Cell Biology Foundation

Name: _____

Class: _____

Date: _____

Time: **297 minutes**

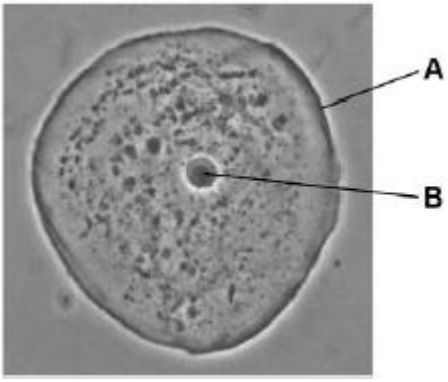
Marks: **294 marks**

Comments:

Q1.

Figure 1 shows an animal cell.

Figure 1



(a) What is structure **A**?

Tick **one** box.

- Cell membrane ☐
- Cell wall ☐
- Chromosome ☐
- Cytoplasm ☐

(1)

(b) What is structure **B**?

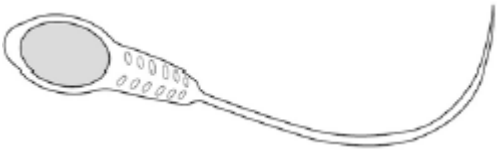
Tick **one** box.

- Chloroplast ☐
- Mitochondria ☐
- Nucleus ☐
- Vacuole ☐

(1)

(c) **Figure 2** shows a sperm cell.

Figure 2



Describe how a sperm cell is adapted to carry out its function.

_____

_____

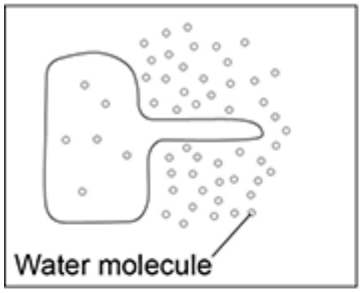
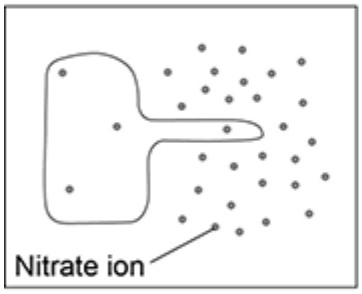
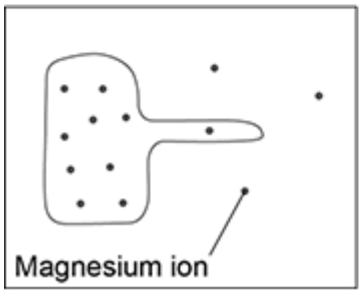
(1)

(d) Substances can move into and out of cells by three processes.

The diagrams show the concentration of different substances inside and outside a root hair cell.

How would each substance move into the root hair cell?

Draw **one** line from each root hair cell to the correct process.

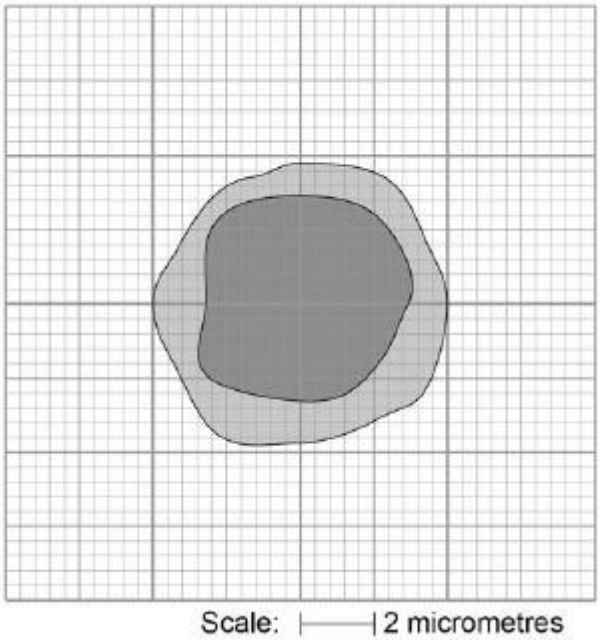
Root hair cell	**Process**
	Active transport
	Diffusion
	Osmosis

(2)

(Total 5 marks)

Q2.

The figure below shows a scale drawing of one type of cell in blood.



(a) Use the scale to determine the width of the cell.

Give your answer to the nearest micrometre.

_____

_____

Width of cell = _____ micrometres

(1)

(b) Complete the table below.

Part of the blood	Function
	Carries oxygen around the body
	Protects the body against infection
Plasma	

(3)

(c) Platelets are fragments of cells.

Platelets help the blood to clot.

Suggest what might happen if the blood did **not** clot.

_____

_____

(1)

(Total 5 marks)

Q3.

Substances can move into cells and out of cells.

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

Water moves into cells and out of cells by

active transport.
osmosis.
reabsorption.

The water moves through a

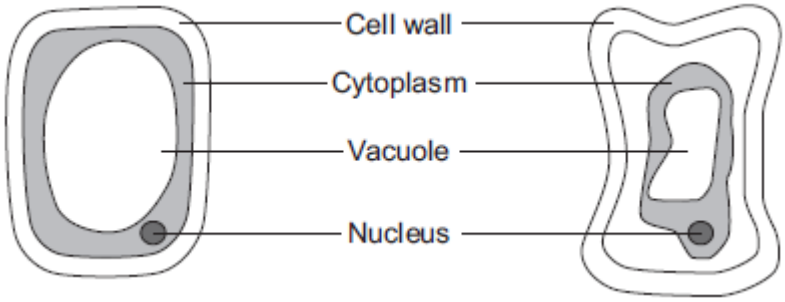
freely permeable
non-permeable
partially permeable

membrane.

(2)

(b) Students put plant cells into two different strengths of sugar solutions, **A** and **B**.

The diagram below shows what the cells looked like after 1 hour.



Cell in sugar solution **A** (after 1 hour)

Cell in sugar solution **B** (after 1 hour)

(i) Describe **two** ways in which the cell in sugar solution **B** is different from the cell in sugar solution **A**.

1. _____

_____

2. _____

_____

(2)

(ii) A student put red blood cells into water.

Suggest what would happen to the cells.

_____

_____

_____

(1)

(c) In the human body, glucose is absorbed into the blood from the small intestine.

The small intestine contains many villi.

Which **two** of the following help the absorption of glucose in the small intestine?

Tick (✓) **two** boxes.

Villi have a cell wall. ☐

Villi are covered in thick mucus. ☐

Villi give the small intestine a large surface area. ☐

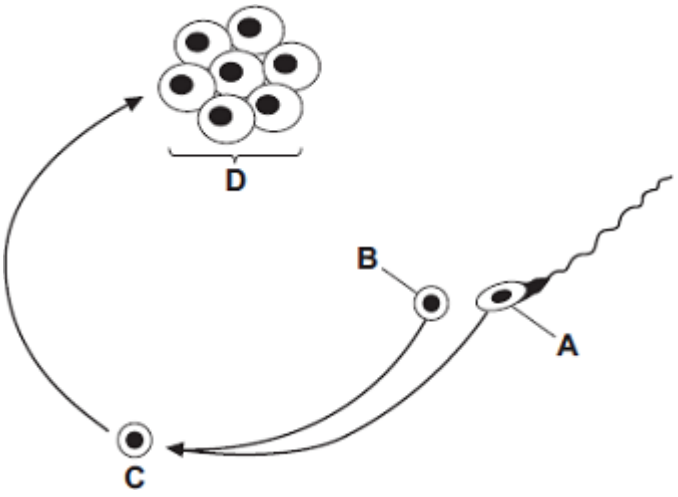
Villi have many blood capillaries. ☐

(2)

(Total 7 marks)

Q4.

The diagram shows some of the stages in IVF (in vitro fertilisation).



(a) Use words from the box to name structures **A**, **B**, **C** and **D**.

egg	**embryo**	**fertilised egg**	**ovary**	**sperm**

Structure **A** _____

Structure **B** _____

Structure **C** _____

Structure **D** _____

(4)

(b) What do doctors do next with structure **D**?

_____

_____

_____

_____

(2)

(c) The table gives statistics for an IVF clinic.

	Age of women treated			
	Below 35 years	**35 – 37 years**	**38 – 39 years**	**40 – 42 years**
Number of women treated	414	207	106	53
Number of women who produced one baby	90	43	17	1
Number of women who produced twins	24	8	4	1
Number of women who produced triplets	1	0	0	0

(i) About what proportion of the treated women aged 35 – 37 years produced one or more babies?

Draw a ring around your answer.

one quarter **one third** **half**

(1)

(ii) This clinic does **not** give IVF treatment to women over 42 years of age.

Use data from the table to explain why.

_____

_____

_____

_____

(2)

(iii) The committee which regulates IVF treatment now advises that only one embryo is used in each treatment.

Suggest **one** reason for this.

_____

(1)

(Total 10 marks)

Q5.

Substances can move into and out of cells.

(a) (i) How does oxygen move into and out of cells?

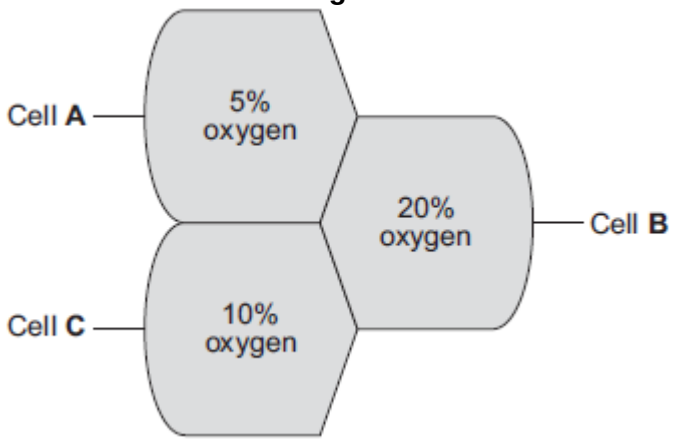
Draw a ring around **one** answer.

diffusion **digestion** **photosynthesis**

(1)

(ii) **Diagram 1** shows the percentage concentration of oxygen in three cells, **A**, **B** and **C**.

Diagram 1



Oxygen can move from cell to cell.

Into which cell, **A**, **B** or **C**, will oxygen move the fastest?

(1)

(b) (i) How does water move into and out of cells?

Draw a ring around **one** answer.

breathing **osmosis** **respiration**

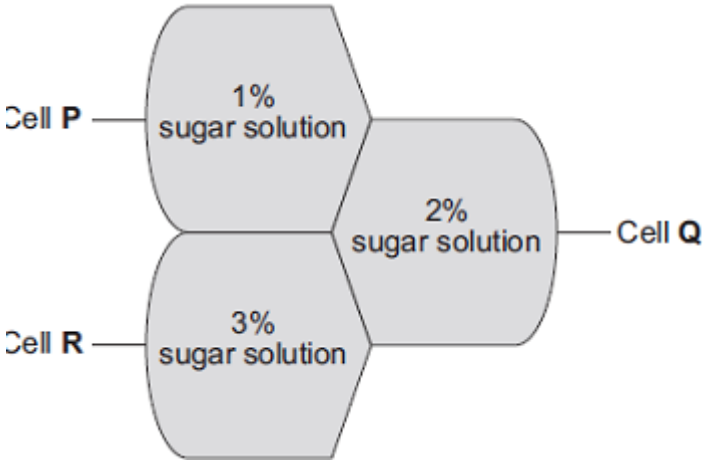
(1)

(ii) Differences in the concentration of sugars in cells cause water to move into or out of cells at different rates.

Diagram 2 shows three different cells, **P**, **Q** and **R**.

The information shows the percentage concentration of sugar solution in cells **P**, **Q** and **R**.

Diagram 2



Water can move from cell to cell.

Into which cell, **P**, **Q** or **R**, will water move the fastest? ☐

(1)

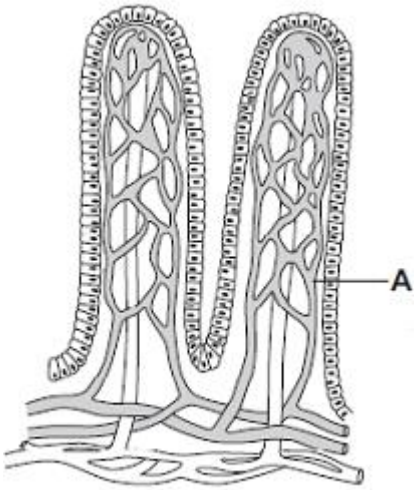
(Total 4 marks)

Q6.

Villi are found in some parts of the digestive system.

Diagram 1 shows two villi.

Diagram 1



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

(i) Structure **A** is a

muscle.
nerve.
capillary.

(1)

(ii) The villi absorb the products of digestion by

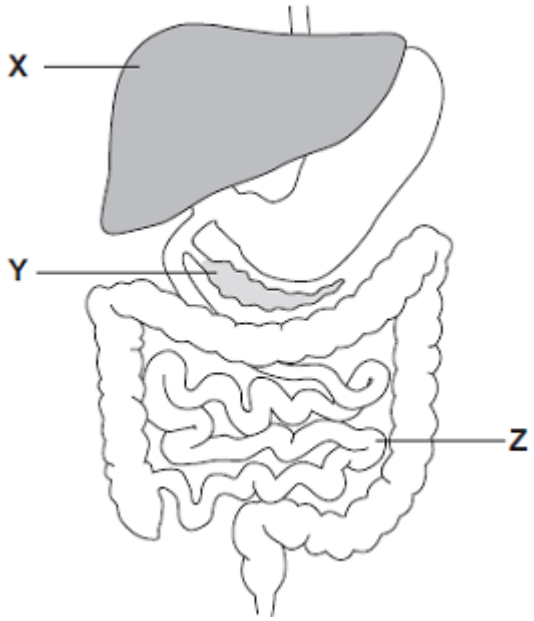
dialysis.
diffusion.

osmosis.

(1)

(b) **Diagram 2** shows the digestive system.

Diagram 2



(i) In which part of the digestive system, **X**, **Y** or **Z**, are most villi found?

(1)

(ii) There are about 2000 villi in each cm^2 of this part of the digestive system.

Why is it helpful to have lots of villi?

_____

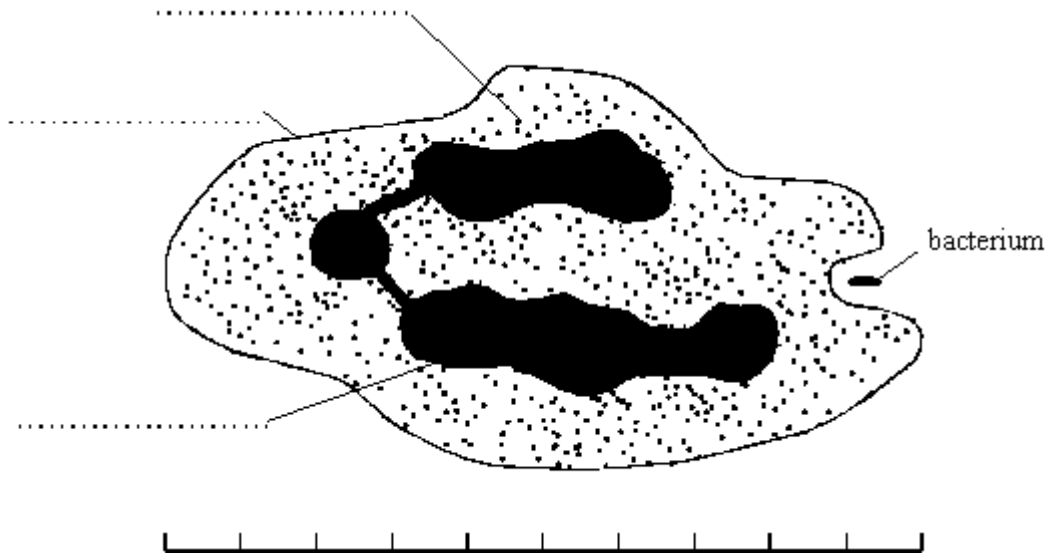
_____

(1)

(Total 4 marks)

Q7.

The drawing shows a white blood cell ingesting a bacterium.



(i) Use words from the list to label the parts of the white blood cell.

cell membrane **cell wall** **cytoplasm** **nucleus** **vacuole**

(3)

(ii) The scale shows that the white blood cell is 10 micrometres long.

How long is the bacterium? Show your working.

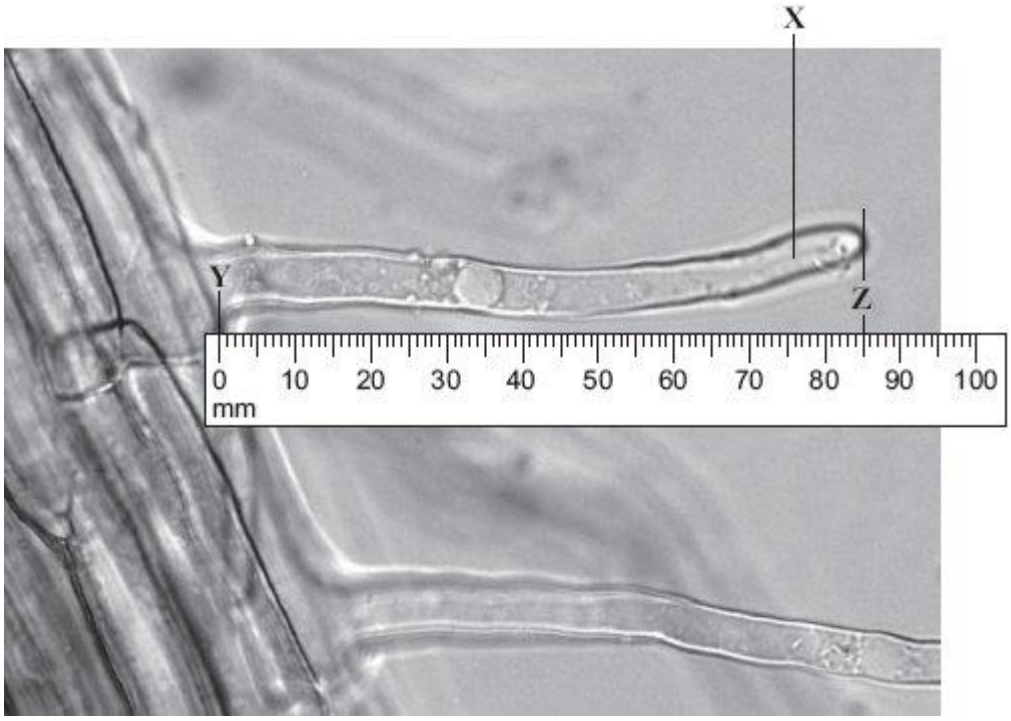
_____ micrometres

(2)

(Total 5 marks)

Q8.

The photograph shows part of the surface of a plant root. This part of the root is covered with hundreds of structures like the one labelled **X**.



(a) What is the name of structure **X**?

Draw a ring around **one** answer.

root hair **stoma** **villus**

(1)

(b) (i) Use the scale to measure the length **Y**–**Z** on the photograph.

On the photograph, length **Y**–**Z** = _____ mm.

(1)

(ii) The photograph shows the root magnified 100 times.

Calculate the actual length **Y**–**Z**.

_____

_____

_____

Actual length **Y**–**Z** = _____ mm.

(2)

(iii) Structure **X** is very small. There are thousands of structures like **X** on a plant root.

How does this help the plant?

_____

_____

_____

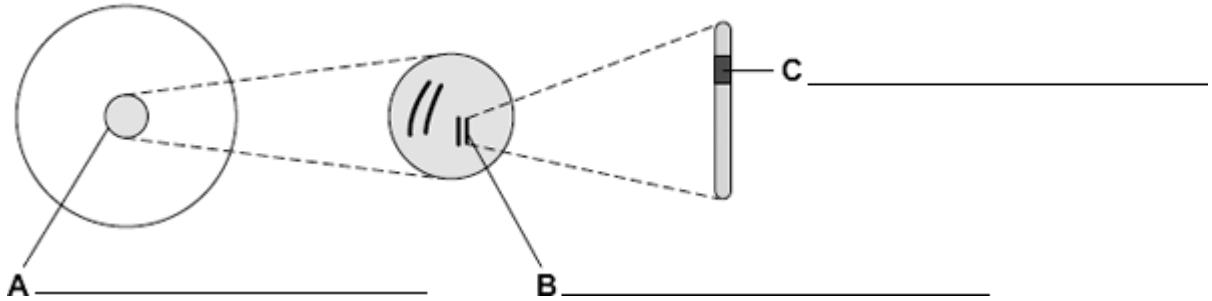
_____

(2)
(Total 6 marks)

Q9.

Diagram 1 shows an animal cell and some of the structures inside the cell.

Diagram 1



(a) Use words from the box to label structures **A**, **B** and **C**, on **Diagram 1**.

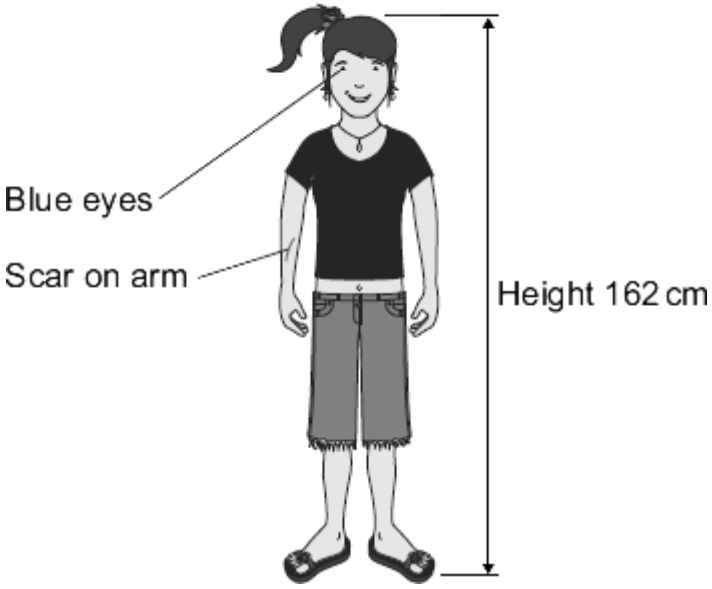
Characteristic	**Chromosome**	**Gamete**	**Gene**	**Nucleus**

(3)

(b) Factors that may affect characteristics include genes and the environment.

Diagram 2 shows some of the characteristics of a girl.

Diagram 2



Draw **one** line from each characteristic in **List A** to the factor(s) that affect the characteristic in **List B**.

List A **Characteristic**	**List B** **Factor(s) that affect the characteristic**
	Affected by genes only

Blue eyes	
	Affected by environment only
Height 162 cm	
	Affected by both genes and the environment
Scar on arm	
	Affected by neither genes nor the environment

(3)

(Total 6 marks)

Q10.

Cells called receptors detect stimuli in the environment.

The diagram shows a light receptor cell.

Use words from the box to label structures **A**, **B** and **C**.

Cell membrane	**Cytoplasm**	**Nucleus**	**Synapse**

(Total 3 marks)

Q11.

Complete the table by writing the correct process next to its description.

Choose your answers from the list in the box

breathing	**diffusion**	**digestion**	**osmosis**	**respiration**

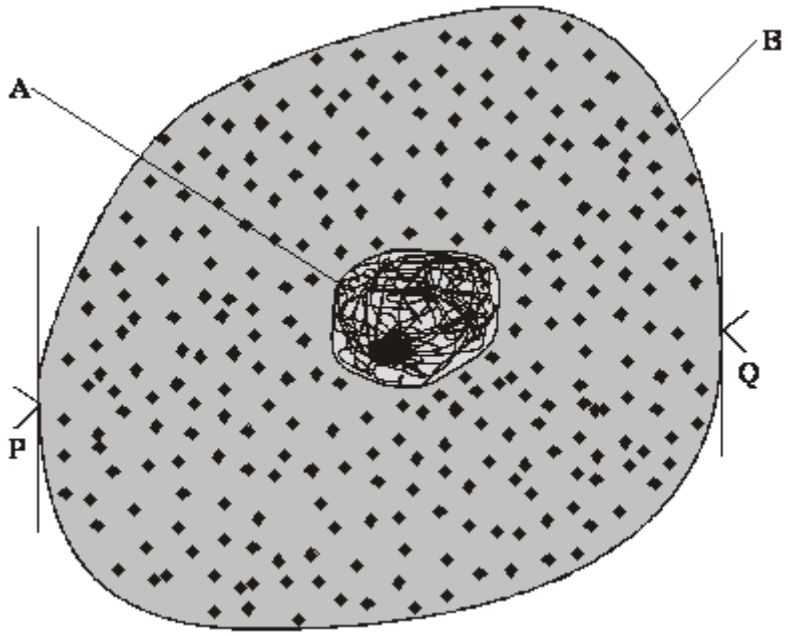
Description	Process
Moving air in and out of the lungs	

The movement of particles of a substance from high to low concentration	
The release of energy from glucose	

(Total 3 marks)

Q12.

The diagram shows an animal cell.



(a) (i) Name structures **A** and **B** by choosing the correct words from the box.

cell membrane	**cell wall**	**cytoplasm**	**nucleus**	**vacuole**

Structure **A** _____

Structure **B** _____

(2)

(ii) Which structure named in the box controls the passage of substances in and out of the cell?

_____

(1)

(b) Distance **P** to **Q** on the diagram is the diameter of the cell. This distance was measured on three cells using a microscope. The results were as follows:

cell 1: 63 micrometres
cell 2: 78 micrometres
cell 3: 69 micrometres

Calculate the average diameter of these cells. Show clearly how you work out your final answer.

_____

_____

Average diameter = _____ micrometres

(2)

(Total 5 marks)

Q13.

(a) Put a tick (✓) in the correct boxes in the table below to show which of the parts given are present in the cells and organisms listed.

	CYTOPLASM	NUCLEUS	CELL WALL	GENES
Leaf mesophyll cell				
Sperm				

(2)

(b) (i) What is the main job of a leaf mesophyll cell?

_____

_____

(1)

(ii) Explain **one** way in which the structure of the leaf mesophyll cell helps it to carry out its job.

_____

_____

_____

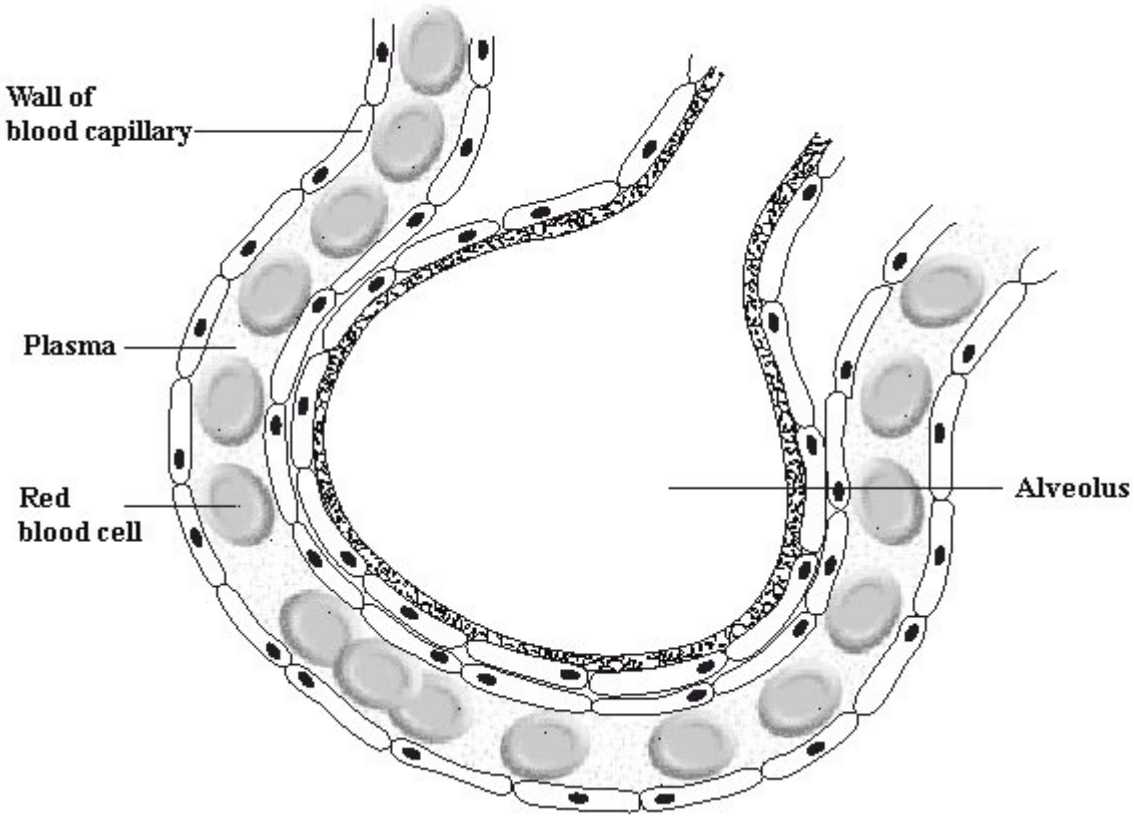
_____

(2)

(Total 5 marks)

Q14.

The diagram shows an alveolus and a blood capillary in the lung.



(i) During gaseous exchange, oxygen and carbon dioxide are exchanged across the wall of the alveolus. **On the diagram**, carefully draw **two** arrows to show the paths taken by oxygen and by carbon dioxide during this process. **Label each arrow**.

(3)

(ii) Name the process by which oxygen moves across the wall of the alveolus.

_____

_____

(1)

(iii) Each lung contains about 350 million alveoli. How does this help gaseous exchange?

_____

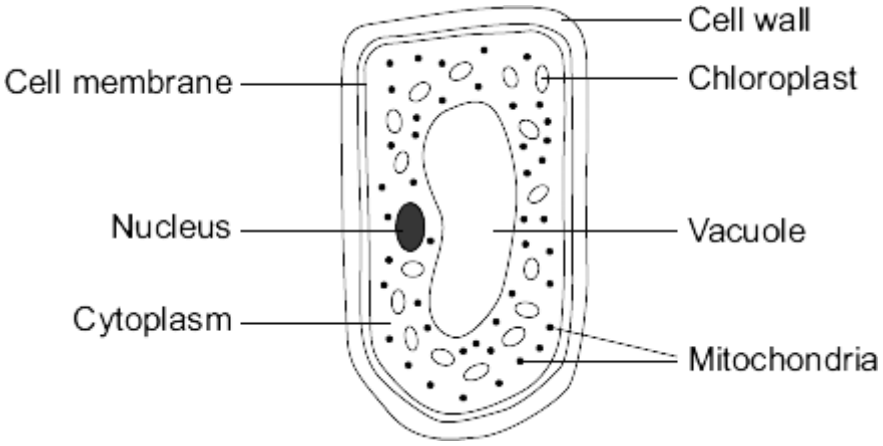
_____

(1)

(Total 5 marks)

Q15.

The diagram shows a cell from a plant leaf.



(a) Name the part of this cell that:

(i) controls the passage of substances in and out of the cell

_____

(1)

(ii) is filled with cell sap.

_____

(1)

(b) Give the names of **two** parts of the leaf cell that would **not** be found in a human liver cell.

_____ and _____

(2)

(c) The chloroplasts produce oxygen.

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

The oxygen produced by the chloroplasts passes out of the cell by

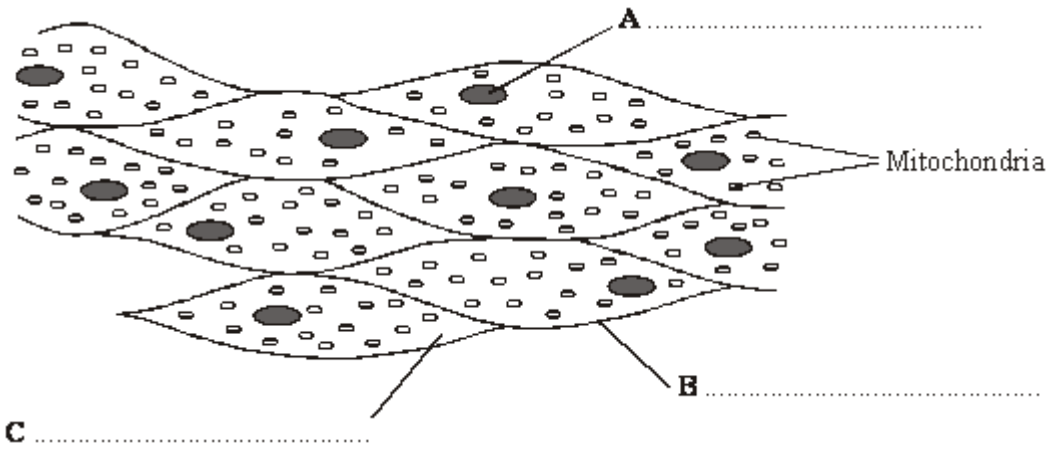
diffusion.
digestion.
respiration.

(1)

(Total 5 marks)

Q16.

The diagram shows a group of muscle cells from the wall of the intestine.



(a) On the diagram, use words from the box to name the structures labelled **A**, **B** and **C**.

cell membrane cell wall chloroplast cytoplasm nucleus

(3)

(b) How are these muscle cells adapted to release a lot of energy?

_____

_____

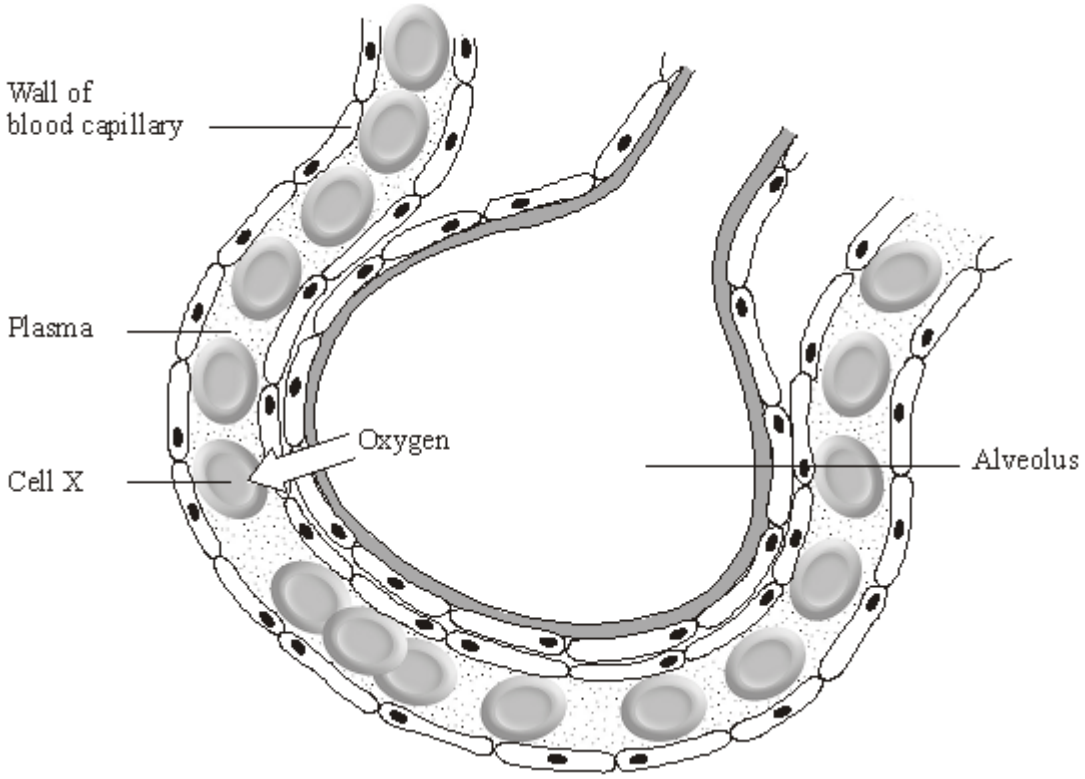
_____

(2)

(Total 5 marks)

Q17.

The diagram shows a small part of a lung.



(a) The arrow on the diagram shows the movement of oxygen from the air in the alveolus to cell **X.**

Complete the sentences by drawing a ring around the correct answer.

(i) Cell **X** is a

platelet
red cell
white cell

(1)

(ii) Oxygen moves from the air in the alveolus into cell **X** by

diffusion
filtration
respiration

(1)

(iii) The substance in cell **X** that combines with oxygen is called

glycogen
haemoglobin
lactic acid

(1)

(iv) Cell **X** does **not** have

a cell membrane
cytoplasm
a nucleus

(1)

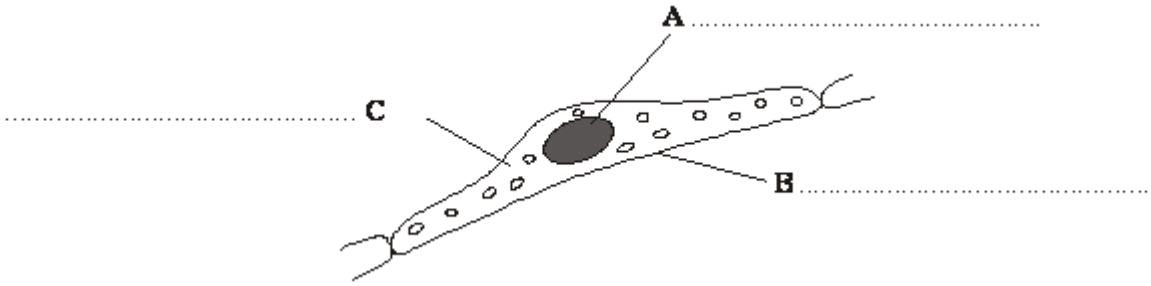
(b) **On the diagram**, draw an arrow to show the movement of carbon dioxide during gas exchange.

(1)

(Total 5 marks)

Q18.

The diagram shows a cell from the lining of the lung. This cell is specialised to allow gases to pass through quickly.



(a) Use words from the box to label structures **A, B** and **C**.

cell membrane	**chloroplast**	**cytoplasm**	**mitochondria**	**nucleus**

(3)

(b) (i) Which feature of this cell allows oxygen to pass through quickly?

Put a tick (✓) in the box next to your choice.

It is thin. ☐

It has a large nucleus. ☐

It has many mitochondria. ☐

(1)

(ii) Complete the sentence by drawing a ring around the correct answer in the box.

Oxygen passes through this cell by

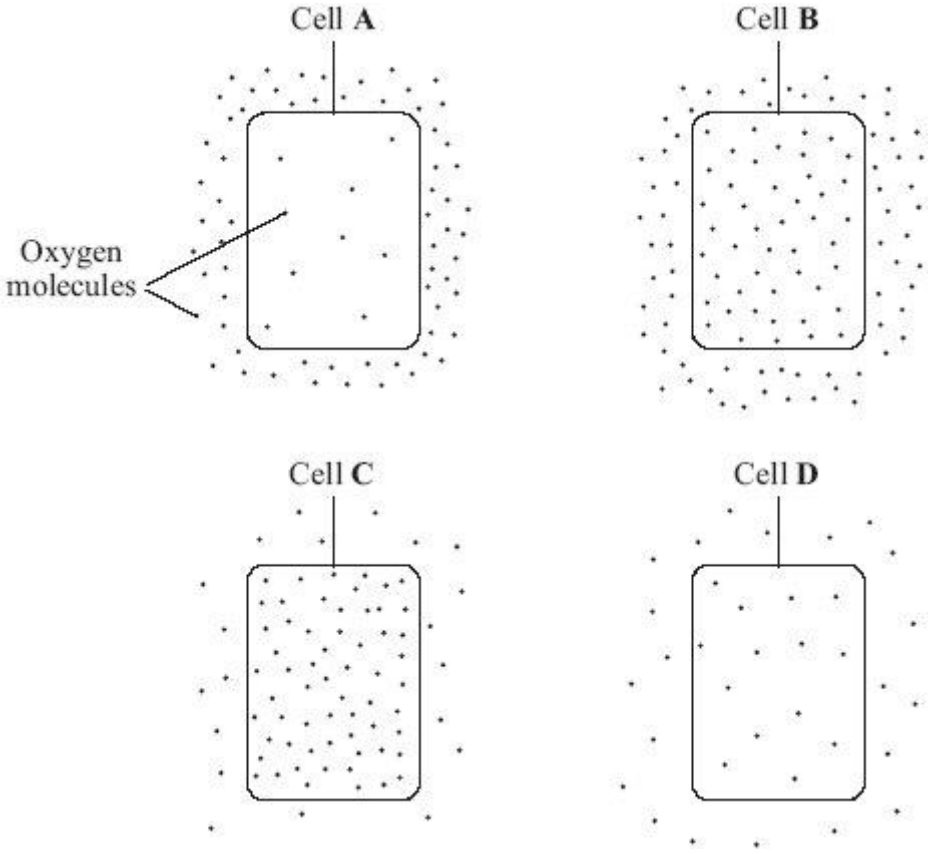
diffusion
osmosis
respiration

(1)

(Total 5 marks)

Q19.

(a) The diagrams show cells containing and surrounded by oxygen molecules. Oxygen can move into cells or out of cells.



Into which cell, **A**, **B**, **C** or **D**, will oxygen move the fastest?

Write your answer, **A**, **B**, **C** or **D**, in the box. ☐

(1)

(b) Draw a ring around the correct word to complete each sentence.

(i) Oxygen is taken into cells by the process of

diffusion
osmosis
respiration

.

(1)

(ii) Cells need oxygen for

breathing
photosynthesis
respiration

.

(1)

(iii) The parts of cells that use up the most oxygen are the

membranes
mitochondria
nuclei

.

(1)

(iv) Some cells produce oxygen in the process of

diffusion
photosynthesis
respiration

.

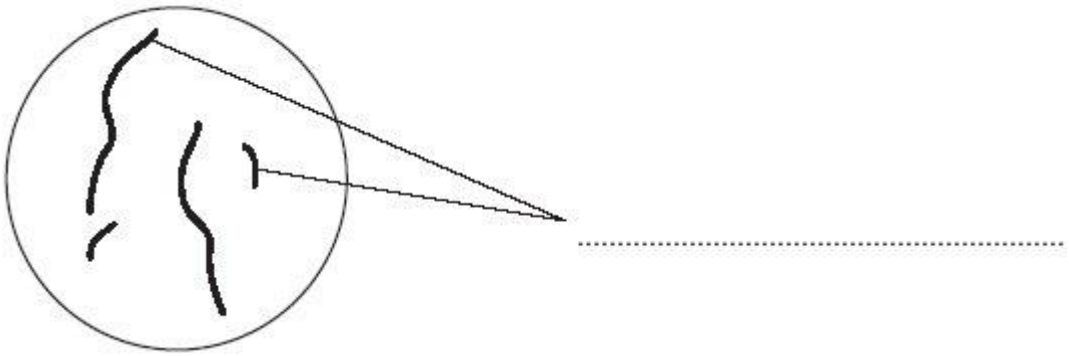
(1)

(Total 5 marks)

Q20.

Diagram 1 shows the nucleus of a body cell as it begins to divide by mitosis.

Diagram 1



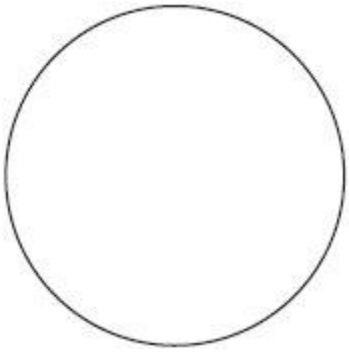
(a) Use a word from the box to label **Diagram 1**.

alleles	**chromosomes**	**gametes**

(1)

(b) Complete **Diagram 2** to show what the nucleus of one of the cells produced by this mitosis would look like.

Diagram 2



(1)

(c) Stem cells from a recently dead embryo can be grown in special solutions.

Some facts about stem cells are given below.

- Stem cells from an embryo can grow into any type of tissue.
- Stem cells may grow out of control, to form cancers.
- Large numbers of stem cells can be grown in the laboratory.
- Stem cells may be used in medical research or to treat some human diseases.
- Patients treated with stem cells need to take drugs for the rest of their life to prevent rejection.
- Collecting and growing stem cells is expensive.

Use **only** the information above to answer these questions.

(i) Give **two** advantages of using stem cells.

1. _____

_____

2. _____

_____

(2)

(ii) Give **two** disadvantages of using stem cells.

1. _____

_____

2. _____

_____

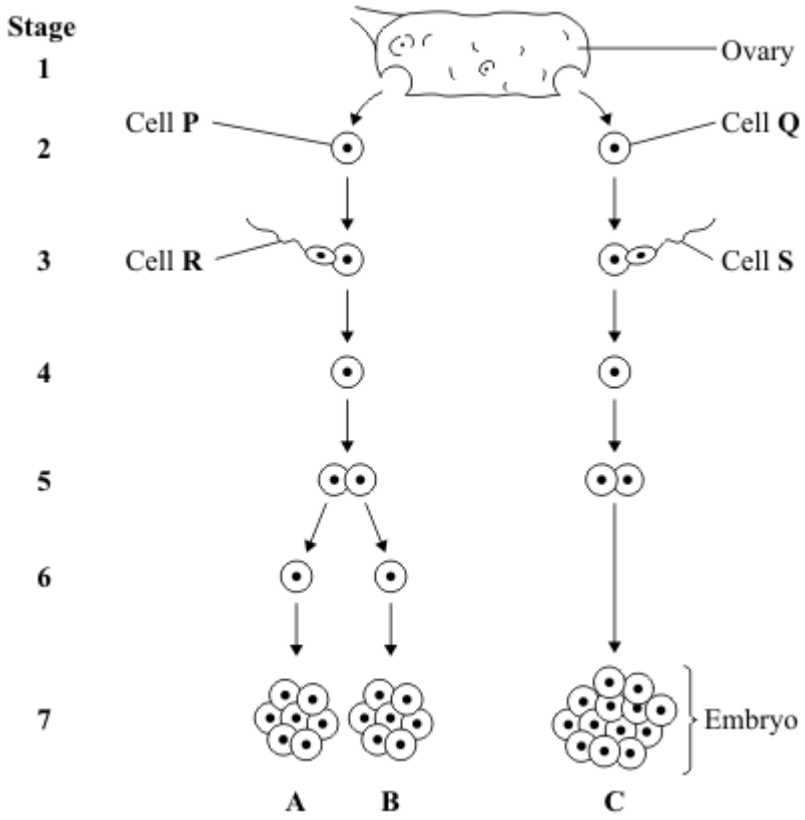
(2)

(Total 6 marks)

Q21.

A woman gives birth to triplets.
Two of the triplets are boys and the third is a girl.
The triplets developed from two egg cells released from the ovary at the same time.

The diagram shows how triplets **A**, **B** and **C** developed.



(a) Which stages on the diagram show gametes?

Draw a ring around your answer.

1 and 2 **2 and 3** **3 and 7** **1 and 7**

(1)

(b) Embryo **B** is male.

Which of the following explains why embryo **B** is male?

Tick (✓) **one** box.

Cell **P** has an X chromosome; cell **R** has an X chromosome. ☐

Cell **P** has a Y chromosome; cell **R** has an X chromosome. ☐

Cell **P** has an X chromosome; cell **R** has a Y chromosome. ☐

(1)

(c) The children that develop from embryos **A** and **C** will **not** be identical.

Explain why.

You may use words from the box in your answer.

egg	**genes**	**sperm**

_____

_____

_____

_____

_____

(2)

(d) Single cells from an embryo at **Stage 7** can be separated and grown in a special solution.

(i) What term describes cells that are grown in this way?

Draw a ring around your answer.

lleles **screened cells** **stem cells**

(1)

(ii) What happens when the cells are placed in the special solution?

Tick (✓) **two** boxes.

The cells divide ☐

The cells fertilise ☐

The cells differentiate ☐

The cells separate ☐

(2)

(iii) Give **one** use of cells grown in this way.

_____

_____

(1)

(iv) Some people might object to using cells from embryos in this way.

Give **one** reason why.

_____

_____

_____

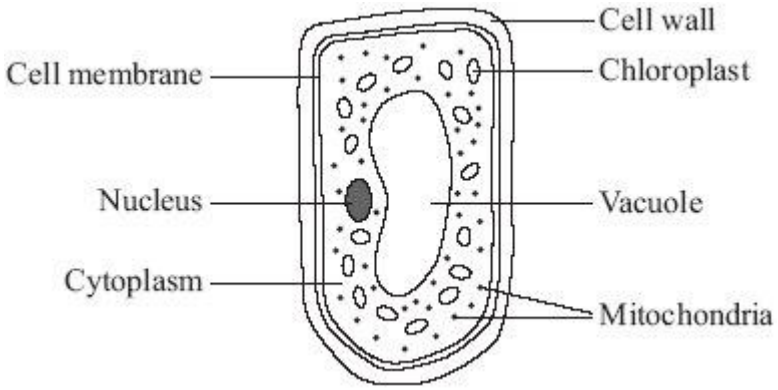
(1)

(Total 9 marks)

Q22.

Diagram 1 shows a cell from a leaf.

Diagram 1



(a) How is the leaf cell specialised to carry out photosynthesis?

Tick (✓) **one** box.

It has a permanent vacuole. ☐

It has many chloroplasts. ☐

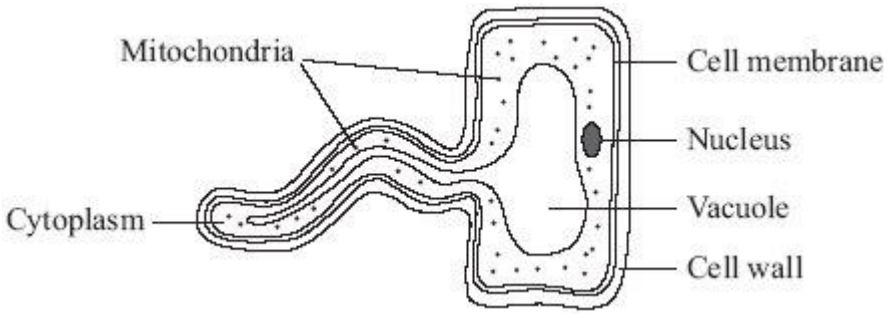
It has cytoplasm. ☐

It has many mitochondria. ☐

(1)

(b) **Diagram 2** shows another type of plant cell.

Diagram 2



Give **two** ways in which this cell is different from an animal cell.

1. _____

_____

2. _____

_____

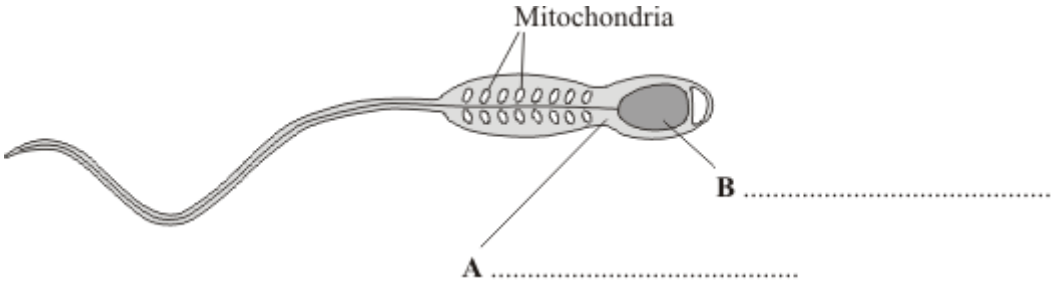
(2)

(Total 3 marks)

Q23.

This question is about cells.

(a) (i) The diagram shows a sperm cell.

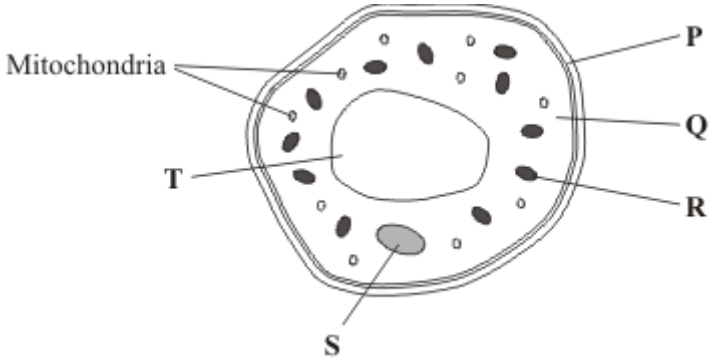


Use words from the box to label parts **A** and **B**.

cell membrane	**cytoplasm**	**nucleus**

(2)

(ii) The diagram shows a cell from a leaf.



Give the letters of **two** parts of the leaf cell which would **not** be found in a sperm cell. ☐ and ☐.

(1)

(b) Sperm cells have many mitochondria.

Why do sperm cells need many mitochondria?

Tick (✓) **one** box.

Sperm cells are involved in fertilisation. ☐

Sperm cells are produced in very large numbers. ☐

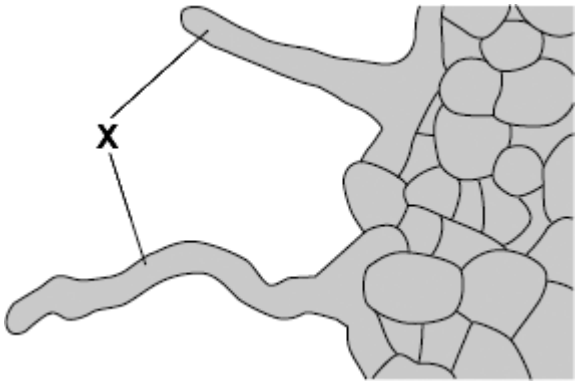
Sperm cells need a lot of energy to swim. ☐

(1)

(Total 4 marks)

Q24.

The diagram shows part of a plant root. A large number of structures like the ones labelled **X** grow out of the surface of the root.



(a) (i) What is the name of structure **X**?

Draw a ring around **one** answer.

root hair **stoma** **villus**

(1)

(ii) Name **two** substances which structure **X** absorbs from the soil.

1. _____

2. _____

(2)

(b) The substances in (a)(ii) are transported from the roots to the leaves. Carbon dioxide also enters the leaves.

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

(i) Carbon dioxide enters leaves through

alveoli.
stomata.
villi.

(1)

(ii) Carbon dioxide enters leaf cells by

active transport.
diffusion.
reabsorption.

(1)

(Total 5 marks)

Q25.

(a) **List A** gives four structures in the human body.

List B gives the functions of some structures in the body.

Draw a straight line from each structure in **List A** to the correct function in **List B**.

List A – Structure	**List B – Function**
	Surround and protect the lungs
Alveoli	
	Filter the blood
Veins	
	Carry blood towards the heart
Villi	
	Absorb digested food
Ribs	
	Allow oxygen to enter the blood

(4)

(b) Draw a ring around the correct answer to complete the sentence.

In the lungs, oxygen enters the blood from the air by

diffusion.

filtration.

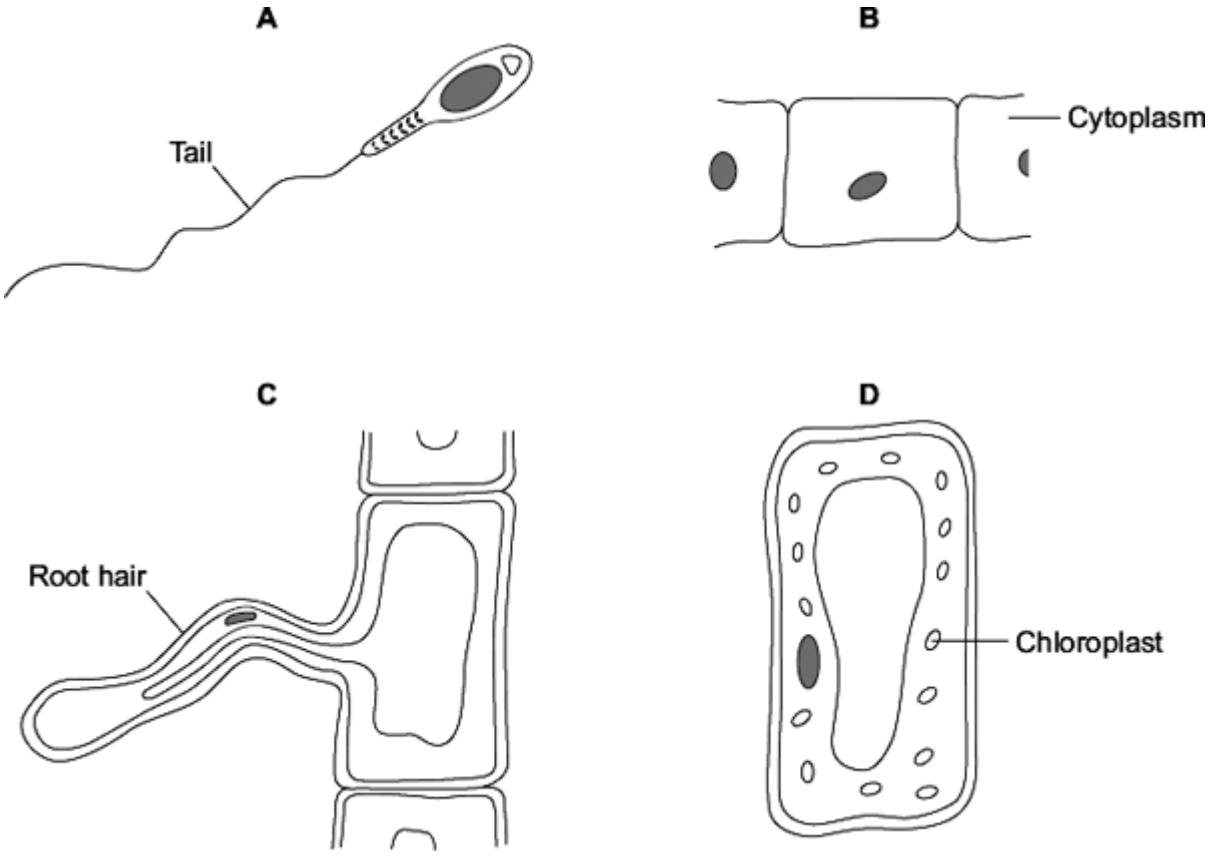
respiration.

(1)

(Total 5 marks)

Q26.

The diagrams show four types of cell, **A**, **B**, **C** and **D**.
Two of the cells are plant cells and two are animal cells.



(a) (i) Which **two** of the cells are plant cells?

Tick (✓) **one** box.

A and **B** ☐

A and **D** ☐

C and **D** ☐

(1)

(ii) Which part is found **only** in plant cells?

Draw a ring around **one** answer.

cell membrane **cell wall** **nucleus**

(1)

(b) (i) Which cell, **A**, **B**, **C** or **D**, is adapted for swimming? ☐

(1)

(ii) Which cell, **A**, **B**, **C** or **D**, can produce glucose by photosynthesis? ☐

(1)

(c) Cells **A**, **B**, **C** and **D** all use oxygen.

For what process do cells use oxygen?

Draw a ring around **one** answer.

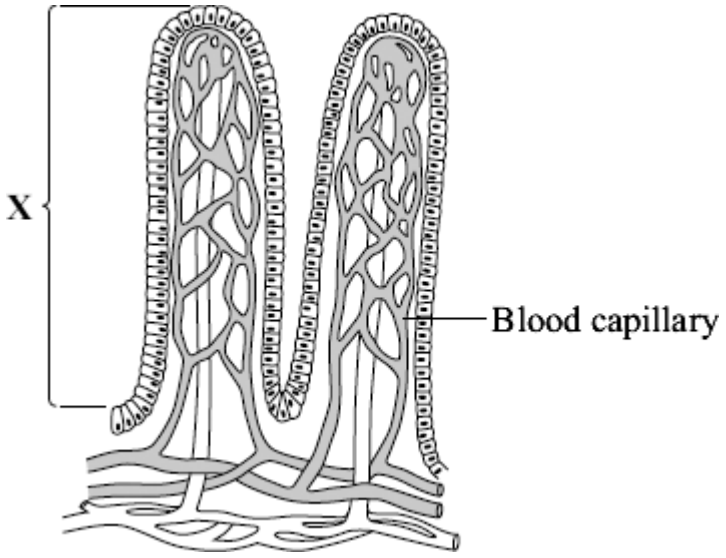
osmosis **photosynthesis** **respiration**

(1)

(Total 5 marks)

Q27.

The diagram shows part of the lining of the small intestine.



(a) (i) Name structure **X**.

Draw a ring around **one** answer.

alveolus **thorax** **villus**

(1)

(ii) Choose **three** ways in which structure **X** is adapted to help the absorption of soluble food.

Tick (✓) **three** boxes.

It is ventilated. ☐

Its outer surface is one cell thick. ☐

It has a large surface area. ☐

It contains a layer of muscle. ☐

It has a good blood supply. ☐

Its cells contain haemoglobin. ☐

(3)

(b) Name the process by which soluble food enters the blood.

Draw a ring around **one** answer.

diffusion **fermentation** **transpiration**

(1)

(Total 5 marks)

Q28.

Humans reproduce sexually.

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

(a) (i) At fertilisation [chromosomes / genes / sex cells] join together.

(1)

(ii) At fertilisation a single cell forms, which has new pairs of [chromosomes. / nuclei. / sex cells.]

(1)

(b) Cystic fibrosis can be inherited by children whose parents do not have it.

(i) A person who has cystic fibrosis has [two / three / four] copies of the cystic fibrosis allele.

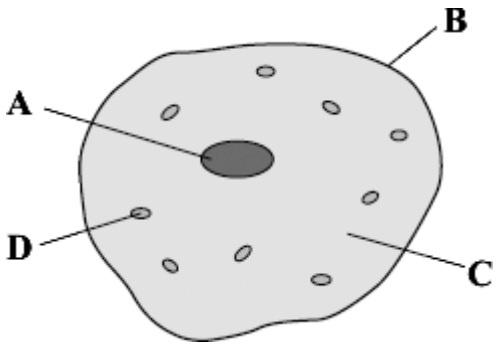
(1)

(ii) The cystic fibrosis allele is [large. / recessive.]

strong.

(1)

(c) The diagram shows a human body cell.



Choose the correct answer from the box to complete each sentence.

cell membrane	**cell wall**	**cytoplasm**	**nucleus**

(i) The part of the cell labelled **B** is the _____

(1)

(ii) The part of the cell labelled **C** is the _____

(1)

(d) Which part of the cell, **A**, **B**, **C** or **D**:

(i) contains the allele for cystic fibrosis ☐

(1)

(ii) is affected by cystic fibrosis? ☐

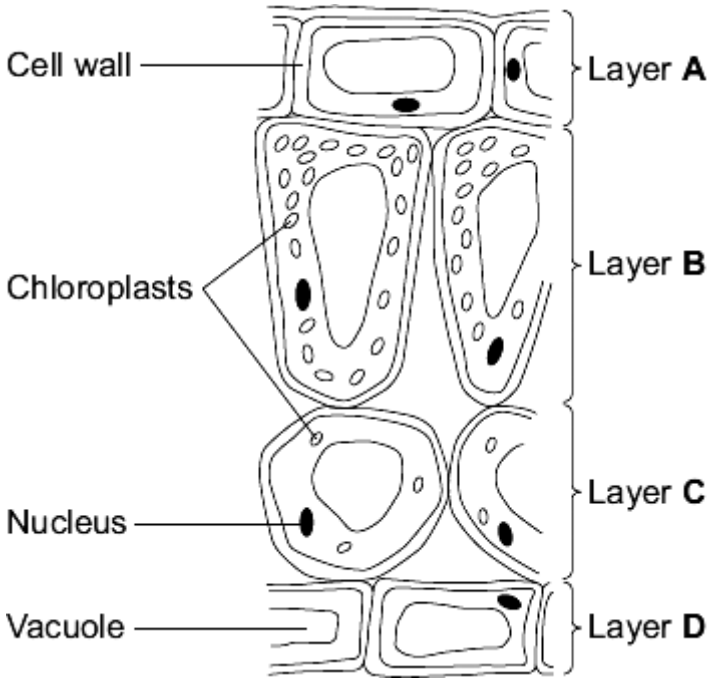
(1)

(Total 8 marks)

Q29.

Leaves are made from layers of cells.

The diagram shows a section through part of a leaf.



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

Tick (✓) **one** box.

Layer A	**Tick (✓)**
Tissue	
Organ	
Cell	

(1)

(ii) Which word describes a whole leaf?

Draw a ring around **one** answer.

organ **tissue** **organism**

(1)

(b) (i) Which **two** layers of cells, **A**, **B**, **C** and **D**, can photosynthesise?

Use information from the diagram to help you.

Tick (✓) **two** boxes.

Layer **A** ☐

Layer **B** ☐

Layer **C** ☐

Layer **D** ☐

(2)

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

_____

_____

(1)

(c) List **X** gives the names of two parts of a cell.
List **Y** gives information about parts of a cell.

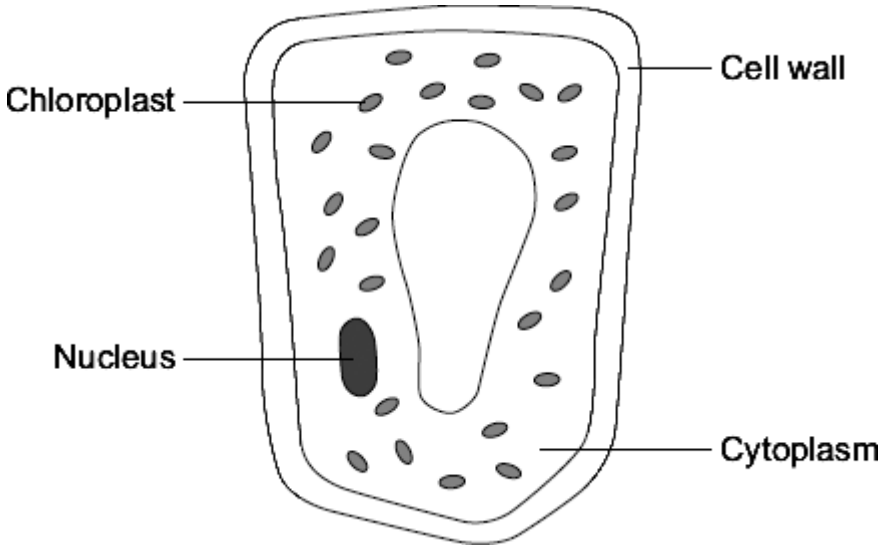
Draw **one** line between each part of the cell in list **X** and information about it in list **Y**.

List X **Part of a cell**	**List Y** **Information**
	Controls the passage of substances into the cell
Vacuole	
	Contains the cell sap
Nucleus	
	Controls the activities of the whole cell

(2)
(Total 7 marks)

Q30.

The diagram shows a plant cell from a leaf.



(a) **List A** gives the names of three parts of the cell.
List B gives the functions of parts of the cell.

Draw a line from each part of the cell in **List A** to its function in **List B**.

List A **Parts of the cell**	**List B** **Functions**
	Where most of the chemical reactions take place
Nucleus	
	Absorbs light energy to make food
Cytoplasm	
	Strengthens the cell
Chloroplast	
	Controls the activities of the cell

(3)

(b) Respiration takes place in the cell.

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

All cells use respiration to release

energy

oxygen.

sugar.

(1)

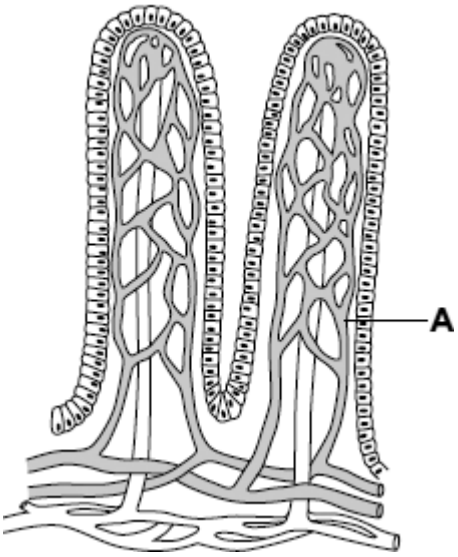
(Total 4 marks)

Q31.

Villi are found in some parts of the digestive system.

Diagram 1 shows two villi.

Diagram 1



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

(i) Structure **A** is a

muscle.
nerve.
capillary.

(1)

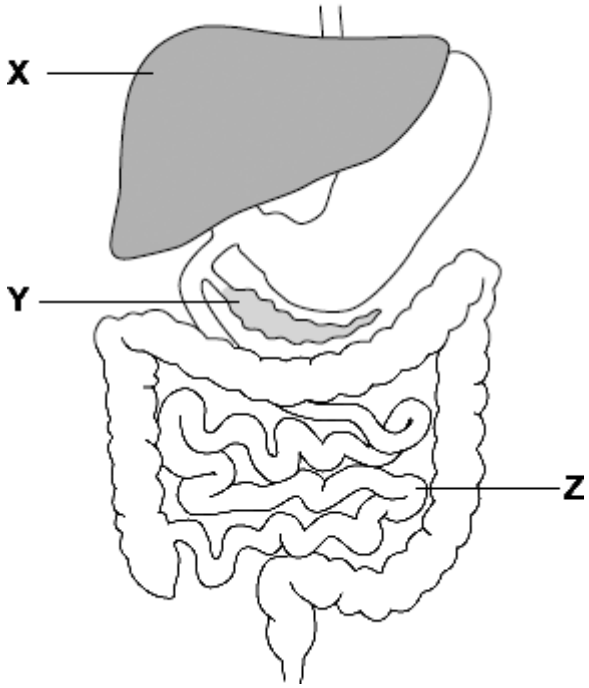
(ii) The villi absorb the products of digestion by

dialysis.
diffusion.
osmosis.

(1)

(b) **Diagram 2** shows the digestive system.

Diagram 2



(i) In which part of the digestive system, **X**, **Y** or **Z**, are most villi found? ☐

(1)

(ii) There are about 2000 villi in each cm^2 of this part of the digestive system.

Why is it helpful to have lots of villi?

_____

_____

(1)

(Total 4 marks)

Q32.

Substances can move into and out of cells.

(a) (i) How does oxygen move into and out of cells?

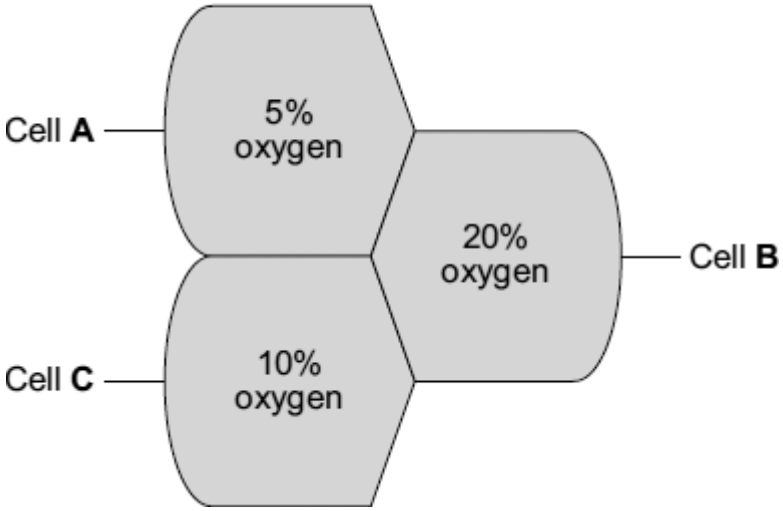
Draw a ring around **one** answer.

diffusion **digestion** **photosynthesis**

(1)

(ii) **Diagram 1** shows the percentage concentration of oxygen in three cells, **A**, **B** and **C**.

Diagram 1



Oxygen can move from cell to cell.

Into which cell, **A**, **B** or **C**, will oxygen move the fastest?

(1)

(b) (i) How does water move into and out of cells?

Draw a ring around **one** answer.

breathing **osmosis** **respiration**

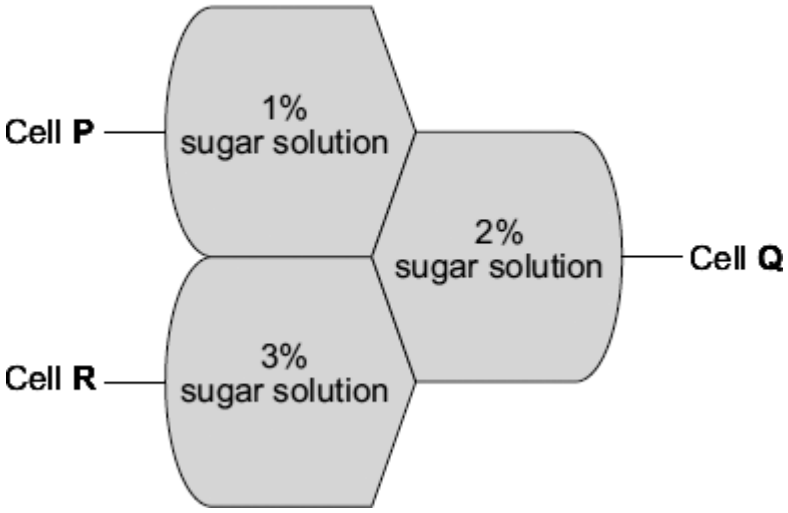
(1)

(ii) Differences in the concentration of sugars in cells cause water to move into or out of cells at different rates.

Diagram 2 shows three different cells, **P**, **Q** and **R**.

The information shows the percentage concentration of sugar solution in cells **P**, **Q** and **R**.

Diagram 2



Water can move from cell to cell.

Into which cell, **P**, **Q** or **R**, will water move the fastest?

(1)

(Total 4 marks)

Q33.

The diagram shows a strawberry plant.

The parent plant grows side shoots.

New plants grow on the side shoots.

The new plants will all have the same inherited characteristics as the original parent plant.

Complete the sentences to explain why.

Use words from the box.

asexual	**differentiation**	**embryos**	**fertilisation**
gametes	**genes**	**mitosis**	**sexual**

(a) The new plant is produced by _____ reproduction.

(1)

(b) In this type of reproduction, body cells divide by _____

(1)

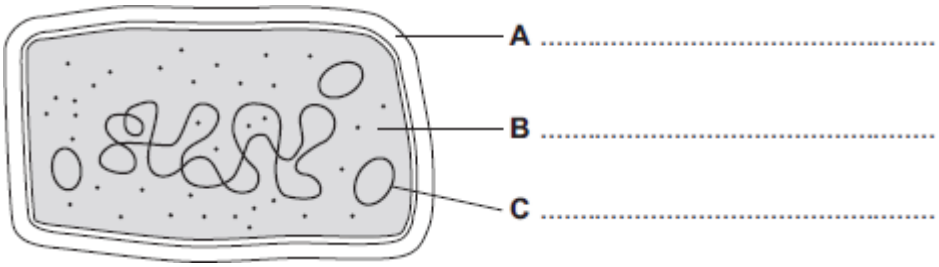
(c) The new plant has the same _____ as the parent plant.

(1)

(Total 3 marks)

Q34.

(a) The diagram shows the structure of a bacterial cell.



(i) On the diagram use words from the box to label structures **A**, **B** and **C**.

cell membrane	**cell wall**	**chloroplast**	**cytoplasm**	**plasmid**

(3)

(ii) Give **one** difference between the structure of the bacterial cell and an animal cell.

_____

(1)

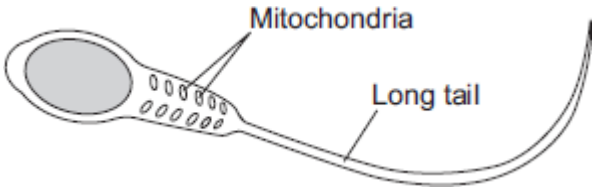
(iii) Name **one** structure that is found in a plant cell but is **not** found in a bacterial or an animal cell.

_____

(1)

(b) Cells can be specialised for a particular job.

The diagram shows the structure of a human sperm cell.



Describe how the long tail and the mitochondria help the sperm to do its job.

Long tail _____

_____

_____

Mitochondria _____

_____

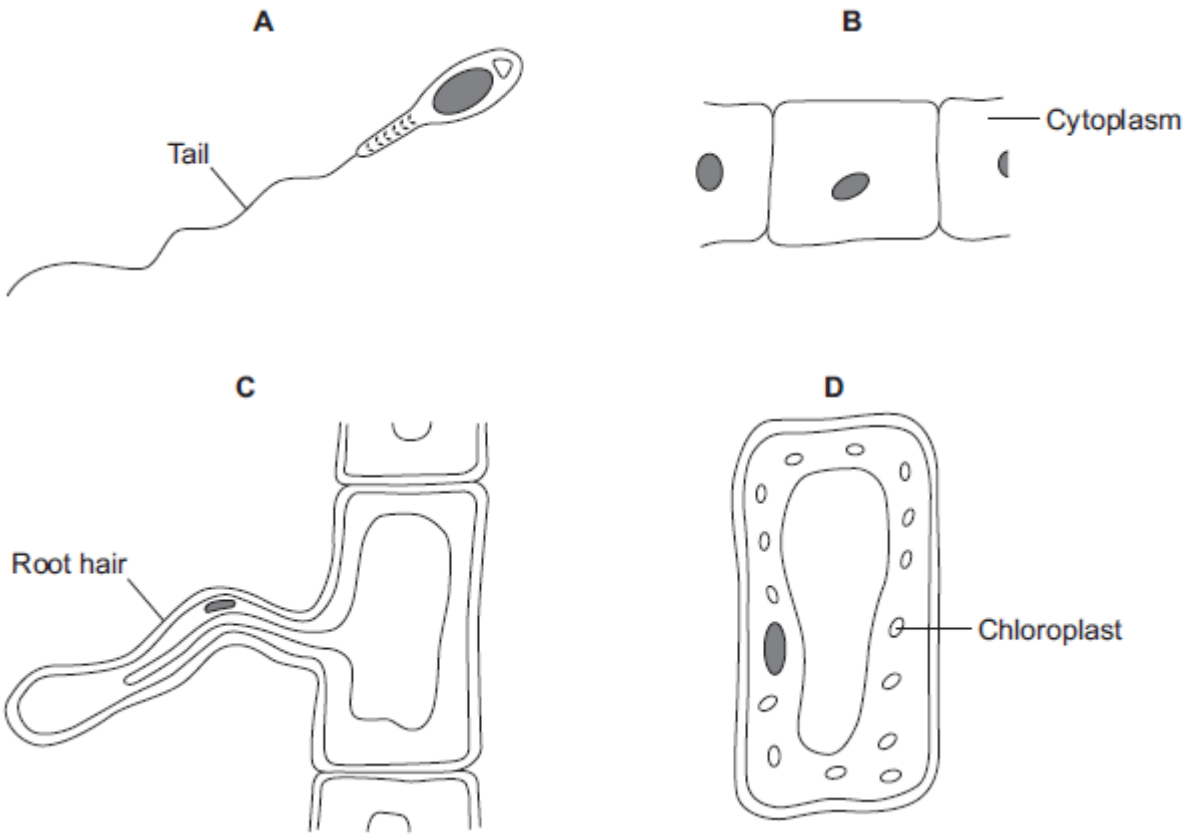
_____

(4)

(Total 9 marks)

Q35.

The diagrams show four types of cell, **A**, **B**, **C** and **D**.
Two of the cells are plant cells and two are animal cells.



(a) (i) Which **two** of the cells are plant cells?

Tick (✓) **one** box.

A and **B** ☐

A and **D** ☐

C and **D** ☐

(1)

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

_____

_____

(1)

(b) (i) Which cell, **A**, **B**, **C** or **D**, is adapted for swimming? ☐

(1)

(ii) Which cell, **A**, **B**, **C** or **D**, can produce glucose by photosynthesis? ☐

(1)

(c) Cells **A**, **B**, **C** and **D** all use oxygen.

For what process do cells use oxygen?

Draw a ring around **one** answer.

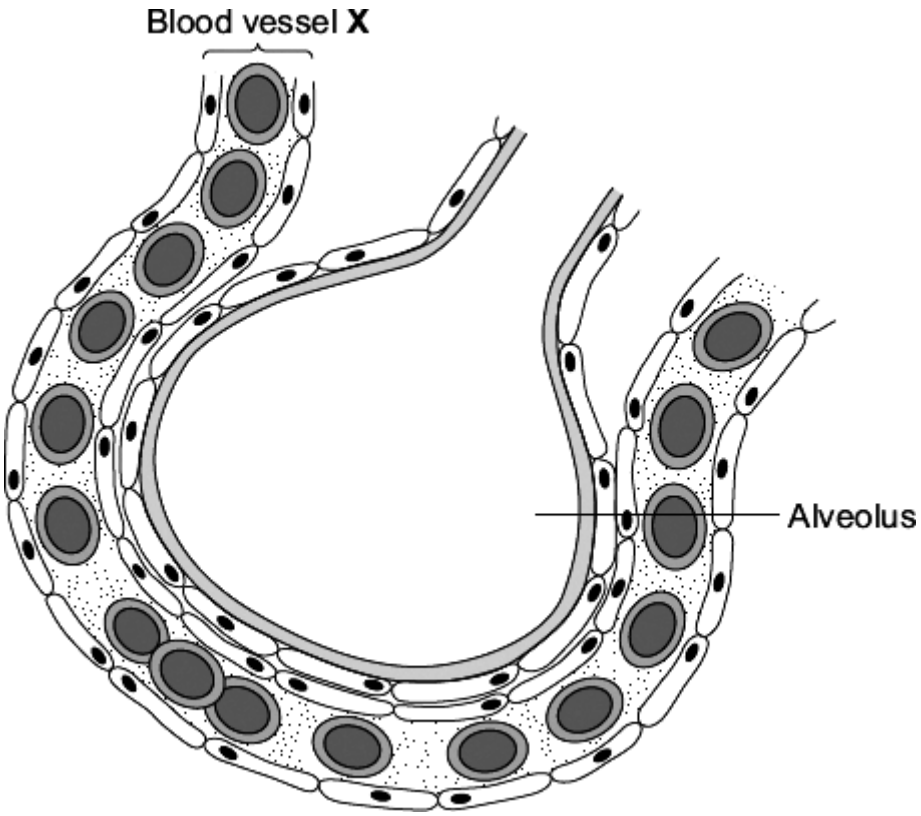
osmosis **photosynthesis** **respiration**

(1)

(Total 5 marks)

Q36.

The diagram shows an alveolus and a blood vessel in the lung.



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

(i) Blood vessel **X** is

an artery.

a capillary.

a vein.

(1)

(ii) Gases pass across the wall of the alveolus by

diffusion.

evaporation.

fermentation.

(1)

(iii) The table compares the concentrations of some gases in inhaled air and

exhaled air.

Complete the table.
Write 'lower' **or** 'higher' in each box.
One line has been completed for you as an example.

Gas	Concentration	
	Inhaled air	**Exhaled air**
Water vapour	lower	higher
Carbon dioxide		
Oxygen		

(2)

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

(i) Oxygen is carried in the blood mainly in

blood plasma.

red blood cells.

white blood cells.

(1)

(ii) In the blood, the oxygen combines with

carbon dioxide.

haemoglobin.

urea.

(1)

(Total 6 marks)

Q37.

Stem cells can be collected from human embryos and from adult bone marrow.
Stem cells can develop into different types of cell.

The table gives information about using these two types of stem cell to treat patients.

Stem cells from human embryos	**Stem cells from adult bone marrow**
It costs £5000 to collect a few cells.	It costs £1000 to collect many cells.
There are ethical issues in using embryo stem cells.	Adults give permission for their own bone marrow to be collected.
The stem cells can develop into most other types of cell.	The stem cells can develop into only a few types of cell.
Each stem cell divides every 30	Each stem cell divides every four

minutes.	hours.
There is a low chance of a patient's immune system rejecting the cells.	There is a high chance of a patient's immune system rejecting the cells.
More research is needed into the use of these stem cells.	Use of these stem cells is considered to be a safe procedure.

Scientists are planning a new way of treating a disease, using stem cells.

Use **only** the information above to answer these questions.

(a) Give **three** advantages of using stem cells from embryos instead of from adult bone marrow.

1. _____

2. _____

3. _____

(3)

(b) Give **three** advantages of using stem cells from adult bone marrow instead of from embryos.

1. _____

2. _____

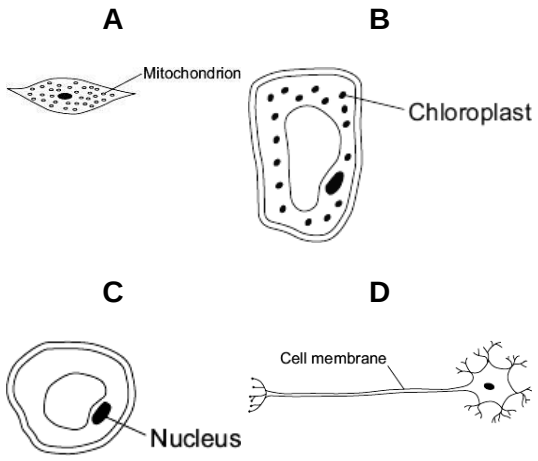
3. _____

(3)

(Total 6 marks)

Q38.

The diagrams show four cells, **A**, **B**, **C** and **D**.



Use letters **A**, **B**, **C** or **D** to answer these questions.

(a) Which cell can photosynthesise?

(1)

(b) Which cell is adapted for receiving and sending information? ☐

(1)

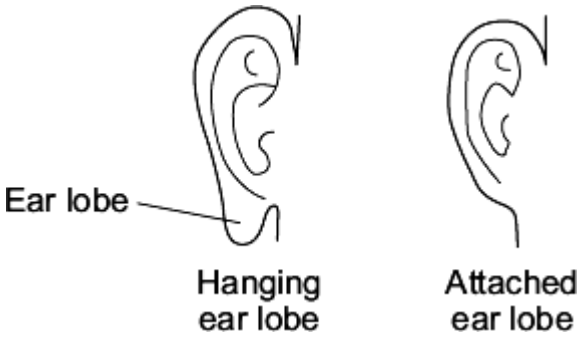
(c) Which cell is adapted to respire quickly? ☐

(1)
(Total 3 marks)

Q39.

People have different shaped ear lobes, either 'hanging' or 'attached'.

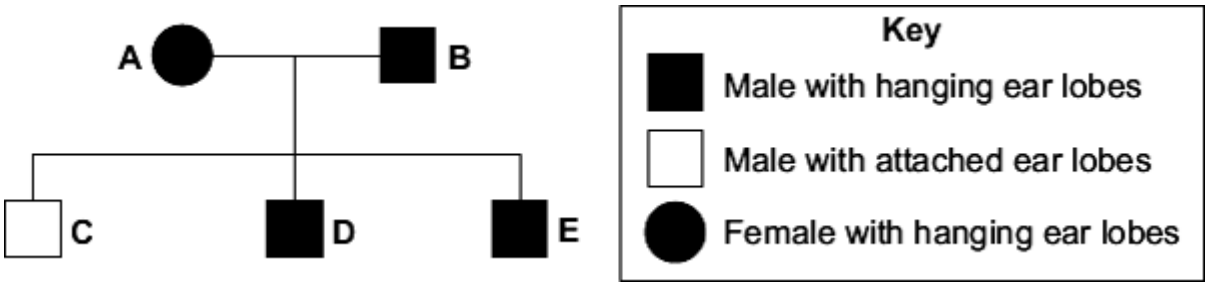
The diagrams show the two shapes of ear lobe.



A gene controls the shape of a person's ear lobes.

The diagram shows a family tree.

Parents **A** and **B** both have hanging ear lobes.



(a) The key does **not** show the symbol for a female with attached ear lobes.

Draw the symbol for the key to show a female with attached ear lobes.

Use information in the family tree and the key.

Symbol = _____

(1)

(b) Look at the family tree.

What does the information in the family tree tell you about the allele for hanging ear lobes?

Draw a ring around the correct word to complete the sentence.

The allele for hanging ear lobes is

dominant.
weak.
recessive.

(1)

(c) (i) Parents **A** and **B** have three children, **C**, **D** and **E**.
All three children are boys.

What are the chances that the next child of parents **A** and **B** will be a girl?

Draw a ring around **one** answer.

no chance (0 %) **a half (50 %)** **certain (100 %)**

(1)

(ii) Which statement explains your answer to part (c)(i)?

Tick (✓) **one** box.

Some of **B**'s sperm cells have an X chromosome. ☐

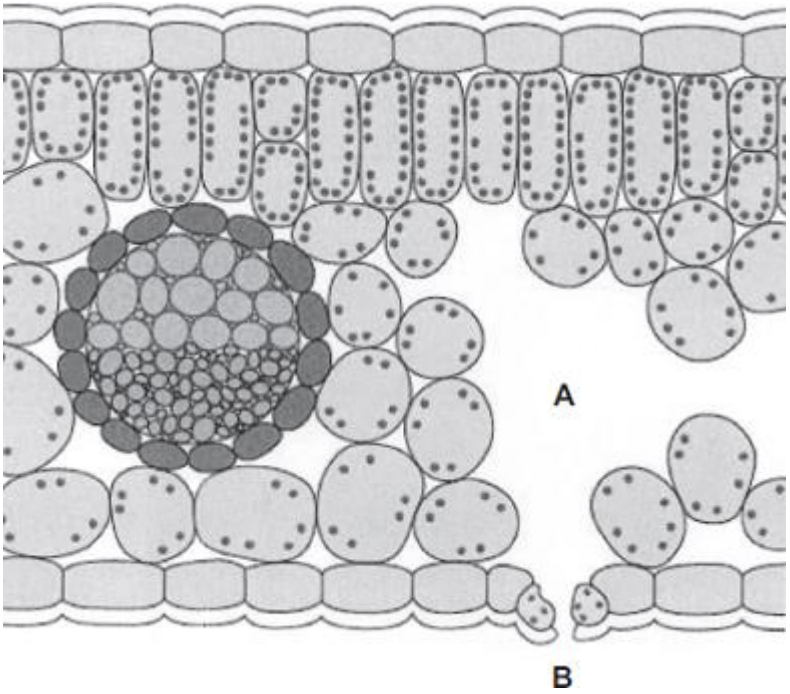
Some of **A**'s egg cells have a Y chromosome ☐

All of **B**'s sperm cells have an X chromosome. ☐

(1)
(Total 4 marks)

Q40.

The diagram shows a section through a plant leaf.



(a) Use words from the box to name **two** tissues in the leaf that transport substances around the plant.

epidermis	**mesophyll**	**phloem**	**xylem**

_____ and _____

(1)

(b) Gases *diffuse* between the leaf and the surrounding air.

(i) What is *diffusion*?

_____

_____

_____

_____

(2)

(ii) Name **one** gas that will diffuse from point **A** to point **B** on the diagram on a sunny day.

_____

(1)

(Total 4 marks)

Q41.

In sexual reproduction, an egg fuses with a sperm.

(a) (i) Draw a ring around the correct answer to complete the sentence.

An egg and a sperm fuse together in the process of

cloning.
fertilisation.
mitosis.

(1)

(ii) Egg cells and sperm cells each contain the structures given in the box.

chromosome	**gene**	**nucleus**

List these three structures in size order, starting with the smallest.

1 _____ (smallest)

2. _____

3 _____ (largest)

(2)

(iii) The egg and the sperm contain genetic material.

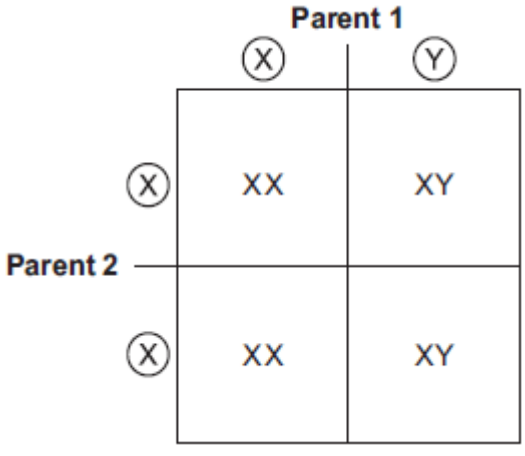
Draw a ring around the correct answer to complete the sentence.

The genetic material is made of

carbohydrate.
DNA.
protein.

(1)

(b) The diagram below shows the inheritance of **X** and **Y** chromosomes.



(i) Draw a tick (✓) on the part of the diagram that shows a sperm cell.

(1)

(ii) What is the chance of having a female child?

Give the reason for your answer.

_____

_____

_____

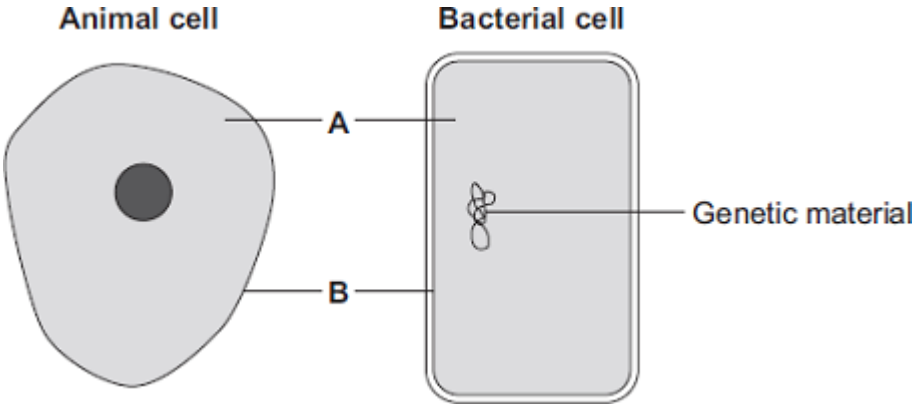
_____

(2)

(Total 7 marks)

Q42.

The diagrams show an animal cell and a bacterial cell.



(a) (i) Structures **A** and **B** are found in both the animal cell and the bacterial cell.

Use words from the box to name structures **A** and **B**.

cell membrane	**chloroplast**	**cytoplasm**	**vacuole**

A _____

B _____

(2)

(ii) Both cells contain genetic material.

Name the structure in the animal cell that contains genetic material.

_____

(1)

(b) **List A** gives three structures found in animal cells.

List B gives four functions of cell structures.

Draw **one** line from each structure in **List A** to its correct function in **List B**.

List A – Structure	**List B – Function**
	Controls what substances enter the cell

Cell membrane	
	Photosynthesis
Mitochondrion	
	Protein synthesis
Ribosome	
	Respiration

(3)

(Total 6 marks)

Q43.

(a) (i) Mitosis and meiosis are types of cell division.

For each feature in the table, tick (✓) **one** box to show if the feature occurs:

- only in mitosis
- only in meiosis.

Feature	**Only in mitosis (✓)**	**Only in mitosis (✓)**
Produces new cells during growth and repair		
Produces gametes (sex cells)		
Produces genetically identical cells		

(2)

(ii) Name the organ that produces gametes (sex cells) in:

a man _____

a woman _____

(2)

(b) **X** and **Y** chromosomes are the sex chromosomes. They determine a person's sex.

What sex chromosomes will be found in the body cells of:

(i) a man _____

(1)

(ii) a woman? _____

(1)

(c) A man and a woman decide to have a child.

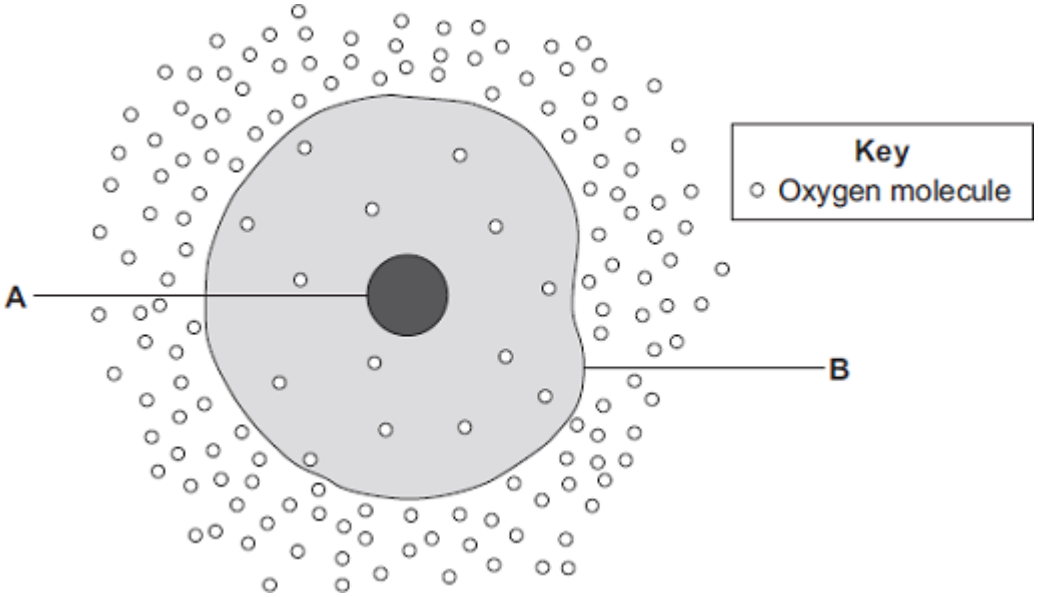
What is the chance that the child will be a boy? _____

(1)

(Total 7 marks)

Q44.

The diagram shows a cell.



(a) (i) Use words from the box to name the structures labelled **A** and **B** .

cell membrane	chloroplast	cytoplasm	nucleus

A _____

B _____

(2)

(ii) The cell in the diagram is an animal cell.

How can you tell it is an animal cell and **not** a plant cell?

Give **two** reasons.

1. _____

_____

2. _____

_____

(2)

(b) Oxygen will diffuse into the cell in the diagram.

Why?

Use information from the diagram.

_____

_____

(1)

(c) The cell shown in the diagram is usually found with similar cells.

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

Scientists call a group of similar cells

- an organ.
- a system.
- a tissue.

(1)

(Total 6 marks)

Q45.

When an organism grows, new cells are produced by cell division.

(a) What type of cell division happens to produce new body cells?

Tick **one** box.

- Differentiation ☐
- Meiosis ☐
- Mitosis ☐

(1)

(b) Why can cancers grow very large?

Tick **one** box.

- Cancer cells are specialised ☐
- Cell division is slow ☐
- Cell division is uncontrolled ☐

(1)

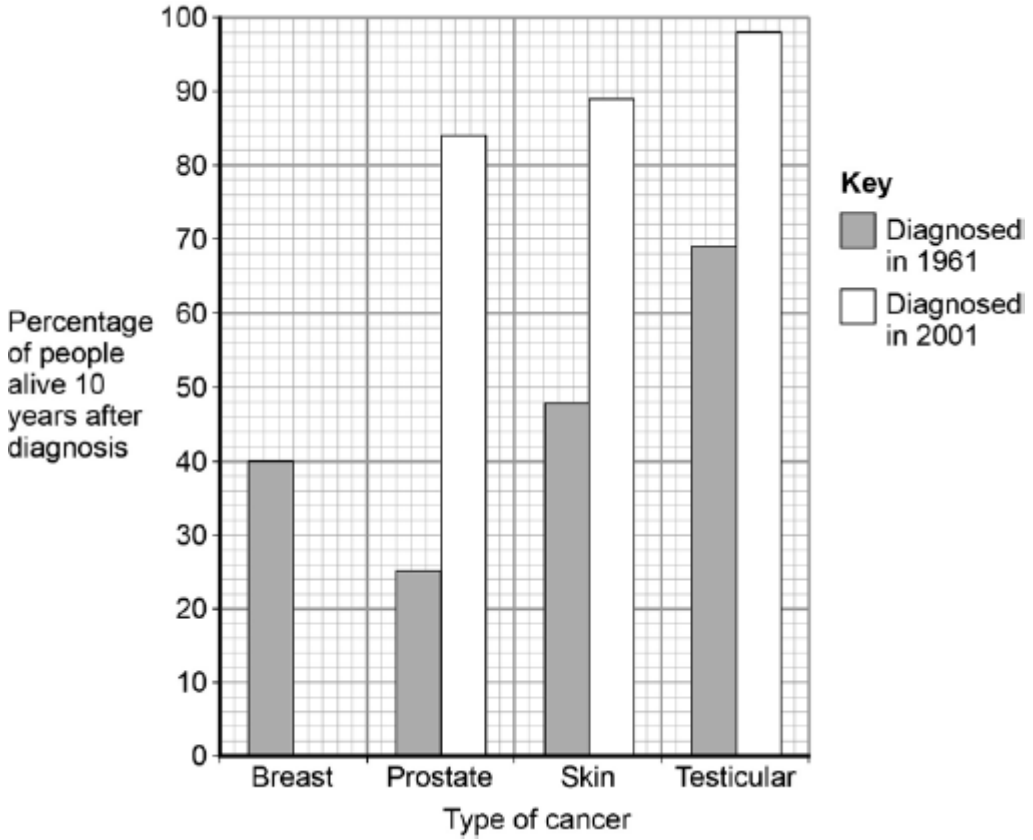
(c) Give **one** factor which increases the risk of getting cancer.

(1)

(d) Survival rates for people with cancer have improved a lot.

People who are alive 10 years after diagnosis are usually considered to be cured.

The figure below shows data for people diagnosed with cancer in 1961 and 2001.



78% of people diagnosed with breast cancer in 2001 were alive 10 years later.

Complete the figure above to show this information.

(1)

(e) Which type of cancer diagnosed in 1961 had the highest survival rate?

Tick **one** box.

Breast ☐

Prostate ☐

Skin ☐

Testicular ☐

(1)

(f) Which type of cancer shows the biggest improvement in the percentage of people

alive after 10 years?

Tick **one** box.

Breast ☐

Prostate ☐

Skin ☐

Testicular ☐

(1)

(g) Suggest **two** reasons why the survival rates for all cancers have increased.

1. _____

_____

2. _____

_____

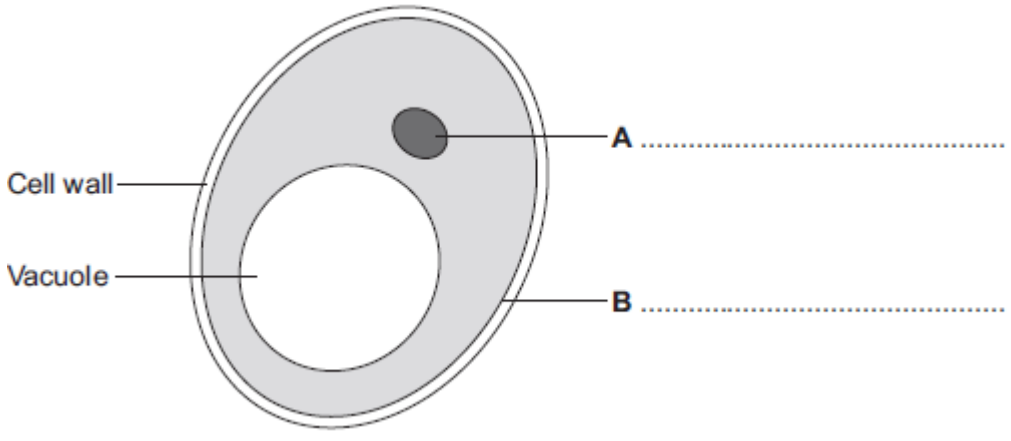
(2)

(Total 8 marks)

Q46.

Human cells and yeast cells have some parts that are the same.

(a) The diagram shows a yeast cell.



Parts **A** and **B** are found in human cells and in yeast cells. On the diagram, label parts **A** and **B**.

(2)

(b) Many types of cell can divide to form new cells.

Some cells in human skin can divide to make new skin cells.

Why do human skin cells need to divide?

_____

_____

(1)

(c) Human stem cells can develop into many different types of human cell.

(i) Use the correct answer from the box to complete the sentence.

embryos	**hair**	**nerve cells**

Human stem cells may come from

_____

(1)

(ii) Use the correct answer from the box to complete the sentence.

cystic fibrosis	**paralysis**	**polydactyly**

Human stem cells can be used to treat

_____

(1)

(Total 5 marks)

Q47.

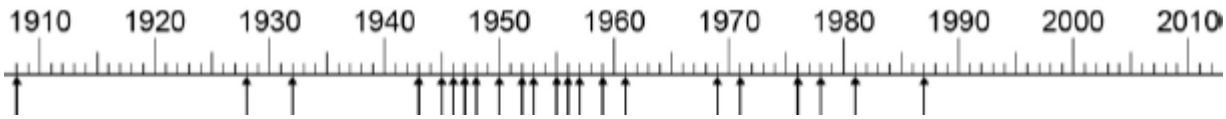
(a) Some antibiotics work by destroying the cell membranes of bacteria.

Suggest why these antibiotics may have side effects in the animals that are given these antibiotics.

_____

(1)

(b) Each arrow on the figure below shows the date of discovery of each new type of antibiotic.



In which 10 year period were most new types of antibiotic discovered?

_____

(1)

(c) The figure above shows 22 new types of antibiotic. These were discovered before 2010.

Determine the percentage of types of antibiotic that have been discovered between 1980 and 2010.

Use information from the figure above.

Give your answer to 2 significant figures.

_____

_____

_____ %

(2)

(d) Bacteria can evolve rapidly.

Many bacteria can develop into new strains which are resistant to antibiotics.

Complete the table below to show if each action is **more likely** or **less likely** to help bacteria to become antibiotic resistant.

Put a tick in each row.

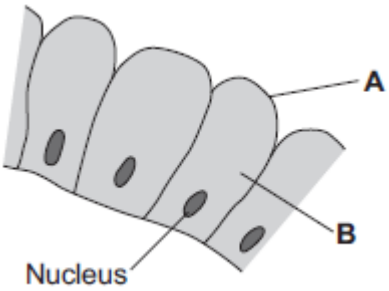
Action	More likely	Less likely
Take painkillers for headache		
Washing with antiseptic hand gel		
Adding antibiotics to food for cows		
Giving antibiotics for colds and flu		
Stopping antibiotics as soon as you feel better		

(4)

(Total 8 marks)

Q48.

The image below shows some cells in the lining of the stomach.



(a) (i) Use words from the box to name structures **A** and **B**.

cell membrane	**chloroplast**	**cytoplasm**	**vacuole**

A _____

B _____

(2)

(ii) What is the function of the nucleus?

Tick (✓) **one** box.

To control the activities of the cell ☐

To control movement of substances into and out of the cell ☐

To release energy in respiration ☐

(1)

(b) Draw **one** line from each part of the human body to its correct scientific name.

Part of human body	**Scientific name**
Layer of cells lining the stomach	An organ
Stomach	An organism
Mouth, stomach, intestines, liver and pancreas	An organ system
	A tissue

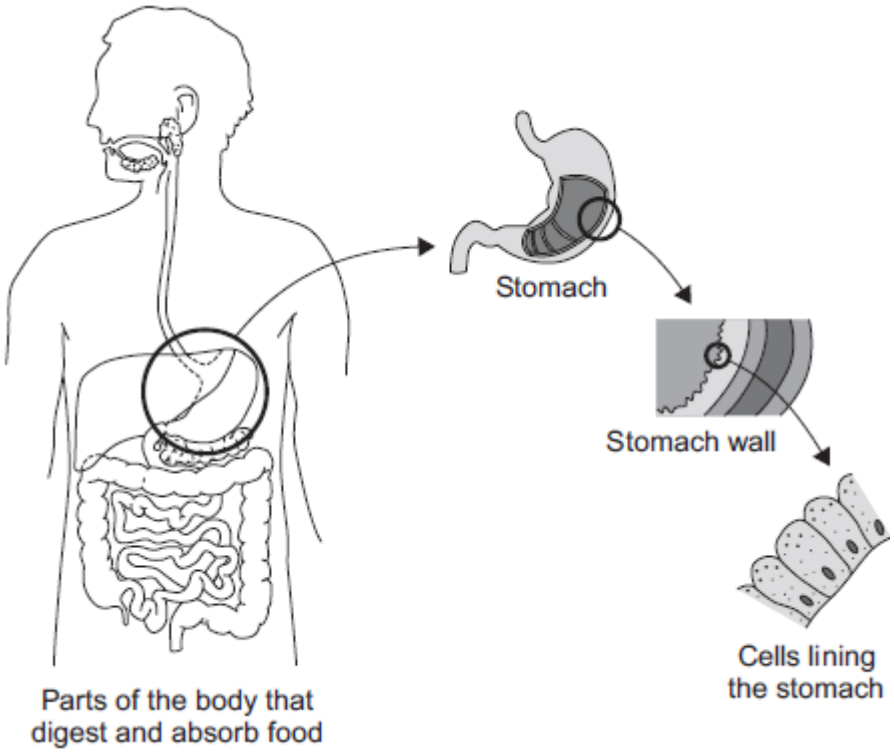
(3)

(Total 6 marks)

Q49.

The diagram below shows the parts of the body that digest and absorb food.

It also shows some details about the structure of the stomach.



(a) Complete the table to show whether each structure is an organ, an organ system or a tissue.

For each structure, tick (✓) **one** box.

Structure	**Organ**	**Organ system**	**Tissue**
Stomach			
Cells lining the stomach			
Mouth, oesophagus, stomach, liver, pancreas, small and large intestine			

(2)

(b) (i) The blood going to the stomach has a high concentration of oxygen.
The cells lining the stomach have a low concentration of oxygen.

Complete the following sentence.

Oxygen moves from the blood to the cells lining the stomach by

the process of _____ .

(1)

(ii) What other substance must move from the blood to the cells lining the stomach so that respiration can take place?

Draw a ring around the correct answer.

glucose **protein** **starch**

(1)

(iii) In which part of a cell does aerobic respiration take place?

Draw a ring around the correct answer.

cell membrane **mitochondria** **nucleus**

(1)

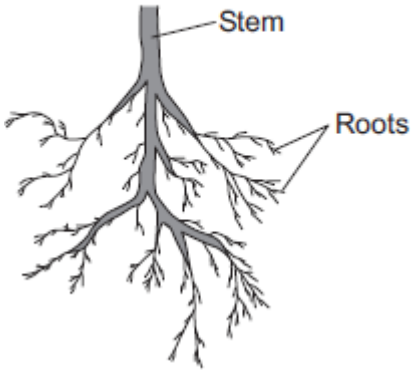
(Total 5 marks)

Q50.

Plants need different substances to survive.

Figure 1 shows the roots of a plant.

Figure 1



(a) (i) Mineral ions are absorbed through the roots.

Name **one** other substance absorbed through the roots.

_____

(1)

(ii) The plant in **Figure 1** has a higher concentration of mineral ions in the cells of its roots than the concentration of mineral ions in the soil.

Which **two** statements correctly describe the absorption of mineral ions into the plant's roots?

Tick (✓) **two** boxes.

The mineral ions are absorbed by active transport. ☐

The mineral ions are absorbed by diffusion. ☐

The mineral ions are absorbed down the concentration gradient. ☐

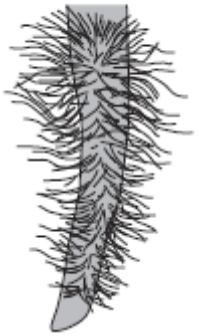
The absorption of mineral ions needs energy.

(2)

(iii) The plant in **Figure 1** has roots adapted for absorption.

Figure 2 shows a magnified part of a root from **Figure 1.**

Figure 2



Describe how the root in **Figure 2** is adapted for absorption.

_____

_____

_____

_____

(2)

(b) The leaves of plants have stomata.

What is the function of the stomata?

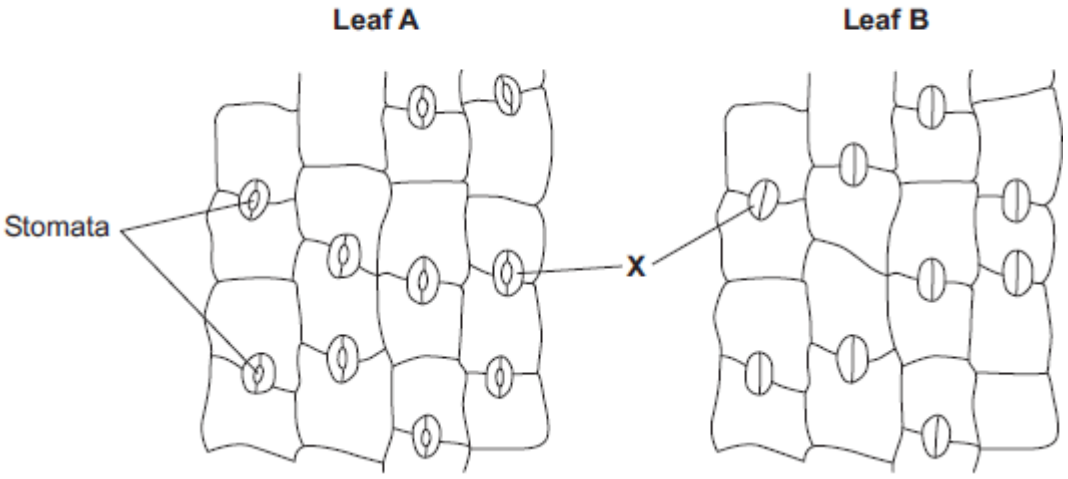
_____

_____

(1)

(c) **Figure 3** shows the underside of two leaves, **A** and **B**, taken from a plant in a man's house.

Figure 3



(i) In **Figure 3**, the cells labelled **X** control the size of the stomata.

What is the name of the cells labelled **X**?

Tick (✓) **one** box.

Guard cells ☐

Phloem cells ☐

Xylem cells ☐

(1)

(ii) Describe how the appearance of the stomata in leaf **B** is different from the appearance of the stomata in leaf **A**.

_____

_____

(1)

(iii) The man forgets to water the plant.

What might happen to the plant in the next few days if the stomata stay the same as shown in leaf **A** in **Figure 3**?

_____

_____

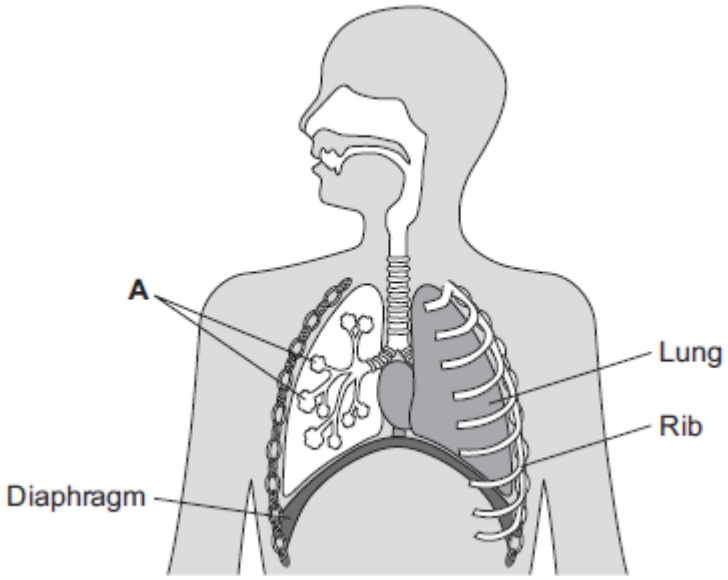
(1)

(Total 9 marks)

Q51.

Our lungs help us to breathe.

The image below shows the human breathing system.



(a) (i) Name part **A**.

_____

(1)

(ii) Give **one** function of the ribs.

_____

(1)

(b) (i) Use the correct answer from the box to complete the sentence.

active transport	**diffusion**	**osmosis**

Oxygen moves from the air inside the lungs into the blood by the process of _____ .

(1)

(ii) Use the correct answer from the box to complete the sentence.

arteries	**capillaries**	**veins**

Oxygen moves from the lungs into the blood through the walls of the _____ .

(1)

(iii) Inside the lungs, oxygen is absorbed from the air into the blood.

Give **two** adaptations of the lungs that help the rapid absorption of oxygen into the blood.

1. _____

_____

2. _____

_____

(2)

(Total 6 marks)

Q52.

Pathogens cause infectious diseases in animals and plants.

(a) Draw **one** line from each disease to the type of pathogen that causes the disease.

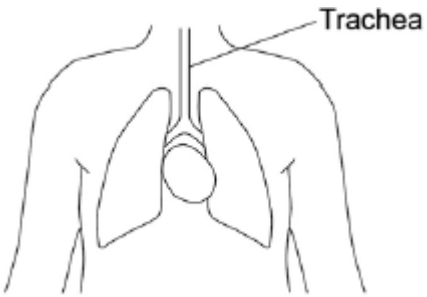
Disease	Type of pathogen
Gonorrhoea	Bacterium
Malaria	Fungus
Measles	Protist
	Virus

(3)

(b) Some parts of the human body have adaptations to reduce the entry of live pathogens.

Look at **Figure 1**.

Figure 1



Explain how the trachea is adapted to reduce the entry of live pathogens.

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4)

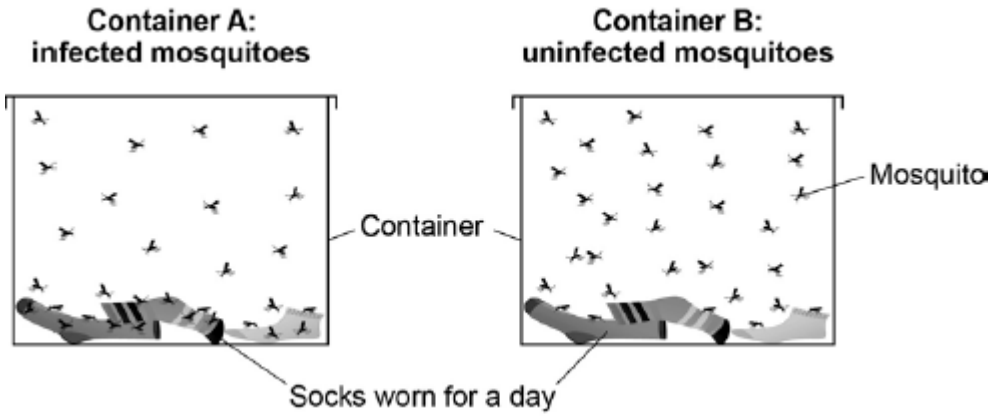
(c) Malaria is a serious disease that can be fatal.

Malaria is spread to humans by infected mosquitoes.

Scientists investigated the behaviour of mosquitoes to understand how the spread of malaria could be controlled.

Figure 2 shows the equipment the scientists used.

Figure 2



This is the method used.

1. 30 mosquitoes **infected with malaria** were placed in Container **A**.

2. 30 **uninfected** mosquitoes were placed in Container **B**.

3. The total number of times the mosquitoes landed on the socks was recorded.

Name the dependent variable and suggest **one** control variable in this investigation.

Dependent variable _____

_____

Control variable _____

_____

(2)

(d) Infected mosquitoes landed on the socks three times more often than uninfected mosquitoes.

Explain how this information can be used to reduce the spread of malaria.

_____

_____

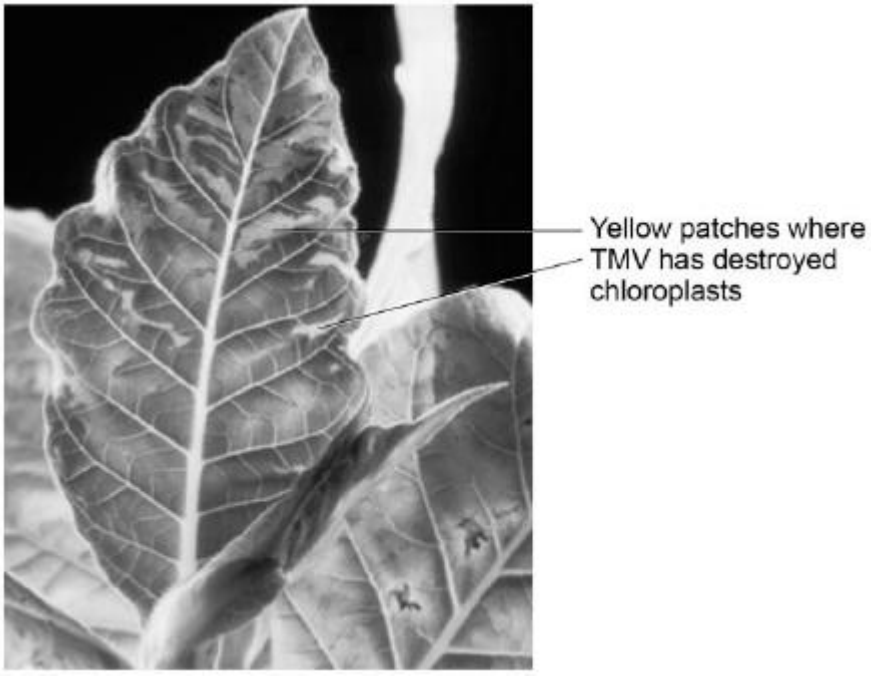
_____

(2)

(e) Tobacco mosaic virus (TMV) affects many species of plant.

Figure 3 shows a leaf infected with TMV.

Figure 3



© Nigel Cattlin/Getty Images

TMV destroys chloroplasts in the leaf.

Explain how this could affect the growth of the plant.

(3)

(Total 14 marks)

Mark schemes

Q1.

(a) cell membrane

extra boxes ticked negates mark

1

(b) nucleus

extra boxes ticked negates mark

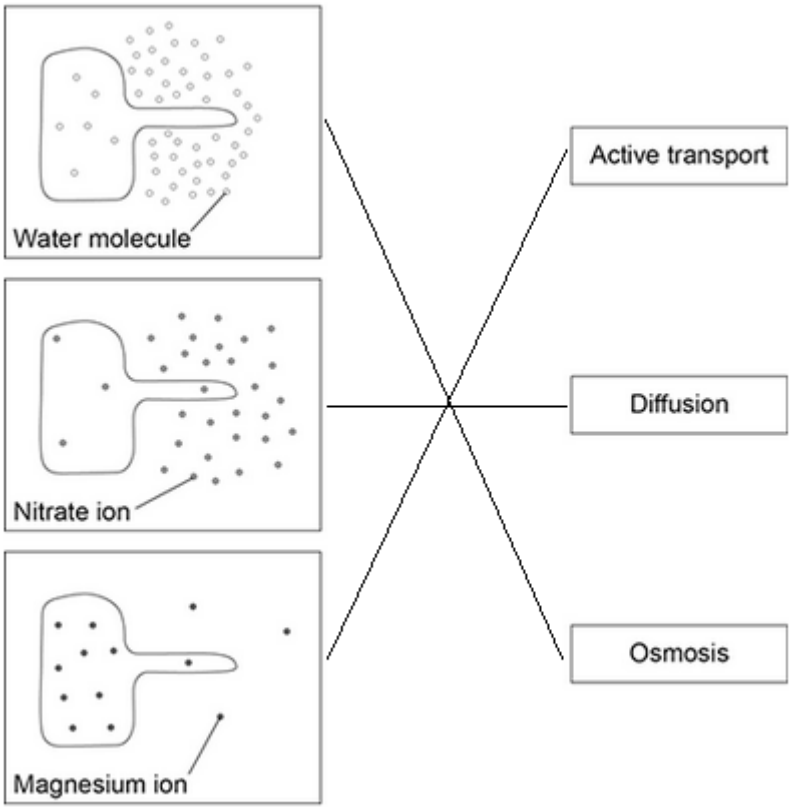
1

(c) has a tail so it can swim (to an egg)

accept has many mitochondria to release energy to swim

1

(d)



*all three correct for **2** marks*

*one or two correct for **1** mark*

2

[5]

Q2.

(a) 8 (micrometres)

1

(b) red blood cell(s)

1

white blood cell(s)

accept named cell

eg phagocyte / lymphocyte

1

(plasma)
transports proteins / dissolved substances / food (molecules) / urea / hormones / blood
cells

1

(c) any **one** from:

- you could lose a lot of blood
- bleed internally

allow bleeding would not stop

allow could bleed to death

1

[5]

Q3.

(a) osmosis

1

partially permeable

1

(b) (i) any **two** from:

allow correct answers in terms of A

- vacuole is small(er)
- cytoplasm has shrunk

allow cytoplasm is smaller

- gap between cytoplasm and cell wall
- cell wall curves inwards

allow cell B is flaccid or cell A is turgid

- the (cell) membrane has moved away from the wall

2

(ii) any **one** from:

- water will move / diffuse in
- (cells) will swell
- (cells) will burst

ignore turgid

1

(c) villi give the small intestines a large surface area

1

villi have many blood capillaries

1

[7]

Q4.

(a) **A** sperm

1

B egg

1

C fertilised egg

1

D embryo

1

(b) insert into mother

ignore fertilise / check fertilisation / check viability

1

womb / uterus

1

(c) (i) one quarter

1

(ii) no / little chance of success over 42

1

reference to table of only two women in the age bracket 40-42 years became pregnant

*the statement 'only 2 out of 53 40-42 year old women became pregnant / had babies' gains **2** marks*

1

(iii) so fewer twins / multiple births

or

multiple births more dangerous

1

[10]

Q5.

(a) (i) diffusion

apply list principle

1

(ii) **A**

apply list principle

1

(b) (i) osmosis

apply list principle

1

(ii) **R**

apply list principle

1

[4]

Q6.

(a) (i) capillary

1

(ii) diffusion

1

(b) (i) Z

ignore any names

1

(ii) large / increased surface / area

allow all food absorbed

or to absorb more food
or improved diffusion

1

[4]

Q7.

(i) cytoplasm
(cell) membrane
nucleus

all correctly labelled
each for 1 mark

3

(ii) 0.5

gains 2 marks
(5/100 × 10 or ½ /1 gains 1 mark if 0.5 not given)

2

[5]

Q8.

(a) root hair

1

(b) (i) 85

if incorrect unit added = 0

1

(ii) 0.85

ignore working or lack of working
*accept correct answer from candidate's (i) for **2** marks*

$\frac{85}{100}$ *with no answer or wrong answer gains **1** mark*

accept ecf

2

(iii) absorb more water / ions

allow 'get / collect / take in / take up / soak up / suck up' for absorb
allow 'lots' for more
allow 'moisture' for water
allow 'minerals / salts / nutrients' for ions
*do **not** allow food or named foods*

*absorb water / ions gains **1** mark*

or

large surface area to absorb water / ions (2)

large surface area linked to incorrect function = 1

ignore small so short diffusion pathway

2

[6]

Q9.

(a) A – nucleus

1

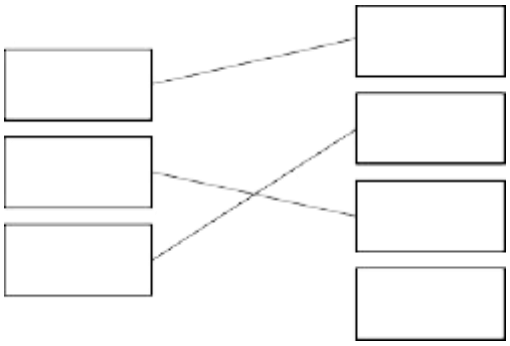
B – chromosome

1

C – gene

1

(b)



extra line from statement cancels the mark

3

[6]

Q10.

A – (cell) membrane

1

B – cytoplasm

1

C – nucleus

1

must be in correct order
accept phonetic spelling – see marking guidance 3.6

[3]

Q11.

<u>in correct sequence</u>:

breathing

1

diffusion

1

respiration

1

[3]

Q12.

(a) (i) **A** = nucleus

1

B = (cell) <u>membrane</u>

1

(ii) (cell) membrane

1

(b) 70

if correct answer, ignore working or lack of working

$\frac{63+78+69}{3}$ *for **1** mark*

2

[5]

Q13.

(a) mesophyll / / / / (all correct) sperm / / x / (all correct)

for 1 mark each

2

(b) (i) absorbs light/to produce food/photosynthesis

(allow references to gaseous exchange)
for 1 mark

1

(ii) has chlorophyll/chloroplasts to absorb light/produce food

for 1 mark each
(if linked to gas exchange allow – moist surface/ dissolve gases)

2

[5]

Q14.

(i) <u>On diagram:</u>

oxygen arrow to blood from air **and** CO_2 arrow to air from blood

1

oxygen arrow to red blood cell

1

CO_2 arrow from plasma

1

(ii) diffusion

1

(iii) large surface **or** large area

*do **not** accept space*

1

[5]

Q15.

(a) (i) (cell) membrane

1

(ii) vacuole

1

(b) any **two** from:

- (cell) wall
- chloroplast(s)
  ignore chlorophyll
- vacuole
  ignore cell sap

2

(c) diffusion

1

[5]

Q16.

(a) **A** nucleus

1

B (cell) membrane

1

C cytoplasm

1

(b) any **two** from:

- (contain mitochondria
- many (mitochondria)
- respiration (occurs in mitochondria)

2

[5]

Q17.

(a) (i) red cell

1

(ii) diffusion

1

(iii) haemoglobin

1

(iv) a nucleus

1

(b) (<u>on diagram</u>) arrow from any part of blood to air

1

[5]

Q18.

(a) **A** nucleus

1

B (cell) membrane

1

C cytoplasm

1

(b) (i) it is thin

1

(ii) diffusion

1

[5]

Q19.

(a) A

1

(b) (i) diffusion

1

(ii) respiration

1

(iii) mitochondria

1

(iv) photosynthesis

1

[5]

Q20.

(a) chromosomes

1

(b) diagram showing four separate chromosomes two long and two short (as in diagram 1)

allow each chromosome shown as two joined chromatids
*do **not** allow if chromosomes touching each other*

1

(c) (i) any **two** from:

- can grow into any type of tissue / named tissue
- used in medical research
- used to treat human diseases
- large numbers can be grown

2

(ii) any **two** from:

- expensive
- grow out of control / ref cancers
- may be rejected
- need for drugs (for rest of life)

2

[6]

Q21.

(a) 2 and 3

1

(b) cell **P** has an X chromosome; cell **R** has a Y chromosome

1

(c) any **two** from:

- (formed from) different egg / 2 eggs
- (formed from) different sperm / 2 sperm
- have different genes / alleles / chromosomes / DNA
  allow genetics

2

(d) (i) stem cells

1

(ii) the cells divide

1

the cells differentiate

1

(iii) (medical) research / named eg growing organs
or

medical / patient treatment
allow (embryo) cloning
*do **not** allow designer babies / more babies*

1

(iv) any **one** from:

- ethical / moral / religious objections
  ignore cruel / not natural / playing God
- potential harm to embryo
  allow deformed
  ignore harm to mother

1

[9]

Q22.

(a) it has many chloroplasts.

1

(b) (has) cell wall

1

(has) vacuole **or** large / permanent vacuole
*do **not** allow chloroplasts*
assume plant cell throughout

accept converse for animal cell

1

[3]

Q23.

(a) (i) A cytoplasm

accept clear indications

1

B nucleus

1

(ii) any **two** from:
two required for **1** mark

- P
- R
- T

accept lower case letters

1

(b) sperm cells need a lot of energy to swim

1

[4]

Q24.

(a) (i) root hair

1

(ii) any **two** from:

ignore food

- water
- ions / minerals / nutrients / salts / correct named eg nitrates

ignore N,P,K

- oxygen

2

(b) (i) stomata

1

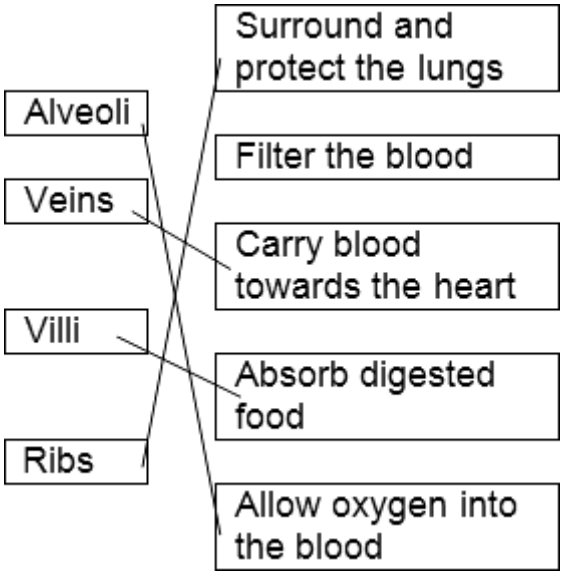
(ii) diffusion

1

[5]

Q25.

(a)



*4 correct = **4** marks*
*3 correct = **3** marks*
*2 correct = **2** marks*
*1 correct = **1** mark*
extra line from a structure cancels the mark

4

(b) diffusion

1

[5]

Q26.

(a) (i) C and D

1

(ii) cell wall

1

(b) (i) A

1

(ii) D

1

(c) respiration

1

[5]

Q27.

(a) (i) villus

1

(ii) its outer surface is one cell thick
*cancel **1** mark for each extra box ticked*

1

it has a large surface area

1

it has good blood supply

1

(b) diffusion

1

[5]

Q28.

(a) (i) sex cells

1

(ii) chromosomes

1

(b) (i) two

1

(ii) recessive

1

(c) (i) cell membrane

allow membrane

1

(ii) cytoplasm

1

(d) (i) A

1

(ii) B

1

[8]

Q29.

(a) (i) tissue

extra box ticked cancels the mark

1

(ii) organ

extra ring drawn cancels the mark

1

(b) (i) Layer B

*each extra box ticked cancels **1** mark*

1

Layer C

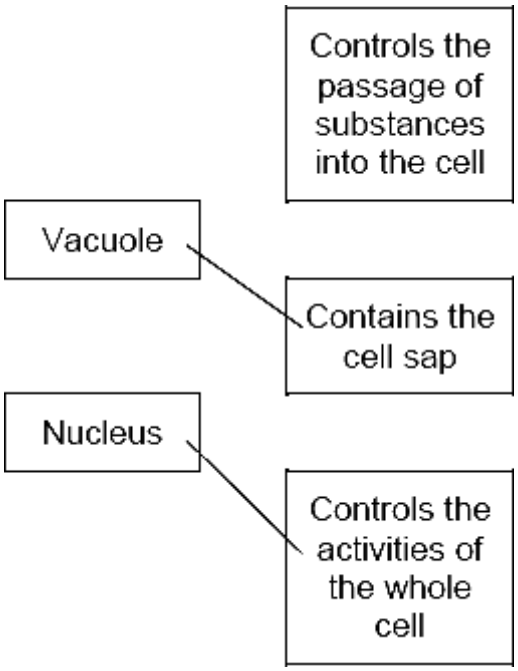
1

(ii) (contain) chloroplasts / chlorophyll

other parts disqualify

1

(c)



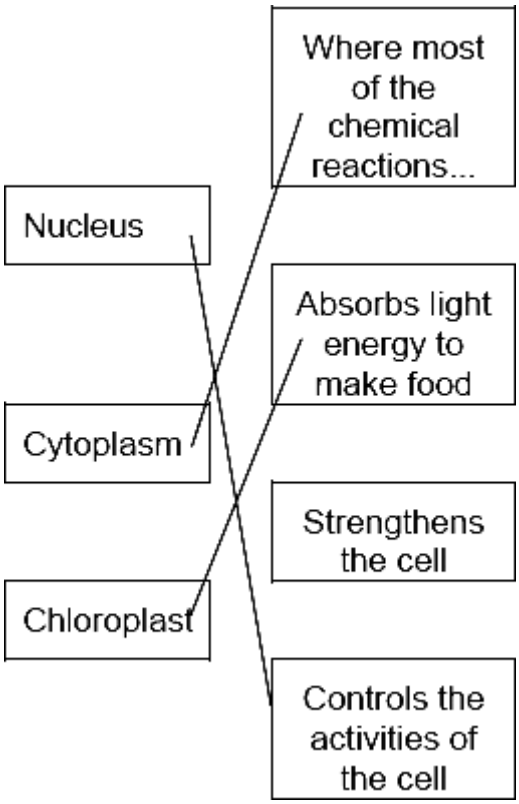
*two correct = **2** marks*
*one correct = **1** mark*
extra line from a part of a cell cancels the mark

2

[7]

Q30.

(a)



***1** mark for each correct line*
mark each line from left hand box
two lines from left hand box cancels mark for that box

3

(b) energy

1

[4]

Q31.

(a) (i) capillary

1

(ii) diffusion

1

(b) (i) Z

ignore any names

1

(ii) large / increased surface / area / **or** to absorb <u>more</u> food **or** improved diffusion

allow all food absorbed

1

[4]

Q32.

(a) (i) diffusion

1

(ii) A

1

(b) (i) osmosis

1

(ii) R

1

[4]

Q33.

(a) asexual

1

(b) mitosis

1

(c) genes

1

[3]

Q34.

(a) (i) **A** − (cell) wall

1

B − cytoplasm

1

C − plasmid

1

(ii) bacterium cell has cell wall / no nucleus / no mitochondria / plasmids present

accept its DNA / genetic material is not enclosed / it has no

nuclear membrane

it = bacterium cell

accept converse for animal cell

ignore flagella

1

(iii) any **one** from:

- chloroplast

  ignore chlorophyll
- (permanent) vacuole

1

(b) (Long tail) moves the sperm / allows the sperm to swim

1

towards the egg

allow correct reference to other named parts of the female reproductive system

1

(Mitochondria) release <u>energy</u> (for movement / swimming)

allow supply / produce / provide

1

in respiration

1

[9]

Q35.

(a) (i) **C** and **D**

no mark if more than one box is ticked

1

(ii) any **one** from:

*do **not** allow if other cell parts are given in a list*

- (have) cell wall(s)
- (have) vacuole(s)

1

(b) (i) **A**

apply list principle

1

(ii) **D**

apply list principle

1

(c) respiration

apply list principle

1

[5]

Q36.

(a) (i) capillary

1

(ii) diffusion

1

(iii)

Carbon dioxide	low(er)	high(er)

1

Oxygen	high(er)	low(er)

1 *mark for each correct row*

1

(b) (i) red blood cells

1

(ii) haemoglobin

1

[6]

Q37.

(a) comparisons are **not** required but should be credited
accept a clear indication of the statement even if incomplete

can develop into most other types of cell

1

each cell divides every 30 minutes

1

low chance of rejection by the patient's immune system

1

(b) any **three** from:

- cheaper / <u>only</u> costs £1000
  *this **must** be comparative*
  ignore costs £1000
- can collect many (stem) cells
- adults give permission for their own bone marrow to be collected
  comparisons are not required but should be credited
- safe

3

[6]

Q38.

(a) B

1

(b) D

1

(c) A

1

[3]

Q39.

(a) 

*the shape must be (roughly) circular **and** not shaded, for the mark*

accept the shape drawn in the key if it is not contradictory

1

(b) dominant

1

(c) (i) a half (50%)

1

(ii) Some of B's sperm cells have an X chromosome

1

[4]

Q40.

(a) xylem **and** phloem

either order

allow words ringed in box

allow mis-spelling if unambiguous

1

(b) (i) movement / spreading out of particles / molecules / ions / atoms

ignore names of substances / 'gases'

1

from high to low concentration

accept down concentration gradient

ignore 'along' / 'across' gradient

ignore 'with' gradient

1

(ii) oxygen / water (vapour)

allow O_2 / O2

ignore O^2/ O

allow H_2O / H2O

ignore H^2O

1

[4]

Q41.

(a) (i) fertilisation

1

(ii) in sequence:

accept 1 next to gene, 2 next to chromosome and 3 next to nucleus in box

1 gene

2 chromosome
3 nucleus

*allow 1 mark for smallest **or** largest in correct position*

2

(iii) DNA

1

(b) (i) On diagram:

tick drawn next to **X** and / or **Y** from Parent 1

tick(s) must be totally outside grid squares
allow ticks around "parent "
extra ticks elsewhere cancel

1

(ii) 0.5 / ½ / 50% / 1:1 / 50:50 / 1 in 2

allow 2/4 / 2 in 4 / 2 out of 4 / 'even(s)' / 'fifty – fifty'
*do **not** allow 1:2 or '50 / 50' or '50 – 50'*

1

2 (out of 4) boxes are **XX**

or

half of the sperm contain an **X**-chromosome

*allow **XY** is male and 2 (out of 4) boxes are **XY***

1

[7]

Q42.

(a) (i) A = cytoplasm

1

B = (cell) membrane

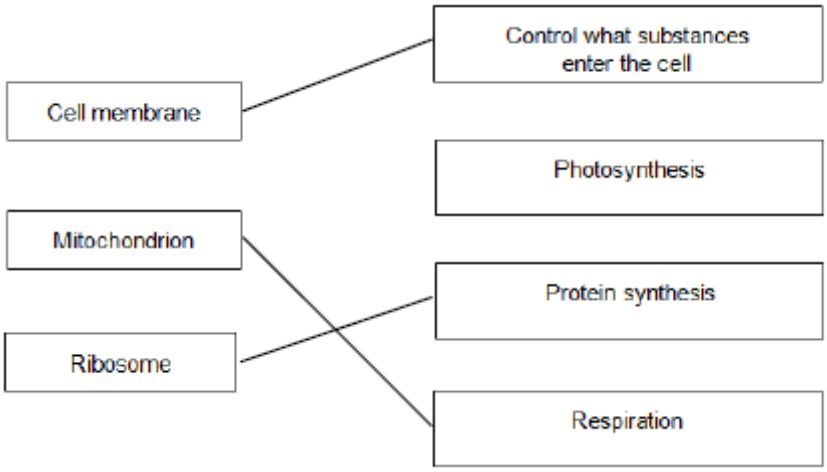
1

(ii) nucleus

accept chromosome / DNA / genes
accept phonetic

1

(b)



extra lines cancel

3

[6]

Q43.

(a) (i)

Feature	Mitosis only	Meiosis only
Produces new cells during growth and repair	✓	
Produces gametes (sex cells)		✓
Produces genetically identical cells	✓	

All 3 correct = **2** marks

2 correct = **1** mark

0 or 1 correct = **0** marks

2

(ii) (a man) testis / testes

accept testicle(s)

1

(a woman) ovary / ovaries

*do **not** accept 'ova' / ovule*

1

(b) (i) XY / YX

or

X and Y

1

(ii) XX

or

X and X or 2 X's

accept X

1

(c) ½ / 0.5 / 50% / 1:1 / 1 in 2

*do **not** accept 1:2 / 50/50*

allow 50:50
allow 2 in 4

1

[7]

Q44.

(a) (i) A = nucleus

1

B = (cell) membrane

1

(ii) any **two** from:

ignore shape

- no (cell) wall
- no (large / permanent) vacuole
- no chloroplasts / chlorophyll

2

(b) because high to low oxygen / concentration **or** down gradient

allow 'more / a lot of oxygen molecules <u>outside</u>'
ignore along / across gradient

1

(c) a tissue

1

[6]

Q45.

(a) mitosis

extra box ticked negates mark

1

(b) cell division is uncontrolled

extra box ticked negates mark

1

(c) any **one** from:

- smoking / tar
- alcohol
- carcinogens

allow named chemical

- viruses (living in cells)
- (ionising) radiation

accept UV / X-rays / gamma waves

1

(d) bar plotted at 78%

ignore width of bar

1

(e) testicular

extra box ticked negates mark

1

(f) prostate

extra box ticked negates mark

1

(g) any **two** from:

- improved treatment / drugs
- earlier diagnosis
- more cancer screening
- improved patient knowledge (of risk factors)

allow improved patient diet / lifestyle

2

[8]

Q46.

(a) **A** = nucleus

allow phonetic spelling

1

B = (cell) membrane

1

(b) for repair / growth **or** to replace cells

ignore new cells / skin

1

(c) (i) embryos

1

(ii) paralysis

1

[5]

Q47.

(a) animal cells also have cell membrane

1

(b) 1945–1955

allow 1946–1956

or *1947–1957*

1

(c) $(2 / 22 =) 9.\dot{0}\dot{9}$

*allow 9.09 (%) or 9 (%) with no working shown for **1** mark*

1

9.1 (%)

*allow 9.1 (%) with no working shown for **2** marks*

1

(d)

More likely	Less likely
	✔

	✔
✔	
✔	
✔	

*allow **3** marks for 4 correct*
*allow **2** marks for 3 correct*
*allow **1** mark for 2 correct*

more than one tick in a row negates a mark

4

[8]

Q48.

(a) (i) A = (cell) membrane

1

B = cytoplasm

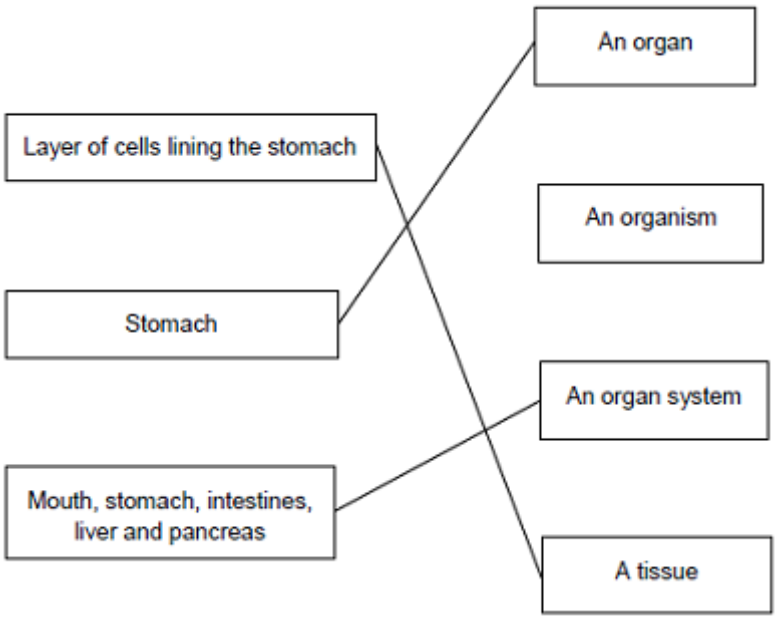
*do **not** accept cytoplast*

1

(ii) To control the activities of the cell

1

(b)



extra lines cancel

3

[6]

Q49.

(a)

Structure	Organ	Organ system	Tissue
Stomach	✓		

Cells lining the stomach			✓
Mouth, oesophagus, stomach, liver, pancreas, small and large intestine		✓	

all 3 correct = 2 marks
2 correct = 1 mark
1 or 0 correct = 0 marks

2

(b) (i) diffusion

allow phonetic spelling

1

(ii) glucose

1

(iii) mitochondria

1

[5]

Q50.

(a) (i) water / H_2O

accept oxygen
allow H_2O
*do **not** allow H^2O or H2O*

1

(ii) the mineral ions are absorbed by active transport

1

the absorption of mineral ions needs energy

1

(iii) have (many root) <u>hairs</u>

1

(which) give a large surface area (for absorption)

1

(b) carbon dioxide in
or
oxygen out
or

control water loss

accept gas exchange
ignore gases in and out
ignore gain / lose water

1

(c) (i) guard cells

1

(ii) (stomata are) closed

allow there is no gap / space

1

(iii) plant will wilt / droop

ignore die

1

[9]

Q51.

(a) (i) alveoli / alveolus

allow air sacs

allow phonetic spelling

1

(ii) any **one** from:

- protection (of lungs / heart)
- help you breathe / inflate lungs.

1

(b) (i) diffusion

1

(ii) capillaries

1

(iii) any **two** from:

- (have many) alveoli

  allow air sacs
- large surface / area
- thin (exchange) surface **or** short diffusion pathway

  accept only one / two cell(s) thick
- good blood supply / many capillaries

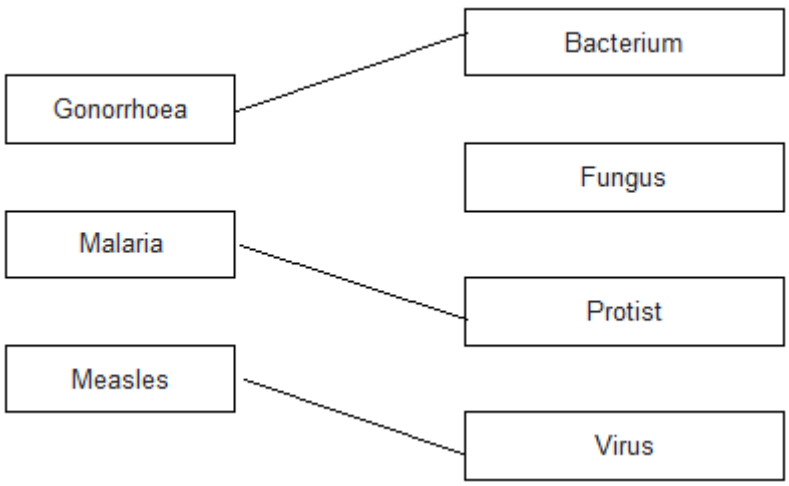
  allow (kept) ventilated or maintained concentration gradient.

2

[6]

Q52.

(a)



3

(b) (trachea) has mucus

1

to trap pathogens

1

(trachea) has cilia

1

to move mucus out of trachea

1

(c) **dependent variable:**
number of times mosquitoes landed on socks

1

control variable:
any **one** from:

- number of mosquitoes in each container
- length of time socks worn
- dampness of socks
- same type of socks
- size of container
- time
- temperature
- species of mosquito
- age of mosquito

1

(d) use worn socks
or
use chemical from worn socks

1

to attract / trap infected mosquitoes

1

or accept:
wear clean socks / change socks regularly (1)
to reduce the chance of attracting mosquitoes (1)

(e) less chlorophyll present

1

(so) less light absorbed

1

(so) reduced photosynthesis
or
(so) less sugar / food made

1

[14]