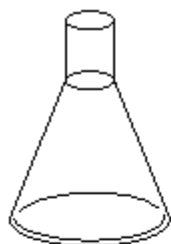
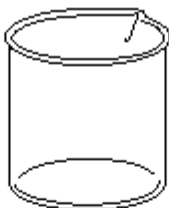
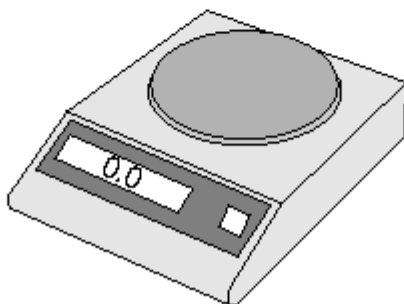
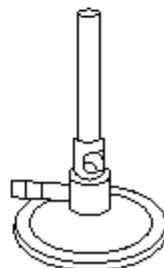


Q1.

The diagram below shows six pieces of equipment.

**A****B****C****D****E****F**

(a) Linda investigates how quickly sugar dissolves in water.

(i) Which piece of equipment does she use to weigh 5 g of sugar?
Tick the correct box.

A	B	C	D	E	F
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1 mark

(ii) Which piece of equipment does she use to measure out 90 cm³ of water?
Tick the correct box.

A	B	C	D	E	F
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1 mark

(b) Linda heats the water in a beaker.

(i) Which piece of equipment shown is a beaker?
Tick the correct box.

A	B	C	D	E	F
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1 mark

- (ii) Which piece of equipment shown is used to heat water?
Tick the correct box.

A

B

C

D

E

F

1 mark

- (c) Linda adds 5 g of sugar to the hot water.

- (i) She measures the time it takes for the sugar to dissolve.
The equipment used for timing is **not** shown in the diagram.

What piece of equipment is used to measure the time taken?

.....

1 mark

- (ii) The equipment used to measure the temperature of the water is **not** shown in the diagram.

What piece of equipment is used to measure temperature?

.....

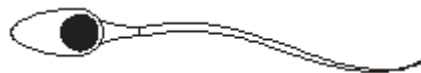
1 mark
maximum 6 marks

Q2.

Choose words from the box below to answer **all** the questions.

cell division	digestion	fertilisation	foetus	genes
intestine (egg)	ovary sperm	ovum testis	uterus	

- (a)



A

- (i) What is the name of cell A?

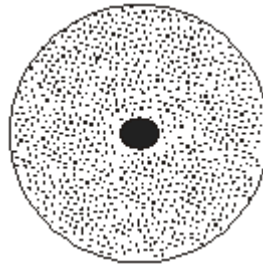
.....

1 mark

- (ii) Where is cell A produced?

.....

(b)



B

(i) What is the name of cell B?

.....

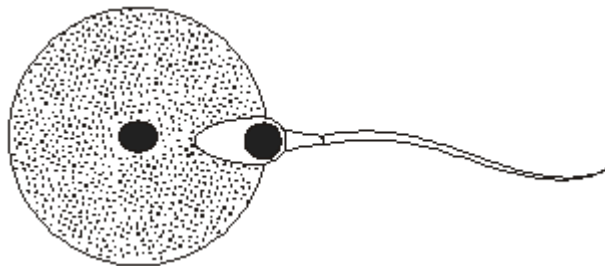
1 mark

(ii) Where is cell B produced?

.....

1 mark

(c)



C

not to scale

What process is shown in C? Choose your answer from the box above.

.....

1 mark

(d) The diagram shows a baby developing inside its mother.



- (i) Which word means an unborn baby? Choose your answer from the box above.

.....

1 mark

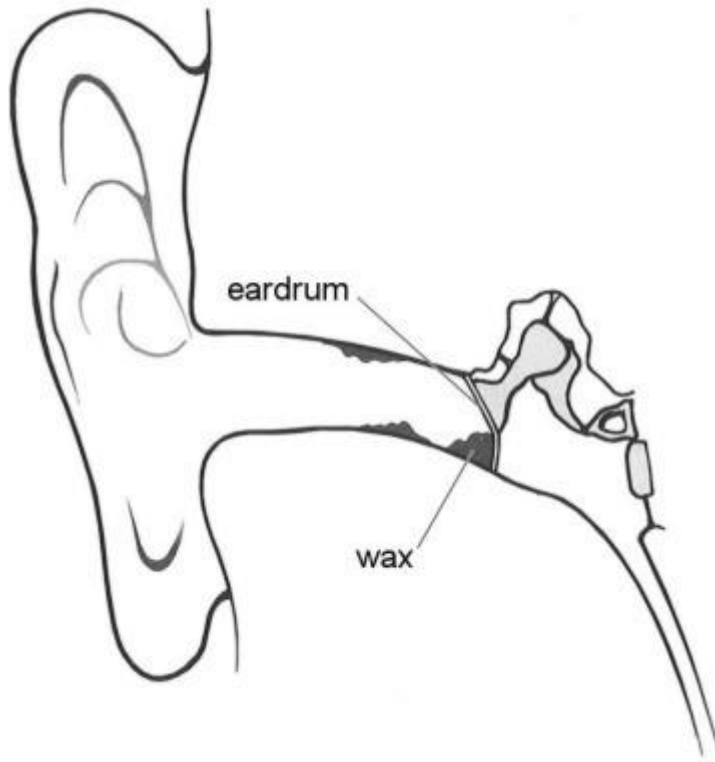
- (ii) Where does the unborn baby develop? Choose your answer from the box above.

.....

1 mark
maximumm 7 marks

Q3.

The diagram below shows part of the human ear.



We can hear somebody speaking because sound waves enter our ears.

- (a) (i) What do our eardrums do when sound waves reach them?

.....

1 mark

- (ii) Sometimes a lot of wax is produced in the ear.
The wax rests against the eardrum, as shown above.

Give **one** reason why we **cannot** hear very well when our ears contain a lot of wax.

.....

.....

1 mark

- (b) The table below shows the lowest and highest frequencies that five living things can hear.

living thing	lowest frequency (Hz)	highest frequency (Hz)
human	20	20 000
sparrow	300	20 000
dog	20	45 000
cat	20	64 000
rabbit	300	42 000

- (i) Which **three** living things from the table **cannot** hear a frequency of 43 000 Hz?

..... and and

1 mark

- (ii) From the table, choose the living thing that can hear the biggest **range** of frequencies.

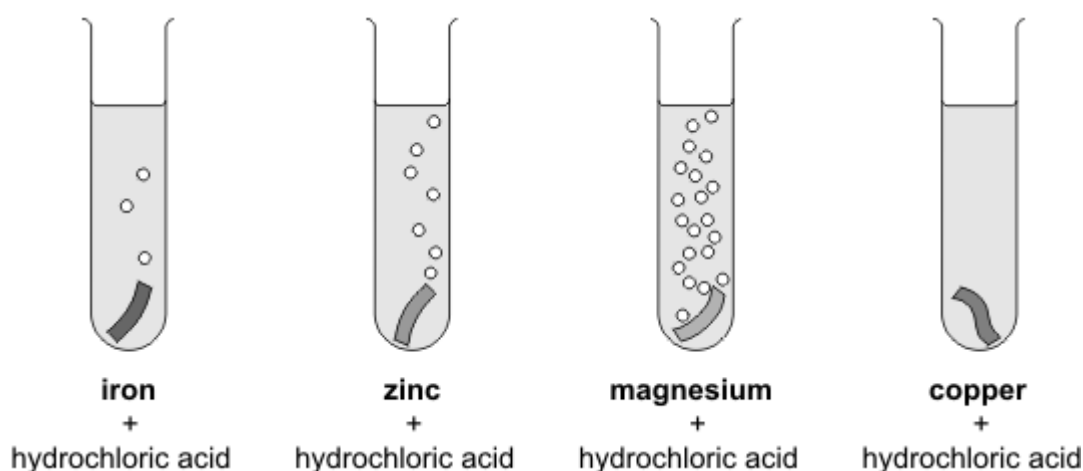
.....

1 mark
maximum 4 marks

Q4.

- (a) Ruth put a piece of a different metal in each of four test tubes.

She poured 10 cm³ of hydrochloric acid onto each metal.



Look at the diagrams above.

- (i) How do these show if a metal reacts with the acid?

.....

1 mark

- (ii) **On the lines below**, put the **four** metals in the order of how strongly they react with the acid.

most reactive

.....

.....

least reactive

1 mark

- (b) Choose the name of a metal from the box below to answer each question.

copper	iron	magnesium	zinc
--------	------	-----------	------

- (i) Which metal from the box is used for electrical wires?

.....

1 mark

- (ii) Which metal from the box goes rusty?

.....

1 mark
maximum 4 marks

Q5.

Michelle added some universal indicator solution to four liquids.

Michelle uses the pH chart to fill in her table of results.

pH chart

pH	1	2	3	4	5	6	7	8	9	10	11	12	13	14
colour	red			orange		green		blue		purple				

- (a) The table below shows some of Michelle's results.

Complete Michelle's table of results below.
Use the pH chart to help you.

liquid	colour of universal indicator solution	pH
milk	green	
rain water		5
hydrochloric acid	red	
bleach		11

2 marks

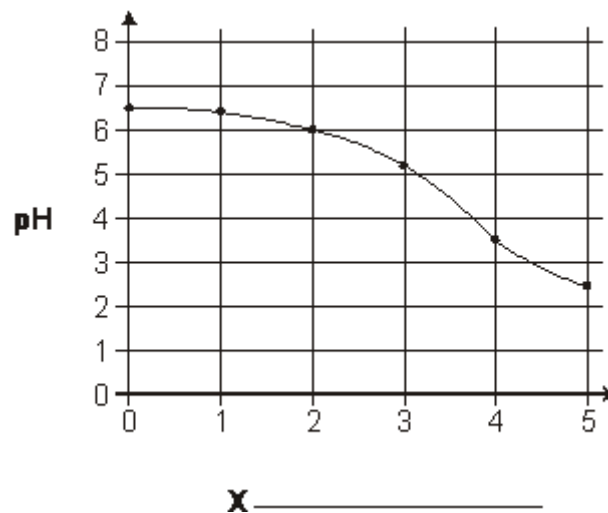
- (b) Explain why using acids can be dangerous.

.....
.....

1 mark

- (c) Michelle measured the pH of some milk stored at room temperature for five days.

The graph of Michelle's results is shown below.
One of the axes has been labelled.



1 mark

- (i) Write the axis label for the graph **at X**.
- (ii) Use the graph. How does the pH of the milk change over the five days?

.....


1 mark
maximum 5 marks

Q6.

David put two bars of iron close to each other.
There was **no** magnetic force between them.
David recorded the result as shown below.


<div style="display: flex; flex-direction: column; align-items: center;"> <div>bar of iron</div> <div style="width: 40px; height: 60px; background-color: #cccccc; margin: 5px;"></div> <div>bar of iron</div> </div>	attract	<input type="checkbox"/>
	repel	<input type="checkbox"/>
	no magnetic force	<input checked="" type="checkbox"/>

- (a) David did three other tests.
Tick the correct box to show the result for each test.
- (i)

bar of copper		result
		attract <input type="checkbox"/>
		repel <input type="checkbox"/>
bar magnet	<div style="border: 1px solid black; padding: 2px; text-align: center;">N S</div>	no magnetic force <input type="checkbox"/>


1 mark

(ii)

bar of iron		result
		attract <input type="checkbox"/>
		repel <input type="checkbox"/>
bar magnet	<div style="border: 1px solid black; padding: 2px; text-align: center;">N S</div>	no magnetic force <input type="checkbox"/>

1 mark

(iii)

bar of steel		result
		attract <input type="checkbox"/>
		repel <input type="checkbox"/>
bar magnet	<div style="border: 1px solid black; padding: 2px; text-align: center;">S N</div>	no magnetic force <input type="checkbox"/>

1 mark

(b) David then did two experiments with magnets.

The tick in each box shows David's results in each experiment.

Label the missing poles on **each** magnet to match David's results.

(i)

bar magnet	<div style="border: 1px solid black; height: 70px; width: 40px; margin: 0 auto;"></div>		result
		attract	<input type="checkbox"/>
		repel	<input checked="" type="checkbox"/>
bar magnet	<div style="border: 1px solid black; height: 70px; width: 40px; margin: 0 auto; text-align: center; line-height: 70px;">N</div>	no magnetic force	<input type="checkbox"/>

1 mark

(ii)

bar magnet	<div style="border: 1px solid black; height: 70px; width: 40px; margin: 0 auto;"></div>		result
		attract	<input checked="" type="checkbox"/>
		repel	<input type="checkbox"/>
bar magnet	<div style="border: 1px solid black; height: 70px; width: 40px; margin: 0 auto; text-align: center; line-height: 70px;">S</div>	no magnetic force	<input type="checkbox"/>

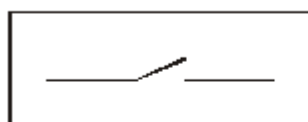
1 mark
maximum 5 marks

Q7.

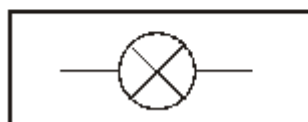
- (a) Draw a line from each circuit symbol below to the correct name.
Draw only four lines.

circuit symbol

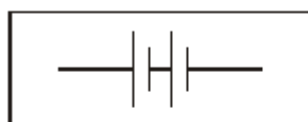
name



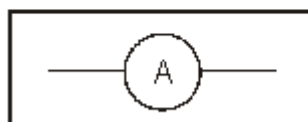
ammeter



switch



motor

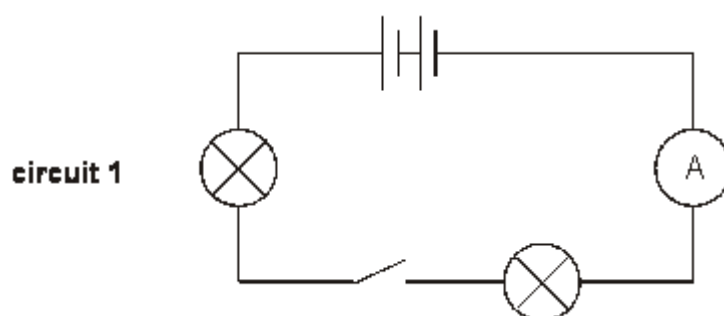


battery

bulb

3 marks

(b) Fred made **circuit 1** as shown below.



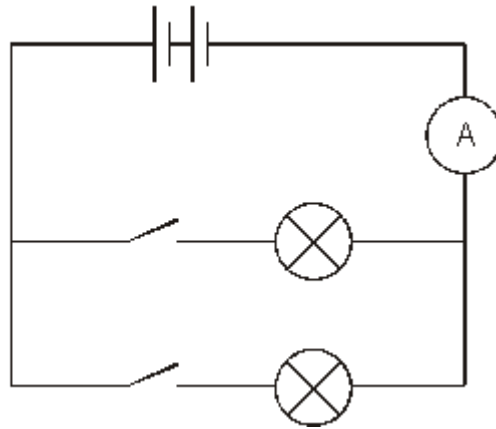
Give the name of the part that is the energy source for the circuit.

.....

1 mark

(c) Fred then made **circuit 2** as shown below.

circuit 2



In the table below, tick a box to show whether **circuit 1** and **circuit 2** are series or parallel circuits.

Tick only **two** boxes.

	series	parallel
circuit 1		
circuit 2		

1 mark

- (d) What metal is usually used for wires in electric circuits?

.....

1 mark
maximum 6 marks

Q8.

- (a) The animals drawn below all have backbones.



amphibian



bird



mammal



fish

not to scale

- (i) What word describes animals with a backbone?

.....

1 mark

- (ii) There are five groups of animals with a backbone. Only four groups are shown above
Give the name of the missing group

.....

1 mark

- (b) The drawing below shows the human backbone. It is made up of a number of small bones.

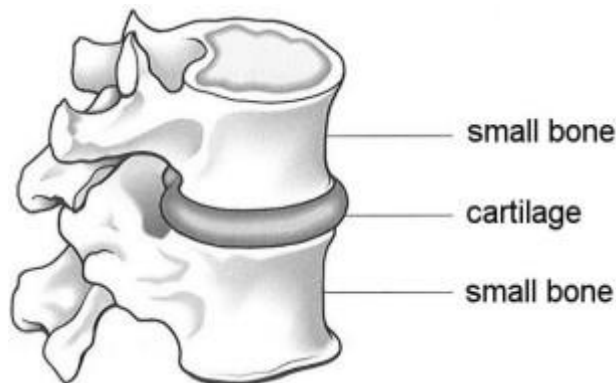


Why is it an advantage that the backbone is made up of small bones rather than one long bone?

.....
.....

1 mark

- (c) The drawing below shows two small bones from the backbone.

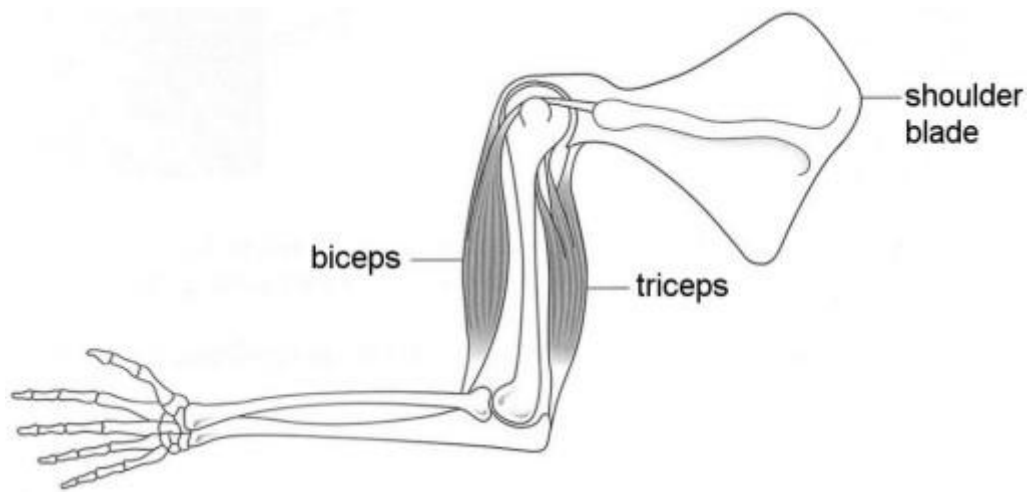


Between the small bones there is a material called cartilage.
Cartilage is softer than bone.
Give **one** advantage of having a softer material between the bones.

.....
.....

1 mark

- (d) The diagram below shows the bones and two muscles of an arm.



The biceps and triceps are muscles which raise and lower the forearm. What happens to the biceps and triceps to **raise** the forearm?

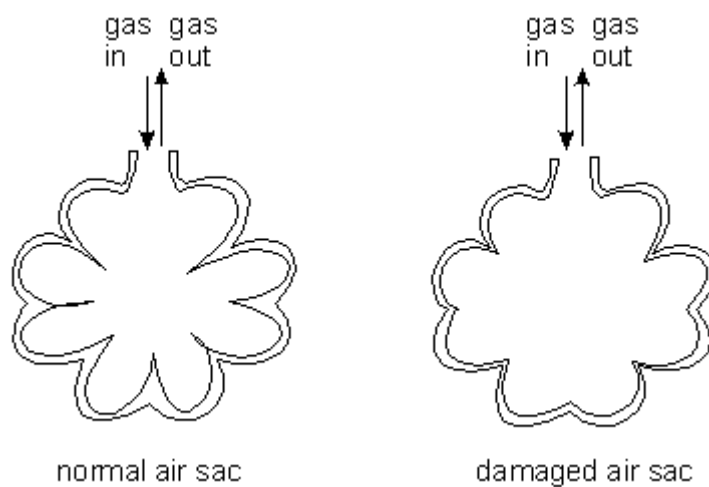
the biceps

the triceps

1 mark
maximum 5 marks

Q9.

People who have emphysema have damaged air sacs in their lungs. The diagrams show a section through a normal air sac and a section through a damaged air sac.



(a) Gas exchange takes place at the inside surface of the air sac when a person breathes.

(i) Which **two** gases are exchanged at this surface of the air sac?

..... and

1 mark

(ii) The amount of gas exchanged is smaller in a damaged air sac. Explain why.

.....

.....

1 mark

- (b) The list shows four substances present in cigarette smoke.

carbon particles carbon monoxide nicotine tar

Choose from the list the substance which:

- (i) causes addiction to smoking cigarettes;

.....

1 mark

- (ii) may cause lung cancer;

.....

1 mark

- (iii) is carried instead of oxygen in the red blood cells.

.....

1 mark

Maximum 5 marks

Q10.

Burning fossil fuels causes air pollution.

- (a) (i) Give the names of **two** fossil fuels.

..... and

1 mark

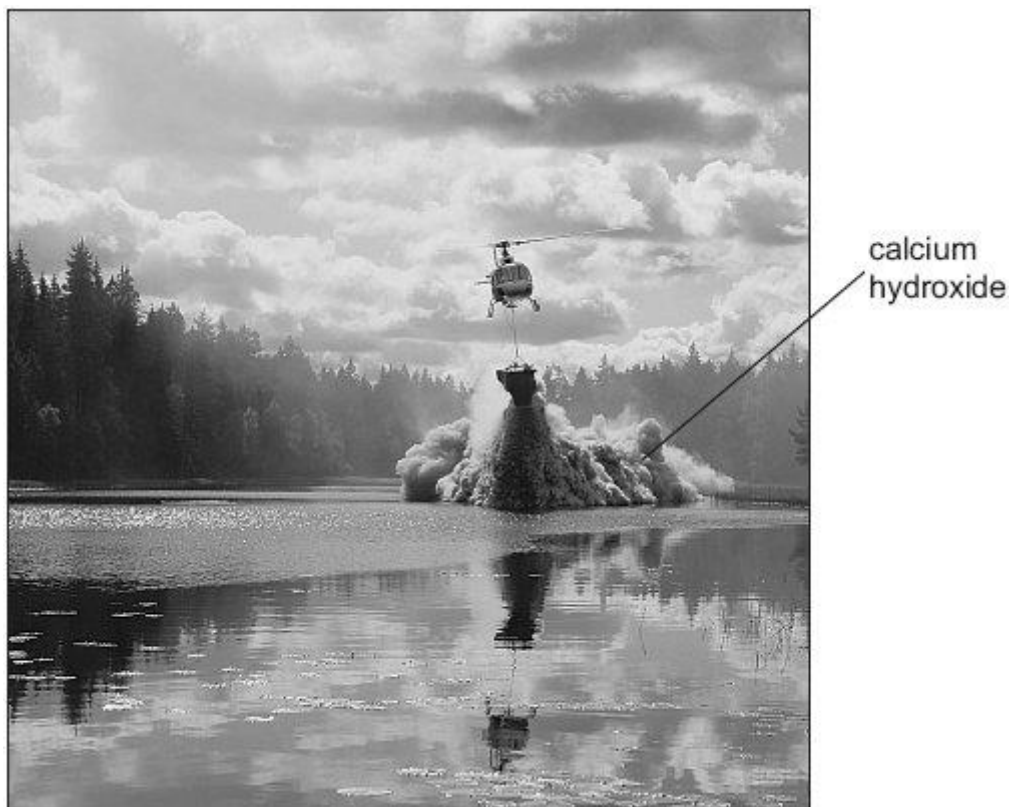
- (ii) Some fossil fuels contain sulphur.

Complete the word equation for the reaction between sulphur and oxygen in the air.

sulphur + oxygen →

1 mark

- (b) Burning fossil fuels leads to the formation of acid rain.
Acid rain has collected in this lake.
A helicopter is dropping calcium hydroxide into the lake.



Calcium hydroxide dissolves in water to form an alkaline solution.

- (i) What effect does an alkali have on the pH of an acidic lake?

.....

1 mark

- (ii) When calcium hydroxide reacts with sulphuric acid in the lake a calcium salt is formed.

What is the name of this salt?

Tick the correct box.

calcium carbonate

☐

calcium chloride

☐

calcium nitrate

☐

calcium sulphate

☐

1 mark

- (c) The photograph below shows trees damaged by acid rain.



- (i) The trees have lost their leaves and have died.
Explain why leaves are needed for a tree to grow.

.....

1 mark

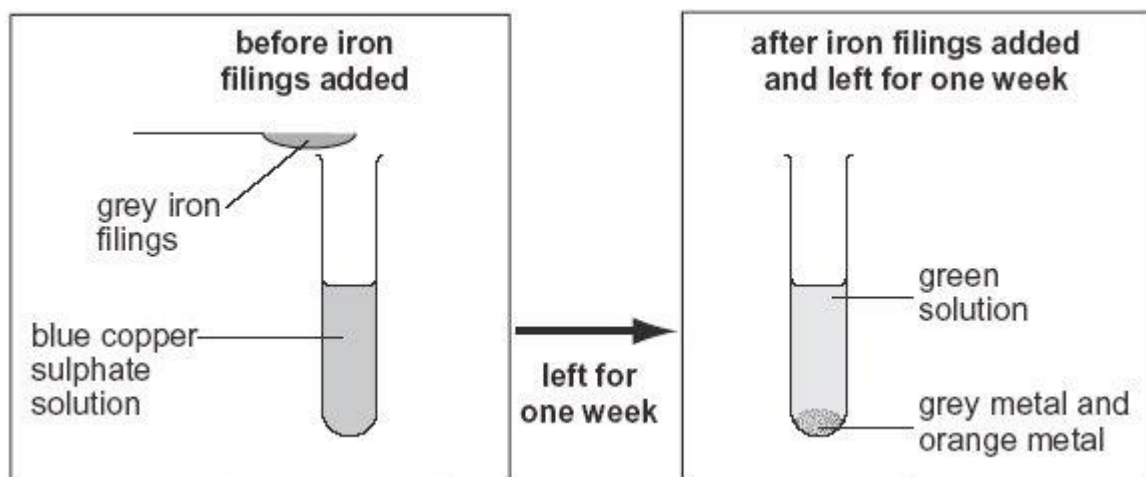
- (ii) What effect does acid rain have on buildings made from limestone?

.....

1 mark
 maximum 6 marks

Q11.

Joanne added iron filings to copper sulphate solution.
 She observed the reaction after one week.



- (a) What evidence in the diagrams shows that a chemical reaction has taken place?

.....

1 mark

(b) The reaction between iron and copper sulphate is a **displacement** reaction.

(i) Give the name of the orange metal visible after one week.

.....

1 mark

(ii) What is the name of the compound formed in this reaction?

.....

1 mark

(iii) Joanne poured the green solution into another test tube. She added some copper pieces to the solution.

Will a displacement reaction occur?

yes ☐

no ☐

Explain your answer.

.....
.....

1 mark

(c) Part of the reactivity series of metals is shown below.

potassium	most reactive
lithium	
calcium	
aluminium	
zinc	
lead	least reactive

Use the information above.

Which **two** metals would react with aluminium nitrate in a displacement reaction?

Tick the **two** correct boxes.

calcium ☐

potassium ☐

zinc ☐

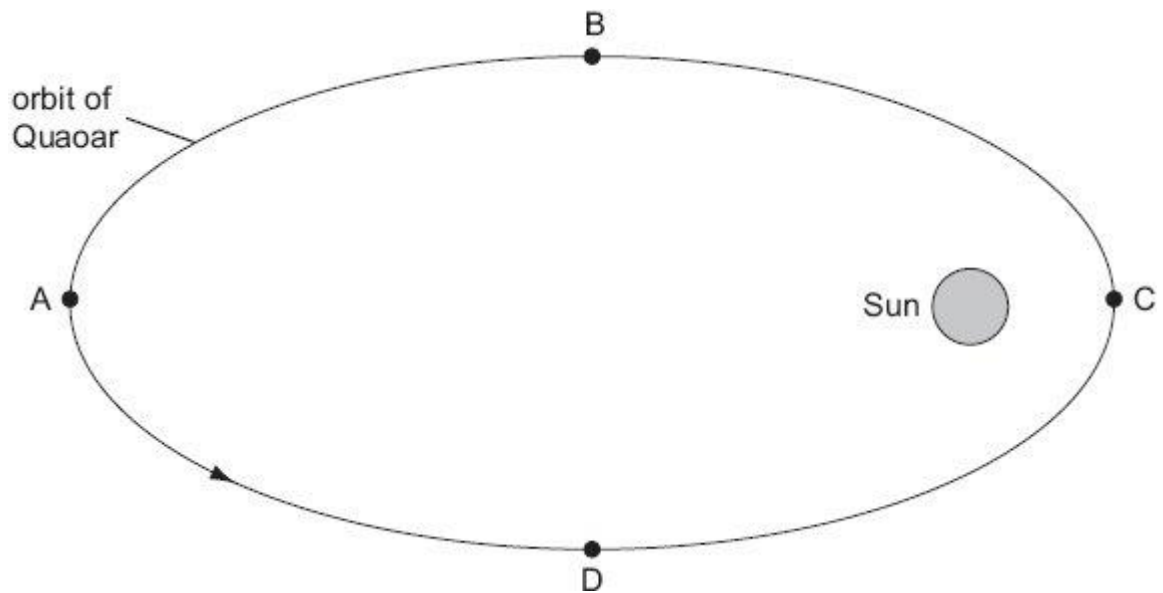
lead ☐

1 mark
maximum 5 marks

Q12.

(a) In 2002 a large asteroid was discovered orbiting the Sun. It was named Quaoar.

The diagram below shows Quaoar in four positions in its orbit.



not to scale

- (i) In which of the four positions, A, B, C or D, is the effect of the Sun's gravity on Quaoar the greatest?

.....

Explain your answer.

.....

1 mark

- (ii) **On the diagram above**, draw arrows to show the direction of the Sun's gravity on Quaoar in each of the positions A, B, C and D.

1 mark

- (iii) At which position, A, B, C or D, is Quaoar travelling most slowly?

.....

Explain your answer.

.....

1 mark

- (b) The table below gives information about three of the planets in our solar system.

planet	average distance from Sun (millions of km)	time for one orbit (Earth years)	Average surface temperature of planet (°C)
Saturn	1427	30	−180
Uranus	2870	84	−210

Pluto	5900	248	-230
-------	------	-----	------

- (i) The time for one orbit of the planet Neptune is 165 Earth years.

Estimate the average distance of Neptune from the Sun.
Use information in the table to help you.

..... millions of km

1 mark

- (ii) How does the surface temperature of these planets vary with distance from the Sun?
Use information in the table to help you.

.....
.....

1 mark

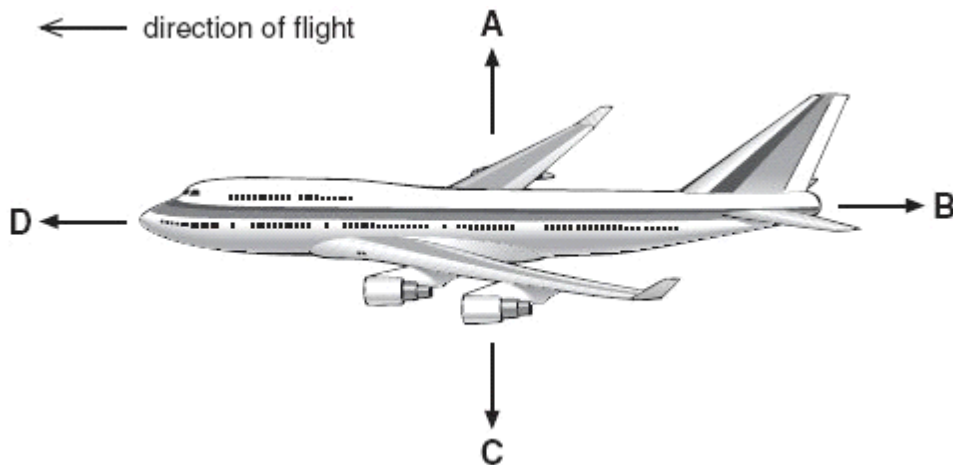
- (iii) Explain why the temperature varies with distance from the Sun in this way.

.....
.....

1 mark
maximum 6 marks

Q13.

The diagram shows four forces acting on a plane in flight.



- (a) Which arrow represents air resistance?
Give the letter.

.....

1 mark

- (b) (i) When the plane is flying at a constant height, which **two** forces must be balanced?
Give the letters.

..... and

1 mark

- (ii) When the plane is flying at a constant speed in the direction shown, which **two** forces must be balanced?
Give the letters.

..... and

1 mark

- (c) (i) Just before take-off, the plane is speeding up along the ground.

Which statement is true?
Tick the correct box.

Force B is zero.

☐

Force B is greater than force D.

☐

Force D is equal to force B.

☐

Force D is greater than force B.

☐

1 mark

- (ii) Which statement is true about the plane just as it leaves the ground?
Tick the correct box.

Force C is zero.

☐

Force C is greater than force A.

☐

Force A is equal to force C.

☐

Force A is greater than force C.

☐

1 mark
maximum 5 marks

Q14.

James shone a ray of light at a mirror as shown below.

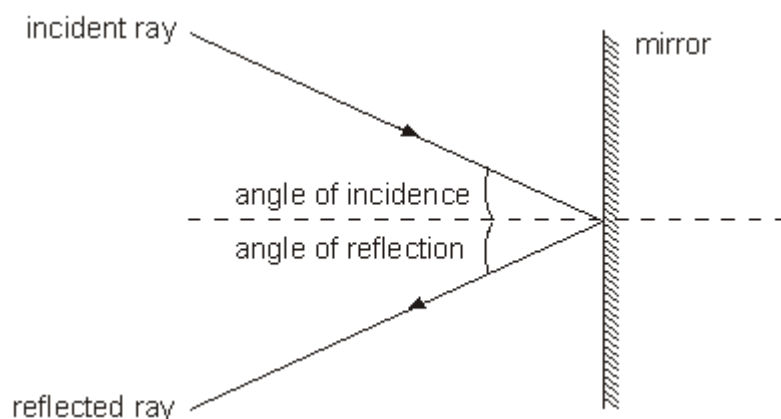


diagram 1

He measured the angle of **reflection** for different angles of incidence. His results are shown below.

angle of incidence ($^{\circ}$)	30	40	50	60	70
angle of reflection ($^{\circ}$)	30	40	50	65	70

- (a) Which angle of reflection was **not** measured accurately?

..... $^{\circ}$

How can you tell this from the table?

.....

1 mark

- (b) James set up a different experiment as shown below.

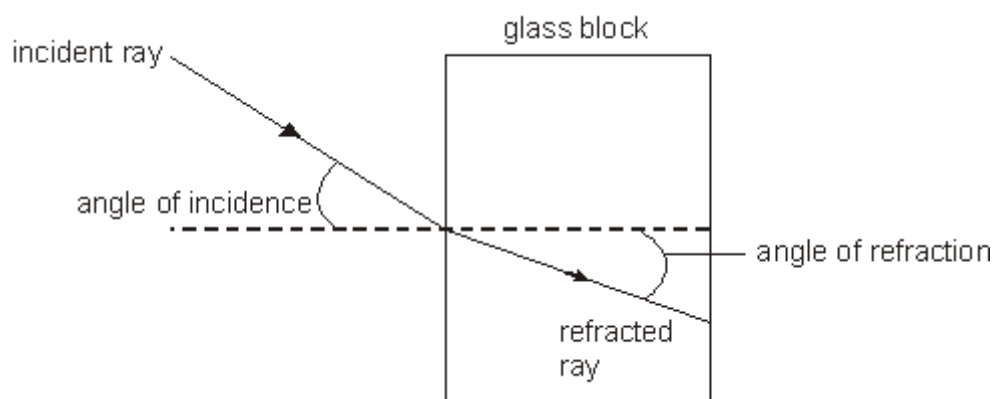
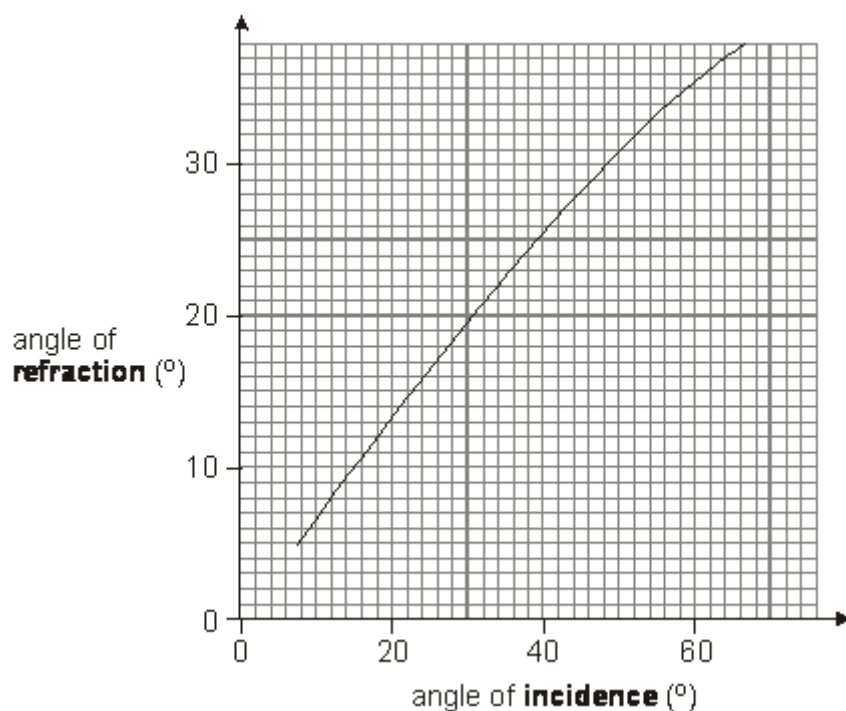


diagram 2

He measured the angle of **refraction** for different angles of incidence.

His results are shown in the graph.



Use the graph to answer the questions below.

- (i) When the angle of **refraction** is 20° , what is the angle of **incidence**?

..... $^\circ$

1 mark

- (ii) What conclusion could James draw from his graph?
Complete the sentence below.

When light passes from air into glass, the angle of **incidence** is

always the angle of **refraction**.

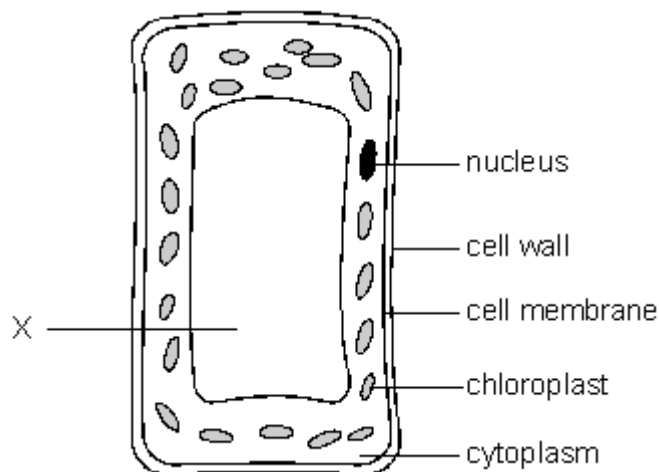
1 mark

- (c) **On diagram 2**, draw a line to continue the refracted ray as it leaves the glass block.

1 mark
maximum 4 marks

Q15.

The diagram shows a plant cell. Some parts of the cell are named.



(a) Which **two named** parts are present in plant cells but not animal cells?

1.

2.

2 marks

(b) Which **named** part contains the genetic information?

.....

1 mark

(c) Which **named** part absorbs light energy for photosynthesis?

.....

1 mark

(d) Name the part labelled **X** on the drawing.

.....

1 mark

(e) Where in a plant would you find a cell like the one in the diagram?

Tick the correct box.

in the centre of a root

☐

in the lower surface of a leaf

☐

near the upper surface of a leaf

☐

near the surface of a root

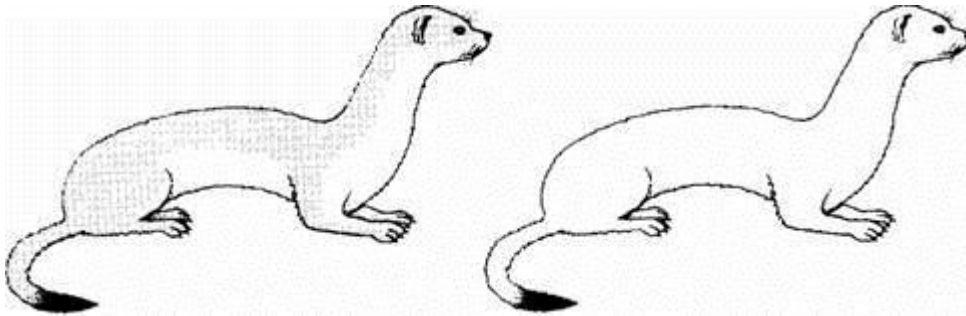
☐

1 mark

Maximum 6 marks

Q16.

(a) The drawings below show a stoat in summer and in winter.



stoat in summer

stoat in winter

In winter the ground is often covered by snow or frost. During this part of the year a stoat's fur is white.

Suggest **two** ways its white coat helps a stoat to survive in the winter.

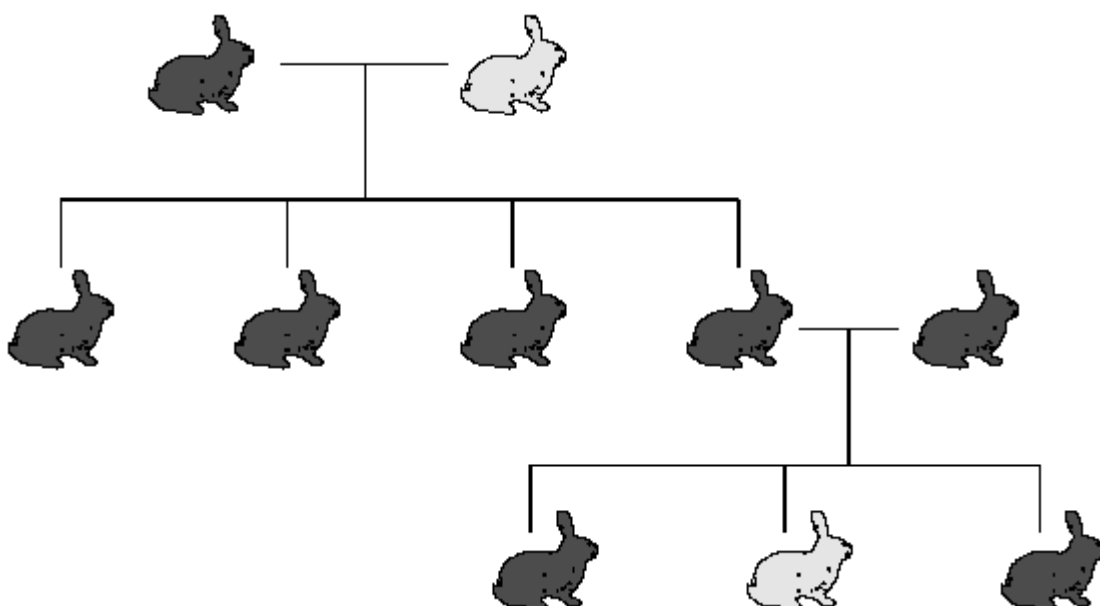
.....

.....

.....

2 marks

(b) The diagram shows the family tree for a family of rabbits.



Use words from the list below to complete the sentences.

adapt **cytoplasm** **genes** **grow** **inherit**
letters **membrane** **mutate** **nuclei**

Rabbits have the same fur colour all year round.

Young rabbits fur colour from their parents.

Information about fur colour is passed on from one generation to the next in the form of in the of

an egg and sperm.

3 marks
Maximum 5 marks

Q17.

Hydrochloric acid is a strong acid.

(a) Winston used universal indicator solution to find the pH of some hydrochloric acid.

(i) Suggest the **colour** of the mixture of universal indicator solution and the hydrochloric acid.

.....

1 mark

(ii) Suggest the **pH** of the hydrochloric acid.

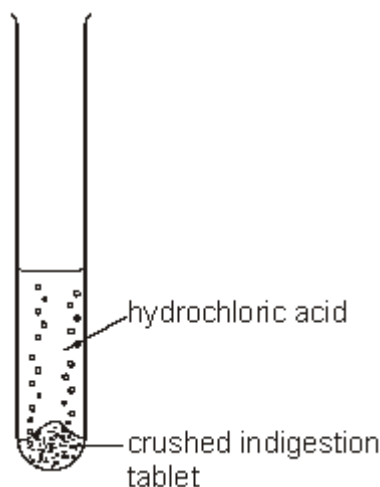
.....

1 mark

(b) Indigestion can be caused when too much hydrochloric acid is produced in the stomach.

Magnesium carbonate can be used to treat indigestion.

Winston crushed some indigestion tablets containing magnesium carbonate. He added them to hydrochloric acid in a test-tube. The mixture fizzed.



The word equation for the reaction is shown below.

magnesium + hydrochloric → magnesium + carbon + water
carbonate acid chloride dioxide

(i) Use the word equation to explain why the mixture fizzed when the reaction took place.

.....
.....

1 mark

(ii) Winston continued to add crushed tablets to the acid until the mixture stopped

fizzing.
Why did the fizzing stop?

.....
.....

1 mark

- (c) When magnesium carbonate reacts with hydrochloric acid, magnesium chloride is formed.

Which **two** words describe magnesium chloride?
Tick the **two** correct boxes.

a compound	<input type="checkbox"/>	a mixture	<input type="checkbox"/>
an element	<input type="checkbox"/>	a salt	<input type="checkbox"/>
a metal	<input type="checkbox"/>	a solvent	<input type="checkbox"/>

2 marks

- (d) It is important that the hydrochloric acid in the stomach is **not** completely neutralised by indigestion tablets.

Why is hydrochloric acid needed in the stomach?

.....
.....

1 mark
maximum 7 marks

Q18.

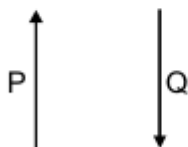
- (a) Methane can be a gas, a liquid or a solid. In the diagram below, arrows P, Q, R and S represent changes of state.

The boxes on the right show the arrangement of particles of methane in the three different physical states.

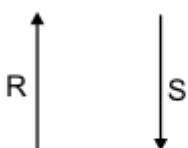
Each circle represents a particle of methane.

physical state of methane

gas

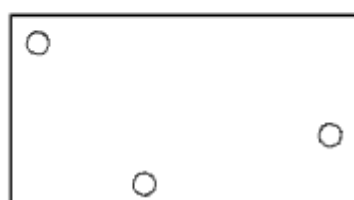
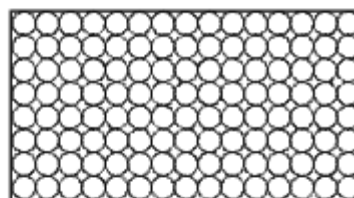
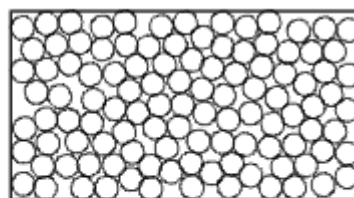


liquid



solid

arrangement of particles



- (i) Draw a line from each physical state of methane to the arrangement of particles in that physical state.
Draw only **three** lines.

1 mark

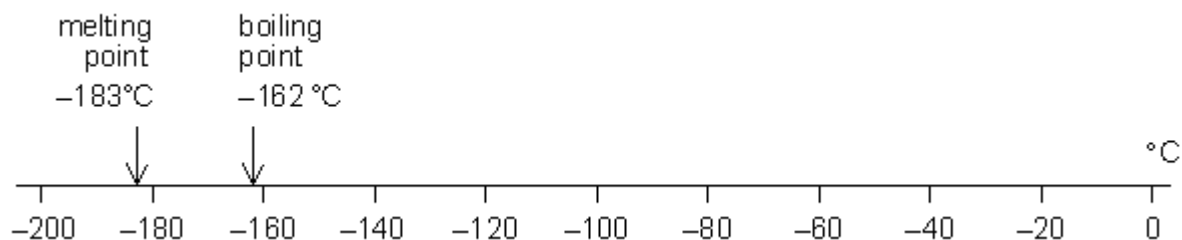
- (ii) Arrows P, Q, R and S represent changes of state.
Which arrow represents:

evaporation?

melting?

2 marks

- (b) Methane is the main compound in natural gas. The scale below shows the melting point and the boiling point of methane.



Methane has three physical states: solid, liquid and gas.

- (i) What is the physical state of methane at -170°C ?

.....

1 mark

- (ii) The formula of methane is CH_4 . The symbols for the two elements in methane are C and H.

Give the names of these two elements.

element C

element H

2 marks

- (iii) When methane burns, it reacts with oxygen. One of the products is water, H_2O .

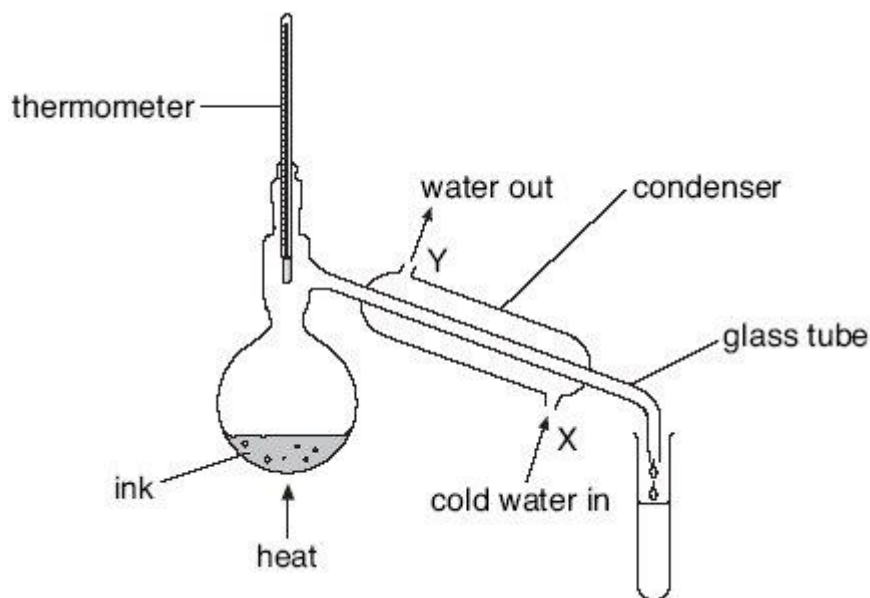
Give the name of the other product.

.....

1 mark
Maximum 7 marks

Q19.

Rema used the apparatus below to distil 100 cm^3 of water-soluble ink.



apparatus A

not to scale

- (a) Which processes occur during distillation?
Tick the correct box.

condensation then evaporation ☐

evaporation then condensation ☐

melting then boiling ☐

melting then evaporation



1 mark

- (b) Give the name of the colourless liquid that collects in the test-tube.

.....

1 mark

- (c) What would the temperature reading be on the thermometer when the ink has been boiling for two minutes?

..... °C

1 mark

- (d) (i) Water at 15°C enters the condenser at X.
Predict the temperature of the water when it leaves the condenser at Y.

..... °C

Explain this change of temperature.

.....

.....

1 mark

- (ii) Give **two** ways in which the water vapour changes as it passes down the glass tube in the condenser.

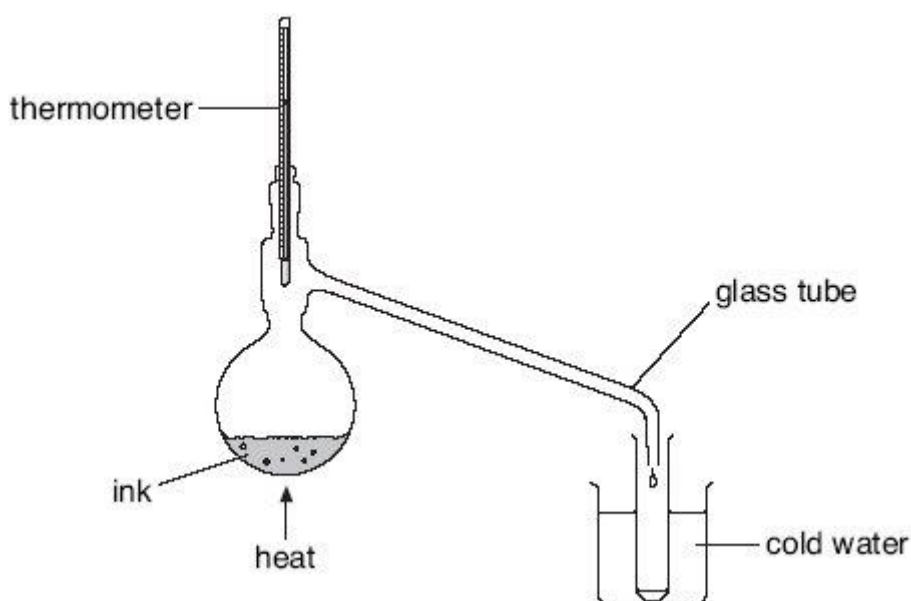
1.

1 mark

2.

1 mark

- (e) Peter used the apparatus below to distil 100 cm³ of water-soluble ink.



apparatus B

Why is the condenser in **apparatus A** better than the glass tube and beaker of water in **apparatus B**?

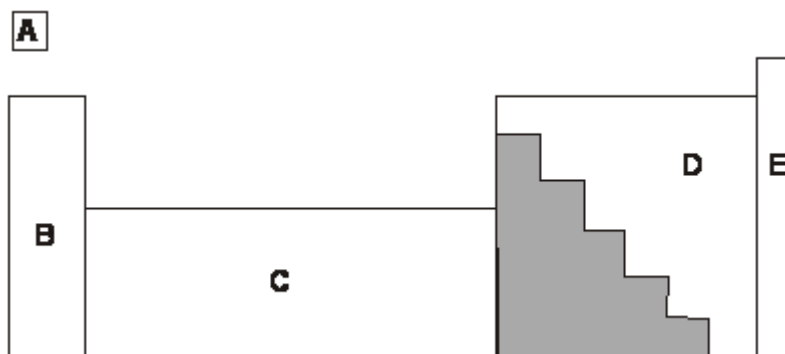
.....

.....

1 mark
maximum 7 marks

Q20.

- (a) The diagram below shows part of the periodic table of elements.



The shaded area contains **only** metal elements.

Two other areas also contain **only** metal elements.

Which areas contain only metal elements?

Tick the **two** correct boxes.

A ☐ B ☐ C ☐ D ☐ E ☐

1 mark

- (b) Copper is a metal.

At room temperature copper is a strong solid.

Give **two** other properties of copper that show it is a metal.

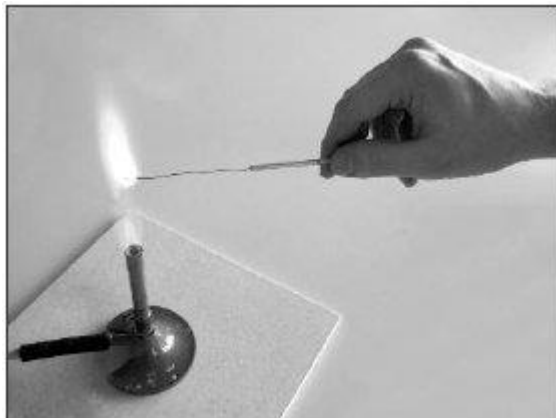
1.

1 mark

2.

1 mark

- (c) When copper metal is heated it reacts with a gas in air.



What is the chemical name of the **product** formed when copper reacts with a gas in air?

.....

1 mark

- (d) Which statement below describes what happens in a **chemical change** but **not** in a physical change?

Tick the correct box.

The product is a solid.

☐

The change only happens at a high temperature.

☐

The atoms have combined in a different way to make a new substance.

☐

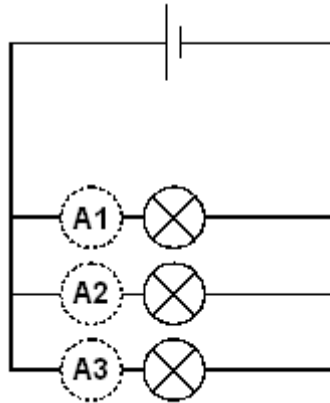
The types of atoms at the start are the same as in the end product.

☐

1 mark
maximum 5 marks

Q21.

Peter measured the current through each of three similar bulbs in a parallel circuit.



He had only one ammeter and he placed it first at A1, then A2, then A3, in order to measure the currents.

The table shows his results.

position of ammeter	current, in amps
A1	0.14
A2	0.16
A3	0.15

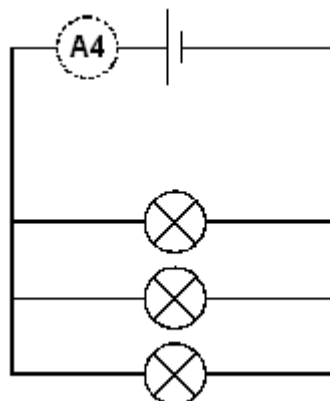
- (a) He expected the current readings to be the **same** for each bulb but found they were **different**.

Suggest **two** reasons why the readings were different.

1.
2.

2 marks

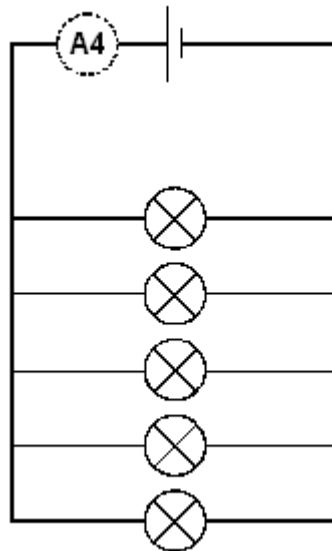
- (b) Peter then measured the current at **A4** and recorded it as 0.45 A. He concluded that the current at **A4** could be calculated by adding together the currents through each of the bulbs at positions **A1**, **A2** and **A3**.



He added two more similar bulbs to his circuit, in parallel. The current through each bulb was 0.15 A.

Use Peter's conclusion to predict the current at **A4** with the 5 bulbs in the circuit.

..... A



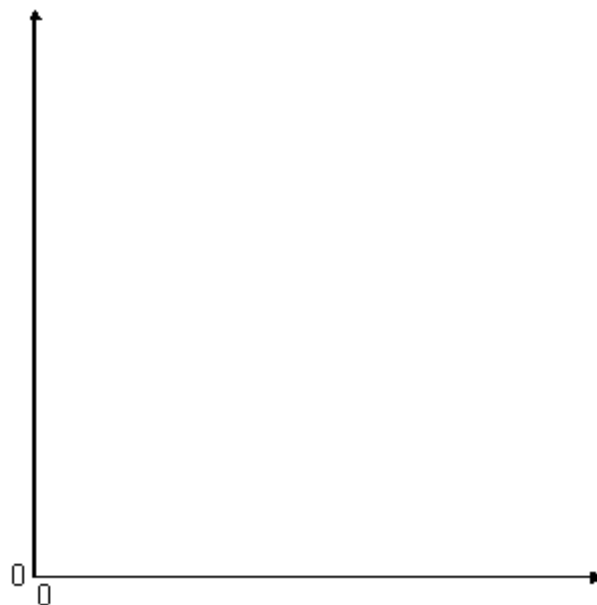
1 mark

- (c) Peter left the circuit connected overnight. He used a datalogger to measure the current at position **A4** at regular intervals of time. The next morning the bulbs were dim.

Using the axes below, sketch (do **not** plot) how the current at position **A4** might change with time.

Indicate on the graph:

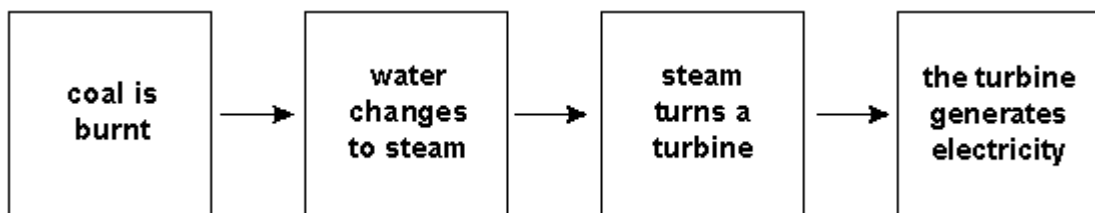
- (i) The correct labels for each axis, including the correct units.
- (ii) The shape of the graph you would expect to obtain.



2 marks
Maximum 5 marks

Q22.

In a power station, coal can be used to generate electricity.



(a) Use words from the box to answer the questions below.

chemical	electrical	gravitational potential	
kinetic	light	sound	thermal

1 mark

(i) What is the useful energy transfer when coal is burnt?

..... energy is transferred to energy

1 mark

(ii) Some of the energy stored in coal is wasted when it is burnt.
Give the name of **one** type of energy released that is **not** useful.

.....

1 mark

(b) Wind turbines are also used to generate electricity.
The wind turns the turbine blades and the turbine blades turn a generator.



Use words from the **box opposite**. Complete the sentence to show the useful

energy transfer in a wind turbine and generator.

..... energy is transferred to energy

1 mark

- (c) Suggest **one** disadvantage of using wind to generate electricity.

.....
.....

1 mark

- (d) Sugar cane is a plant.

The sugar from the cane is used to make alcohol.
Alcohol is a fuel.



- (i) Which energy source do plants use to produce sugar?

.....

1 mark

- (ii) Is sugar cane a renewable **or** non-renewable source of energy?
Tick one box.

renewable source

☐

non-renewable source

☐

Give a reason for your answer.

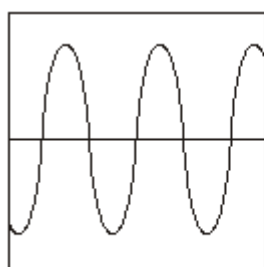
.....

1 mark

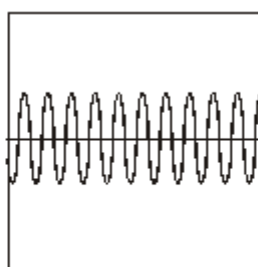
maximum 7 marks

Q23.

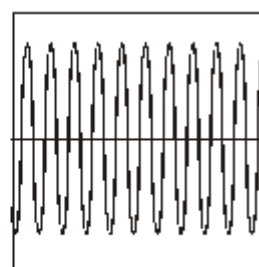
- (a) The diagrams below show the patterns produced on an oscilloscope by three different sound waves.



A



B



C

- (i) Which **two** waves have the same loudness?
Write the letters.

..... and

How do the diagrams show this?

.....
.....

1 mark

- (ii) Which **two** waves have the same pitch?
Write the letters.

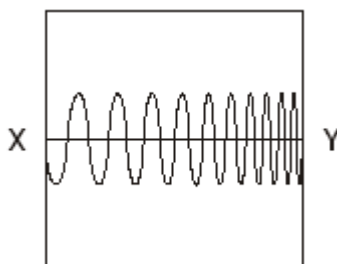
..... and

How do the diagrams show this?

.....
.....

1 mark

- (iii) Shuli is listening to a sound that produces the pattern below.



Describe how the sound that Shuli **hears** changes between X and Y.

.....

1 mark

- (b) The table below shows the maximum time a person can listen to music at different sound levels without damage to the ear.

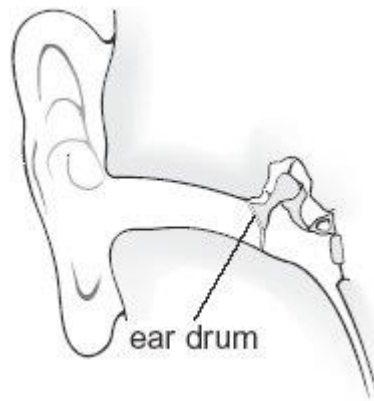
sound level (decibels)	maximum time (hours)
86	8
88	4
90	2
92	1
94	0.5

Estimate the maximum time a person could listen to a sound of 87 decibels.

..... hours

1 mark

- (c) The diagram below shows part of the human ear.



What happens to the ear drum as a sound gets louder?

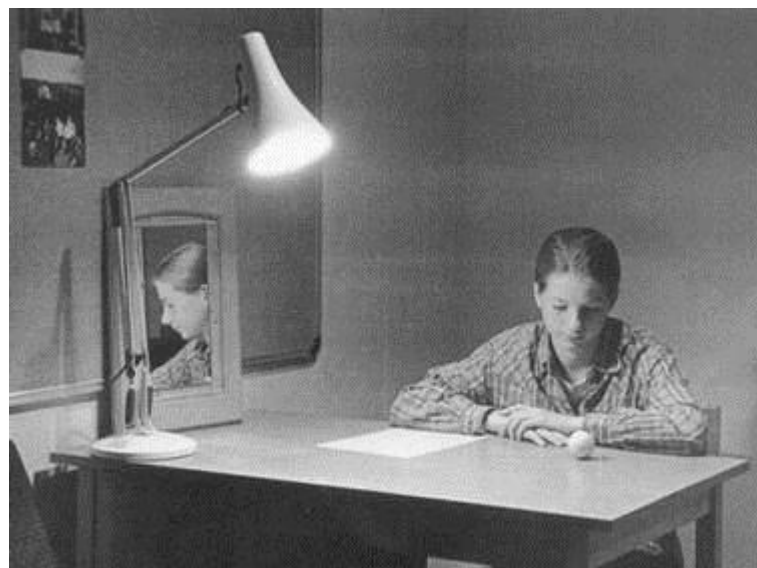
.....

.....

1 mark
maximum 5 marks

Q24.

Light shines onto a ball. Naomi is looking at the ball.



- (a) Describe how light from the lamp lights up the ball and makes it visible to Naomi.

.....

.....

.....

.....

2 marks

- (b) (i) Naomi uses different colours of light and different coloured balls.

Complete the table to show the colours that the balls appear to Naomi.

colour of ball	colour of the light	the colour the ball appears to Naomi
white	red	
green	white	

2 marks

- (ii) Why does a black object appear black in any light?

.....

1 mark

- (c) Choose from the following terms to complete the sentences below.

less than

equal to

greater than

At a plane mirror, the angle of incidence is

the angle of reflection. The distance from the object to the mirror is

..... the apparent distance from the mirror to the image.

2 marks

- (d) A beam of white light shines onto a sheet of white paper. An identical beam of light shines onto a mirror. The light is scattered from the paper and reflected from the mirror.

Describe how scattering by paper and reflection by a mirror are **different** from each other.

.....

.....

.....

.....

2 marks

Maximum 9 marks

Q25.

'Wilting roses are a thing of the past.'

Scientists at the University of Leeds have found a way to modify the genes of flowering plants.

They claim that flowers from modified plants remain fresh in a vase of water for up to six months longer than flowers from unmodified plants.



Plan an investigation you could carry out in the school laboratory to test the claim that flowers from modified plants last for much longer than flowers from unmodified plants.

You will be provided with flowers from modified plants and from unmodified plants.

In your plan give:

- the **one** factor you will change as you carry out your investigation;
(This is the independent variable.)
- the factor you will measure;
(This is the dependent variable.)
- **one** of the factors you should control to ensure a fair test;
- the time scale for the investigation.

.....

.....

.....

.....

.....

.....

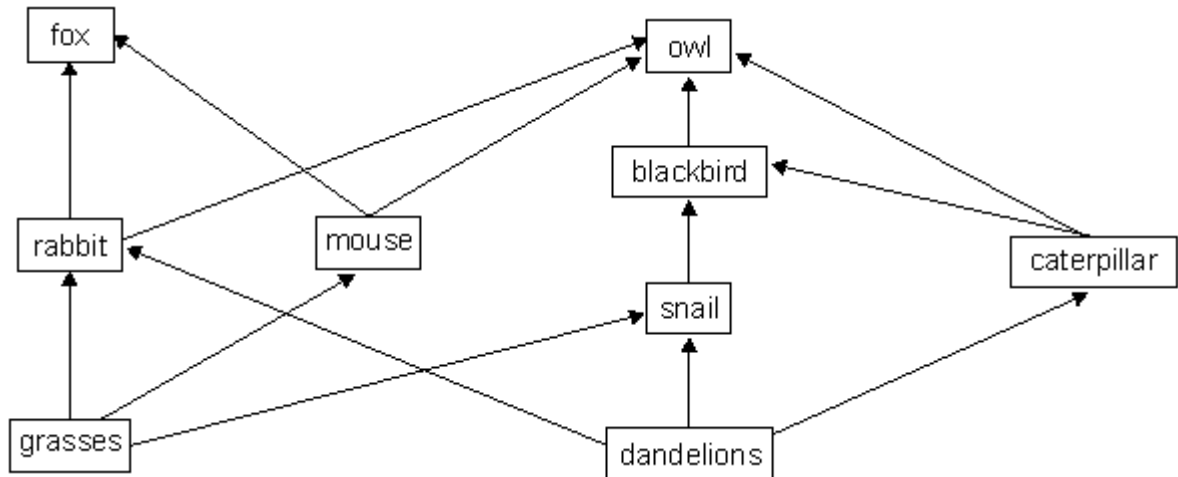
.....

.....

.....

Q26.

The diagram below shows part of a grassland food web.



- (a) One year the snail population increased in the grassland area.

How could an increase in the number of snails cause the caterpillar population to **increase**?

.....

.....

1 mark

- (b) Snail poison can be used to control the number of snails. After some time, each owl contains more poison than each snail.
Explain why each owl contains more poison than each snail.

.....

.....

.....

2 marks

- (c) A scientist wants to record the number of dandelion plants in the grassland area.

Describe how they could use a 1m² quadrat to estimate the number of dandelions growing in the grassland area.

.....

.....

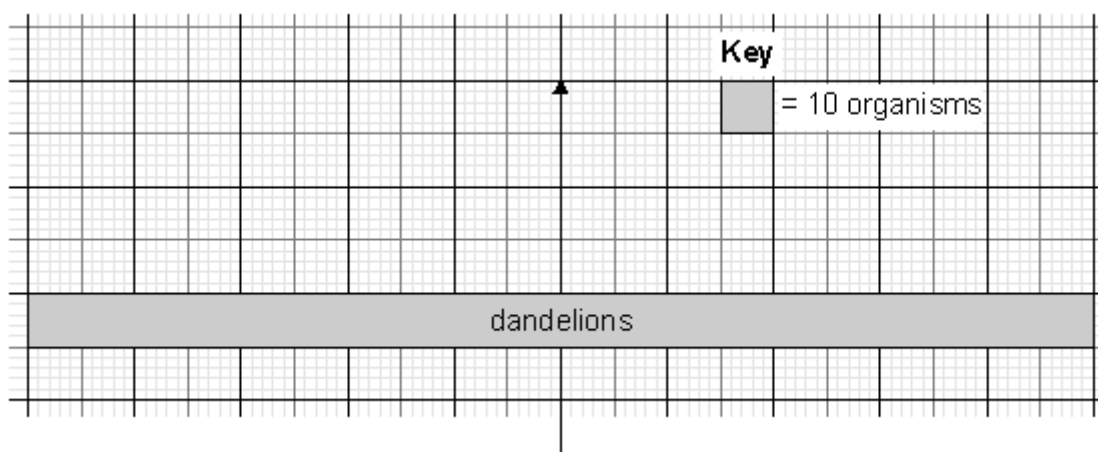
.....

2 marks

- (d) The table below shows the population numbers for one food chain from the food web.

organism	number
dandelions	200
rabbits	20
foxes	4

Complete the pyramid of numbers on the graph paper below to represent this food chain. Label the pyramid to show each animal.

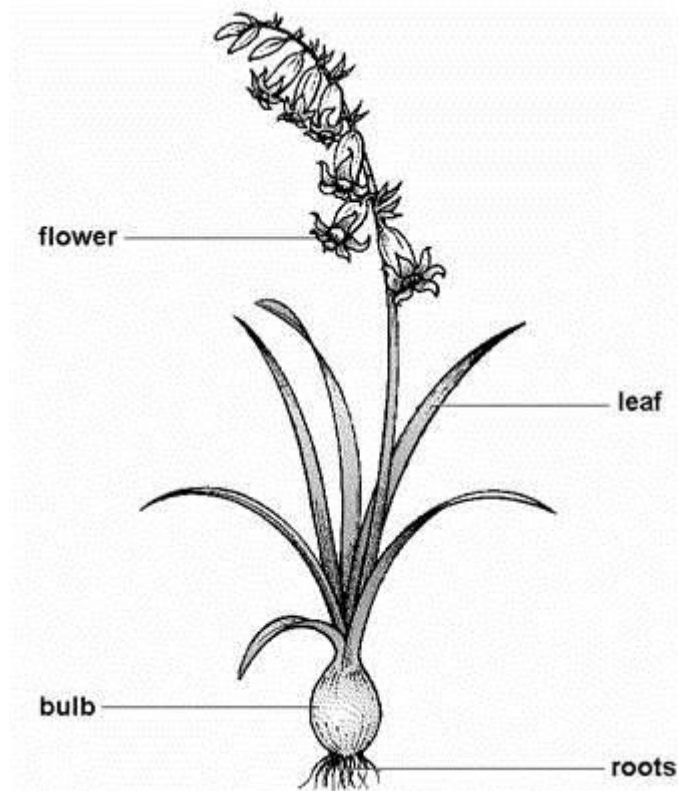


2 marks
maximum 7 marks

Q27.

The drawing shows a bluebell plant. The plant grows from an underground stem called a bulb.

Each year new leaves and flowers grow from the bulb.



- (a) Describe the process by which glucose is made in the leaves.

.....

.....

.....

.....

.....

3 marks

- (b) Many plants make starch from glucose.
What group of nutrients do both glucose and starch belong to?

.....

1 mark

- (c) In the sixteenth century bluebell bulbs were dug up to obtain a starch-like substance that was used to make collars stiff.



- (i) Digging up bluebell bulbs has caused a decrease in the number of bluebells growing in Britain.
It is now against the law to dig up bluebells.

Suggest **one** other environmental reason why the number of bluebell plants has decreased in Britain.

.....
.....

1 mark

- (ii) Every 10 years the trees and bushes in some bluebell woods are cut down to ground level.

What effect does this have on the number of bluebells in the woods?
Explain your answer.

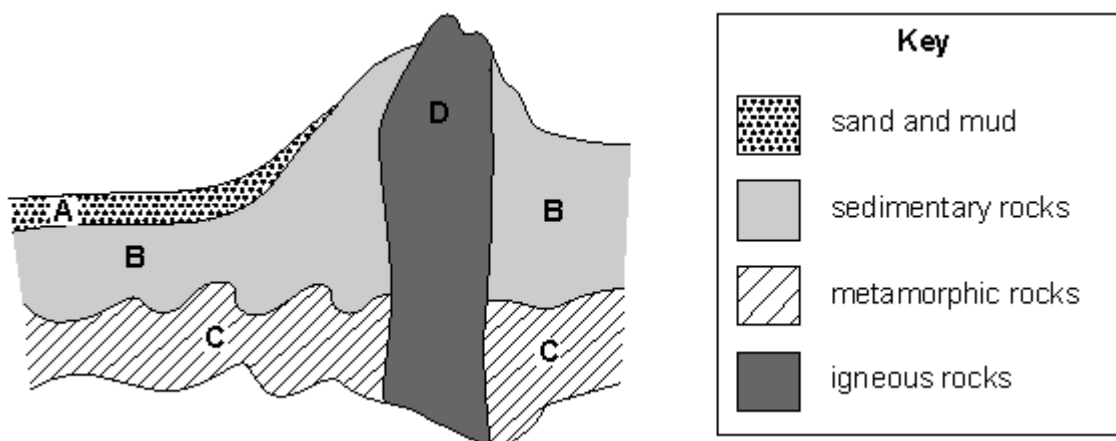
.....
.....

1 mark

Maximum 6 marks

Q28.

The diagram shows rocks in a mountain range.



- (a) Choose the correct letter from the diagram to best match the descriptions below.
You may write each letter more than once.

- (i) rock changed by heat and pressure

.....

- (ii) rock formed by magma cooling and solidifying

.....

- (iii) the oldest rock shown in the diagram

.....

- (iv) region where eroded materials are deposited

.....

- (v) region not being affected by erosion

.....

3 marks

- (b) Rainwater can damage rocks by physical and chemical weathering.

- (i) Give one way rainwater causes **physical** weathering.
Give the name and describe the process in the table below.
- (ii) Give one way rainwater causes **chemical** weathering.
Give the name and describe the process in the table below.

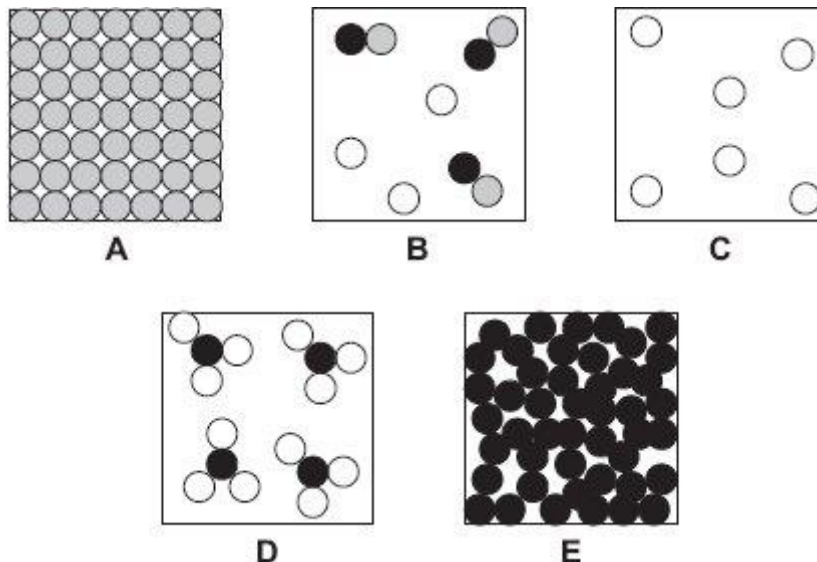
	name	description of process
physical weathering		
chemical weathering		

4 marks
maximum 7 marks

Q29.

- (a) The diagrams below show the arrangement of atoms or molecules in five different substances A, B, C, D and E.

Each of the circles ,  and  represents an atom of a different element.



Give the letter of the diagram which represents:

- (i) a mixture of gases;

.....

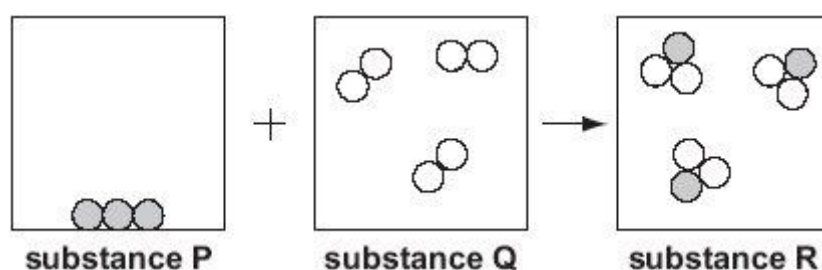
1 mark

- (ii) a single compound.

.....

1 mark

- (b) The diagram below shows a model of a chemical reaction between two substances.



- (i) How can you tell from the diagram that a chemical reaction took place between substance P and substance Q?

.....

1 mark

- (ii) Substance P is carbon.

Suggest what substances Q and R could be.

substance Q

substance R

1 mark

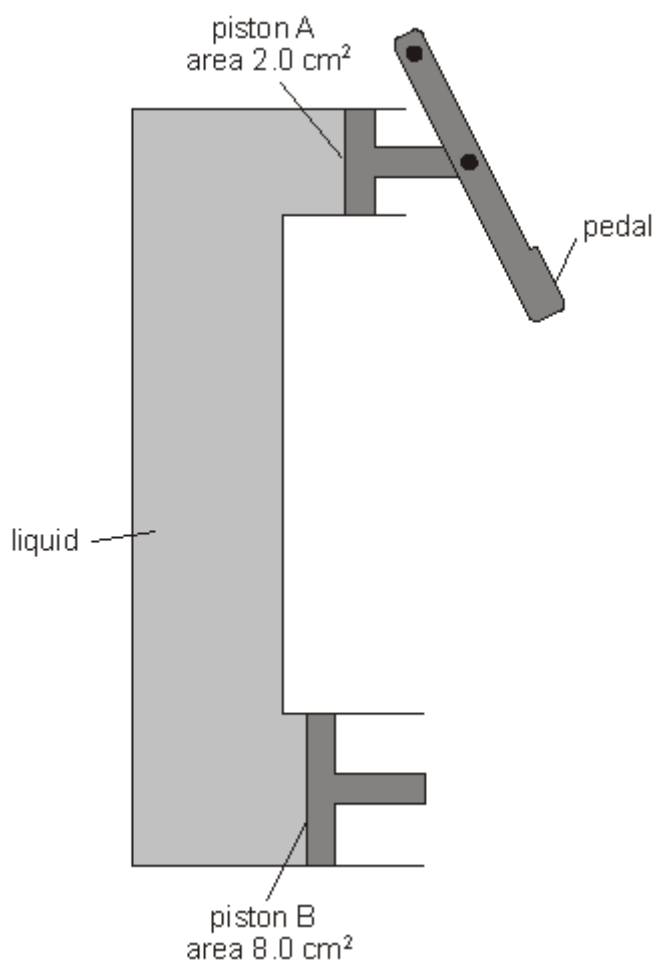
- (iii) How does the diagram show that mass has been conserved in this reaction?

.....

1 mark
 maximum 5 marks

Q30.

The diagram below shows a container filled with a liquid.



At each end of the container there is a piston.
 Piston A has a smaller area than piston B.

- (a) (i) Rebekah pushes on the pedal. This produces a force of 200 N on piston A.

Calculate the pressure that piston A exerts on the liquid.
 Give the unit.

.....

2 marks

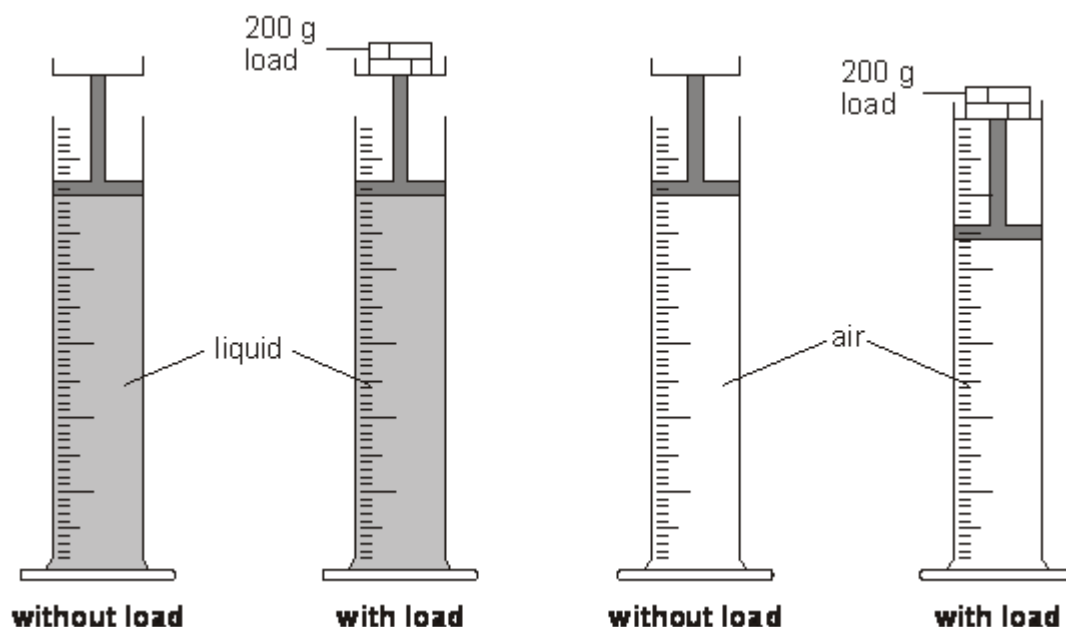
- (ii) The liquid in the container exerts the same pressure on piston B.

Use this pressure to calculate the force on piston B.

.....
 N

1 mark

- (b) Rebekah set up a different experiment as shown below.
 She measured the volume of the liquid and the air in the
 cylinders before and after a 200 g load was added to the piston.



- (i) When the loads were added to the pistons, the volume of the liquid did **not** change but the volume of the air decreased.

Explain why this happened.

.....

1 mark

- (ii) The diagram on the opposite page represents the way the brake system of a car works.
 The brake pedal pushes piston A.
 Piston B pushes the brakes on.

If air bubbles get into the liquid, the brakes do **not** work properly.
 Explain why.
 Use the diagrams above to help you.

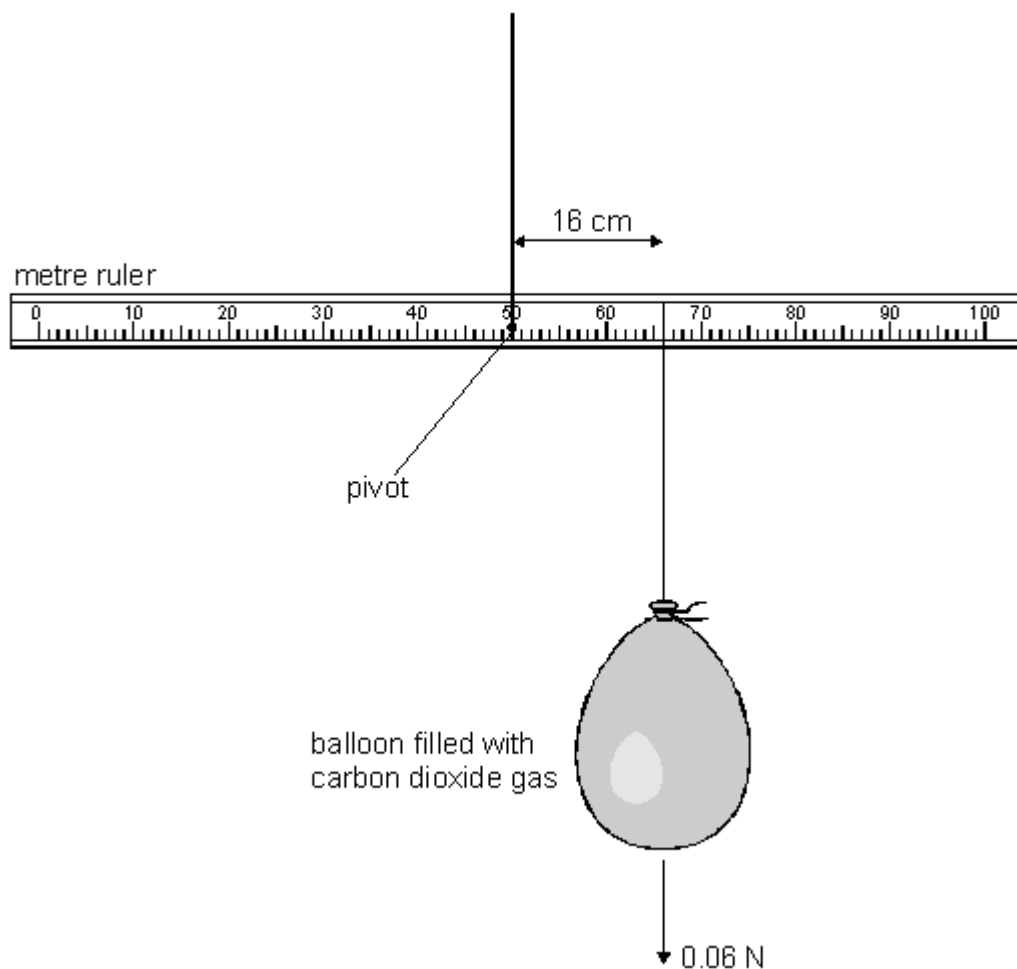
.....

1 mark
 maximum 5 marks

Q31.

Alex has a 100 cm ruler pivoted at the centre. She ties a balloon filled with carbon dioxide 16 cm from the pivot, as shown below.

The total weight of the balloon and carbon dioxide is 0.06 N.



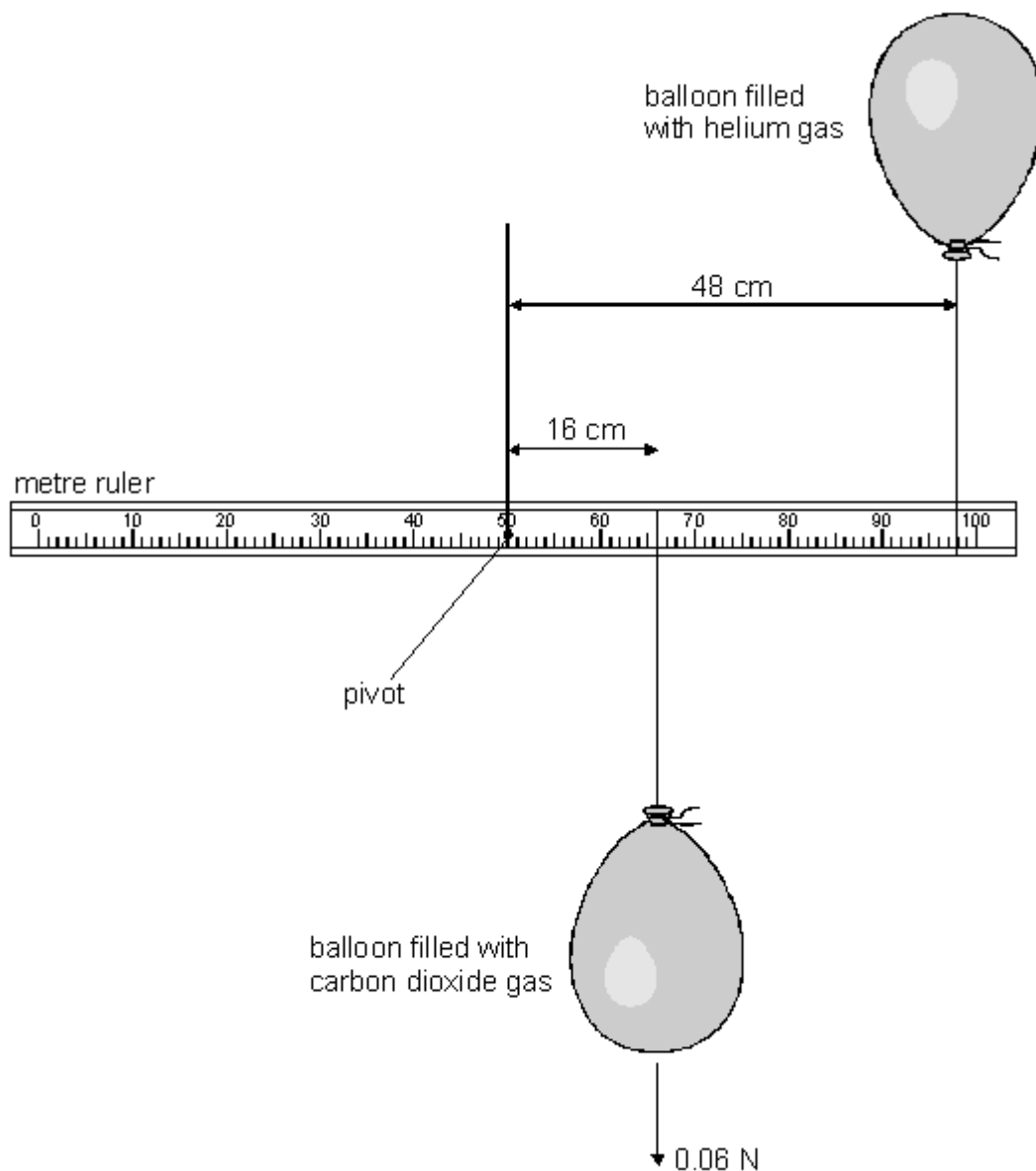
- (a) The ruler becomes unbalanced.
Calculate the turning moment the balloon produces about the pivot on the ruler.
Give the unit.

.....

.....

2 marks

- (b) Alex ties another similar balloon, filled with helium, 48 cm from the pivot.
The helium balloon exerts an upward force on the ruler.
The ruler is balanced as shown below.



- (i) When the ruler is balanced, what turning moment must the helium balloon produce about the pivot?

.....

1 mark

- (ii) Calculate the upward force exerted by the helium balloon on the ruler.

.....

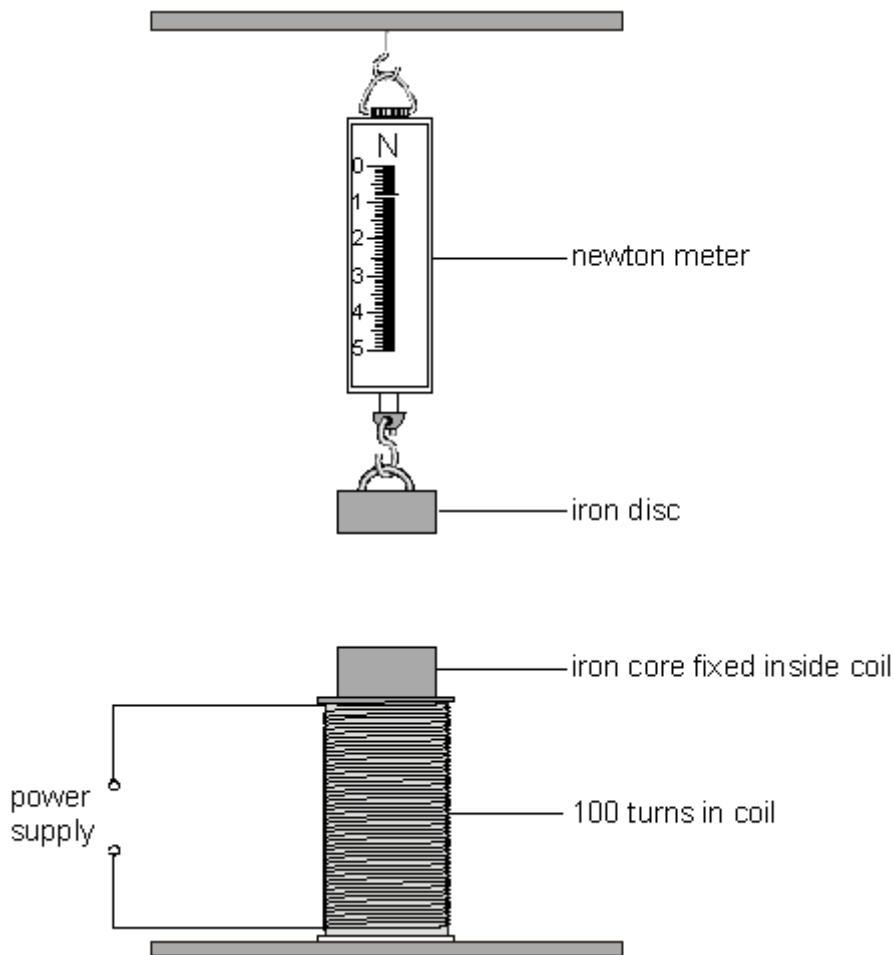
..... N

1 mark

Maximum 4 marks

Q32.

Mary used the apparatus below to test the strength of an electromagnet. She used the reading on the newton meter to measure the force of the magnet on the iron disc.



- (a) Explain why the reading on the newton meter increases when a current passes through the coil.

.....

.....

.....

.....

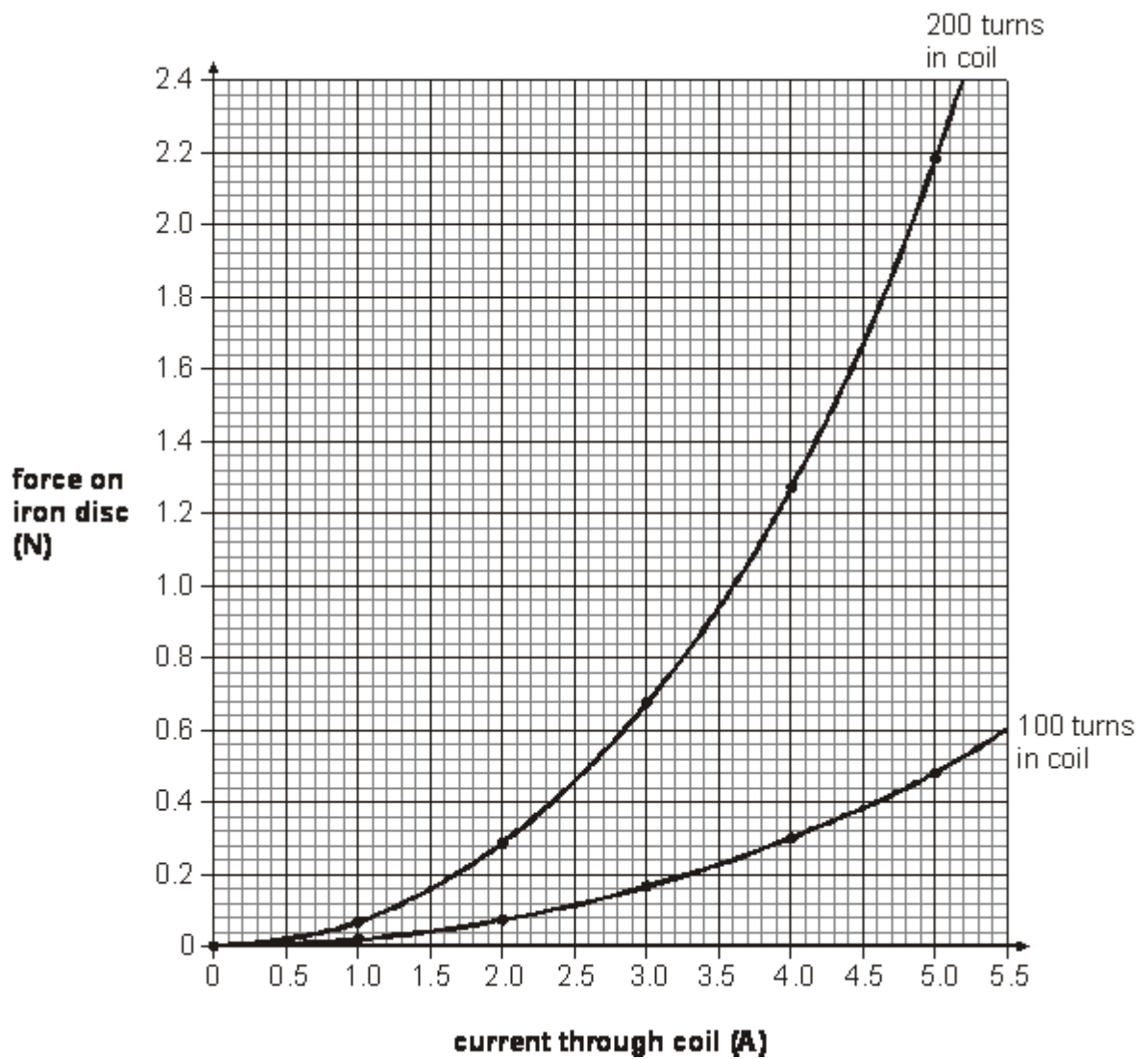
2 marks

- (b) When a current passes through the coil, some of the electrical energy is changed to thermal energy.
What would happen to the coil if the current passing through it was too large?

.....

1 mark

- (c) Mary made two electromagnets, one with 100 turns of wire in the coil and one with 200 turns.
She varied the current through the coil of each electromagnet.
She measured the force of each electromagnet on the iron disc.
The graph shows her results.



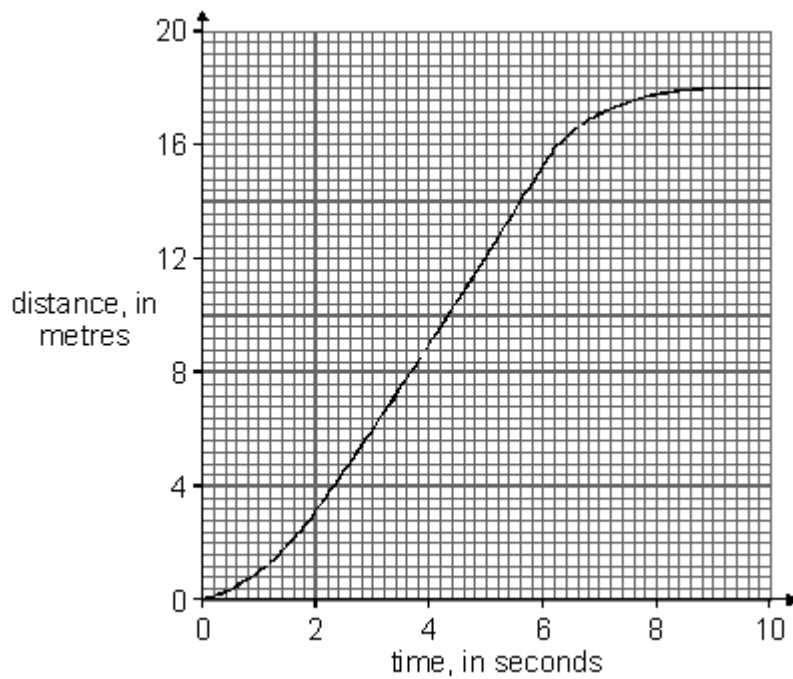
Write **two** conclusions that Mary could make from these results.

1.
2.

2 marks
maximum 5 marks

Q33.

A remote-controlled car was timed over a period of 10 seconds.
A graph of **distance** against **time** is shown below.



(a) Describe the motion of the car between:

(i) 2 seconds and 6 seconds;

.....

1 mark

(ii) 9 seconds and 10 seconds.

.....

1 mark

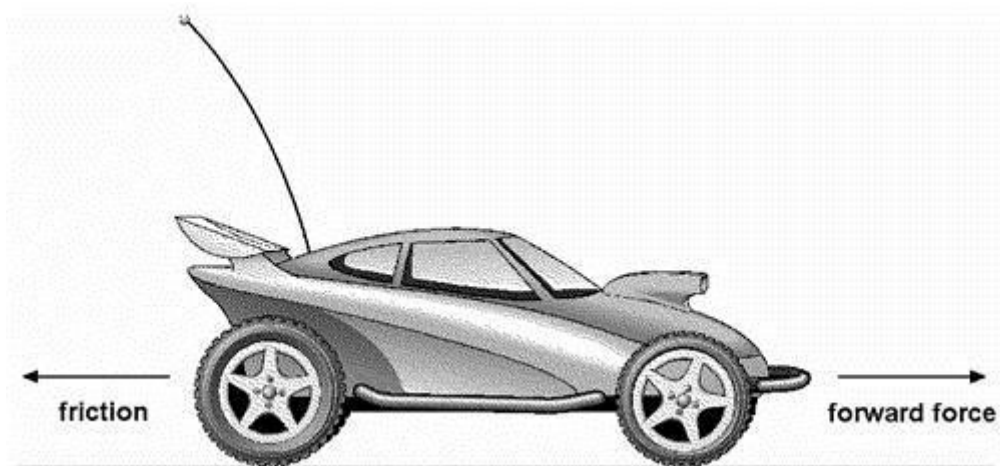
(b) Calculate the average speed of the car between 0 and 10 seconds.
Give the unit.

.....

.....

2 marks

(c) The diagram below shows **two** of the forces acting on the car when it is moving.



- (i) When the motor was switched off, the car slowed down and then stopped.

While the car was slowing down, which of the following was true? Tick the correct box.

Friction was zero and the forward force was greater than zero.

☐

The forward force was zero and friction was greater than zero.

☐

Friction was zero and the forward force was zero.

☐

The forward force and friction were both greater than zero.

☐

1 mark

- (ii) Use the graph to find the time when the car started to slow down.

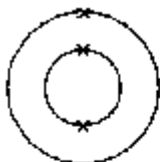
The car started to slow down after s.

1 mark

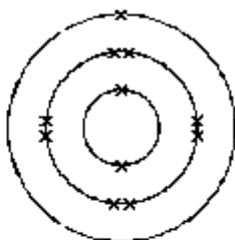
Maximum 6 marks

Q34.

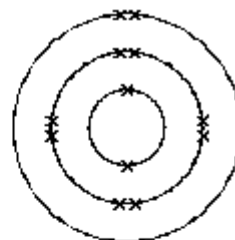
- (a) The electronic arrangements of six elements are shown in the diagrams below. They are labelled A-F. Each electron is shown by an x.



A



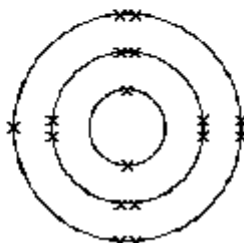
B



C



D



E



F

- (i) Which element is in group 6 of the periodic table?

.....

1 mark

- (ii) Three of the elements are metals.
Give the letters of **two** elements which are metals.

.....

1 mark

- (b) When element B reacts with another element, each atom of B loses its outer electron to leave an ion with a full outer shell of electrons.

What will be the charge on the ion formed from an atom of element B?

.....

1 mark
Maximum 3 marks

Mark schemes

Q1.

- (a) (i) • E ✓
if more than one box is ticked, award no mark
1 (L3)
- (ii) • D ✓
if more than one box is ticked, award no mark
1 (L3)
- (b) (i) • B ✓
if more than one box is ticked, award no mark
1 (L3)
- (ii) • F ✓
if more than one box is ticked, award no mark
1 (L3)
- (c) (i) • stop watch **or** stop clock
accept 'watch' **or** 'clock'
'timer' is insufficient
1 (L3)
- (ii) • thermometer
accept 'temperature sensor'
'sensor' is insufficient
1 (L3)

[6]

Q2.

- (a) (i) • sperm
1 (L3)
- (ii) • testis
accept 'testes'
1 (L4)
- (b) (i) • ovum **or** egg
1 (L3)
- (ii) • ovary
accept 'ovaries'
1 (L4)
- (c) fertilisation
1 (L3)
- (d) (i) • foetus
1 (L4)
- (ii) • uterus
1 (L3)

[7]

Q3.

- (a) (i) vibrate
accept 'move in and out'
'move' is insufficient
1 (L4)
- (ii) any **one** from
- it stops the sound waves **or** vibrations reaching our eardrums
accept 'it stops sound reaching our eardrum'
accept 'it absorbs sound'
accept 'it blocks the ear'
 - it stops the eardrum vibrating
accept 'it stops the eardrum moving in and out'
 - the eardrum vibrates less
accept 'soundwaves are reflected by the wax'
1 (L3)
- (b) (i) human *and* sparrow *and* rabbit
accept 'bird' for sparrow
answers may be in any order
all three answers are required for the mark
1 (L4)
- (ii) cat
1 (L4)

[4]**Q4.**

- (a) (i) any **one** from
- bubbles
 - fizzing
accept 'effervescence'
 - gas is given off
*'metal goes into solution **or** turns into a salt'*
and 'there would be a rise in temperature'
are insufficient answers as they are
not shown in the drawings
1 (L3)
- (ii)
- magnesium
accept 'Mg'
 - zinc
accept 'Zn'
 - iron
accept 'Fe'

- copper
accept 'Cu'
answers must be in the correct order
all four answers are required for the mark
1 (L4)
- (b) (i) • copper
accept 'Cu'
1 (L3)
- (ii) • iron
accept 'Fe'
1 (L4)

[4]

Q5.

- (a) • 7
• orange
• an answer in the range 1–3 accept '1–3'
• purple
for **all four** rows correct, award two marks
for any **two** or **three** rows correct, award one mark
answers must be in the correct column and row in the table
2 (L3)
- (b) any **one** from
• they are corrosive
• they burn **or** irritate
accept 'they can damage your skin or eyes'
'in case it touches your skin' is insufficient
it is harmful **or** poisonous' is insufficient
'it can kill you' is insufficient
'wear gloves' is insufficient
do **not** accept 'it is flammable'
1 (L4)
- (c) (i) • time, in days
accept 'time'
accept 'days'
do **not** accept 'hours' or 'minutes'
1 (L4)
- (ii) it goes down or decreases
accept 'it becomes acidic'
'it goes red' is insufficient
accept 'it goes from 6.5 to 2.5'
accept 'the acid gets stronger'
'it goes sour' is insufficient
if the label for X is incorrect in part (ci),

do not penalise again in part (cii)

1 (L4)

[5]

Q6.

- (a) (i) • **no** magnetic force ✓
*if more than one box is ticked, award no mark
ignore added poles*

1 (L4)

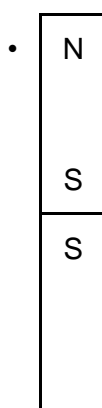
- (ii) • **attract** ✓
*if more than one box is ticked, award no mark
ignore added poles*

1 (L3)

- (iii) • **attract** ✓
*if more than one box is ticked, award no mark
ignore added poles*

1 (L3)

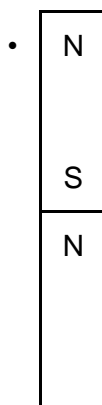
- (b) (i)



all three poles are required for the mark

1 (L4)

- (ii)



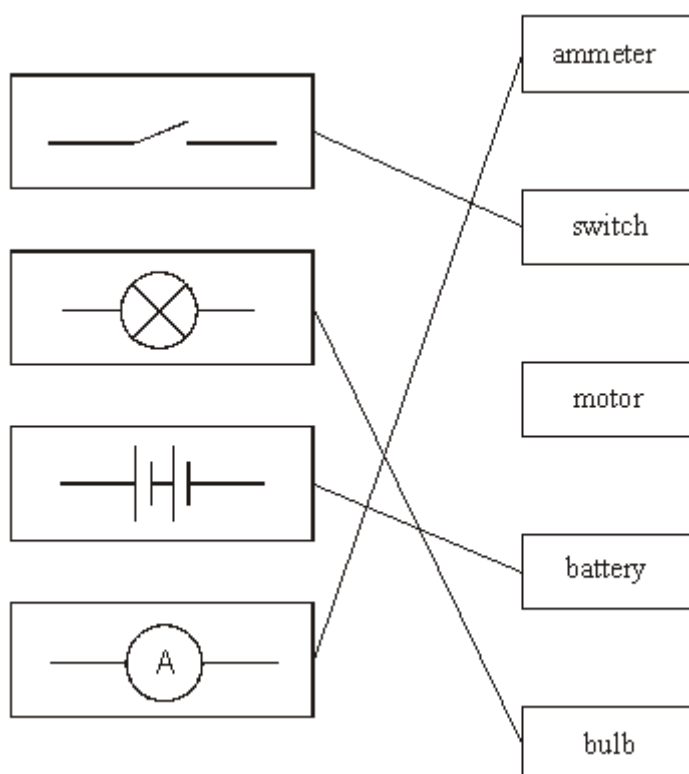
all three poles are required for the mark

1 (L4)

[5]

Q7.

(a)



*all four lines are required for three marks
any three lines are required for two marks
any two lines are required for one mark
if more than one line is drawn from a symbol,
do not give credit for that symbol*

3 (L4)

(b) battery

*accept 'cell' or 'cells'
accept 'power supply' or 'power pack'*

1 (L4)

(c)

	series	parallel
circuit 1	✓	
circuit 2		✓

*both ticks are required for one mark
if more than one box is ticked in any row, award no mark*

1 (L4)

(d) copper

*accept 'aluminium'
accept 'gold'
do not accept any other metal*

1 (L4)

[6]

Q8.

- (a) (i) vertebrates
do not accept 'vertebrae'
1 (L5)
- (ii) reptiles
1 (L5)
- (b) any **one** from
- so that it can bend
 - to allow movement
- 1 (L5)
- (c) any **one** from
- to stop the bones rubbing together
accept 'it reduces friction'
 - to stop bones getting worn down
 - to cushion the bones
accept 'it can be squashed'
accept 'it absorbs shock'
- 1 (L5)
- (d) *the biceps contracts*
the triceps relaxes
both answers are required for the mark
1 (L6)

[5]

Q9.

- (a) (i) oxygen and carbon dioxide
1 (L5)
- (ii) smaller surface area
1 (L5)
- answers may be in either order*
both are required for the mark
accept 'O₂ and CO₂'
accept 'nitrogen' instead of oxygen and carbon dioxide
do not accept 'smaller'
- (b) (i) nicotine
1 (L5)
- (ii) tar
1 (L5)
- (iii) carbon monoxide
1 (L5)

Q10.

- (a) (i) any **two** from
- coal
 - peat
 - natural gas
accept 'gas'
 - oil
accept 'petrol' or 'diesel'
- 1 (L5)
- (ii) sulphur dioxide
accept 'sulphur oxide' or 'sulphur trioxide'
answers may be in either order
***both** answers are required for the mark*
- 1 (L6)
- (b) (i) it raises the pH of it
accept 'it neutralises it' or 'it neutralises some of the acid'
- 1 (L5)
- (ii) calcium sulphate ✓
if more than one box is ticked, award no mark
- 1 (L6)
- (c) (i) leaves are needed for photosynthesis **or** for making food
accept 'they absorb light'
- 1 (L5)
- (ii) any **one** from
- it weathers limestone
accept 'it erodes them or wears away the building'
'it damages the stone' is insufficient
 - it reacts with the stone
accept 'it dissolves limestone or the building'
'it corrodes them' is insufficient
- 1 (L5)

Q11.

- (a) any **one** from
- there is a colour change
accept 'it goes green or orange'
'the colour' is insufficient
 - a new metal is formed

- accept 'the iron filings change colour'*
1 (L5)
- (b) (i) copper
accept 'Cu'
1 (L5)
- (ii) iron sulphate
accept 'FeSO₄'
1 (L6)
- (iii) • no ✓
any **one** from
- iron is more reactive than copper
accept 'iron is higher on the reactivity series'
 - copper is less reactive than iron
accept 'copper does not displace iron'
both an indication that the reaction does not happen
and the explanation are required for the mark
1 (L6)
- (c) • calcium ✓
potassium ✓
if more than two boxes are ticked, award no mark
both answers are required for the mark
1 (L6)

[5]

Q12.

- (a) (i) C - it is the closest to the Sun
*accept 'it is closer **or** close'*
both the letter and the correct explanation
are required for the mark
1 (L5)
- (ii) an arrow from each of the points A, B, C and D towards the Sun
all four arrows are required for the mark
1 (L5)
- (iii) A
it is furthest from the Sun **or** the effect of the
Sun's gravity is weakest
*accept 'it is further **or** far away'*
*accept 'gravity is low **or** lower'*
both the letter and the correct explanation
are required for the mark
1 (L6)

- (b) (i) a number greater than 2870 and smaller than 5900
1 (L5)
- (ii) the further away the lower the temperature
accept the converse
accept 'the further away the colder it is'
1 (L5)
- (iii) any **one** from
- planets further away receive less energy **or** heat
accept 'light' for energy
do not accept 'the Sun's heat cannot reach heat planets that are far away'
 - energy from the Sun spreads out
accept 'the Sun's rays are weaker or not as strong'
'the Sun is weaker' is insufficient
 - less heat reaches the planets that are further away
1 (L6)

[6]

Q13.

- (a) B
1 (L5)
- (b) (i) A and C
accept 'lift and weight'
answers may be in either order
both letters are required for the mark
1 (L5)
- (ii) D and B
accept A and C
answers may be in either order
both letters are required for the mark
1 (L5)
- (c) (i) • Force D is greater than force B. ✓
if more than one box is ticked, award no mark
1 (L6)
- (ii) • Force A is greater than force C. ✓
if more than one box is ticked, award no mark
1 (L6)

[5]

Q14.

- (a) • 65
it is different from the angle of incidence **or** all the others are the same
accept 'number 4' or 'the fourth'
accept 'it is not 60°' or 'it should be 60°'

accept 'the angle of reflection and the angle of incidence should be the same'

accept 'it is 5° out'

accept 'they are not the same'

both the answer and the correct explanation are required for the mark

award a mark for '60°' if the explanation is correct

'they go up in tens' is insufficient

'it does not fit the pattern' is insufficient

1 (L5)

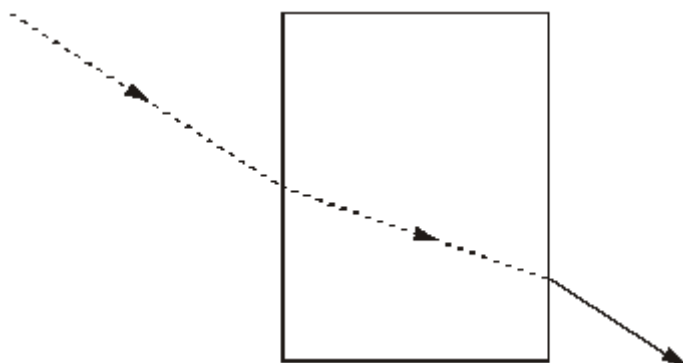
- (b) (i) • a number from 30 to 32

1 (L5)

- (ii) • greater than
accept 'greater' or 'bigger'

1 (L5)

(c)



accept a continuous straight line that bends away from the normal

accept a line without an arrow

The ray need not be parallel to the incident ray

1 (L6)

[4]

Q15.

- (a) cell wall

answers may be in either order

1 (L6)

chloroplast

accept 'vacuole'

*do **not** accept 'X'*

1 (L6)

- (b) nucleus

*do **not** accept 'chromosomes'*

1 (L6)

- (c) chloroplast

*do **not** accept 'chlorophyll'*

1 (L6)

- (d) vacuole

accept 'sap'

*accept the correct label written within the vacuole on the diagram **or** next to label X*

1 (L6)

- (e) near the upper surface of a leaf ✓

if more than one box is ticked, award no mark

1 (L6)

[6]

Q16.

- (a) it helps it to hide from its prey

1 (L6)

it helps it to hide from predators

answers may be in either order

*accept 'hides it from rabbits **or** from animals it eats'*

*accept 'hides it from animals which eat **or** hunt it'*

accept 'to camouflage it'

for one mark only accept 'it is an insulator'

***or** 'it keeps them warm'*

1 (L6)

- (b) inherit

1 (L6)

genes

1 (L6)

nuclei

accept 'nucleus'

1 (L6)

[5]

Q17.

- (a) (i) red **or** pink

*accept 'orange' **or** 'yellow'*

1 (L5)

- (ii) any number greater than 0 and smaller than 7

accept '0'

1 (L6)

- (b) (i) carbon dioxide is gas

*accept 'carbon dioxide **or** a gas is produced'*

1 (L5)

- (ii) any **one** from

- no more carbon dioxide **or** gas was produced
- the reaction stopped

- all the hydrochloric acid was used up
accept 'the acid had been neutralised'
do not accept 'all the magnesium carbonate was used up'
- there was an excess of magnesium carbonate **or** carbonate

1 (L6)

(c) a compound ✓✓

1 (L6)

a salt ✓✓

if more than two boxes are ticked, deduct one mark for each incorrect tick
minimum mark zero

1 (L6)

(d) any **one** from

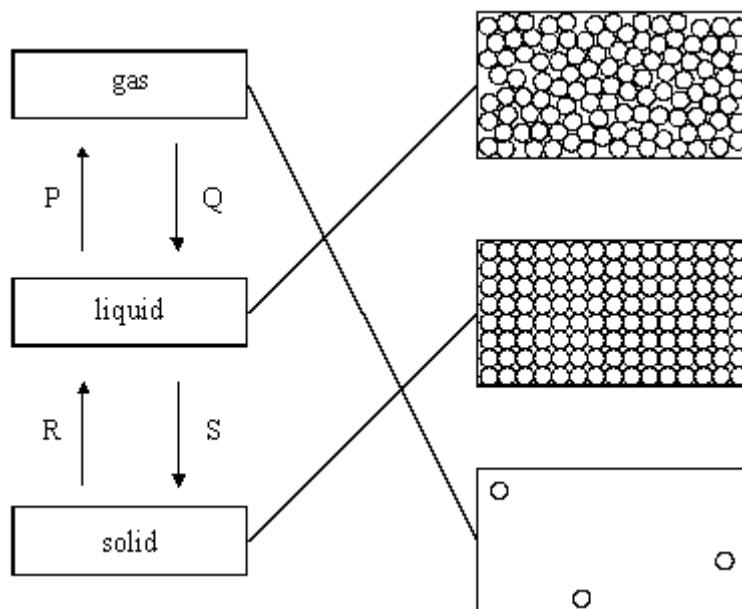
- without it digestion would stop **or** slow down
accept 'to break down food'
- acid is needed for digestion
- the enzymes only work in acid conditions **or** at a low pH
- it is needed to kill bacteria **or** microbes
do not accept 'germs'

1 (L6)

[7]

Q18.

(a) (i)



all three lines must be correct for the mark

1 (L6)

(ii) evaporation: P

1 (L5)

- melting: R* 1 (L5)
- (b) (i) liquid 1 (L6)
- (ii) carbon 1 (L6)
- hydrogen 1 (L6)
- (iii) carbon dioxide
accept 'CO₂'
accept 'carbon monoxide' or 'CO'
accept 'carbon' or 'soot'
answers must be in the correct order 1 (L6)

[7]

Q19.

- (a) evaporation then condensation ✓
if more than one box is ticked, award no mark 1 (L5)
- (b) water
accept 'distillate' 1 (L5)
- (c) 100
accept a temperature from 99 to 101 1 (L5)
- (d) (i) a temperature above 15 but below 100
 any **one** from
 - it is heated by the water vapour
accept 'vapour or steam or hot water' for water vapour
 - thermal energy **or** heat is transferred from the water vapour
accept 'it heats up'
***both** the answer and the correct explanation are required for the mark* 1 (L6)
- (ii) any **one** from
 - it condenses
accept 'it makes condensation'
 - it changes to a liquid
accept 'it is liquid'
accept 'it changes state'
accept 'it turns to water'

1 (L6)

- its temperature falls
accept 'it cools' 'it changes temperature' is insufficient

1 (L6)

(e) any **one** from

- cold water replaces warm water
*accept 'it cools the water vapour better **or** more efficiently **or** quickly'*
accept 'it will work faster'
- the water stays cold **or** cooler
- there is a bigger difference in temperature between the water vapour and the water
- some vapour escapes in B
*accept 'it is cooled over a bigger length **or** for longer'*
accept 'more water is collected'

1 (L6)

[7]

Q20.

- (a) • B ✓
C ✓

***both** answers are required for the mark
if more than two boxes are ticked, award no mark*

1 (L6)

(b) any **two** from

- it conducts electricity
- it conducts heat
one mark may be awarded for 'it is a good conductor' if a reference to heat or electricity is not given
- it is ductile or malleable
'it bends' is insufficient
- it has a high melting **or** boiling point
accept 'it is shiny'
accept 'it is sonorous'
accept 'it forms basic oxides'
'it is strong or hard' is insufficient

2 (L5)

(c) copper oxide

accept 'CuO'
*do **not** accept 'copper dioxide'*

1 (L6)

- (d) The atoms have combined in a different way to make a new substance. ✓
*if more than **one** box is ticked, award no mark*

1 (L6)

[5]

Q21.

- (a) any **two** from:

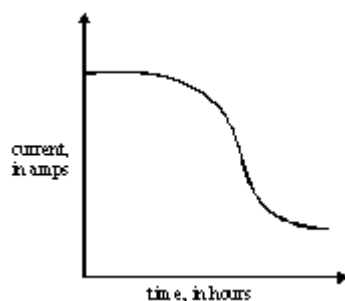
- manufacturing differences **or** bulbs are different
accept 'different resistances'
accept 'different ages'
- reading error
- dirty contacts
accept 'bulbs were not screwed in properly'
- unreliable **or** inaccurate meter
accept 'faulty ammeter'
*accept 'different wires' **or** 'differences in the wires'*

2 (L6)

- (b) 0.75

1 (L6)

- (c)



***both** axes must be labelled correctly with both the variable and the unit*

Y axis : current, in amps **or** A **or** milliamps **or** mA
accept 'I , in amps'

X axis : time, in hours **or** minutes **or** seconds
accept 't, in hours'

1 (L7)

a line **or** curve from top left to bottom right

1 (L7)

[5]

Q22.

- (a) (i) • chemical
answers must be in the correct order
1 (L6)
- thermal
accept 'kinetic'
'heat' is insufficient
'movement' is insufficient
1 (L6)
- (ii) any **one** from
- sound
- light
1 (L6)
- (b) • kinetic
electrical
answers must be in the correct order
***both** answers are required for the mark*
'movement' is insufficient for kinetic
1 (L6)
- (c) any **one** from
- the wind speed varies
accept 'it depends on the weather'
- sometimes the wind does not blow
accept 'the wind is unreliable'
- the wind cannot be controlled
accept 'it varies'
accept 'it could be too windy'
responses that do not refer to wind, such as 'they spoil the landscape' or 'they kill birds' or 'they are too noisy' or 'interfere with TV and radio signals' are insufficient
1 (L5)
- (d) (i) • Sun(light)
accept 'light'
accept 'solar (energy)'
*do **not** accept 'heat'*
'photosynthesis' is insufficient
1 (L5)
- (ii) • renewable source ✓
***both** the correct answer and a correct explanation are required for the mark*
- you can grow more plants
accept 'you grow it (again)'
*do **not** accept 'you can use it again'*
'it is a biofuel' is insufficient
1 (L6)

Q23.

- (a) (i) • A and C

letters may be in either order
both the letter and the correct explanation
 are required for the mark

their amplitudes are the same

accept 'the waves are the same height'

'the height of the waves' is insufficient

accept 'they are equally tall'

*'they are big **or** tall' is insufficient*

'taller waves are louder' is insufficient

*do **not** accept 'they are equally long'*

1 (L6)

- (ii) • B and C

letters may be in either order

both the letter and the correct explanation
 are required for the mark

their frequencies are the same

accept 'the waves are the same distance apart'

'the distance apart of the waves' is insufficient

'the less spaced out the waves,

the higher the pitch' is insufficient

accept 'the wave lengths are the same'

*'they are the same length **or** thickness **or** width' is
 insufficient*

accept 'there are the same number of waves'

1 (L6)

- (iii) • its pitch becomes higher

accept 'the frequency gets higher'

'it gets higher' is insufficient

'it becomes high' is insufficient

1 (L6)

- (b) • any number between 4.5 and 7.5 hours (inclusive)

1 (L5)

- (c) any **one** from

- it vibrates with a greater amplitude

accept 'it moves more'

- it has larger vibrations

accept 'burst ear drum'

*'it vibrates harder' and 'it vibrates more'
 are insufficient responses*

*do **not** accept 'it vibrates faster'*

1 (L5)

Q24.

- (a) the light is scattered by the ball
*accept 'it is scattered or reflected
 or bounces off the ball'*

1 (L5)

some of the light from the ball enters Naomi's eye
accept 'it goes into or gets to her eye'

1

- (b) (i)

colour of ball	colour of the light	the colour the ball appears to Naomi
<i>white</i>	<i>red</i>	<i>red</i>
<i>green</i>	<i>white</i>	<i>green</i>

do not accept 'pink' or 'light red'

1 (L6)

do not accept 'light green'

1 (L6)

- (ii) any **one** from

- it absorbs all the light
accept 'it absorbs light'
- it does not scatter any light
accept 'it does not reflect light'

1 (L6)

- (c) equal to

1 (L6)

equal to

accept 'equals' or 'the same as'

1 (L6)

- (d) **one mark is for describing scattering and one mark is for describing reflection**

scattering sends **or** reflects light in all directions
*accept 'scattered light goes all over the place'
 or 'the light from the paper goes off in lots of rays'
 or 'no image can be seen in the paper'*

1 (L6)

reflection sends light in one direction **or** to one point
*accept 'the light from the mirror is all in one ray or beam'
 or 'reflected light goes at one exact angle'
 or 'an image can be seen in the mirror'*

1 (L6)

Q25.

Markers should read through the whole answer before marking this question.

modified and unmodified plants

accept 'type of plant'

'(flowers from) different plants' is insufficient

1 (L7)

the number of days **or** weeks **or** months the flowers stayed fresh

accept 'how long they stayed fresh'

1 (L7)

any **one** from

- modified and unmodified plants should be the same variety
- conditions under which flowers are kept should be the same
- modified and unmodified plants should be the same starting age

accept 'amount of sunlight should be the same'

accept 'amount of water should be the same'

accept 'nutrients added should be the same'

1 (L7)

A suitable time span (which will allow comparison) for example
'until they have all wilted'

or

'until all ordinary plants have wilted'

award a mark for answers of 2 weeks or more

1 (L7)

[4]

Q26.

- (a) • blackbirds eat more snails so they eat fewer caterpillars
accept 'blackbirds eat snails instead of caterpillars'
'blackbirds eat more snails' is insufficient
*do **not** accept 'blackbirds stop eating caterpillars'*

1 (L6)

- (b) • blackbirds eat the snails, owls eat the blackbirds

accept 'the owls eat many blackbirds'

accept 'blackbirds eat many snails'

'snails eat the poison' is insufficient

1 (L7)

- the poison (passes up the food chain and) becomes more concentrated

accept 'bioaccumulation'

accept 'the poison accumulates'

accept 'animals do not excrete the poison'

accept 'the poison persists (in the body)'

'owls eat a large amount of poison that has been passed up the food chain' is insufficient

'owls are bigger' is insufficient

1 (L7)

(c) any **one** from

- throw the quadrat (randomly) and count the number of dandelions
- take several readings and find an average

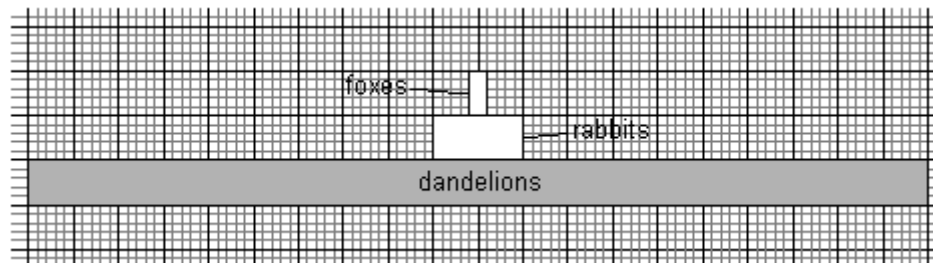
*for **two** marks, an answer must contain one of the first two marking points **and** an indication that the number will be multiplied by the area*

1 (L7)

- multiply the number by the total (grassland) area

1 (L7)

(d) • a pyramid of numbers drawn to scale with dandelions on the bottom where:
rabbits cover 50 small squares
foxes cover 10 small squares



accept an otherwise correct response that is not aligned to the centre

*one mark for labelled boxes in the correct order as shown
one mark for correctly sized bars (even if not labelled)*

2 (L7)

[7]

Q27.

(a) any **three** from

- by photosynthesis
- carbon dioxide and water used
- oxygen produced

*accept for two marks the second and third marking points in a word **or** symbol equation, for example 'carbon dioxide + water → glucose + oxygen'*

- chlorophyll **or** chloroplasts absorb solar energy **or** sunlight
accept 'solar energy transferred to chemical energy'

3 (L7)

(b) carbohydrates

1 (L6)

(c) (i) any **one** from

- loss of habitat
accept 'more buildings'
- use of herbicides **or** weedkillers
- climate change
accept 'global warming'
- competition with other plants
*do **not** accept 'growing populations'*
as this answer is too vague

1 (L7)

- (ii) it increases
because there is more light **or** there is more photosynthesis
***both** the answer and the explanation
are required for the mark*

1 (L6)

[6]

Q28.

- (a) • C
D
C
A
C

accept 'metamorphic'
accept 'igneous'
accept 'metamorphic'
accept 'sand and mud'
accept 'metamorphic'

*for all **five** correct answers, award three marks*
*for any **four** correct answers, award two marks*
*for any **two** or **three** correct answers, award one mark*
*if only **one** correct answer, award no marks*

3 (L6)

- (b) (i) **physical weathering name**

- freeze-thaw
accept 'erosion'
*a name can be awarded a mark in either the process or
name cell if it is not contradicted elsewhere*
the process named must match the description given

1 (L7)

description of process

- it can freeze and crack the rock
*accept a description of erosion for physical weathering
where 'erosion' has been named*
e.g. 'rain hits the rocks and bits break off'
'the rain wears away or erodes rock' is insufficient

1 (L7)

- (ii) **chemical weathering name**

- acid rain

*a name can be awarded a mark in either the process or name cell if it is not contradicted elsewhere
the process named must match the description given*

1 (L7)

description of process

- reacts with rock
accept 'the rock corrodes'
'it changes the rock' is insufficient
'the rock changes colour' is insufficient
do **not** accept *'it erodes the rock'*

1 (L7)

[7]

Q29.

(a) (i) B

1 (L7)

(ii) D

1 (L7)

(b) (i) any **one** from

- a compound or a new substance has been formed
accept 'the ratio is always 1P to 2Qs'
*accept 'the atoms **or** particles have joined'*
- R **or** the product is a new substance
accept 'the elements have joined'

1 (L7)

(ii) substance Q: oxygen

substance R: carbon dioxide

both answers are required for the mark

1 (L7)

(iii) the same numbers of each type of atom are present

accept 'the same number of atoms is present'
*accept 'the same particles **or** same number of particles are present'*
accept 'there is the same amount of each element'
do **not** accept *'the same number of molecules is there'*
'the same amount of elements' is insufficient

1 (L7)

[5]

Q30.

(a) (i) • 100
accept '200 ÷ 2.0'

1 (L7)

- N/cm²

accept ' 10^6 N/m^2 ' **or** ' 10^6 Pa ' for two marks

1 (L7)

(ii) 800

accept ' 100×8 '

accept the numerical answer to **a i** $\times 8$
the unit is not required for the mark

1 (L7)

(b) (i) any **one** from

- air **or** gas can be compressed
accept '*gases are easier to compress*'
'air **or** gas provides less resistance' is insufficient
- water **or** liquids cannot be compressed
- gaps between particles of
accept '*atoms can be compressed together*'
air **or** gas can be reduced

1 (L6)

(ii) any **one** from

- less force would be transmitted to the brakes
accept '*the brakes have less effect*'
'the brakes are spongy' is insufficient
- less pressure at B
accept '*less pressure could be produced*'
accept '*less **or** no resistance to the brakes*'
- piston B would not move
accept '*the air bubbles could be compressed*'

1 (L7)

[5]

Q31.

(a) 0.96

accept ' 0.06×16 '

1 (L7)

Ncm

accept '*cmN*'

accept for both marks ' 0.0096 Nm '

do **not** accept lower case *n* for *N*

the mark for the unit may be given in (b) (i)
provided it is not contradicted in part (a)

1 (L7)

(b) (i) any **one** from

- 0.96 Ncm
- the same as the carbon dioxide balloon

accept the same numerical answer given in (a)
(the unit is not required)
accept 'the same'

1 (L7)

(ii) 0.02

consequential marking applies
accept numerical answer to (b) (i) \div 48

1 (L7)

[4]

Q32.

- (a) • the core becomes magnetised
accept 'the disc becomes magnetised'
accept 'there is a magnetic field'
accept 'it becomes an (electro)magnet'
accept 'the stronger the current the stronger the magnet'
*do **not** accept 'the iron core becomes magnetic'*
*do **not** accept 'the magnet gets stronger'*

1 (L7)

any **one** from

- the core attracts the iron disc
accept 'the disc is pulled down'
'the disc moves down' is insufficient as it
does not imply that a force is exerted
- there is more force on the iron disc
accept 'the magnet exerts a force on the disc'
'there is a force on the disc' is insufficient
as it does not refer to the origin of the force

1 (L7)

(b) any **one** from

- it would melt
accept 'it would fuse'
'the coil would break' is insufficient
- it would get too hot
accept 'it could catch fire'
accept 'it would blow'
'it would get hot' is insufficient

1 (L7)

- (c) • the greater the current, the greater the force **or** field
accept the converse
answers must refer to a pattern describing
a continuous variable
*do **not** accept 'it becomes more magnetic'*
- the more turns, the greater the force **or** field

accept the converse
 accept 'the more turns, the more powerful
 or stronger the magnet'
 answers must include a comparison
 'the more turns, the more powerful it is' is insufficient
 accept 'the electromagnet with 200 turns is stronger'
 accept 'doubling the turns more than doubles the force'
 award one mark if the answer refers to
 a number of coils rather than number of turns

2 (L7)

[5]

Q33.

- (a) (i) constant speed **or** steady speed

accept not accelerating

1 (L7)

- (ii) stationary **or** not moving **or** stopped

accept 'steady speed of zero'

do **not** accept 'it has a steady speed'

1 (L7)

- (b) 1.8

accept $\frac{18}{10}$

1 (L7)

m/s

accept 'metres per second' **or** 'ms⁻¹'

do **not** accept 'mps'

1 (L7)

- (c) (i) The forward force was zero and friction was greater than zero. ✓

if more than one box is ticked, award no mark

1 (L7)

- (ii) 6

accept answers from 5.8 to 6.2

1 (L7)

[6]

Q34.

- (a) (i) F

1

- (ii) any **two** from

- A
- B
- C

two letters are required for the mark

1

- (b) one positive **or** +1 **or** 1+
accept 'B+' **or** '+' **or** 'positive'
do **not** accept '1'

1

[3]