10 Scott is learning about cells.

He uses a microscope to look at some of his cheek cells.

The picture shows what he can see.

(a) Label the diagram.

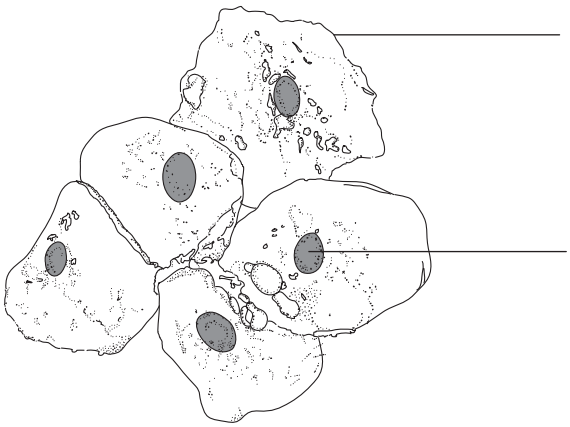
Choose the best words from this list.

cell membrane

cell wall

cytoplasm

nucleus



.....

.....

[2]

(b) Scott finds out about different cells in the body and the jobs they do.

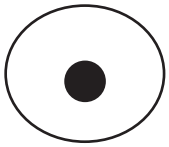
Finish the table by writing the job of each cell.

The first one has been done for you.

cell	job it does
egg cell	develops into an embryo when fertilised
sperm cell	
white blood cell	
red blood cell	

[3]

(c) Look at the picture of a fertilised egg cell.



If this egg implants into the uterus it will grow into a foetus.

Describe the **two** processes involved in growth.

1 .....

.....

2 .....

..... [2]

[Total: 7]

11 Look at the picture.

It shows a strawberry plant reproducing.

(a) Finish the sentences about the strawberry plant.

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

asexual **different** **identical** **sexual** **similar**

The strawberry plant sends out runners.

This is a type of reproduction called …… reproduction.

The runners have plantlets on them.

The plantlets are genetically …… to the parent plant. [2]

(b) Gardeners can make more plants by taking cuttings.

Here are four sentences (**A-D**) about taking cuttings.

A Put the cutting into a pot of sandy compost.

B Cut a short stem off the parent plant.

C Put a clear plastic bag over the plant.

D Dip the stem into plant hormone.

They are in the wrong order.

Fill in the boxes to show the correct order.

The first one has been done for you.

B			

[2]

(c) The plant stem needs to be dipped into plant hormone.

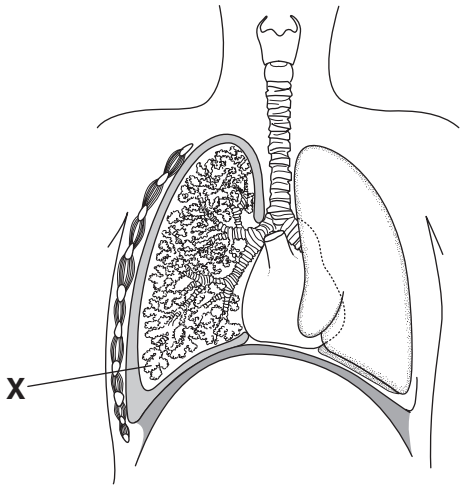
Explain why.

.....

..... [1]

[Total: 5]

12 Look at the diagram. It shows the lungs and heart.



(a) Write down the name of part **X**.

..... [1]

(b) A gas leaves the lungs and enters the blood.

(i) Write down the name of this gas.

..... [1]

(ii) Describe how this gas enters the blood.

Include ideas about concentration in your answer.

.....

.....

.....

..... [2]

[Total: 4]

13 Read the article about bacterial mutations.

Bacterial mutations

There are many types of bacteria.

New strains occur because bacteria keep mutating.

Some of these new strains have an advantage when it comes to fighting off antibiotics.

MRSA is a bacterium which is resistant to antibiotics.

(a) Write down what is meant by the term **mutation.**

..... [1]

(b) Mutations can occur spontaneously or are caused by some factors.

Write down **two** factors that can cause mutations to occur.

1 .....

2 ..... [2]

(c) Bacteria reproduce in the body and make us ill.

They reproduce by dividing into two.

This can take about 30 minutes.

If you start with 10 bacteria there would be 40 bacteria after 1 hour.

How many would there be after 3 hours?

number of bacteria ..... [1]

[Total: 4]

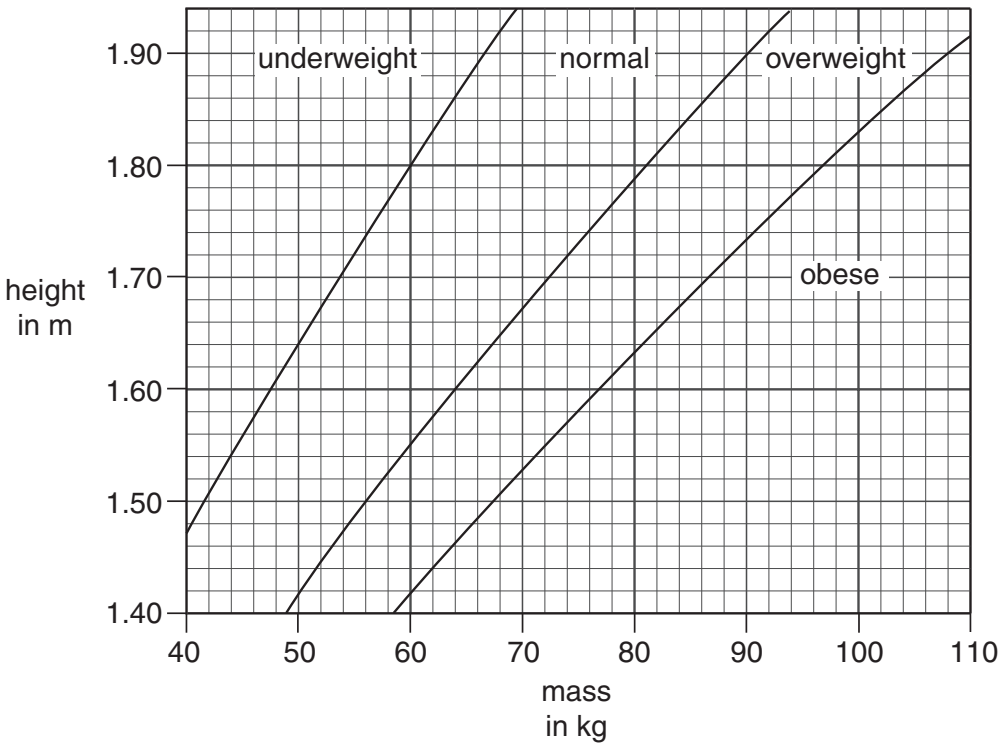
END OF QUESTION PAPER

1 Chris and Sam want to see if they have suitable balanced diets.

They measure their mass and height.

	mass in kg	height in m
Chris	90	1.85
Sam	50	1.75

(a) (i) Use the information in the table and the BMI chart to work out whether **Chris** is underweight, normal, overweight or obese.



Put a (ring) around the correct answer.

underweight **normal** **overweight** **obese**

[1]

(ii) Sam works out that he is slightly underweight.

How much should he increase his mass by to reach a normal mass?

Use the information in the table and the BMI chart to work out your answer.

answer ..... kg [1]

(b) Sam's doctor tells him to eat the recommended daily average intake of protein.

Work out Sam's recommended daily average intake (RDA).

Use information in the table and the formula:

$$\text{RDA in g} = 0.75 \times \text{body mass in kg}$$

answer ..... [1]

(c) Sam can increase the amount of protein in his diet by eating more animal products such as meat or plant products such as beans.

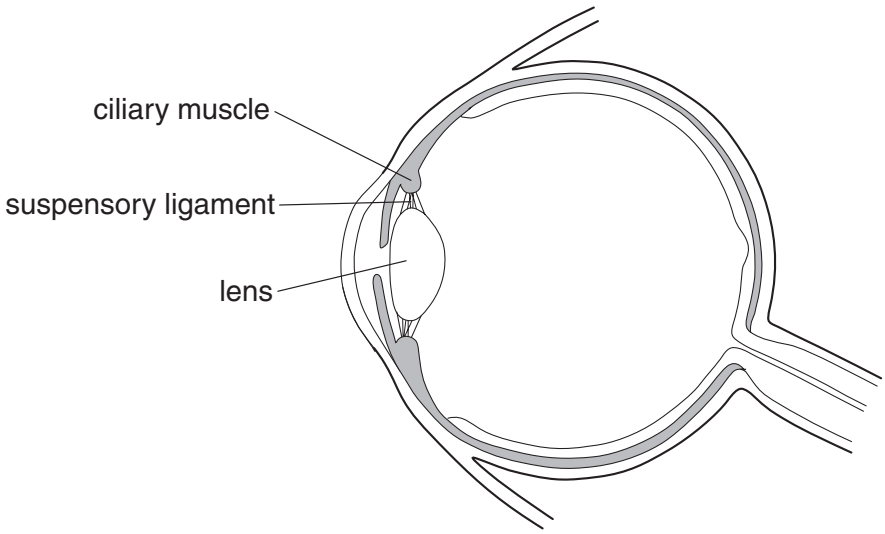
Write down **one** factor that could influence what he eats.

..... [1]

[Total: 4]

2 Look at the diagram of the eye.

It shows an eye looking at a near object.



(a) The lens changes shape to focus light.

Explain how the lens changes shape when the eye is focusing light from a **distant** object.

In your answer include the changes to the

- lens
- ciliary muscle
- suspensory ligaments.

.....

.....

.....

..... [3]

(b) Some people can only see with one eye.

Describe how this affects vision.

.....

..... [1]

[Total: 4]

3 Ayshea is running in a long-distance race.

During the race, Ayshea's breathing rate and heart rate increase.

(a) During the race, Ayshea's muscles produce a lot of heat.

One way she loses this extra heat is by sweating more.

(i) Explain how sweating causes Ayshea to lose heat.

..... [1]

(ii) Losing extra heat keeps Ayshea's body temperature the same.

What word describes keeping body temperature the same?

Put a (ring) around the best answer.

dehydration **homeostasis** **hypothermia** **insulation** **respiration**

[1]

(b) After the race, Ayshea sits down.

However, her breathing and pulse rate stay high for a while.

Explain why.

.....

.....

..... [2]

[Total: 4]

4 **(a)** Cystic fibrosis is an inherited disorder.

It is caused by a recessive allele.

Neil and Nancy are going to have a baby.

They both carry the recessive allele but neither has cystic fibrosis.

They have the alleles **Ff**.

What is the probability of Neil and Nancy having a child with cystic fibrosis?

Use a genetic diagram to work out your answer.

probability of child having cystic fibrosis ..... [3]

(b) Other disorders can also be inherited.

Put a (ring) around the disorder that is inherited.

anaemia **malaria** **red-green colour blindness** **scurvy**

[1]

[Total: 4]

5 Dominic has been smoking cigarettes for many years.

He now has a smokers' cough.

(a) The cells lining Dominic's trachea, bronchi and bronchioles are different from those of a non-smoker.

Explain how they are different.

.....

..... [1]

(b) Dominic wants to give up smoking cigarettes.

To help him, his doctor gives him some nicotine patches.

Explain why nicotine patches can help.

.....

..... [1]

(c) Dominic's doctor tells him that giving up cigarettes will help him to be more fit and healthy.

What is the difference between being **fit** and being **healthy**?

Being fit means .....

.....

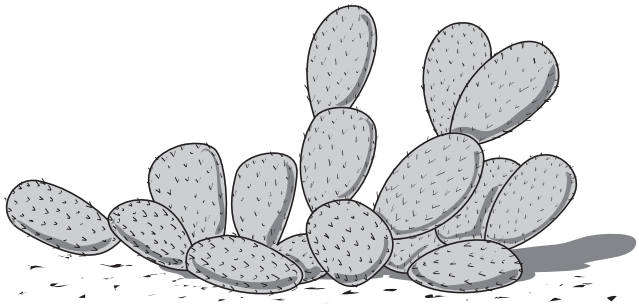
Being healthy means .....

..... [2]

[Total: 4]

6 Read the following article that appeared in a recent newspaper.

Money to grow Cacti!



Las Vegas is a city in the middle of the desert in America.

Water is in very short supply.

The local council have decided to take action.

They are paying local people one dollar per square metre to replace their grass lawns with a plant called the cow's tongue cactus.

They think that this will help to solve the water shortage.

(a) Cacti are plants.

Write down **one** characteristic of cacti that places them in the plant kingdom.

..... [1]

(b) The scientific name for the cow's tongue cactus is *Opuntia engelmannii.*

Put a tick (✓) in the box next to the system used to produce this name.

bimodal	☐
binomial	☐
classification	☐
conservation	☐

[1]

(c) The council think that the cacti will need less water than grass.

The cacti have special adaptations that help them to live in dry areas.

Explain **two** of these adaptations.

1 adaptation .....

how it helps .....

.....

2 adaptation .....

how it helps .....

..... [2]

(d) Cacti that are better adapted to dry areas are more likely to survive.

When these surviving cacti reproduce they will pass on their adaptations.

Cacti evolve by this process.

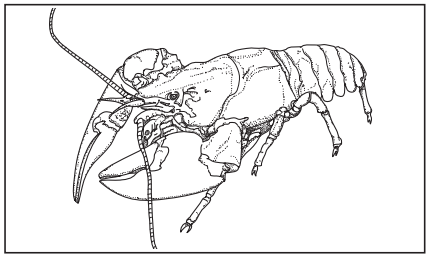
Write down the name given to this process.

..... [1]

[Total: 5]

7 Read the passage about the British crayfish.

British Crayfish in Danger



Crayfish are small animals that live on the bottom of rivers.

Scientists have discovered that British crayfish are becoming endangered due to a larger, faster breeding American crayfish.

These crayfish were brought over from America for food but escaped into rivers. This affected the community living in the rivers.

There is a plan to move a population of British crayfish to a habitat where there are no American crayfish.

(a) The British and the American crayfish are different species.

Put a tick (✓) in the box next to the statement that tells you that they are different species.

They cannot mate and produce fertile crayfish. ☐

They have different coloured claws. ☐

They usually live in different countries. ☐

One breeds much faster than the other. ☐ [1]

(b) The plan to move the British crayfish is part of a conservation programme.

(i) Write down **two** reasons why people think that it is important to set up conservation programmes.

1 .....

.....

2 .....

..... [2]

(ii) Setting up a conservation programme for the crayfish should be quite easy.

People have also tried to set up conservation programmes for whales.

This has been much more difficult.

Suggest **two** reasons why.

.....

.....

.....

.....

..... [2]

[Total: 5]

8 Burning fossil fuels such as oil produces a number of substances that can cause pollution.

One of these substances is carbon dioxide.

(a) Many scientists think that increasing levels of carbon dioxide may alter the temperature of the Earth.

Finish the following sentences to show how they think this might happen.

Radiation from the sun passes through the …… surrounding the Earth.

The Earth's surface is warmed and some of the radiation is re-radiated.

The carbon dioxide in the air …… some of this radiation.

The Earth therefore warms up.

This process is called …… …… . [3]

(b) Some scientists think that the temperature of the Earth may **not** rise much.

They say that increasing carbon dioxide levels may increase the photosynthesis rate of plants.

Explain why this may stop the temperature from becoming too high.

In your answer use ideas about limiting factors.

.....

.....

..... [2]

[Total: 5]

[Turn over

9 Byron wants to investigate two ecosystems near his house.

One is a natural pond.

The other is a pond that had been dug in a field that contained cows.

(a) He samples the small animals living in the natural pond.

These are the animals that he catches in this pond.

natural pond

(i) He sampled about 0.5 m^3 of the water in the pond.

The pond contains 200 m^3 of water in total.

Estimate the number of flatworms () living in the pond.

total number of flatworms = ... [2]

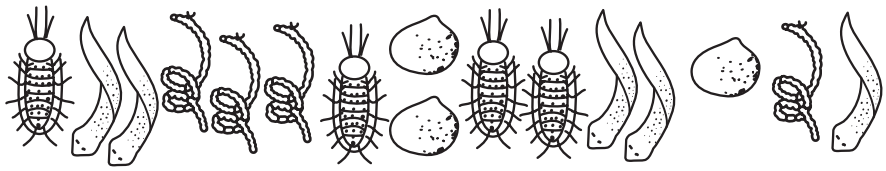
(ii) Write down **one** reason why this estimate of the number of flatworms in the pond may be inaccurate.

.....

..... [1]

(b) Byron then looks at the pond in the cows' field.

He samples in the same way and finds the following animals.



pond in cows' field

Byron is worried that one of the ponds is polluted.

Suggest what he should look for in the samples to prove that one of the ponds is polluted.

.....

.....

..... [2]

[Total: 5]

10 Scott is learning about cells.

(a) He finds out that muscle cells contain large numbers of mitochondria.

Explain why muscle cells need large numbers of mitochondria.

.....

..... [2]

(b) Scott uses a microscope to look at a plant leaf cell.

He sees three structures that are **not** in muscle cells.

Write down the names of **two** of these structures.

1 .....

2 ..... [2]

(c) Scott looks on the internet and finds out about stem cells.

Stem cell research: Yes or no?

The debate on stem cell research continues.

New laboratories for stem cell research are being built in Newcastle.

Scientists will use stem cells taken from early embryos to make different body tissues.

Some scientists claim the research could lead to the cure of some diseases.

However, some people object to this research.

(i) Explain what is meant by the term **stem cell**.

.....

..... [1]

(ii) Some people object to stem cell research.

Suggest **one** reason why.

.....

..... [1]

[Total: 6]

11 Look at the picture.

It shows someone cloning a plant by taking a cutting.

(a) The plant stem needs to be dipped into plant hormone.

Explain why.

.....

..... [1]

(b) Plants can also be cloned by tissue culture.

Describe the method used.

In your answer include

- the precautions taken
- the conditions needed.

.....

.....

.....

..... [3]

(c) During cloning, cells divide by mitosis.

During mitosis, chromosomes in the nucleus divide.

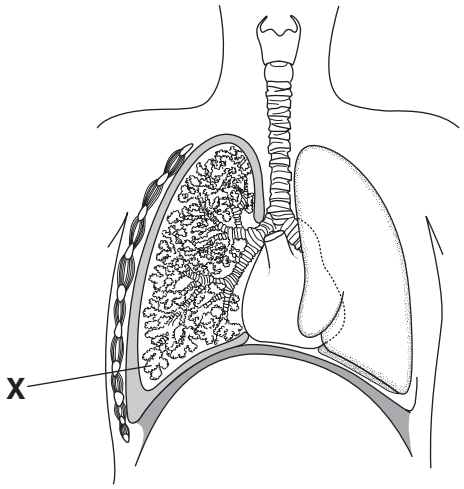
Describe **one other** thing that happens to the chromosomes during mitosis.

..... [1]

[Total: 5]

[Turn over

12 Look at the diagram. It shows the lungs and heart.



(a) Write down the name of part **X**.

..... [1]

(b) Oxygen leaves the lungs and enters the blood.

Describe how oxygen enters the blood.

Include ideas about concentration in your answer.

.....

.....

.....

..... [2]

(c) The cells lining part **X** are very thin.

This helps them carry out their function.

Explain why.

.....

..... [1]

[Total: 4]

13 Read the article about bacterial mutations.

Bacterial mutations

There are many types of bacteria.

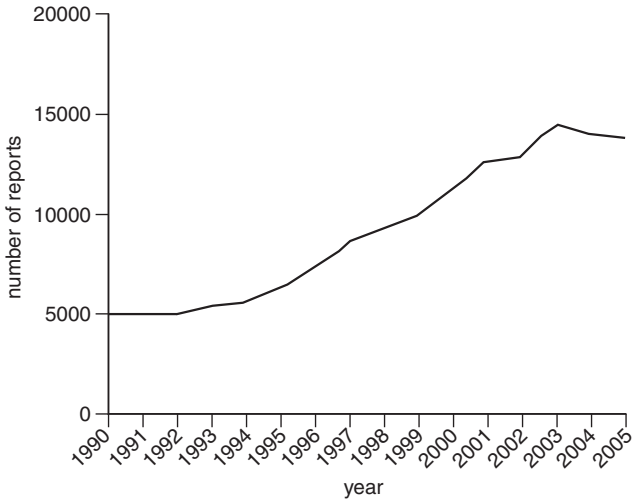
New strains occur because bacteria keep mutating.

Some of these new strains have an advantage when it comes to resisting antibiotics.

MRSA is a bacterium which is resistant to antibiotics.

(a) Look at the graph.

It shows the number of MRSA cases between 1990 and 2005.



Estimate the rise in cases between 1990 and 2003.

..... [1]

(b) Mutations can occur spontaneously or are caused by some factors.

Write down **two** factors that can cause mutations to occur.

1 .....

2 ..... [2]

[Turn over for remainder of question 13

(c) Mutations are changes to DNA.

(i) How could the structure of DNA change?

..... [1]

(ii) Why may a DNA change alter the functioning of a cell?

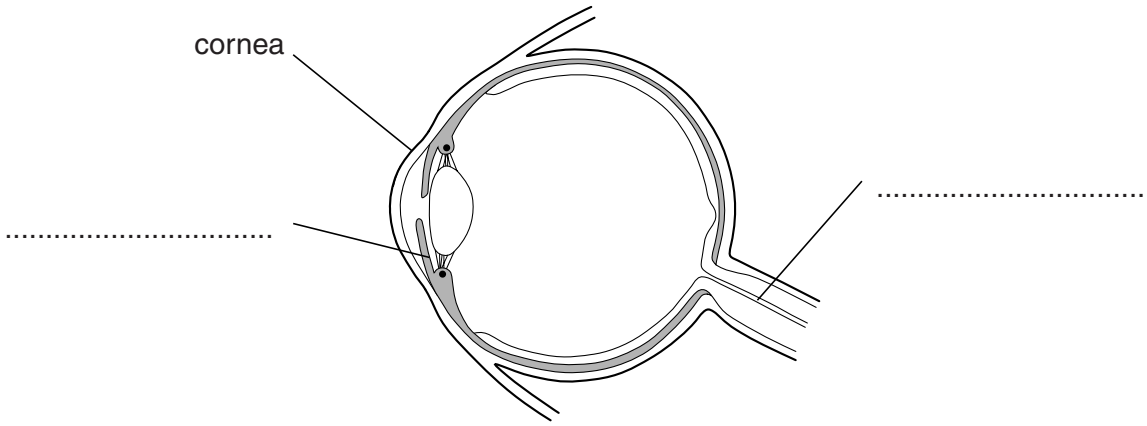
..... [1]

[Total: 5]

END OF QUESTION PAPER

1

1 The diagram shows parts of a human eye.



(a) Finish labelling the diagram.

Choose words from this list.

iris **optic nerve** **pupil** **retina**

[2]

(b) Describe the job of the **cornea**.

.....

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

(c) Eye colour is a characteristic controlled **only** by genes.

(i) Write down **one other** characteristic controlled only by genes.

Choose from this list.

body mass **earlobe shape** **scars** **spoken language**

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

(ii) Which part of the human cell contains genes?

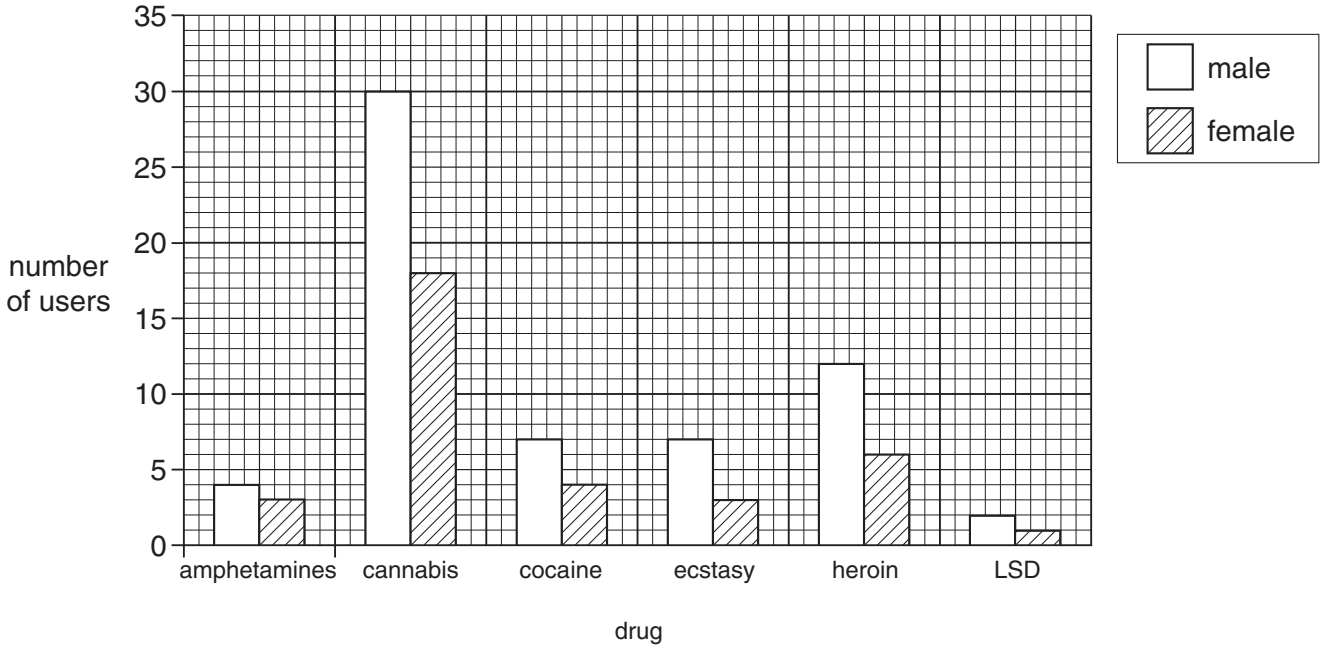
..... **[1]**

[Total: 5]

2 Some people use illegal drugs.

A sample of 16-24 year old drug users were asked to name one drug they use.

The bar chart shows how many named each drug.



(a) Which drugs are used by less than 5 males in the sample?

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

(b) More males than females in the sample use cannabis.

Calculate how many more males than females use cannabis.

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

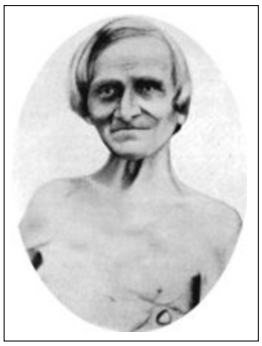
(c) Ecstasy is a **stimulant**.

Describe the effect stimulants have on the brain.

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

[Total: 3]

3 Read the report about Alexis St Martin.



In 1822 Alexis St Martin was shot. He survived but was left with a hole in his stomach. A doctor by the name of Dr Beaumont used the hole to investigate digestion.

Dr Beaumont removed gastric juice from the stomach. He added a piece of meat to the juice. The gastric juice digested the meat.

He also put a piece of meat in the stomach. This meat digested faster.

(a) Gastric juice contains substances that help with chemical digestion.

Some of these substances are enzymes.

Write down the name of another substance which helps digestion in the stomach.

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

(b) Meat contains protein.

Write down the name of **one** enzyme that digests the protein in meat.

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

(c) A second type of digestion helps meat to be digested faster in the stomach.

Write down the name of this type of digestion.

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

(d) Digestion in the stomach needs energy from respiration.

Finish the word equation for aerobic respiration.

glucose + ... → ..... + ... + energy **[2]**

[Total: 5]

4 This question is about diseases.

(a) The lists show examples of diseases and pathogens which can cause disease.

Draw a **straight** line from each **disease** to the **pathogen** that causes it.

disease	pathogen
athlete's foot	fungus
cholera	bacteria
dysentery	protozoa

[2]

(b) Sarah has cut her knee.

Some bacteria enter the cut.

Describe how Sarah's body will protect her from these bacteria.

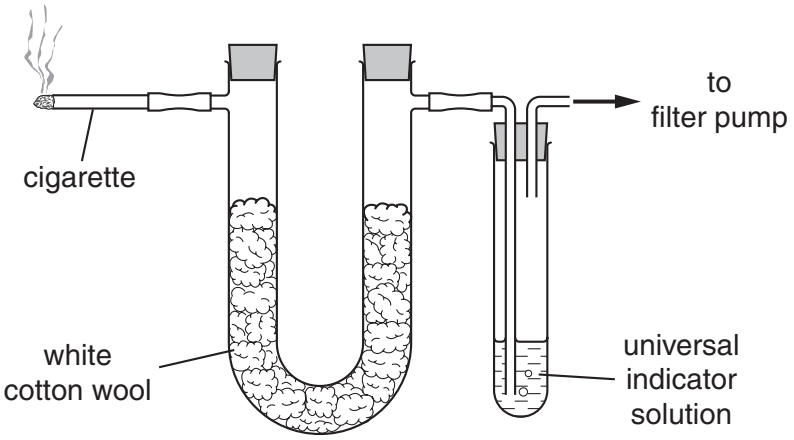
.....

.....

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

[Total: 4]

5 Look at the diagram of a smoking machine.



(a) Cigarette smoke turns the white cotton wool yellow.

Which chemical in cigarette smoke turns the white cotton wool yellow?

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

(b) Cigarette smoke causes less oxygen to be carried in the blood.

Which chemical in cigarette smoke causes this lack of oxygen?

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

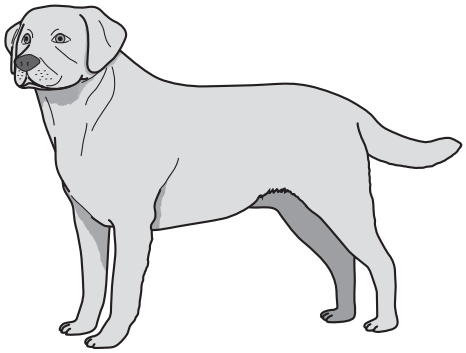
(c) Cigarette smoke can cause cancer.

Write down **one other** disease that can be caused by cigarette smoke.

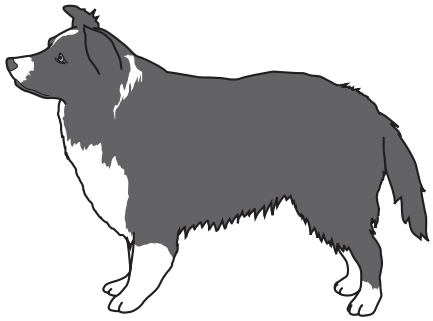
..... **[1]**

[Total: 3]

6 The pictures show two different breeds of dog.



labrador



border collie

(a) Look at the pictures. The two dogs show **variation**.

Describe **two** ways you can see in the diagram that the two dogs show variation.

1 .....

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

(b) Look at the list.

amphibians

birds

fish

mammals

reptiles

(i) To which group of animals do dogs belong?

Choose your answer from the list.

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

(ii) Give **one** reason for your choice.

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

(c) All the different breeds of dog are descended from wild animals that lived as predators.

Dogs have features that are adaptations to be a predator.

Describe **one** feature of dogs that is an adaptation to be a predator.

.....

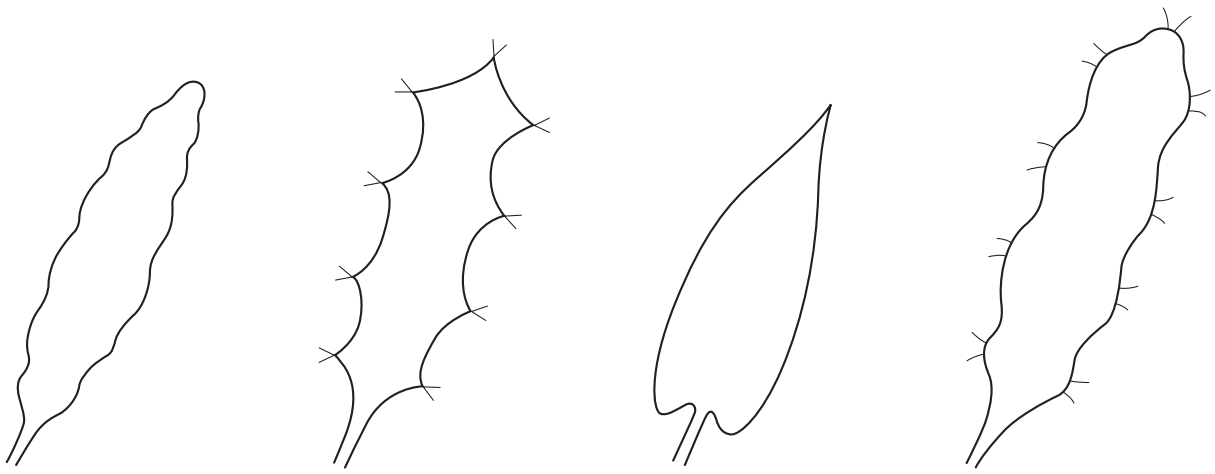
..... **[1]**

[Total: 5]

Turn over

7 Tom and Elloise are studying some of the plants growing in the school playing field.

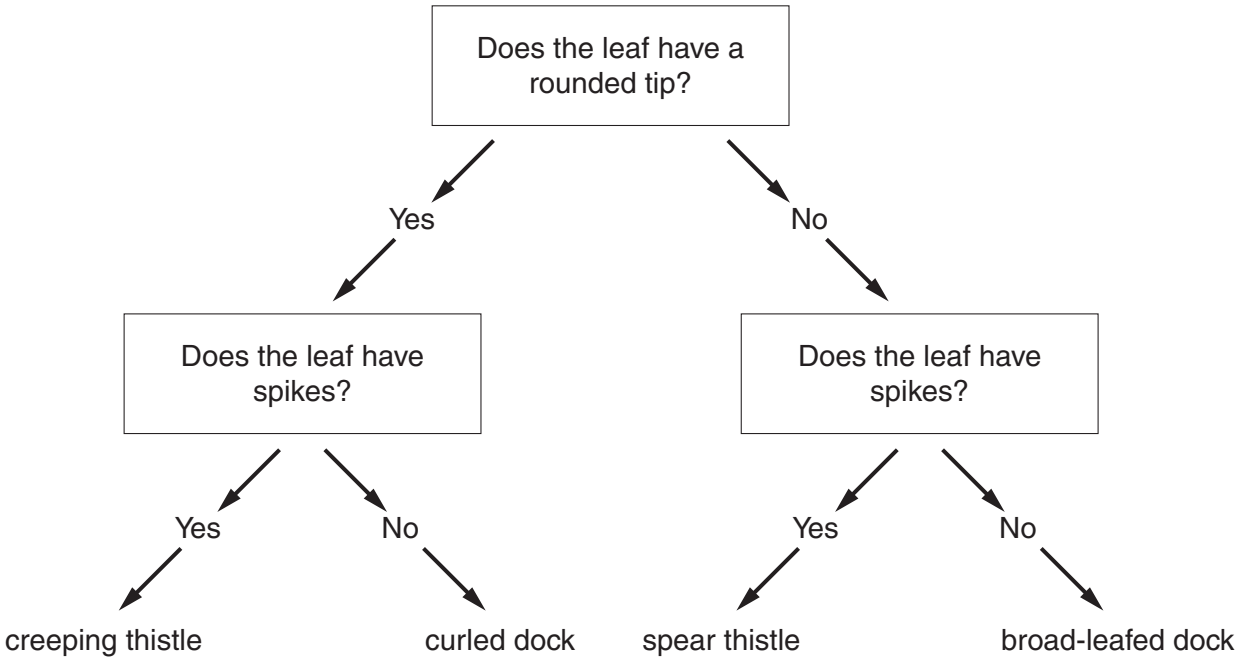
Look at the drawings of leaves from four of these plants.



A **B** **C** **D**

(drawings not to scale)

(a) Use the key to identify plants **A** and **B**.



Plant **A** is .....

Plant **B** is ..... **[2]**

(b) Tom and Elloise use quadrats to count how many there are of plant **A**.

The table shows their results.

quadrat	number found of plant A
1st	0
2nd	1
3rd	0
4th	2

Each quadrat has an area of $0.25\,m^2$.

The playing field has an area of $2000\,m^2$.

Use this information to estimate the total number of plant **A** in the playing field.

You should show how you work out your answer.

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

(c) All plants photosynthesise.

Why do plants need to photosynthesise?

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

[Total: 5]

8 Anglesey is an island off the coast of Wales.

Before the 1960s the only squirrels living on the island were red squirrels.

In the 1960s the first grey squirrels arrived on the island.

By the 1980s red squirrels had disappeared from many parts of the island.

At the same time the number of grey squirrels had increased a lot.

By 1998 there were about 3000 grey squirrels and only about 40 red squirrels on the island.

In 1998 a project started to protect the red squirrels.

This was done by removing grey squirrels from Anglesey.

red squirrel

grey squirrel

(a) Why did red squirrels need protecting on Anglesey?

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

(b) What effect would removing grey squirrels from the island have on the population of red squirrels?

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

(c) Suggest **one other** way red squirrels could have been protected on Anglesey.

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

(d) Red squirrels and grey squirrels compete for food.

Write down **one other** thing animals compete for.

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

(e) Some animals have eyes on the front of the head.

Suggest why squirrels have eyes on the **side** of the head.

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

[Total: 5]

9 This question is about pollution.

(a) A lot of pollution is caused by using fossil fuels.

Write about how using fossil fuels causes pollution.

In your answer include

- how fossil fuels are used
- the different types of pollution caused.

.....

.....

.....

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

(b) Look at the list.

finite resources

maintained resources

sustainable resources

What term best describes fossil fuels?

Choose your answer from the list.

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

(c) CFC gases are used in some aerosols and refrigerators.

CFCs are **not** produced by fossil fuels but they still cause a pollution problem.

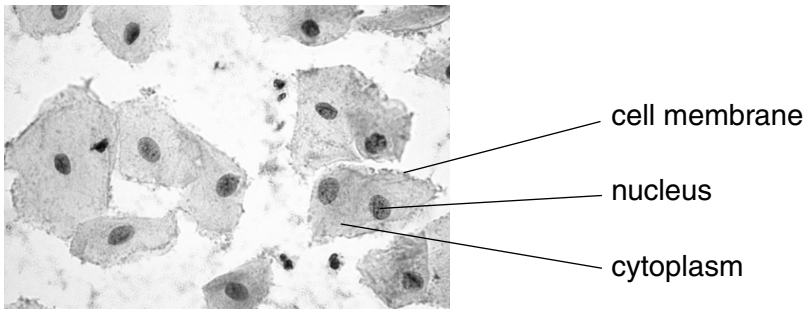
What problem does CFC pollution cause?

.....

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

[Total: 5]

10 Gareth is looking at cheek cells using a microscope.



(a) Answer the following questions using labelled parts from the photograph.

(i) Which part of the cheek cell controls the movement of substances into and out of the cell?

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

(ii) Where in the cheek cell do most chemical reactions happen?

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

(b) Gareth now wants to look at some onion cells using a microscope.

Describe how he could prepare a microscope slide of onion cells.

.....

.....

.....

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

[Total: 5]

11 Basil is a gardener.

He keeps a diary of the work that he does in his garden.

Here is part of his diary.

27th September

Today I decided to make some new plants.
My strawberries had sent out long shoots.
I planted the small plants which were on the end of these shoots.

I made new geranium plants in a different way.
I cut small shoots off the plants and dipped them into a powder to make them grow roots.
I then planted the shoots in some soil.

(a) What is in the powder that Basil uses to make his geraniums grow?

Put a (ring) around the correct answer in this list.

enzymes **plant hormones** **seeds** **sperm**

[1]

(b) Basil knows that both his new geranium and strawberry plants will look like their parents.

Explain why they will look like their parents.

.....

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

[Total: 3]

12 Zoe is expecting a baby and Gary is the father.

(a) Complete the sentences about Zoe's baby by writing a word in each space.

Zoe's baby grew from a single cell called a zygote.

This cell was formed when a …… cell from Gary joined with an egg cell made by Zoe.

The cell from Gary can swim to the egg cell because it has a …… .

The zygote grows into a baby by a type of cell division called …… .

[3]

(b) Zoe reads a book about how babies grow.

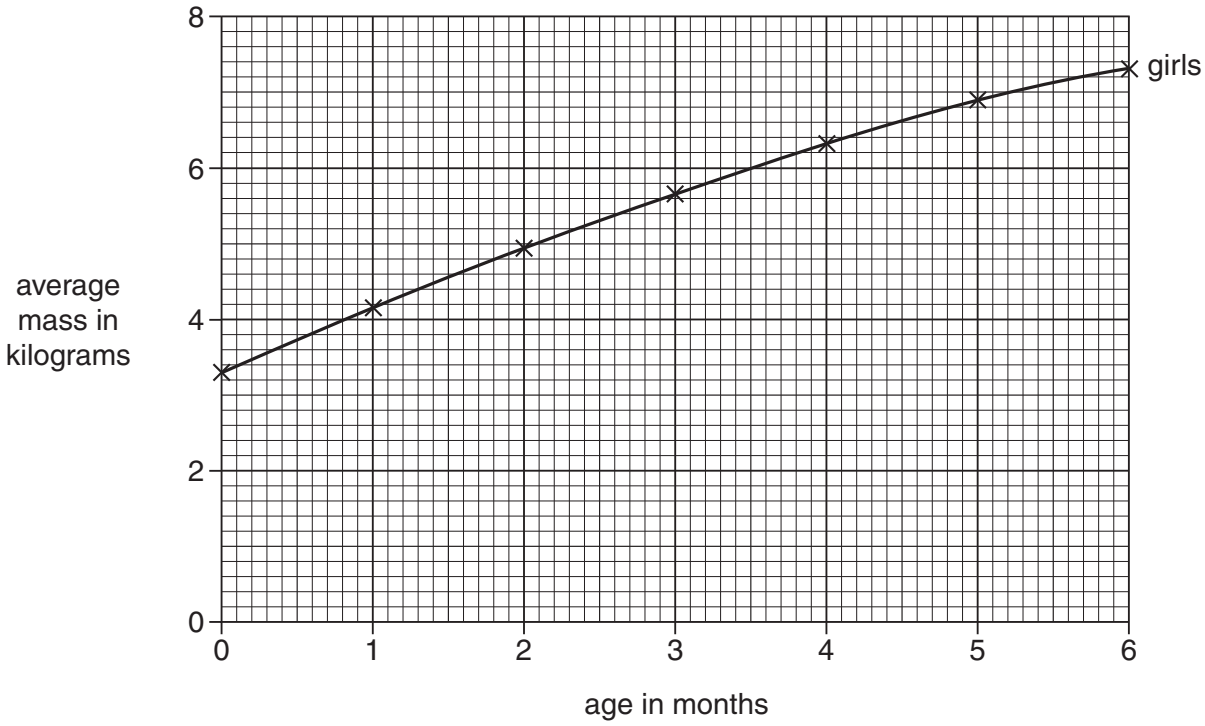
It shows how the average mass of baby boys changes during the first six months of life.

age of baby boy in months	average mass in kilograms
0	3.3
1	4.4
2	5.4
3	6.2
4	7.0
5	7.5
6	7.9

(i) The graph shows the average mass of baby girls.

Plot the information in the table about baby boys on this graph.

Finish the graph by drawing the best curve. **[3]**



(ii) Write down **one** difference between the growth of boys and girls during their first six months.

.....

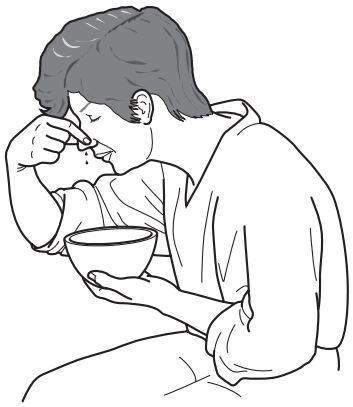
..... **[1]**

[Total: 7]

Turn over

13 HHT is a genetic disorder.

It makes people have bad nose bleeds.



(a) HHT causes problems with blood vessels.

There are three main types of blood vessel in the body.

Arteries carry blood under high pressure out to the body from the heart.

Veins normally carry blood under low pressure back to the heart.

Usually there are very small blood vessels that connect arteries to veins.

(i) Write down the name of these small blood vessels.

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

(ii) These small blood vessels do an important job in the body.

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

act as a store of cholesterol for the body ☐

allow exchange of materials with tissues ☐

contain muscle cells to pump the blood ☐

contain valves to stop the blood flowing backwards ☐

[1]

(b) In a person with HHT some of the vessels that join arteries to veins are missing.

This means that blood under high pressure flows directly into a vein from an artery.

This often causes the vein to break and cause bleeding.

Which part of the blood would cause it to clot during a nose bleed?

Put a (ring) around the correct answer in this list.

platelets **red blood cells** **white blood cells**

[1]

(c) HHT is caused by a change in a gene.

This stops a protein being made that is needed for blood vessel growth.

(i) Write down the word used to describe a change in a gene.

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

(ii) Scientists hope to be able to move genes from one person to another so that they do not develop HHT.

What name is given to this treatment that scientists are trying to develop?

Underline the name in this list.

cloning

fertilising

genetic engineering

selective breeding

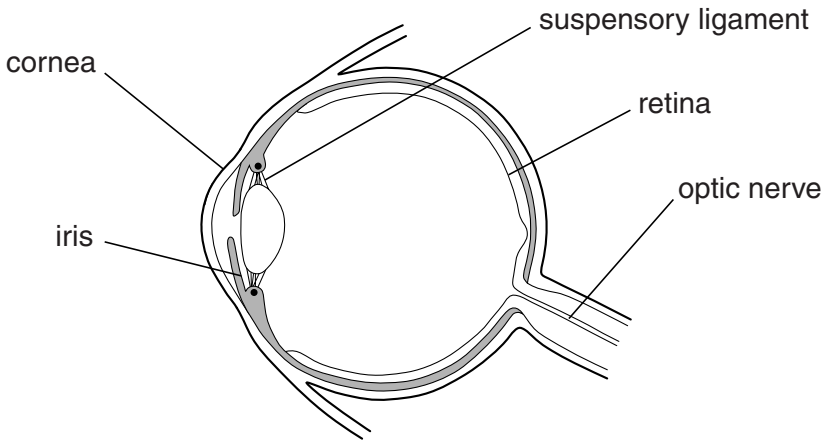
[1]

[Total: 5]

END OF QUESTION PAPER

1

1 The diagram shows parts of a human eye.



(a) Finish the sentences about the eye.

Choose the correct answers from the diagram.

The part that controls the amount of light entering the eye is called the ..... .

The part that is involved in accommodation is called the ..... . **[2]**

(b) Describe the job of the **cornea**.

.....

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

(c) Humans have binocular vision.

Write down **one** advantage and **one** disadvantage of binocular vision.

advantage .....

.....

disadvantage .....

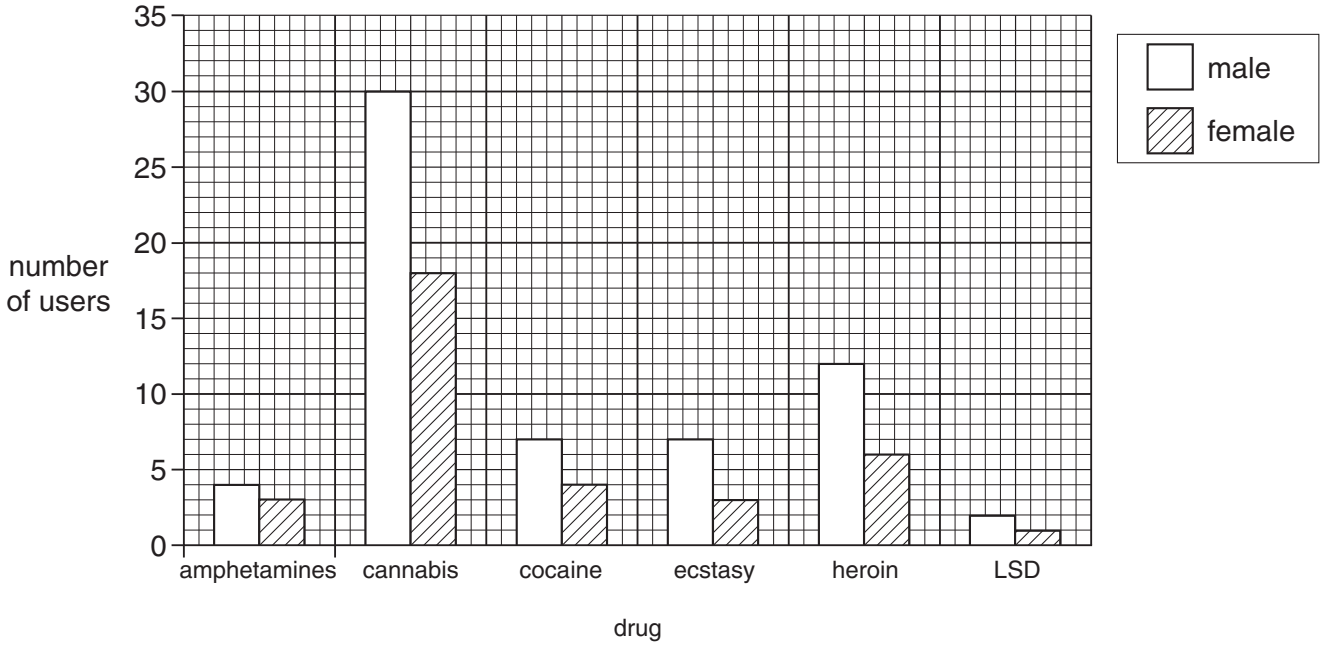
..... **[2]**

[Total: 5]

2 Some people use illegal drugs.

A sample of 16-24 year old drug users were asked to name one drug they use.

The bar chart shows how many named each drug.



(a) Calculate the total number of 16-24 year olds in the sample that named a hallucinogen.

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

(b) Ecstasy is a **stimulant**.

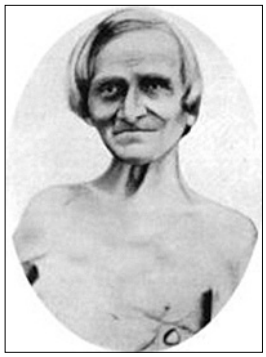
Describe the effect stimulants have on the synapses of the nervous system.

.....

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

[Total: 3]

3 Read the report about Alexis St Martin.



In 1822 Alexis St Martin was shot. He survived but was left with a hole in his stomach. A doctor by the name of Dr Beaumont used the hole to investigate digestion.

Dr Beaumont removed gastric juice from the stomach. He added a piece of meat to the juice. The gastric juice digested the meat.

He also put a piece of meat in the stomach. This meat digested faster.

(a) Gastric juice contains substances that help with chemical digestion.

Some of these substances are enzymes.

Write down the name of another substance which helps digestion in the stomach.

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

(b) Meat contains protein.

Write down the name of **one** enzyme that digests the protein in meat.

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

(c) Digestion in the stomach needs energy from respiration.

Finish the word equation for aerobic respiration.

glucose + ... → ..... + ... + energy **[2]**

[Total: 4]

4 Sarah is being immunised against tetanus with a harmless pathogen.

© Commercial Eye / Stone / Getty Images

(a) Explain how the immunisation will protect Sarah from the tetanus bacteria.

.....

.....

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

(b) Immunisations are usually tested on human volunteers.

These tests involve placebos.

Why are placebos used in these tests?

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

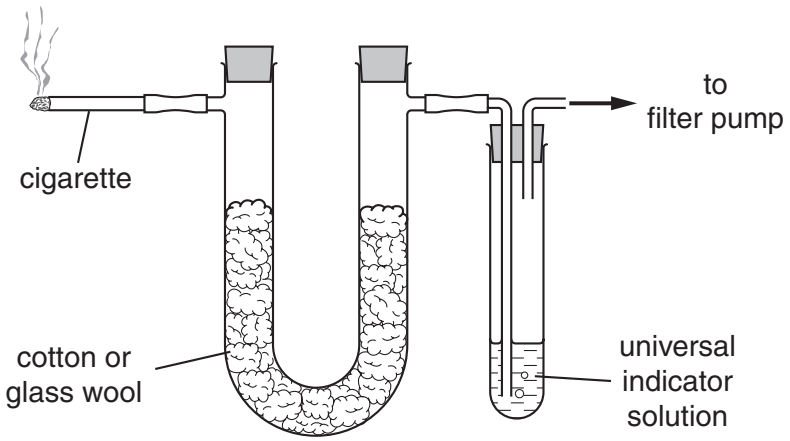
A placebo is used…

…to avoid harm to the volunteer.	☐
…because the placebo can cause immunity.	☐
…to compare the effects of the drug and the placebo.	☐
…to avoid the thoughts of the patient affecting the test.	☐
…because it will not interact with the drug.	☐
…because it is cheaper than the actual drug.	☐

[2]

[Total: 5]

5 Look at the diagram of a smoking machine.



(a) Tar collects on the inside of the tubes. Tar also collects in the lungs of a smoker.

Describe **two** problems this could cause the smoker.

1 .....

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

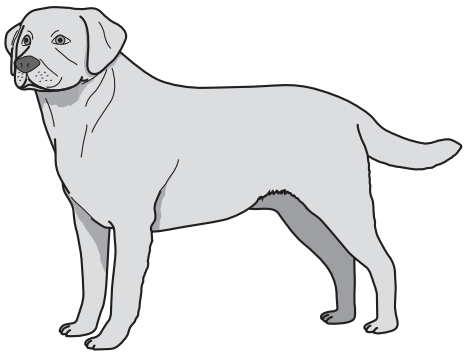
(b) Cigarette smoke causes less oxygen to be carried in the blood.

Which chemical in cigarette smoke causes this lack of oxygen?

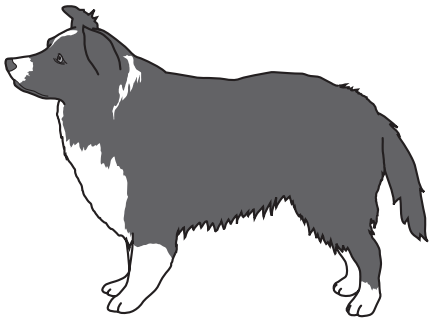
..... **[1]**

[Total: 3]

6 The pictures show two different breeds of dog.



labrador



border collie

(a) Look at the list.

amphibians

birds

fish

mammals

reptiles

(i) To which group of animals do dogs belong?

Choose your answer from the list.

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

(ii) Give **one** reason for your choice.

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

(b) Although labradors and border collies are different breeds, they both belong to the same **species**.

How could you show that labradors and border collies both belong to the same species?

.....

.....

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

(c) Many dogs have fleas living on their skin. Fleas are parasites.

What is meant by the term **parasite**?

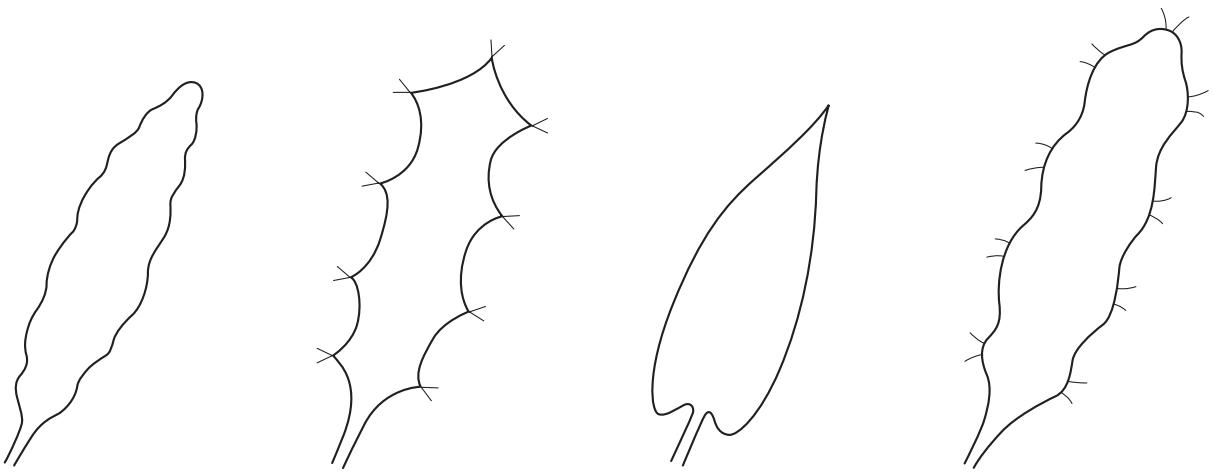
.....

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

[Total: 5]

7 Tom and Elloise are studying some of the plants growing in the school playing field.

Look at the drawings of leaves from four of these plants.



A **B** **C** **D**

(drawings not to scale)

(a) Tom and Elloise use quadrats to count how many there are of plant **A**.

The table shows their results.

quadrat	number found of plant A
1st	0
2nd	1
3rd	0
4th	2

Each quadrat has an area of 0.25 m^2.

The playing field has an area of 2000 m^2.

Use this information to estimate the total number of plant **A** in the playing field.

You should show how you work out your answer.

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

(b) All plants photosynthesise.

Complete the balanced symbol equation for photosynthesis.

$$6\ H_2O + \underset{\text{(chlorophyll)}}{\overset{\text{(light energy)}}{\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots}} \rightarrow C_6H_{12}O_6 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$

[2]

(c) The glucose plants make in photosynthesis is converted into other substances.

Each substance has a different function in the plant.

Complete the table to describe their functions. The first one has been done for you.

substance	function
protein	growth and repair
cellulose	
starch	

[2]

[Total: 6]

8 Anglesey is an island off the coast of Wales.

Before the 1960s the only squirrels living on the island were red squirrels.

In the 1960s the first grey squirrels arrived on the island.

By the 1980s red squirrels had disappeared from many parts of the island.

At the same time the number of grey squirrels had increased a lot.

By 1998 there were about 3000 grey squirrels and only about 40 red squirrels on the island.

In 1998 a project started to protect the red squirrels.

This was done by removing grey squirrels from Anglesey.

red squirrel

grey squirrel

(a) Suggest **one other** way red squirrels could have been protected on Anglesey.

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

(b) Scientists think that the grey squirrels caused the red squirrel population to decrease because both types of squirrel share the same **ecological niche**.

(i) Explain what is meant by an ecological niche.

.....

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

(ii) Why could sharing an ecological niche cause a decrease in the red squirrel population?

.....

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

(c) Some red squirrels live in woodland that is managed as a **sustainable resource**.

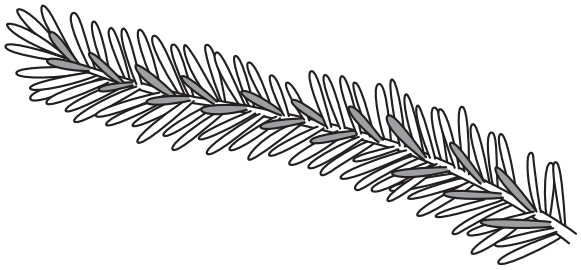
How is woodland maintained as a sustainable resource?

.....

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

(d) Some squirrels live in woodlands of conifer trees.

The leaves of conifer trees are called needles.



Some of the features of the needles are adaptations to living in a dry environment.

The adaptations help to reduce water loss.

Explain how these adaptations help to reduce water loss.

needle shape .....

.....

thick cuticle .....

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

[Total: 6]

9 This question is about pollution.

(a) CFC gases are used in some aerosols and refrigerators.

What problem does CFC pollution cause?

.....

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

(b) Waste pollution is becoming much more of a problem as the human population increases exponentially.

What is meant by **exponential growth**?

You may sketch a graph to help you answer.

.....

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

(c) Increasing amounts of waste pollution is one consequence of the human population increase.

Describe **one other** possible consequence of the human population increase.

.....

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

[Total: 3]

10 Zoe is expecting a baby and Gary is the father.

(a) Complete the sentences about Zoe's baby.

Zoe's baby grew from a single cell called a zygote.

The zygote has two copies of each chromosome.

A cell that has two copies of each chromosome is called …… .

The zygote grows into a baby by a type of cell division called …… .

[2]

(b) Zoe reads a book about how babies grow.

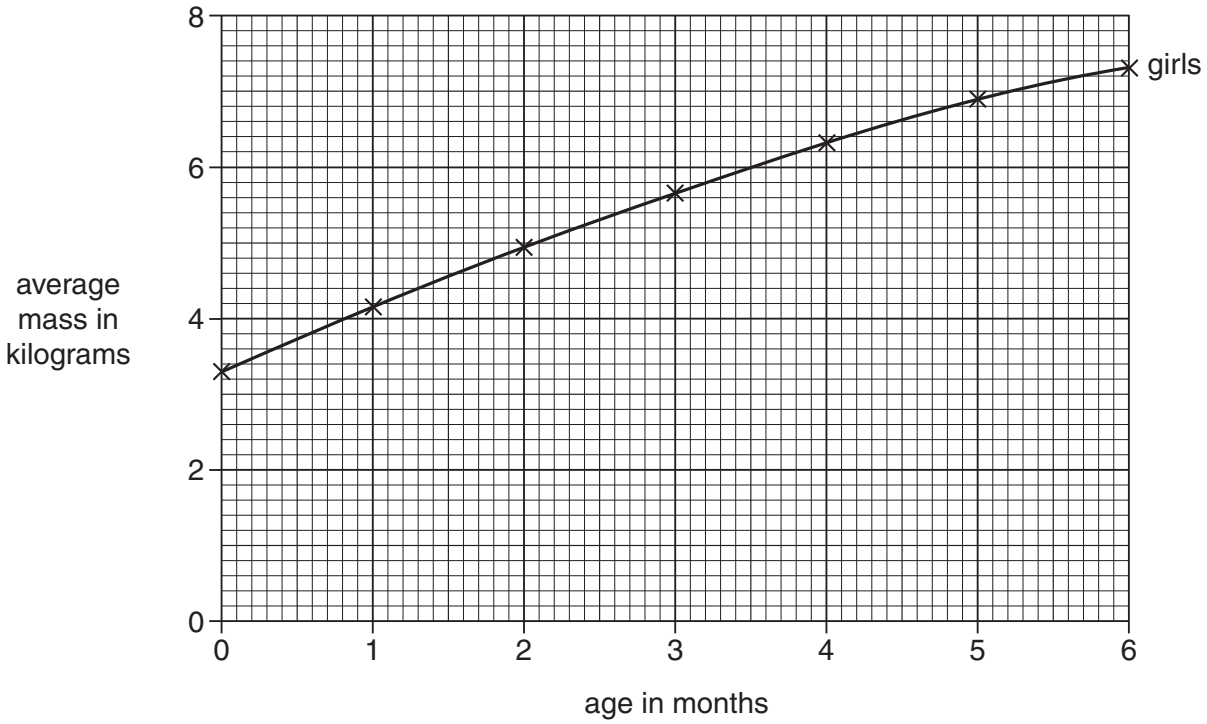
It shows how the average mass of baby boys changes during the first six months of life.

age of baby boy in months	average mass in kilograms
0	3.3
1	4.4
2	5.4
3	6.2
4	7.0
5	7.5
6	7.9

(i) The graph shows the average mass of baby girls.

Plot the information in the table about baby boys on this graph.

Finish the graph by drawing the best curve. **[3]**



(ii) What is the difference between the average mass of baby boys and baby girls at 3.5 months?

Use your graph.

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

(iii) Explain why Zoe might use a graph like this once her baby is born.

.....

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

[Total: 7]

11 HHT is a genetic disorder.

It makes people have bad nose bleeds.

(a) HHT causes problems with blood vessels.

There are three main types of blood vessel.

Arteries carry blood under high pressure out to the body from the heart.

Veins normally carry blood under low pressure back to the heart.

Usually there are very small blood vessels that connect arteries to veins.

(i) Write down the name of these small blood vessels.

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

(ii) These small blood vessels do an important job in the body.

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

act as a store of cholesterol for the body ☐

allow exchange of materials with tissues ☐

contain muscle cells to pump the blood ☐

contain valves to stop the blood flowing backwards ☐

[1]

(b) In a person with HHT, some of the vessels that join arteries to veins are missing.

This means that blood under high pressure flows directly into a vein from an artery.

This often causes the vein to break and cause bleeding.

Veins often break when blood enters under high pressure but arteries do not.

Why is this?

.....

.....

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

(c) HHT is caused by a mutation which changes the DNA of a gene.

This stops the protein that is needed for blood vessel growth being made correctly.

(i) What change might occur in the DNA of a gene?

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

(ii) Why could this change stop the protein being made correctly?

.....

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

(iii) Scientists hope to be able to change a person's genes so that they do not develop HHT.

Write down **one** reason why some people are worried about scientists being able to change a person's genes.

.....

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

[Total: 6]

12 Scientists have discovered that cells make special proteins if they get too hot.

These proteins are called heat shock proteins and they do many jobs such as repairing damaged enzymes.

(a) Explain why enzymes may be damaged if a cell becomes too hot.

.....

.....

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

(b) The heat shock proteins are coded for by genes.

Put a tick (✓) in the box next to the way that a gene codes for a protein.

The amino acids in DNA code for the order of bases in the protein.	☐
The DNA codes for proteins by unzipping and making new strands.	☐
Each of the four bases in DNA codes for a different amino acid in the protein.	☐
The bases in DNA code for the order of amino acids in the protein.	☐

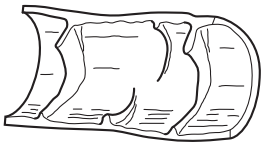
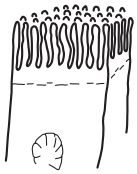
[1]

[Total: 3]

13 The small intestine has a large surface area.

The table shows three of the adaptations that give it such a large area.

The name of the second adaptation is missing.

name of adaptation	diagram of adaptation	total surface area of small intestine including adaptation in cm^2
folds		10 000
		100 000
microvilli		2 000 000

(a) What is the name given to the second adaptation?

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

(b) Why is it important that the small intestine has such a large surface area?

.....

.....

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

(c) Write down **one other** adaptation that the small intestine has that helps it to do its job.

.....

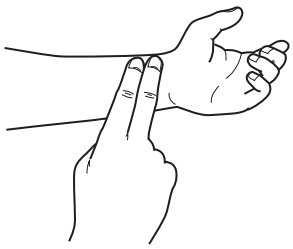
..... **[1]**

[Total: 4]

END OF QUESTION PAPER

1 Nathan is a GCSE Biology student.

Nathan is investigating how pulse rates change during exercise.



(a) Nathan measures the pulse rates of four students while they are at rest.

All the students then do the same type of exercise for the same amount of time.

Nathan then measures their pulse rates again immediately after their exercise.

The table shows his results. Some of the results are missing.

(i) Complete the table to show the missing results.

student name	resting pulse rate in beats per minute	pulse rate after exercise in beats per minute	increase in pulse rate during exercise in beats per minute
Alex	68	100	32
Jody	82	130	.....
Nicola	75	125	50
Rejna	70	.....	35

[2]

(ii) Look at the results table.

Write down the name of the student whose pulse rate increased the most during exercise.

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

(b) Pulse rates increase during exercise.

This means the blood flows more quickly to and from the muscles.

Explain why it is important that blood flows more quickly during exercise.

In your answer include

- the names of the substances carried to and from the muscles
- why the substances need to be carried to and from the muscles.

.....

.....

.....

.....

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

[Total: 6]

2 Annabelle is feeling unwell.

She is suffering from the symptoms of flu.
These include a fever, sore throat and a runny nose.

(a) Flu is an infectious disease caused by a pathogen.

What type of pathogen causes flu?

Put a (ring) around the correct answer in the list.

bacteria

fungus

protozoa

virus

[1]

(b) Annabelle's body has several ways of defending itself from infection by pathogens.

Draw straight lines to connect each **body defence** to **how it works**.

One line has been drawn for you.

body defence	**how it works**
acid in the stomach	stops pathogens entering the body
blood clotting	traps dirt and pathogens
mucus in the lungs	seals wounds
skin	kills pathogens in food

[2]

(c) Annabelle's body can also defend itself by producing antibodies when a pathogen invades.

Her antibodies give her immunity if the same pathogen invades again.

This is called **active immunity**.

People can also have **passive immunity**.

Write about how passive immunity is different from active immunity.

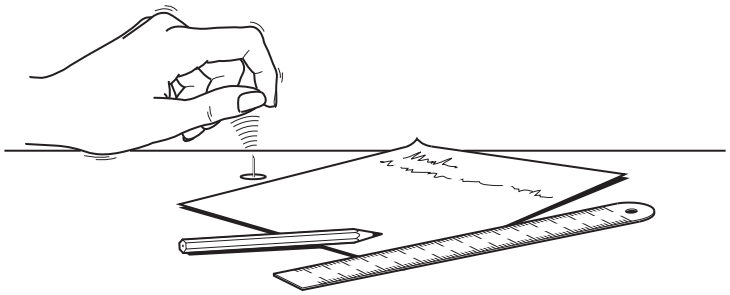
.....

.....

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

[Total: 4]

3 This question is about the nervous system.



Jeanette is cleaning her desk.
She accidentally puts her finger on the point of a drawing pin.
Without thinking, she quickly pulls her hand away from the drawing pin.

(a) What type of response is shown by Jeanette?

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

(b) In this response

(i) what is the stimulus?

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

(ii) what is the effector?

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

(c) Jeanette has a headache. She decides to take a painkiller.

(i) Look at the list of drugs.

Which one is a painkiller?

Put a (ring) around the correct answer.

aspirin **ecstasy** **LSD** **nicotine**

[1]

(ii) How does the painkiller stop Jeanette feeling pain?

.....

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

[Total: 5]

4 This question is about reproduction and inheritance.

James Claire Carol

(a) James and Carol have a daughter called Claire.

Carol needed fertility treatment before Claire was born.

This is because her ovaries did not produce enough of one type of cell.

(i) Name the cell that Carol needed to produce in her ovaries.

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

(ii) Carol needed sex hormone treatment to become fertile.

How do sex hormones travel to the ovaries?

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

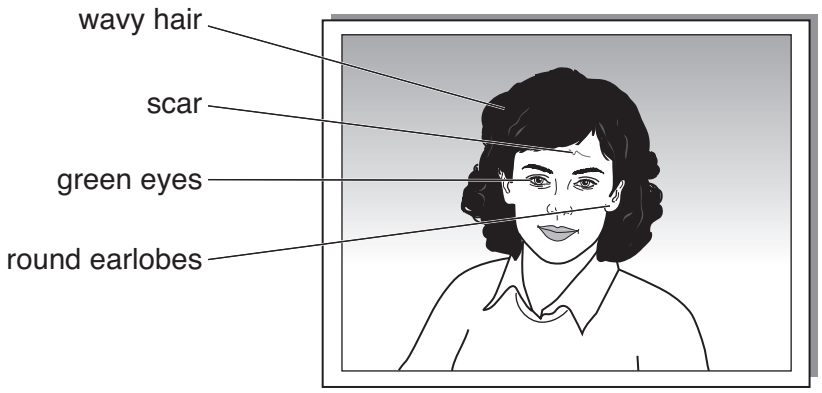
(b) Claire has inherited characteristics from James and Carol.

The information for these characteristics is carried on chromosomes.

How many chromosomes are found in **one** of Claire's skin cells?

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

(c) Look at the picture of Carol.



Write down **one** characteristic of Carol shown in the picture that can **only** be caused by her environment.

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

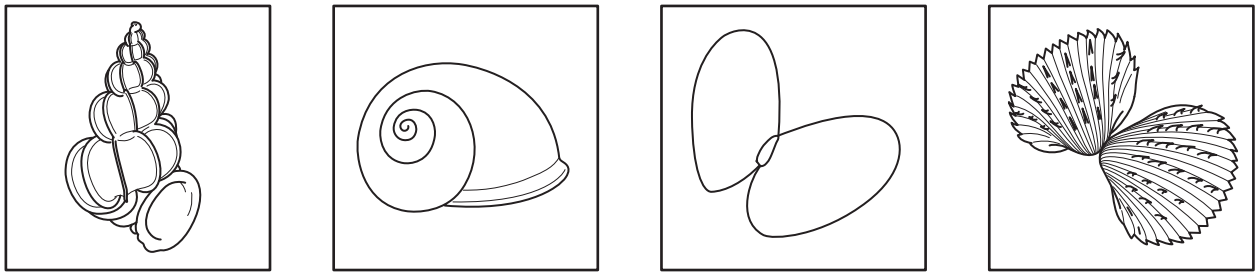
(d) Claire is a girl.

What sex chromosomes does she have?

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

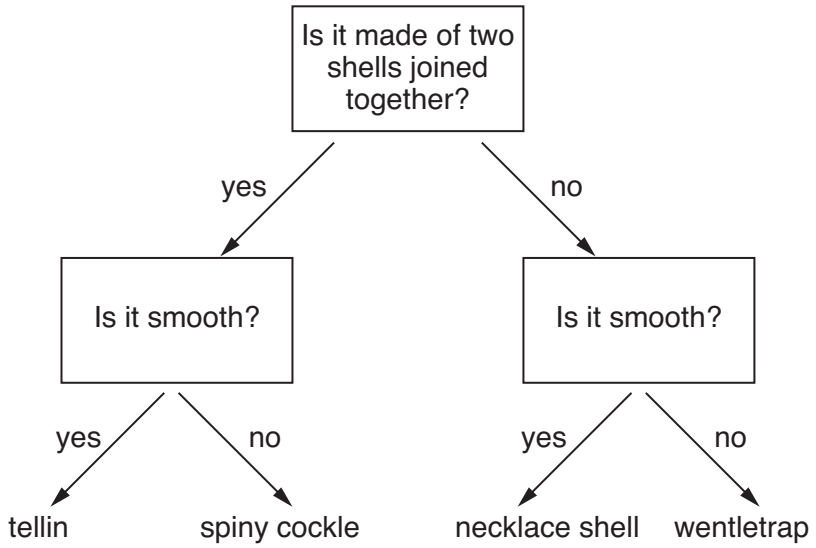
[Total: 5]

5 Cathy collects some shells from the sea shore.



A **B** **C** **D**

(a) Use the key to name shell **A** and shell **C**.



The name of shell **A** is .....

The name of shell **C** is ..... **[2]**

(b) The shells come from a group of animals called molluscs.

Molluscs do **not** have a backbone.

What group of animals do molluscs belong to?

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

(c) Cathy reads a guide book to find out more about the shells.

> Most **molluscs** feed on tiny plants called **algae**.
>
> The **molluscs** themselves are eaten by sea birds such as **gulls** as well as other animals such as **crabs**.
>
> **Gulls** also sometimes eat **crabs**.

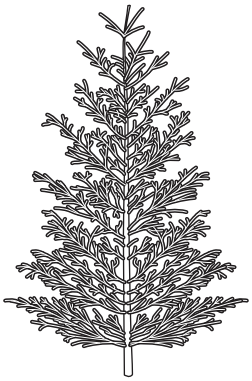
Put ticks (✓) in the table to show which of the organisms described in the article are predators.

organism	predator
algae	
crab	
gull	
mollusc	

[2]

[Total: 5]

6 Look at the pine tree.



(a) Pine trees make food by photosynthesis.

(i) What type of food is made by photosynthesis?

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

(ii) What gas is made by photosynthesis?

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

(b) Some pine trees are grown for wood.

Wood is an example of a **sustainable resource**.

Explain what is meant by a sustainable resource.

.....

.....

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

(c) Pine trees grow faster in the summer than the winter.

Write down **one** reason why.

.....

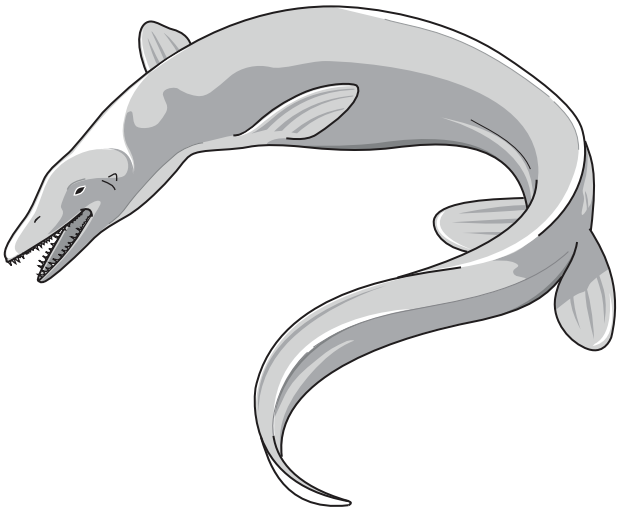
..... **[1]**

[Total: 5]

7 Mosasaurs are animals that lived in the sea around 65 to 70 million years ago.

They were about 15 m long.

The picture shows what scientists think a mosasaur looked like.



(a) Scientists think that mosasaurs were predators.

Look at the picture.

Describe **two** ways, that you can see, that mosasaurs were adapted as predators.

1 .....

.....

2 .....

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

(b) There are no mosasaurs alive today.

(i) What word describes animal species that have not survived?

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

(ii) What evidence did scientists use to work out what mosasaurs looked like?

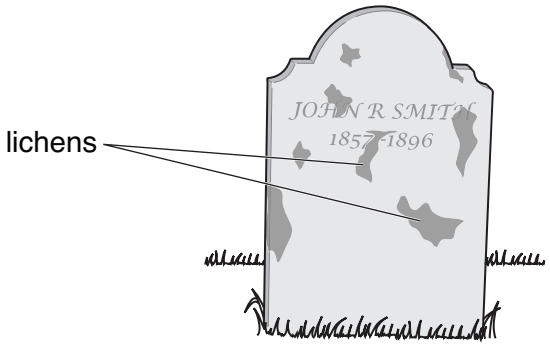
..... **[1]**

[Total: 4]

8 Lichens are an example of an indicator species.

The higher the level of sulfur dioxide pollution the less likely lichens are to be found.

They can be found growing on surfaces such as rocks, walls and gravestones.



(a) Iain is investigating how many lichens are growing in different parts of the country.

He does this by looking at gravestones in three different towns.

These are his results.

	town		
	Smithton	**Hughesly**	**Chapmanstow**
total number of gravestones looked at	80	45	64
number of gravestones with lichens	12	9	16
percentage of gravestones with lichens	15%		25%

(i) Calculate the percentage of gravestones with lichens in Hughesly.

answer ..... % **[2]**

(ii) Which town is likely to have the **least** sulfur dioxide pollution?

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

(b) Lichens are made of fungi and algae.

The fungi give the algae water and minerals that the fungi absorb from whatever they are growing on.

The algae give the fungi food that the algae make by photosynthesis.

What term is used to describe the relationship between the fungi and the algae?

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

(c) Lichens are found on surfaces such as rocks, walls and gravestones.

Suggest why they are **not** usually found on soil.

.....

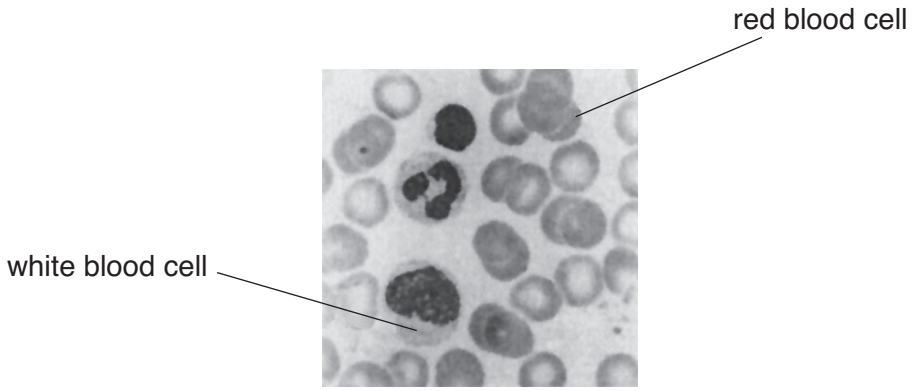
.....

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

[Total: 6]

9 Look at the picture.

It shows cells in human blood.



(a) Write down the job of red blood cells.

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

(b) Blood is moved around the body in blood vessels called arteries.

Write down the name of **one other** type of blood vessel.

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

(c) Write down the name of the organ that pumps blood around the body.

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

(d) Each white blood cell contains a nucleus.

Write down the job of the nucleus in a cell.

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

(e) Look at the statements.

Which **one** is a correct statement about substances in the blood?

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

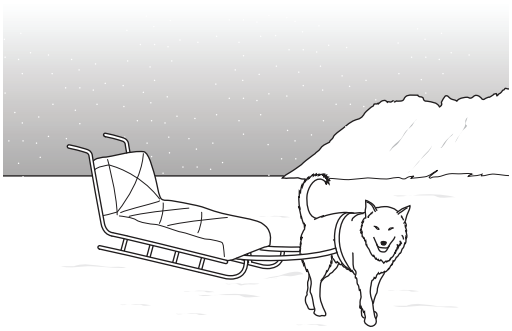
Carbon dioxide leaves the blood in the lungs.	
Food enters the blood in the lungs.	
Oxygen enters the blood in the small intestine.	
Oxygen leaves the blood in the lungs.	

[1]

[Total: 5]

10 Butch is a husky dog.

Huskies, like Butch, are a breed of dog used for pulling sledges.



(a) Husky dogs are produced by selective breeding.

They need to be strong to pull sledges.

To breed the best huskies the strongest females are bred with the strongest males.

Describe the next stages in selective breeding.

.....

.....

.....

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

(b) Scientists could clone Butch.

Which term best describes **cloning**?

Put a (ring) around the correct answer.

asexual reproduction

cell division

meiosis

sexual reproduction

[1]

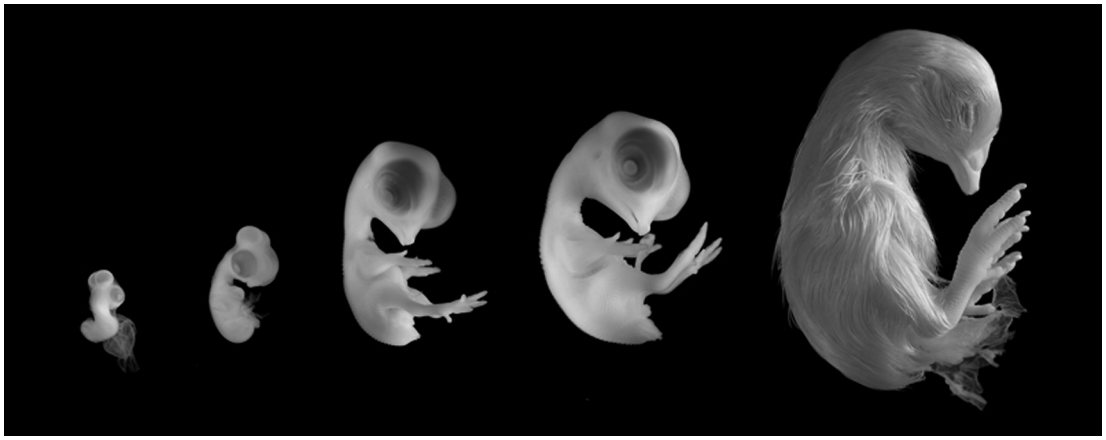
(c) The dog cloned from Butch will have the same characteristics as Butch.

Explain why.

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

[Total: 4]

11 Look at the picture. It shows a chicken embryo at different stages of growth.



(a) Cell division is needed for the chicken embryo to grow.

Cell division will continue even after the chicken is fully grown.

Write down **one other** reason, apart from growth, why cells divide.

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

(b) Adult male chickens produce sperm cells which are needed for fertilisation.

Sperm cells have different features that help them to do their job.

Write about **two** features that sperm cells have and why they have them.

1. feature .....

reason .....

2. feature .....

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

(c) Chicken embryos contain lots of different cells.

The cells do different jobs.

What process best describes making different types of cells?

Put a (ring) around the correct answer.

cell differentiation **cell division** **mitosis**

[1]

(d) Chicken embryos contain **stem cells**.

Write down the meaning of the term stem cells.

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

[Total: 5]

12 This question is about plant hormones.

(a) Hormones control growth in plants.

Look at the list. Which **one** of the processes is also controlled by plant hormones?

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

diffusion	
flowering	
photosynthesis	
respiration	

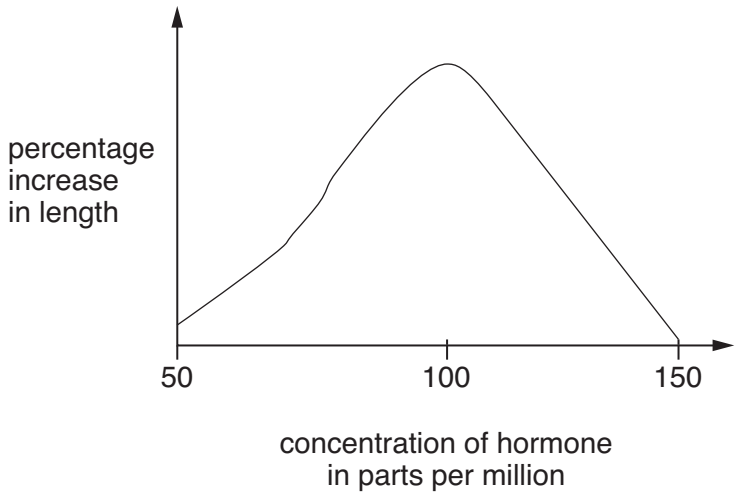
[1]

(b) Pat investigates the effect of plant hormone concentration on shoot growth.

She puts shoots of the same length in different concentrations of plant hormone.

Pat then measures the increase in length of the shoots.

The graph shows her results.



Describe the pattern in the results.

In your answer include information from the graph.

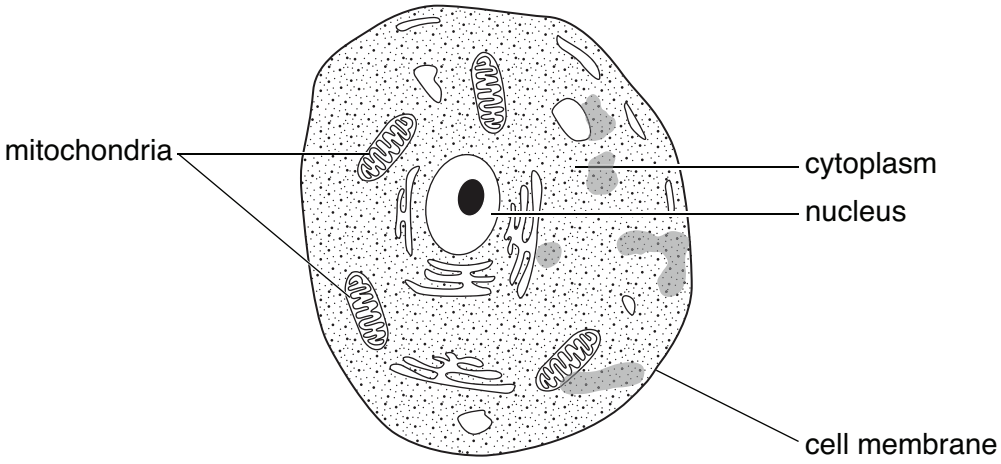
.....

.....

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

[Total: 3]

13 Look at the picture of an animal cell.



(a) Write down the name of the process that takes place in the mitochondria.

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

(b) The cytoplasm contains enzymes.

Write down the effect of enzymes on the speed of chemical reactions.

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

(c) Proteins are made in the cytoplasm.

Write down what the proteins are used for.

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

[Total: 3]

END OF QUESTION PAPER