

NAME:	SCIENCE TEACHER:	10BA
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SCIENCE

Year 10 Examination 2014

Answer all questions in the spaces provided on the paper.

Show all your working in calculations.

Give units for all answers (eg kg or m) unless they are already provided.

Check you have pages 1-29.

Question 1 [3 marks]

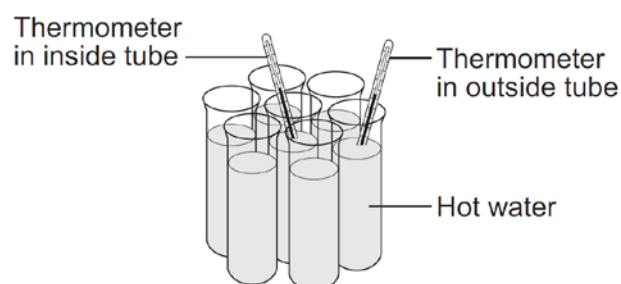
Penguins are often seen huddling together. A group of students did an investigation to find out if huddling helps to keep animals warm. The students put hot water into each of seven large test tubes.

The students recorded the temperature of the water in two of the tubes every minute for 10 minutes.



- (a) Which would be the best experimental control for this investigation? (circle your answer)

- A repeating the investigation to check the results
- B recording the temperature of water in a tube left on its own
- C measuring the temperature of real penguins in a huddle
- D moving the tubes around every two minutes



The table shows the data collected by the students.

Time (minutes)	Temperature of water in inside tube ($^{\circ}\text{C}$)	Temperature of water in outside tube ($^{\circ}\text{C}$)
0	75	74
10	68	49

- (b) To collect data for a line graph, the students should... (circle your answer)

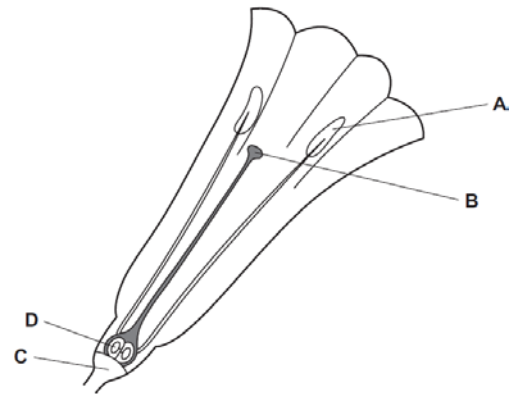
- A collect results for more than 10 minutes.
- B make sure that the water in the tubes was at the same temperature at the start.
- C collect results more often during the 10 minutes.
- D use a thermometer that measures to greater precision.

- (c) The students looked at their results and wrote a conclusion.

Write down conclusion for the experiment based on the results given in the table.

Question 2 [4 marks]

Flowers are organs in which sexual reproduction takes place. The diagram shows a section through a flower.



- (a) State the letter of the part in which
- (i) the pollen is produced _____
 - (ii) the fertilised egg is produced _____

- (b) Explain how the structure of the flower indicates that it is pollinated by insects. (2 ideas needed).

After pollination and seed formation, the ovary of a flower develops into a fruit. Fruits contain seeds. Most plants produce fruits that are adapted for dispersing seeds. Seeds are dispersed so that young plants do not grow near their parents.

- (c) Explain the advantage to plants of dispersing their seeds.

The photograph shows a cocklebur fruit. The photograph is magnified.

- (d) Suggest how cocklebur fruits are adapted for dispersing their seeds.

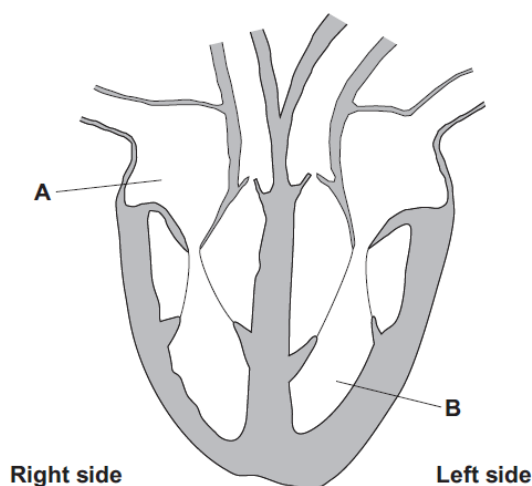


Q2:

Question 3 [5 marks]

A sports physiologist must have a detailed understanding of the heart system.

The diagram shows the structure of the heart.

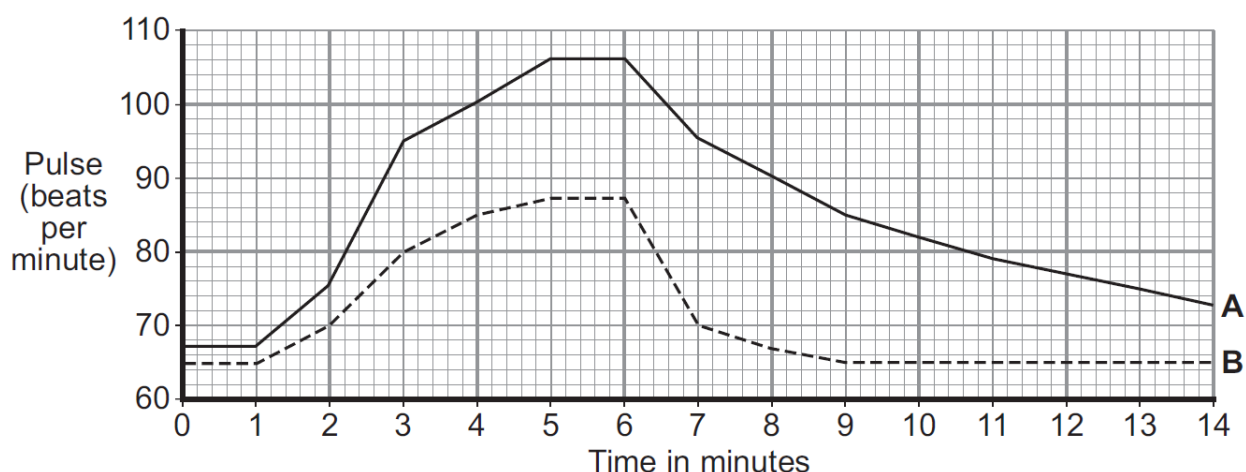


- (a) Draw arrows on the diagram to show how the blood circulates through the heart.

- (b) Name the parts of the heart labelled A and B.

A	B
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An athlete and an office worker monitored their heart rate by taking their pulse before, during and after exercise. The graph shows their results.



- (c) Why does the heart rate increase during exercise?

- (d) Suggest which line, A or B, shows the results for the athlete.

Line _____

Give two reasons for your answer.

1

2

Question 4 [2 marks]

The table shows the amounts of energy, sugar and salt in 100 mL of some sports drinks.

Drink	Energy in kJ	Sugar in g	Salt in mg
A	361	20	0
B	378	22	63
C	427	23	153
D	230	13	5

Which drink

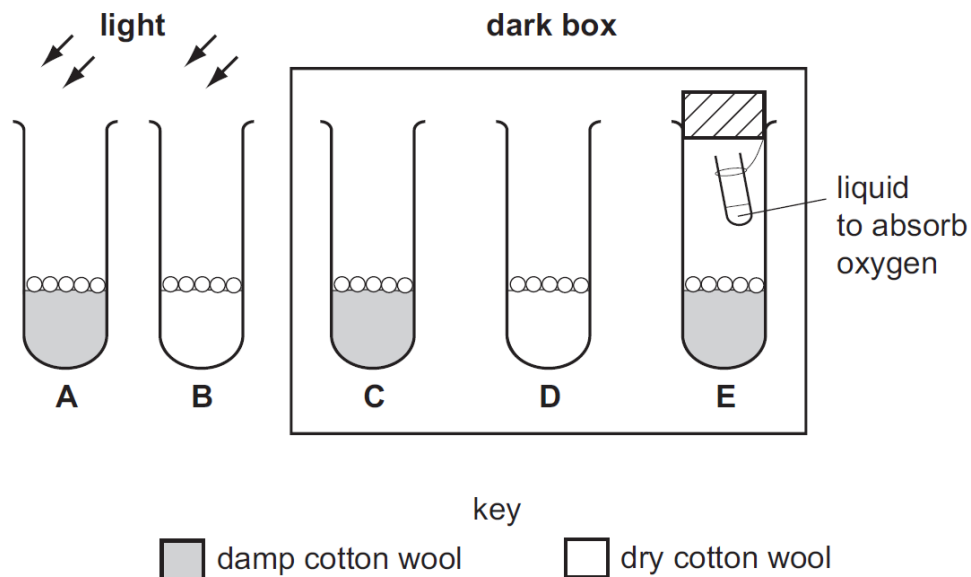
- (a) contains least energy _____
- (b) contains 220 g of sugar per litre _____
- (c) is most likely to cause increased body mass _____
- (d) is least likely to cause an increase in blood pressure _____



Question 5 [3 marks]

A student set up an experiment to investigate the conditions needed for the germination of lettuce seeds.

He placed five lettuce seeds on cotton wool in each of five test-tubes. The diagram shows the conditions present in each tube.



The table shows his results.

Tube	conditions			Number of seeds that germinated
A	Water	Oxygen	Light	5
B	No water	Oxygen	Light	0
C				5
D				0
E				0

(a) Complete the table to show the conditions present in each tube. Tubes A and B have been done for you.

(b) What conclusions can the student make from these results?

Question 6 [3 marks]

The table below shows the atomic numbers and mass numbers for six elements.

Element	carbon	nitrogen	oxygen	fluorine	neon	sodium
Atomic number	6	7	8	9	10	11
Mass number	12	14	16	19	20	23

The electrons in atoms are arranged in shells or energy levels.

- (a) What is the largest number of electrons that can fit into the first shell of each of the atoms in the table?

- (b) Which element in the table has 8 protons in the nucleus of its atoms?

- (c) What is the electron arrangement of a sodium atom?

- (d) Explain why the sodium atom has no electrical charge.

Question 7 [3 marks]

The picture shows a fire fighter putting out a forest fire.

The fire fighter's clothing has thick thermal padding inside and a light coloured, fire proof, shiny layer outside.



- (a) What is the main way that heat is transferred through the air from the fire to the fire fighter?

- (b) Why is the outside layer of the clothing shiny?

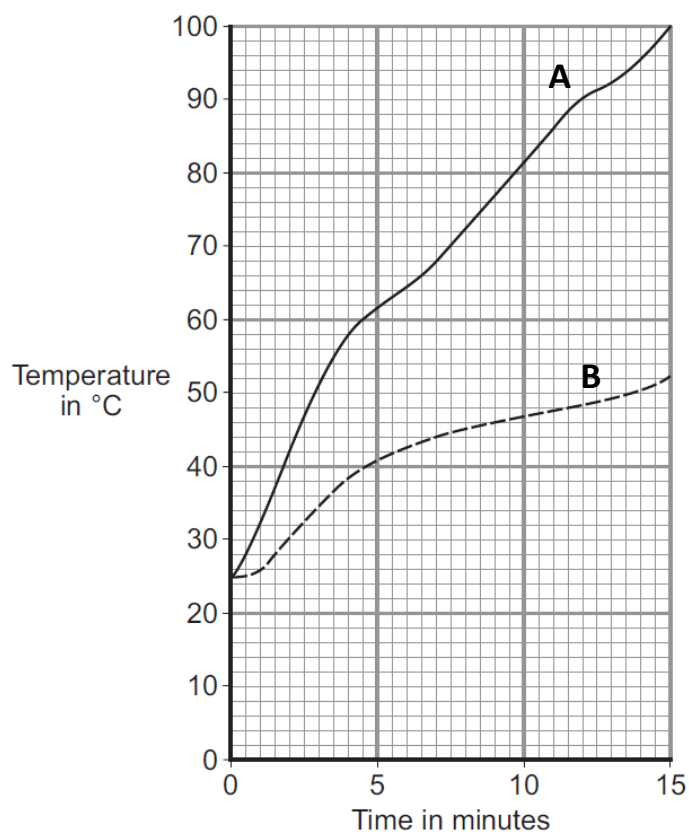
The graph shows the result of a laboratory test on two types of thermal padding.

Each type of padding was put onto a very hot metal surface and the temperature inside the padding was taken every minute.

- (c) Which type of padding, A or B, would it be best to use inside the fire fighter's clothing? Give a reason for your answer.

Padding _____

Reason:

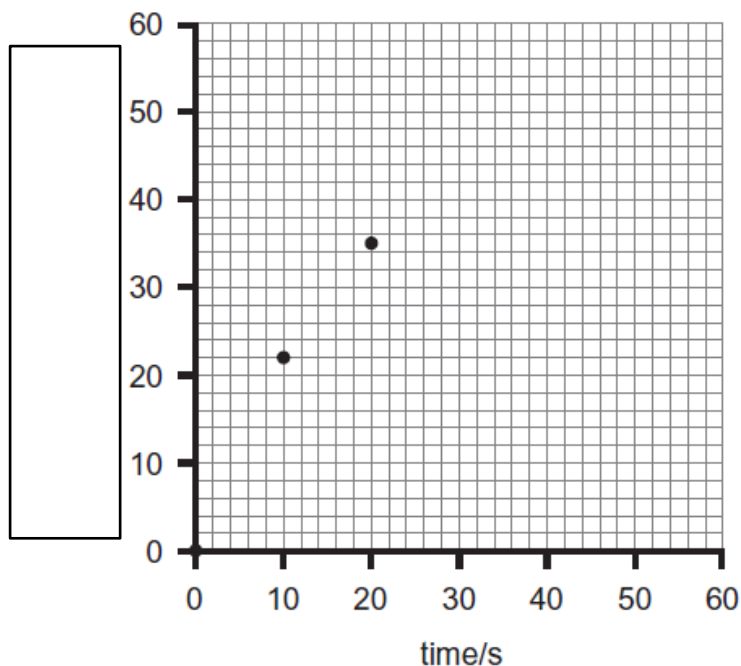


Question 8 [3 marks]

Ashley carried out an investigation into the volume of carbon dioxide given off when baking powder is added to acid. Her results are shown below.

Time (s)	0	10	20	30	40	50	60
Volume (mL)	0	22	35	42	48	50	50

- (a) On the grid below plot the rest of the points and draw a curve of best fit.



- (b) Label the y-axis.
(c) Use your graph to find how long it took to produce 30 mL of gas.

Question 9 [3 marks]

Indicators can change colour in acid and alkaline solutions. Indicators can be made from plant material such as red cabbage. Use this information in the table to answer the questions that follow.

Substance	Colour of universal indicator paper	Colour of red litmus paper	Colour of red cabbage solution	pH range
Hydrochloric acid	Red	Red	Red	1-2
Sodium hydroxide	Dark blue	Blue	Yellow	12-14
Water	Green	Red	Purple	7
Ethanoic acid	orange	red	red	3-6

Q8:

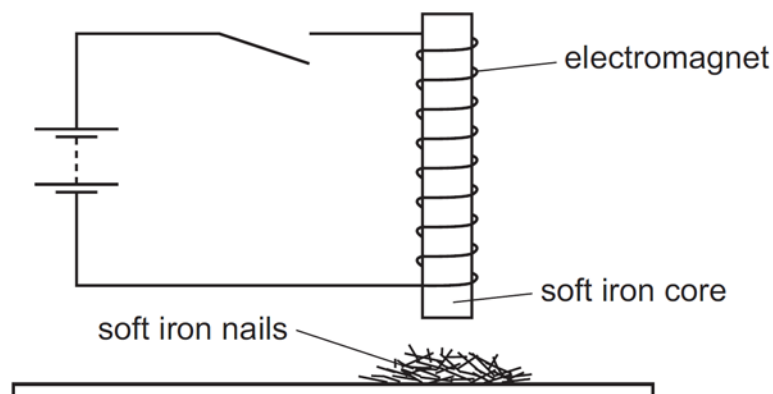
(a) Why is red litmus paper not a suitable indicator for testing pH?

(b) Explain why red cabbage solution can be described as an indicator.

(c) Why is universal indicator a better indicator than red cabbage solution for testing acids?

Question 10 [2 marks]

An electromagnet with a soft iron core is connected to battery through an open switch. The soft iron core lies just above some small soft iron nails.



The switch is now closed, left closed for a few seconds, and then opened.

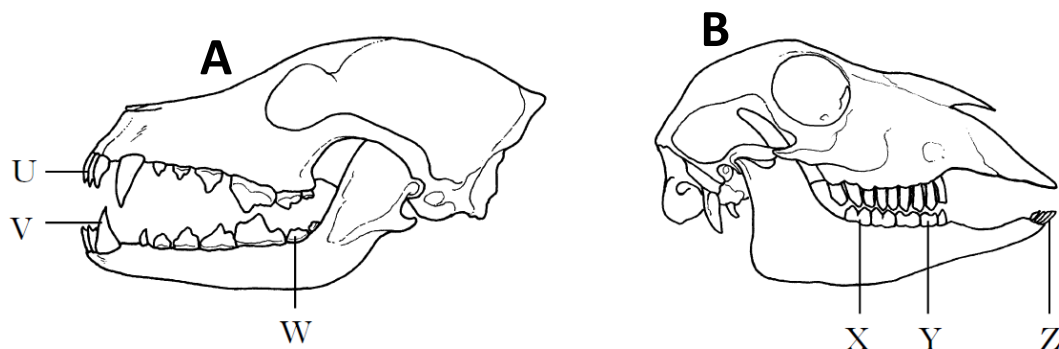
What do the soft iron nails do:

(a) (i) as the switch is closed?

(ii) as the switch is then opened?

(b) Why does the student use a soft iron core?

Question 11 [4 marks]



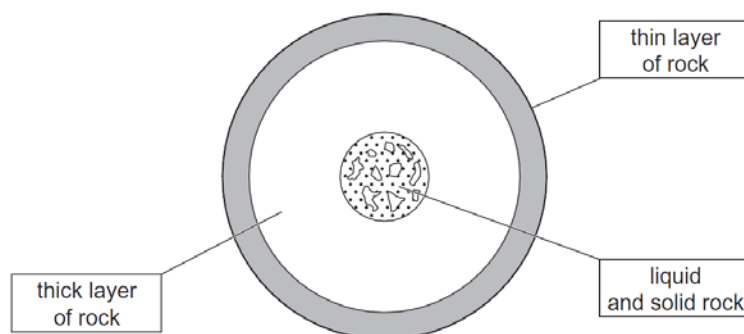
The diagram shows the skulls of two mammals.

(a) Use letters (U to Z) from the diagram to identify the following teeth.

- (i) Incisors _____ and _____
- (ii) A tooth used for piercing and holding prey _____
- (iii) A tooth used for crushing and grinding plant material _____

(b) Which skull belongs to a herbivore; Explain in detail why you chose this skull.

Question 12 [1 marks]



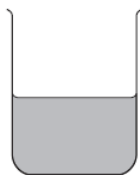
(a) Use the diagram to describe what the mantle is made from.

(b) What name is given to the outer layer?

Q11: Q12:

Question 13 [3 marks]

A forensic scientist mixed the soil from a crime scene with water to carry out some tests.



- (a) How would the forensic scientist produce a clear solution?

- (b) How would the forensic scientist measure the pH of this solution?

A bag of powder was found in the car at the crime scene.

- (c) Describe how the forensic scientist would test a sample of the powder to see if it was soluble.

- (d) When the powder was mixed with an acid, a gas was given off. How could you tell if the gas is carbon dioxide?

Tick one box.

☐

When the gas is added to limewater, the limewater turns cloudy.

☐

When a glowing splint is put in the gas, the splint lights up.

☐

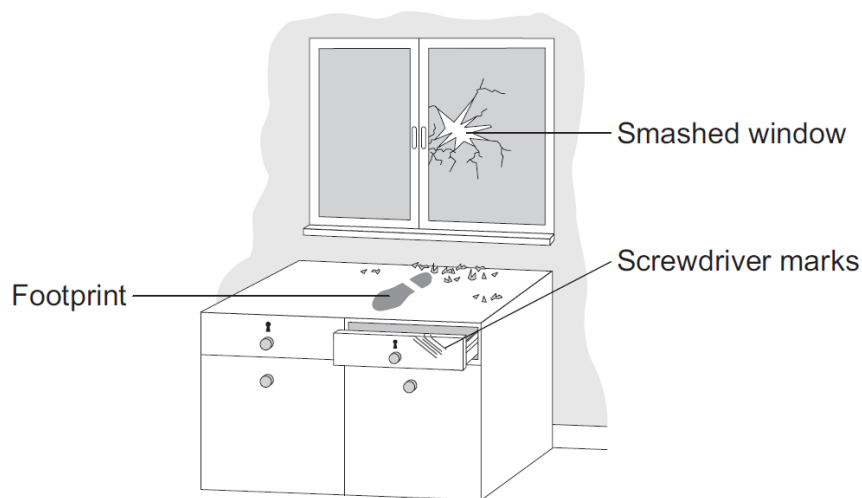
When a burning splint is placed in the gas there is a popping sound.



Question 14 [1 marks]

A Scenes of Crime Officer (SOCO) took a photograph of a crime scene.

The drawer had been forced open using a screwdriver and marks were left in the wood. A shoeprint was left on the top of the cupboard.

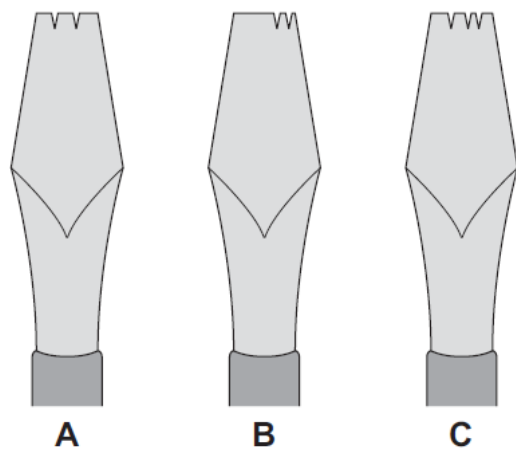


- (a) How would the SOCO collect evidence of the marks left by the screwdriver at the crime scene?

The marks made by the screwdriver were analysed by a forensic scientist.

Three screwdrivers were collected, one from each of three possible suspects.

The diagram below shows the marks on the drawer at the crime scene



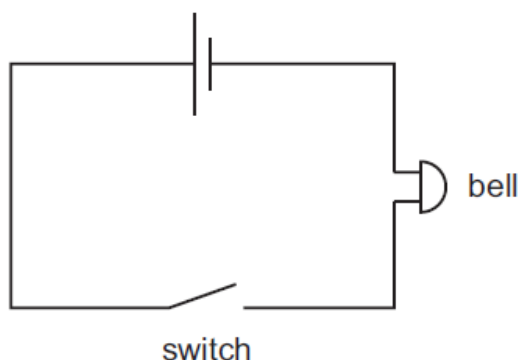
- (b) Which screwdriver, A, B or C, caused the marks on the drawer?

Q14:

Question 15 [3 marks]

A house has a door bell which is operated by a switch at the door. The switch is closed when the bell push is operated.

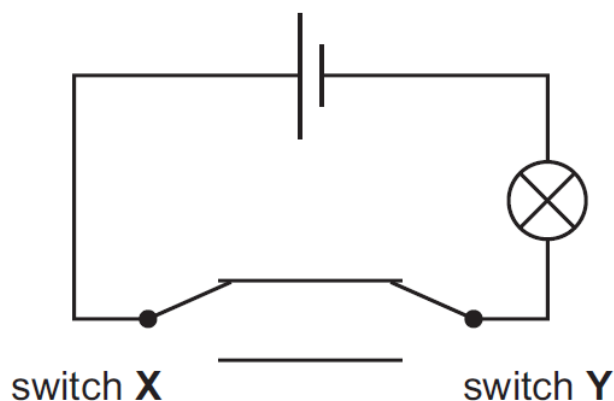
The diagram shows the electrical circuit for this.



- (a) **On the diagram above**, add another switch and connecting wires to enable the bell to work from another door as well.

The diagram opposite shows a circuit for a two-way switch to operate a lamp.

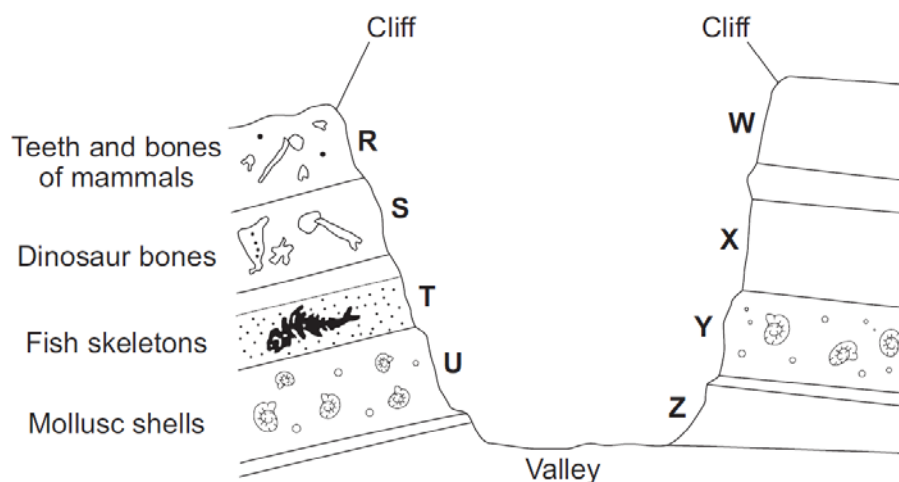
- (b) Use the circuit diagram to complete the table below.
State the position of the switch and whether the lamp is off or on.



Switch X	Switch Y	Lamp on or off
up	up	
up	down	
down		off
	down	on

Question 16 [3 marks]

The diagram shows a section through rock layers containing fossils.

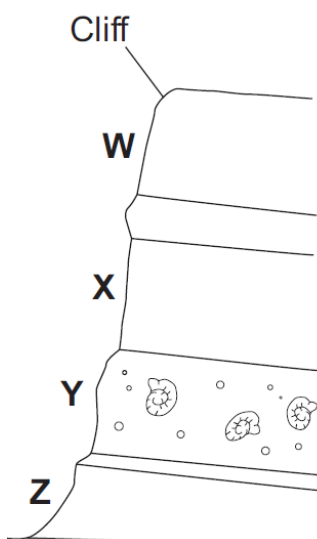


- (a) Which layers of rock are probably the same age? Give a reason for your answer.

- (b) Which of these statements about rocks and fossils is true? Tick your answer(s)

- ☐ Older fossils are usually found in deeper rocks.
- ☐ Rocks of the same age in a particular area will contain fossils of totally different life forms.
- ☐ The deeper the rock, the more different types of fossil are found.
- ☐ Fossils are never found in surface layers of rocks.

- (c) On the diagram, draw the fossils that would be found in layer W.



Question 17 [4 marks] Polymers

Polymers are materials made of giant molecules. Polymer molecules can be linear, branched or cross-linked. Linear and branched molecules form thermoplastic polymers such as polythene, polystyrene and nylon.

Thermoplastic polymers soften when heated. Cross-linked molecules form thermosetting polymers. These polymers do not soften when heated.

Urea-formaldehyde is a thermosetting polymer used to make electrical plugs and sockets. Bakelite, the first commercially produced man-made polymer, is also thermosetting.

Polymers have a wide range of applications due to their useful properties, including strength, good electrical and thermal insulation and resistance to attack by corrosive chemicals. Low density polythene or LDPE is widely used in the packaging industry as a tough, transparent film. High density polythene or HDPE is used where greater strength is required. HDPE is used to make heavy duty bottles and traffic cones. HDPE is also used in the construction industry to make pipes and gutters.

Polymer properties can be changed by using additives, such as plasticisers, lubricants, pigments and anti-oxidants. Plasticisers give the polymer more flexibility and lubricants reduce friction. Pigments are used to make final products of different colours. To protect polymers against attack by oxidising agents, anti-oxidants are added.

Use the information above to answer the following questions:

(a) What happens to nylon when it is heated?

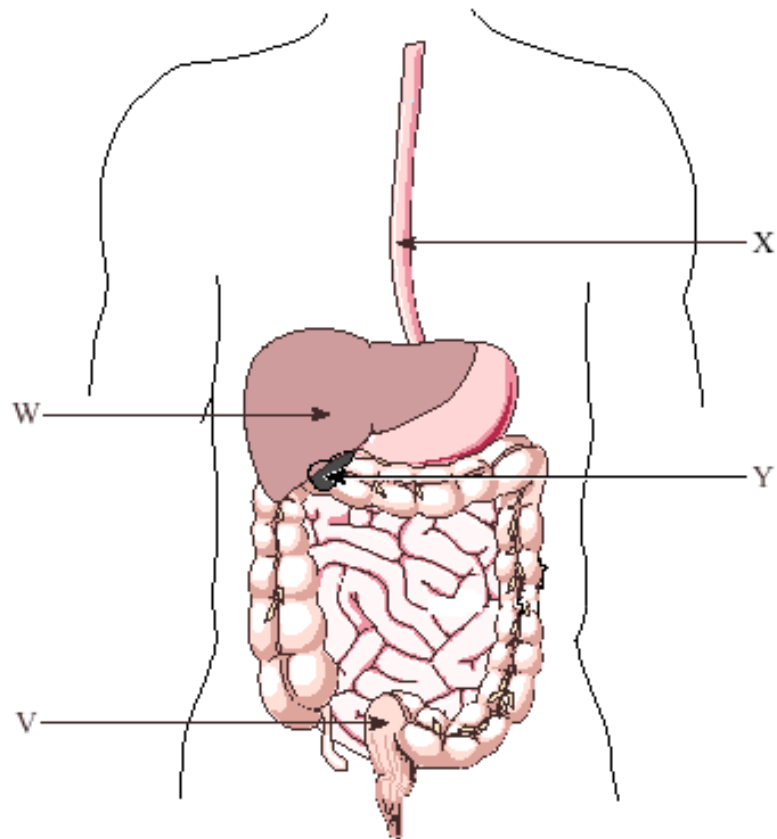
(b) What type of molecules are present in Bakelite?

(c) Why are traffic cones made from HDPE and not LDPE?

(d) What type of additive can be used to make HDPE bright orange in colour?

Question 18 [2 marks]

The human digestive system is shown below.



State the names of the following parts of the digestive system shown above.

Choose from:

rectum small intestine liver stomach pancreas
oesophagus small intestine

V
W
X
Y

Question 19 [2 marks]

For a person to stay healthy and be able to do all the things that they want to do they must have a balanced diet.

Complete the sentences below.

Use the words from the list:

Fat Carbohydrates Calcium Protein Fibre

- (a) _____ and lipids supply the body with energy.
- (b) _____ are needed to build up bones, teeth, blood and nerves.
- (c) _____ provides the bulk of the food and this gives the muscle of the digestive system something to push on to keep food moving through the body.
- (d) Eating too much _____ can lead to heart disease and blocked arteries.



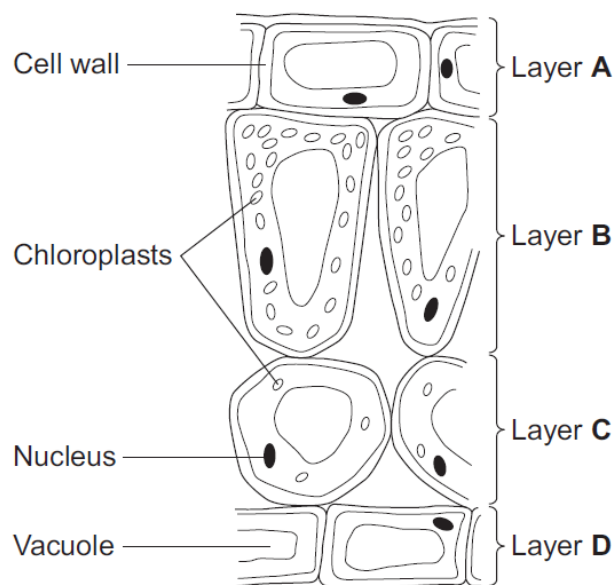
Question 20 [3 marks]

Leaves are made from layers of cells. The diagram shows a section through part of a leaf.

- (a) Which word in the table describes layer A?

Tick one box.

- ☐ tissue
- ☐ organ
- ☐ cell



- (b) Which word describes a whole leaf?

Tick one box.

- ☐ organ ☐ tissue ☐ organism

- (c) Which two layers of cells, A, B, C and D, can photosynthesise?
- (i) Use information from the diagram to help you. Tick the correct answers.

☐ Layer A

☐ Layer C

☐ Layer B

☐ Layer D

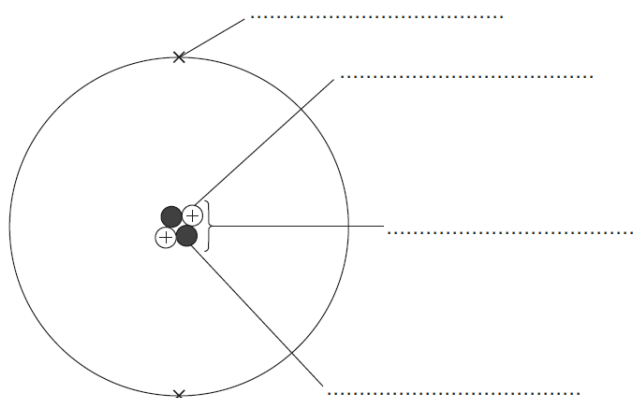
- (ii) Give one reason for your answer.

Question 21 [4 marks]

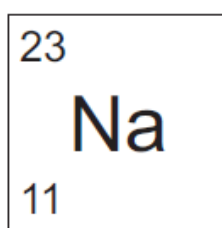
The diagram shows the model of an atom.

- (a) Use the correct answers from the list below to label it.

nucleus **electron** **positron** **neutron** **proton**



- (b) Here is some information about an atom of sodium.



- (i) What is the atomic number of sodium? _____
- (ii) What is the mass number of sodium? _____
- (iii) How many neutrons are there in a sodium atom? _____

Question 22 [2 marks]

A man lay injured at a crime scene. A witness gave the description of a person she saw leaving the scene of the crime to a forensic artist.

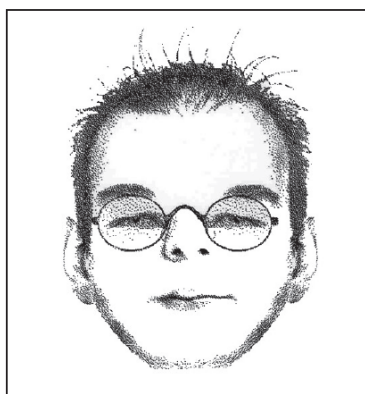
His hair was slightly spiky,
he had thick eyebrows and
a high forehead. He was
wearing round glasses and
his eyes were sleepy looking.
His nose was quite wide and
he had a thin mouth.



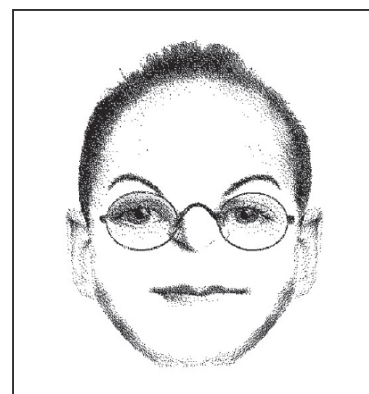
- (a) Which identikit picture, A, B or C, matches the witness description? Circle the correct answer.



A



B



C

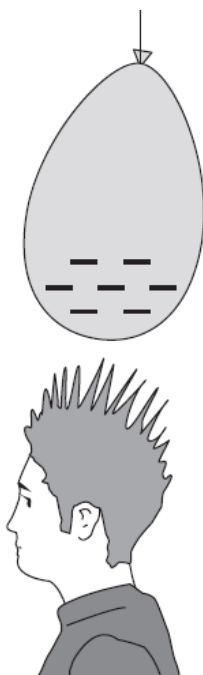
- (b) Distinguishing features help us to tell the difference between one person and another. Draw a ring around **two** distinguishing features that would be the most help in identifying a suspect.

scar *hair colour* *tattoo* *chin shape* *eye colour*

Q22:

Question 23 [3 marks]

The diagram shows a student after rubbing a balloon on his hair. The balloon and hair have become charged.



- (a) Draw a ring around the correct answer in each box to complete each sentence.

After rubbing, the charge on his hair is

positive negative neutral

- (b) When the balloon is rubbed on his hair the balloon gains

neutrons protons electrons

- (c) Complete the sentence below using the words, **electron**, **positive**, **charge**, **negative**, **attracted**, **repels** and **proton**. You may use some of these words.

After the student rubs the balloon on his hair his hair stands on end because...

Question 24 [3 marks]

Many people suffer from medical conditions which affect what they can eat. The table below gives information about some of these conditions.

Condition	Symptoms	Dietary advice
coeliac disease	diarrhoea, malnutrition, tiredness	wheat free diet
diabetes (type 2)	increased thirst, loss of weight, blurred vision	low fat and low sugar diet
heart disease	pain in chest and arms, heart attacks	low fat and low sugar diet
lactose intolerance	bloating, nausea, abdominal pain	lactose free diet

A menu from a restaurant is shown below.

Starters		KEY ♥ low in fat and sugar L lactose free V vegetarian W wheat free
Garlic bread	V	
Sweet potato soup	L V W	
Red pepper soup	♥ W	
Vegetable tartlets	♥ V	
Main courses		
Bean and green pepper salad	♥ V	
Chicken and melon shells	♥	
Chicken with grapefruit glaze	L	
Thai beef salad	♥ W	
Tomato and feta tarts	V W	
Desserts		
Chocolate and pear tart	L V W	
Fig and apricot crunch	♥ V	
Strawberry ice cream	V W	
Summer fruit mousse	L V W	

Use the table and the menu to answer the questions below.

(a) Mr Thomson has to eat a wheat free diet.

(i) Which condition does he suffer? Circle your answer.

diabetes heart disease lactose intolerance coeliac disease

(ii) Which two main courses can he eat?

(b) Mr Davidson has diabetes. Which dessert should he choose? Circle your answer.

Chocolate & pear tart strawberry ice cream fig & apricot crunch

(c) Mr Smith should only choose chicken with grapefruit glaze as his main course.

Give two symptoms of the condition from which he suffers.

Question 25 [4 marks]

Draw a ring around the correct answer to complete each sentence.

(a) Earth scientists think that, since the Earth formed, the surface of the Earth has { warmed up / stayed the same temperature / cooled down }.

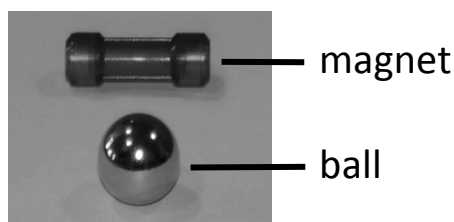
(b) The outer layers of the Earth are cracked into pieces called { crust / mantle / tectonic } plates.

(c) These plates move because of { conduction / convection / core } currents under the Earth's surface.

(d) This movement can cause { droughts / hurricanes / volcanic eruptions }.

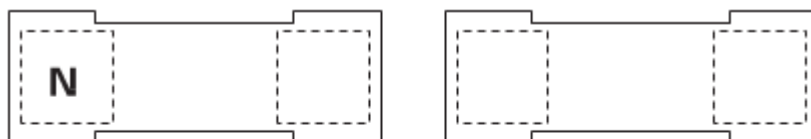
Question 26 [4 marks]

Sam has a toy made of magnets and balls. He tries to put different magnets together.

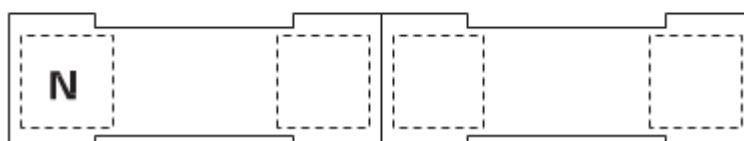


(a) Write N (North) or S (South) on each of the magnets to explain Sam's observations.

- (i) The ends of these magnets push away from each other

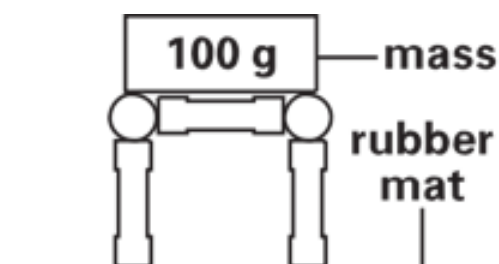


- (ii) The ends of these magnets pull together

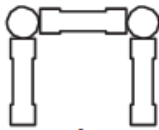
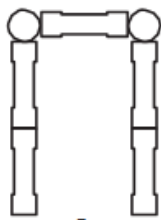
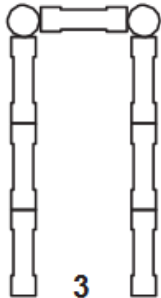


The magnets attract the balls. Sam makes a tower using the magnets and the balls. He wants to test how strong the tower is. He puts a 100 g mass on the tower.

He adds masses until the tower falls apart onto a rubber mat.



Sam repeats his test with two different towers. His results are shown in the table below.

Number of magnets in each leg of the tower	 1	 2	 3
Mass held before tower falls apart (g)	1500	1000	700

(b) Tick three boxes to show which variable (things) Sam kept the same to make it a fair test.

☐

the size of each magnet

☐

the number of balls in each tower

☐

the size of each ball

☐

the size of the rubber mat

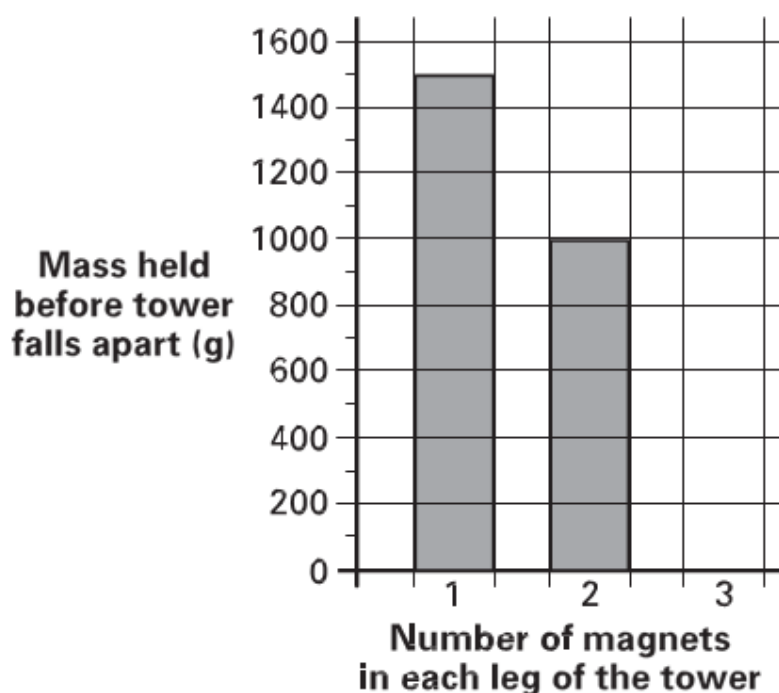
☐

the number of masses put on each tower

☐

the number of magnets in each tower

(c) Complete the bar graph to show the results from Sam's experiment.



Question 27 [3 marks]

Green plants are able to make their own food.

Complete each sentence by drawing a circle around the correct answer.

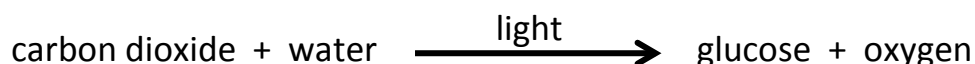
(a) Green plants make their own food during the process of

diffusion

photosynthesis

respiration

The process can be summarized by the equation:



(b) The energy needed for this process is trapped for the plant by

chlorophyll

glucose

light

(c) Some of the food made by the plants is stored as insoluble

chlorophyll

glucose

starch

Question 28 [3 marks]

The drawing shows a gemstone set in a gold ring. Crystals of gemstones are found in different rocks.



There are three groups of rocks: igneous, metamorphic and sedimentary

Crystals can be found in rocks that have been changed into different rocks by high temperature and high pressure.

(a) Which group of rocks is formed in this way?

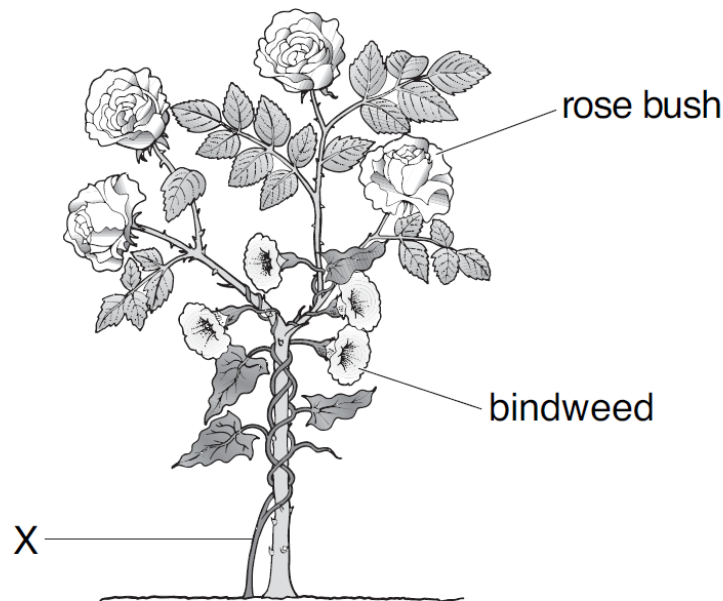
Crystals can be found in rocks formed by the cooling of hot magma.

(b) Which group of rocks is formed in this way?

(c) Circle the correct answer. When magma cools down slowly the size of the crystals formed is { smaller / larger }.

Question 29 [3 marks]

Bindweed is a plant that grows tightly around other plants. The drawing below shows bindweed growing around a rose bush.



(a) Complete the sentences below. Choose from the words in the list.

air ***light*** ***support*** ***water*** ***minerals***

- (i) Bindweed grows as high as possible on the rose bush so that the bindweed can get as much _____ as possible.
- (ii) Bindweed grows around the rose bush because the rose bush provides _____ for the bindweed.

(b) A gardener cut through the stem of the bindweed at X. Two days later the bindweed above X was dead. Why did the bindweed die?

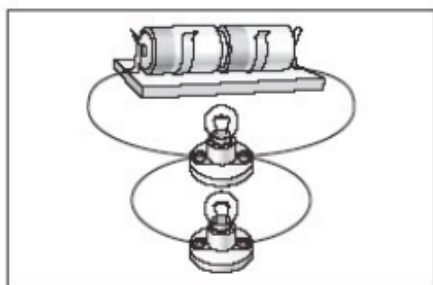
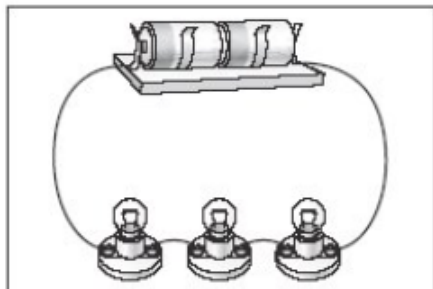
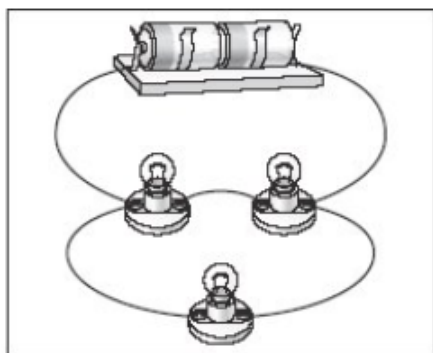
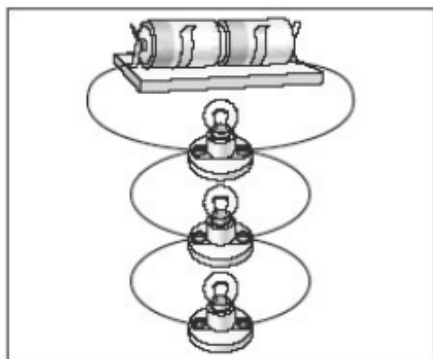
Circle the correct answer.

no air ***no light*** ***no warmth*** ***no water***

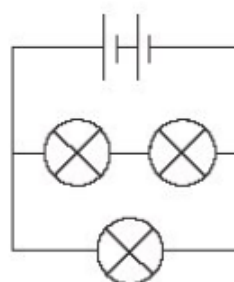
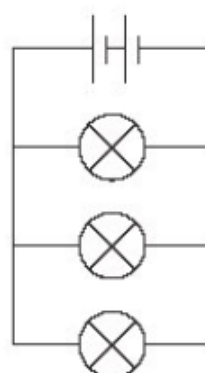
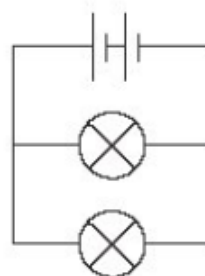
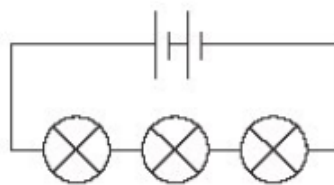
Question 30 [2 marks]

Draw a line from each electrical circuit to the correct circuit diagram. Draw only four lines.

electrical circuit



circuit diagram



Question 31 [2 marks]

The photograph below shows the remains of an animal found in chalk rock.



(a) What are the remains of living things found in rock called?

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(b) Look carefully at the animal remains in the photograph.

(i) Which animal could it be related to? Tick the correct box.

- ☐ snail
- ☐ starfish
- ☐ ladybird
- ☐ slug

(ii) Give a reason for your answer.
