **D** could be the distance time graph for the sprinter during the last part of the race?

A

distance

0   6

time

B

distance

0   6

time

C

distance

0   6

time

D

distance

0   6

time

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

[Total: 4]

Turn over

3 Jilly is investigating how resistors affect electric circuits.

(a) She builds a series circuit.
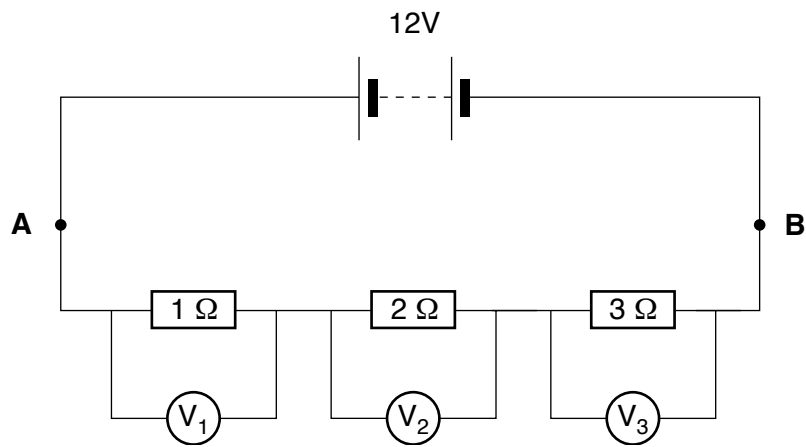
(i) The current at **A** is 2 Amps.

What is the current at **B**?

Put a (ring) around the correct answer.

    0 A   **2 A**   **4 A**   **6 A**   **12 A**

                                                        [1]

(ii) What is the potential difference between **A** and **B**?

Put a (ring) around the correct answer.

        4 V   **6 V**   **12 V**   **36 V**

                                                          [1]

(iii) Which voltmeter will show the highest voltage?

Put a (ring) around the correct answer.

        V₁   **V₂**   **V₃**

                                                          [1]

(iv) Jilly makes some notes about voltage.

Only two of her notes are correct.

Put ticks (✓) in the **two** boxes next to the correct notes.

The voltage is the flow of charge in the circuit. ☐

The voltage of the battery measures the push it gives charges. ☐

The bigger the voltage across a resistor the more energy is lost by a charge going through it. ☐

The voltage measures the total resistance in the circuit. ☐

[2]

(b) Jilly now builds a parallel circuit.
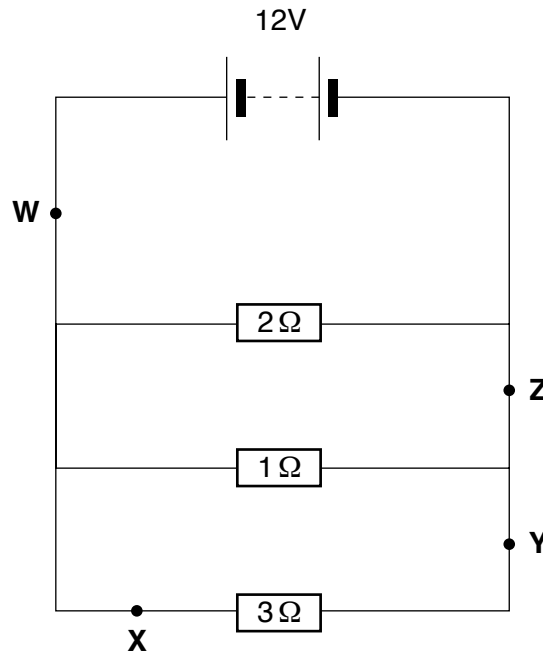
(i) Where is the current the largest in the parallel circuit, **W**, **X**, **Y or Z**?

Put a ring around the correct answer.

W   **X**   **Y**   **Z**

[1]

(ii) Which resistor will have the largest electric current flowing through it?

Put a ring around the correct answer.

1Ω   **2**Ω   **3**Ω

[1]

[Total: 7]

Turn over

4 James is building a fire alarm.

He wants his alarm to detect light and heat.

He decides to use an LDR and a thermistor in his circuit.

(a) Complete the sentence by choosing the best words from the list.

<div align="center">

decreases

does not change

increases

speeds up

stops

</div>

The resistance of the thermistor decreases when the temperature .... **[1]**

(b) Draw a straight line from each **component** to its **circuit symbol**.

[2]

[Total: 3]

5   Barry suggests a model of an electric circuit.

The **people** pick up bags of sugar from the **energy store**.

The **narrow corridor** is hard to get through. It gets very warm as people struggle through it.

The **checker** uses a stopwatch to measure the rate that the people pass him.

corridor

energy store

checker
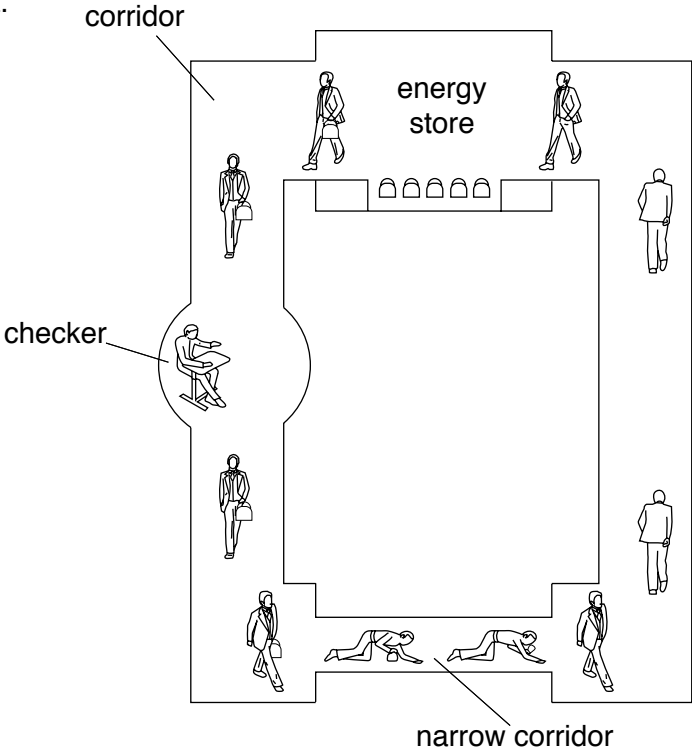
narrow corridor

The boxes show parts in the model and parts in an electric circuit.
Draw a straight line from each **part in the model** to the correct **part in an electric circuit**.

part in the model

| narrow corridor |

| people |

| energy store |

| checker |

part in an electric circuit

| electrons |

| resistor |

| voltmeter |

| ammeter |

| battery |

[4]

[Total: 4]

Turn over

6 Tristram has a crystal hanging on his window.
The crystal produces visible light spectrums on his wall.
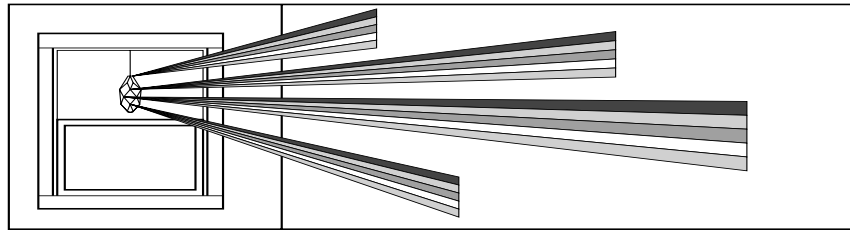
(a) A visible light spectrum is made up of different colours of light.

Which of the following are always different for different colours of light?

Put ticks (✓) in the boxes next to the **two** correct answers.

wavelength ☐

speed ☐

frequency ☐

amplitude ☐

intensity ☐

[2]

(b) Visible light is a type of electromagnetic radiation.

    (i) The electromagnetic spectrum includes visible light.

gamma	**A**	ultraviolet	**B**	infrared	**C**	radio

        Which letter **A**, **B** or **C** shows the position of visible light? ....

                                                                   [1]

    (ii) Which of the statements about visible light are true?

        Put ticks (✓) in the boxes next to the **two** correct statements.

            visible light travels at a very high speed   ☐

            visible light cannot travel through empty space   ☐

            visible light is not absorbed much by glass   ☐

            visible light has no photons   ☐

                                                              [2]

                                                   [Total: 5]

Turn over

7 Radio programmes in the United Kingdom are now broadcast as both analogue and digital signals.
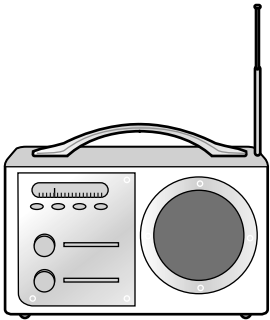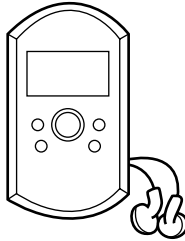
Analogue radio   Digital radio

(a) For each statement decide whether it applies to **analogue** signals, **digital** signals or **both**.

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

statement	analogue signals	digital signals	both analogue and digital
the signal varies in the same way as the original sound wave			
the signal is a code made up of **1**s and **0**s			
the signal is transmitted as an electromagnetic wave			
the signal is made up of short pulses			

[4]

(b) Complete the sentences by choosing the best word from this list.

aerial   **decoder**   **receiver**

(i) In an analogue radio a copy of the original sound wave is made by a

.... [1]

(ii) In a digital radio a copy of the original sound wave is made by a ....

[1]

[Total: 6]

8 Katie plays a domino game in a lesson about waves.

Each domino has a word and a meaning of a different word.

word
meaning of a different word
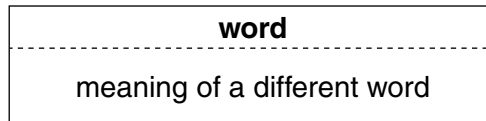
Dominos must be put down with the correct word **below** its meaning.

The first one has been done for you.

Frequency x wavelength is speed, so **F** is the domino placed below **A**.

Write the correct letter in the boxes beside the grey dominos.

A

amplitude
frequency x wavelength

F

speed
a wave bounces from a surface

B

diffraction
direction of a wave changes as it enters a different medium

C

interference
waves spread out from a narrow gap

D

reflection
two waves meet and their effects add together

E

refraction
the distance from the height of the wave to the undisturbed position

F

speed
a wave bounces from a surface

[4]

[Total: 4]

END OF QUESTION PAPER

1 A sprinter runs a 100m race.
The graph shows how his speed changed during the race.

(a) The highest speed of the sprinter was 12 m/s.

Which two of the following statements together explain why the average speed was less than 12 m/s.

Put ticks (✓) in the **two** boxes next to the correct answers.

The sprinter's speed was 12 m/s only for the last part of the race.　☐

The sprinter gets tired at the end of the race.　☐

The sprinter increases his speed at the beginning of the race.　☐

The sprinter moves at a constant speed of 10 m/s.　☐

[2]

(b) Which of the following is the best meaning of instantaneous speed?

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

A very quick speed.　☐

An average speed over a very short time.　☐

A constant speed.　☐

[1]

(c) Which of the following graphs **A**, **B**, **C** and **D** could be the distance-time graph for the sprinter during the last part of the race?

A

distance

0   6
time

B

distance

0   6
time

C

distance

0   6
time

D

distance

0   6
time

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

[Total: 4]

Turn over

2   There are four forces **A**, **B**, **C**, and **D**, acting on an aeroplane as it flies.
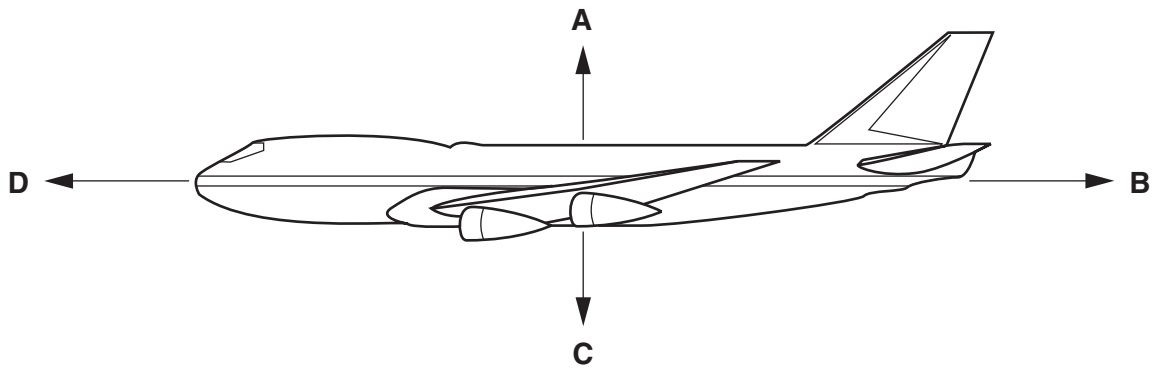
(a)   When the plane is flying at a steady speed and a constant height, which of the following combinations of forces must equal zero?

Put ticks (✓) in the boxes next to the correct answers.

A and **B**   ☐

A and **C**   ☐

A and **D**   ☐

B and **C**   ☐

B and **D**   ☐

C and **D**   ☐

[2]

(b) Each of the forces on the plane is one of an interaction pair.

One force of the interaction pair acts on the plane, the other force acts on a different object.

Draw a straight line from each **force on the plane** to the **object its interaction pair is acting on**.

force on the plane	object its interaction pair is acting on
A	exhaust particles from jet engine
B	the Earth
C	molecules of air
D	

[4]

(c) The table below has four statements about energy changes for the plane.

You must decide if the statement is correct when the plane is:

- taking off and climbing
- in level flight at a steady speed
- descending and landing

For each statement put ticks (✓) in the box or boxes that are correct for each statement.

	take off and climb	level flight	descent and landing
gains kinetic energy and gains gravitational potential energy	☐	☐	☐
work done by the engine is dissipated as heat	☐	☐	☐
energy is conserved	☐	☐	☐

[3]

[Total: 9]

Turn over

3 Jilly builds a circuit to test some ideas about voltage and current.

12V

A

1 Ω   2 Ω   3 Ω

B
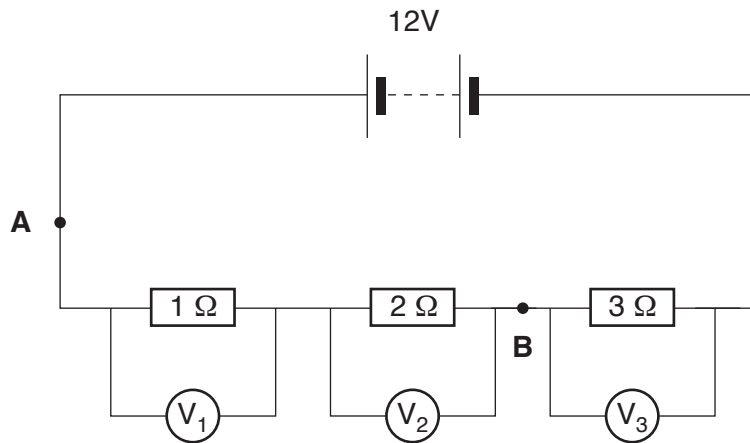
V_1 V_2 V_3

(a) Jilly records the voltmeter readings.

    (i) Which of the equations is correct?

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

$V_1 + V_2 + V_3 = \dfrac{12}{3}$ Volts ☐

$V_1 + V_2 + V_3 = 12$ Volts ☐

$V_1 + 2V_2 + 3V_3 = 12$ Volts ☐

$\dfrac{V_1 + V_2 + V_3}{3} = 12$ Volts ☐

[1]

    (ii) What will be the voltage between points **A** and **B**?

        Put a ⬭ring⬭ around the correct answer.

        1V   2V   4V   6V   8V   12V

[1]

    (iii) What is the current through the 2 Ω resistor?

        Put a ⬭ring⬭ around the correct answer.

        2 A   4 A   6 A   12 A   24 A

[1]

(b) Jilly adds another 12V battery **in parallel** with the first battery.
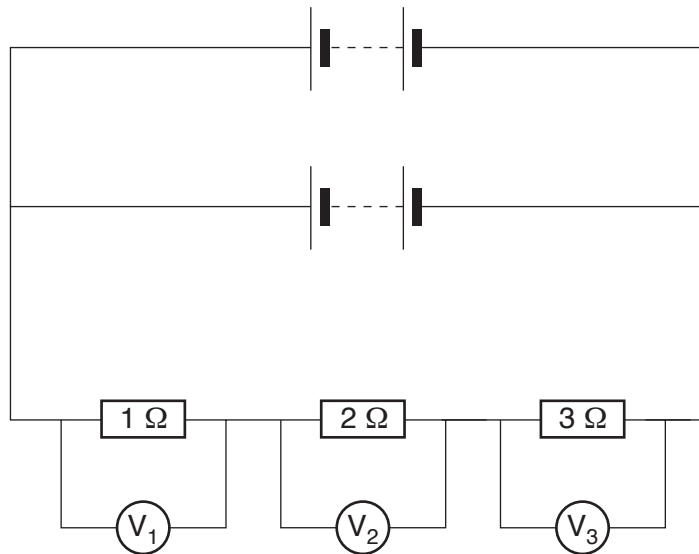
What effect will the additional battery have on the voltage across the resistors?

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

voltage increases but does not double

voltage doubles

no change to voltage

voltage halves

voltage decreases but does not halve

[1]

[Total: 4]

Turn over

4
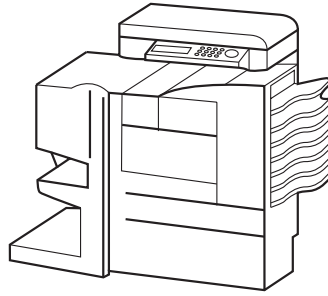
Photocopiers usually plug into the mains electrical supply.

But the internal workings need a variety of different voltages.

Transformers are used to change the voltages.

(a) Which of the following statements describe how a transformer works?

Put ticks (✓) in the **three** boxes next to the best answers.

A moving magnet induces a voltage in a coil of wire. ☐

Two separate coils of wire are wound around an iron core. ☐

A changing magnetic field is produced by a changing electric current. ☐

An iron core is a good conductor of electric current. ☐

A changing magnetic field induces a voltage in a coil of wire. ☐

The voltage is changed by the transformer but the electric current stays the same. ☐

[3]

(b) One transformer in a photocopier is used to produce 6000V from 600V.

The transformer has 100 coils on the 600V side.

(i) How many coils will the transformer have on the 6000V side?

Put a (ring) around the correct answer.

        10   **600**   **1000**   **6000**   **10 000**

[1]

(ii) Which formula would allow you to correctly calculate the number of coils?

Put ticks (✓) in the box next to the correct answers.

$$N_s = \frac{V_p}{V_s} + N_p \qquad \square$$

$$N_s = N_P \frac{V_p}{V_s} \qquad \square$$

$$N_s = N_P \frac{V_s}{V_p} \qquad \square$$

$$N_s = N_P + \frac{V_s}{V_p} \qquad \square$$

[1]

(c) The alternating current from the transformer is converted into a direct current.

The graphs show how different currents change with time.
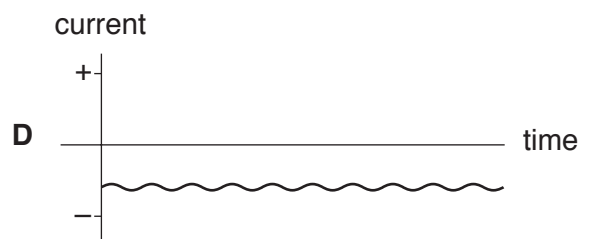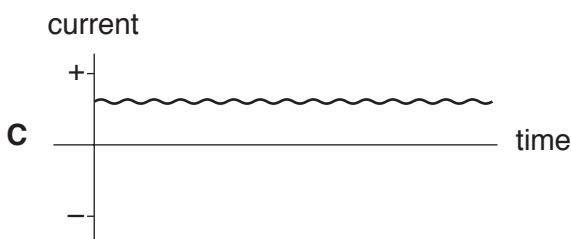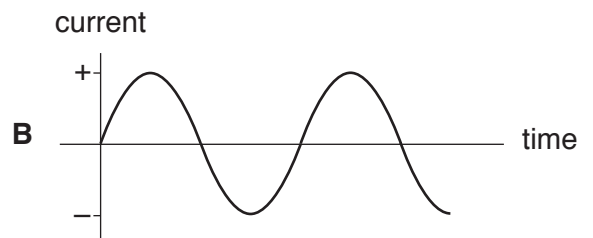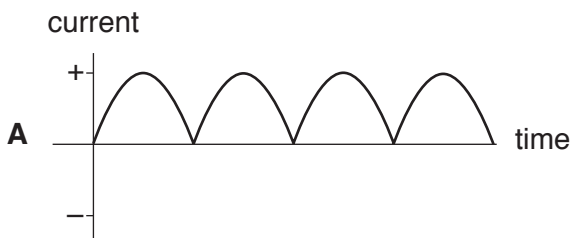
Which of the graphs **A**, **B**, **C** and **D**, show direct current?

Write down the letters of the graphs.

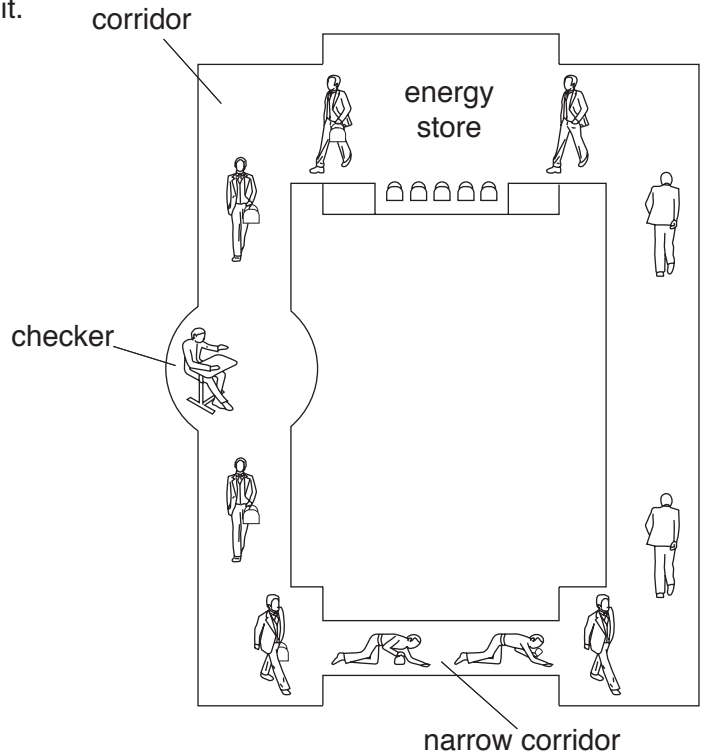graphs .... **[2]**

[Total: 7]

Turn over

[4]

5 Barry suggests a model of an electric circuit.

corridor

energy store

checker

narrow corridor

The **people** pick up bags of sugar from the **energy store**.

The **narrow corridor** is hard to get through. It gets very warm as people struggle through it.

The **checker** uses a stopwatch to measure the rate that the people pass him.

The boxes show parts in the model and parts in an electric circuit.
Draw a straight line from each **part in the model** to the correct **part in an electric circuit**.

part in the model

part in an electric circuit

electrons

narrow corridor

resistor

people

voltmeter

energy store

ammeter

checker

battery

[4]

[**Total: 4**]

6   Katie plays a domino game in a lesson about waves.

Each domino has a word and a meaning of a different word.

word
meaning of a different word
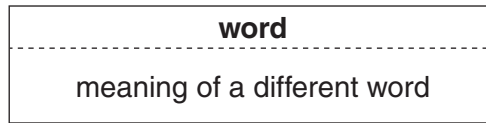
Dominoes must be put down with the correct word **below** its meaning.

The first one has been done for you.

Frequency x wavelength is speed, so **F** is the domino placed below **A**.

Write the correct letter in the boxes beside the grey dominoes.

A
amplitude
frequency x wavelength

F
speed
a wave bounces from a surface

B
diffraction
direction of a wave changes as it enters a different medium

C
interference
waves spread out from a narrow gap

D
reflection
two waves meet and their effects add together

E
refraction
the distance from the height of the wave to the undisturbed position

F
speed
a wave bounces from a surface

[4]

[Total: 4]

Turn over

7 This question is about different scientific models for light.

(a) Which of the following are evidence for the model that light is a wave?

Put ticks (✓) in the boxes next to the correct answers.

light travels at a very high speed ☐

two light beams can produce an interference pattern ☐

light reflects from mirrors ☐

light can be different colours ☐

light is diffracted through small slits ☐

[2]

(b) In the photon model a beam of light is a stream of photons.

The intensity of a beam of light is the energy it delivers per second.

(i) In the photon model which of the following affect the intensity of light?

Put ticks (✓) in the boxes next to the correct answers.

the speed of the photon ☐

the number of photons arriving each second ☐

the amplitude of the photon ☐

the energy carried by each photon ☐

[2]

(ii) In the photon model the energy of an individual photon depends on light wave properties.

To increase the energy of a photon, which light wave property must be increased?

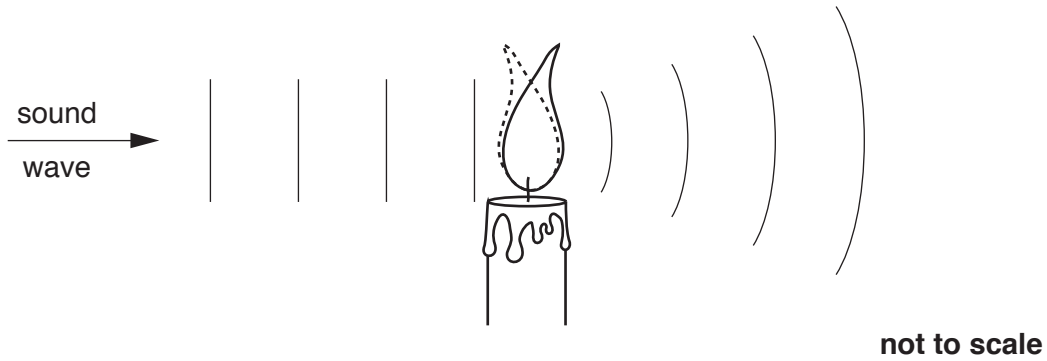Put a ⬭ring around the correct answer.

wave speed   frequency   wavelength

[1]

[Total: 5]

8 When a sound wave passes through a candle flame it makes the candle flicker backwards and forwards.

not to scale

(a) The sound wave has a frequency of 30 Hz and a speed of 300 m/s.

(i) Calculate the wavelength of the wave.

wavelength = ... m **[1]**

(ii) How often will the flame flick backwards and forwards in 4 seconds?

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

(b) The following observations were made during the experiment.

A	The flame acts like a lens for sound waves.
B	The size and brightness of the flame stays the same.
C	The louder the sound the bigger the flicker of the flame.
D	The flame flickers backwards and forwards in the direction the wave is moving.

Some of the observations provide evidence for the statements below.

For each statement write the letter for the observation that provides the best evidence.

the sound wave is a longitudinal wave ☐

the wave speed is greater in the flame than in the air ☐

the energy of the sound wave is related to the amplitude ☐

[3]

[Total: 5]

END OF QUESTION PAPER