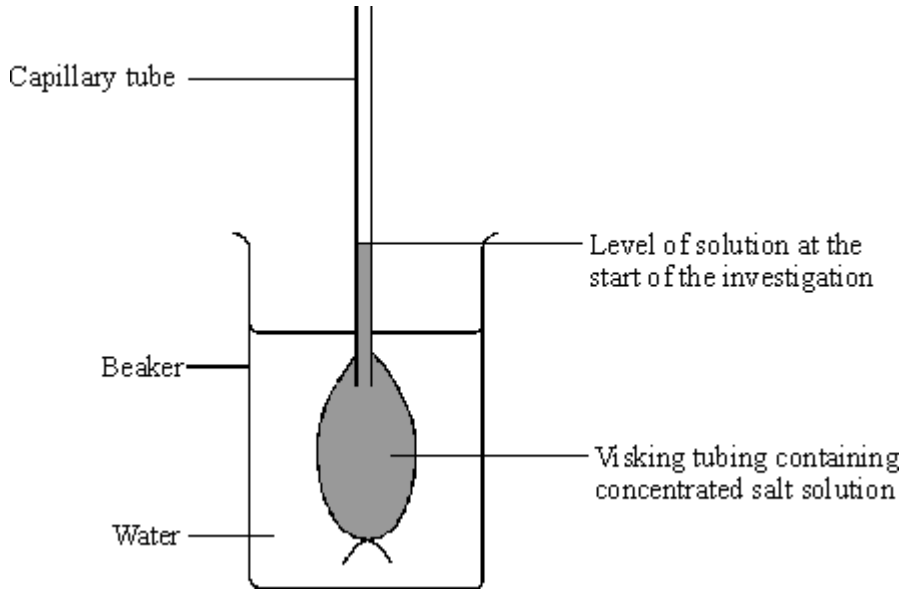
1 Some students set up the equipment below to investigate osmosis.



(a) What is osmosis?

_____

_____

_____

(3)

(b) (i) What will happen to the water level in the capillary tube during the investigation because of osmosis?

_____

(1)

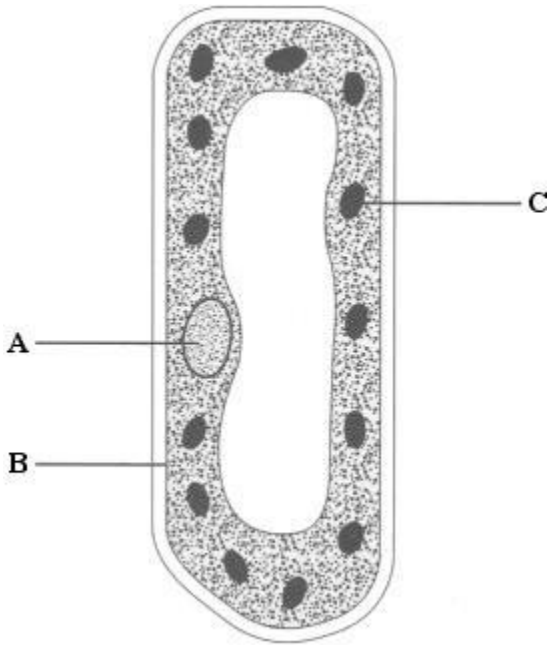
(ii) Use your knowledge of osmosis to explain why this happens.

_____

(2)

(Total 6 marks)

2 The diagram shows a cell from a plant leaf.



(a) Name structures **A** and **B**.

A _____

B _____

(2)

(b) Structure **C** is a chloroplast. What is the function of a chloroplast?

_____

(1)

(c) The table gives one difference between a plant cell and an animal cell.

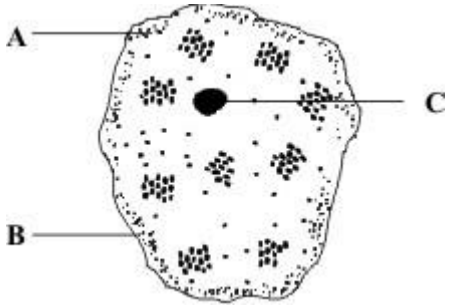
Complete the table to give **two** more differences.

Plant cell	Animal cell
1. Has chloroplasts	1. No chloroplasts
2.	2.
3.	3.

(2)

(Total 5 marks)

3 The diagram shows an animal cell.



(a) Name **each** labelled part and give its function.

A Name _____

Function _____

_____

B Name _____

Function _____

_____

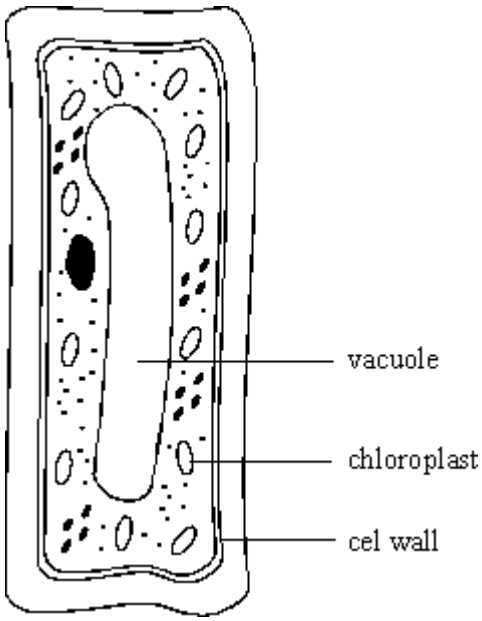
C Name _____

Function _____

_____

(6)

(b) (i) This plant cell also contains chloroplasts, a cell wall and a vacuole. Label **each** of these parts on the diagram.



(3)

(ii) Give the function of these parts of a plant cell.

Chloroplast function _____

_____

Cell wall function _____

_____

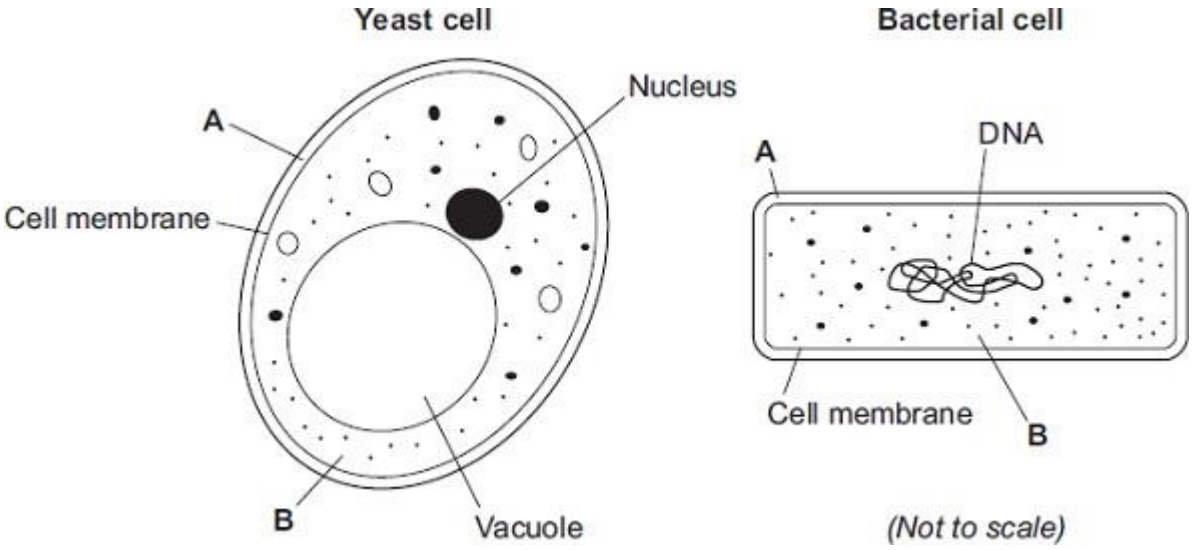
Vacuole function _____

_____

(3)

(Total 12 marks)

4 (a) The diagrams show the structures of a yeast cell and a bacterial cell.



(i) Both the yeast cell and the bacterial cell have structures **A** and **B**.

Name structures **A** and **B**.

A _____

B _____

(2)

(ii) The yeast cell and the bacterial cell have different shapes and sizes.

Give **one** other way in which the structure of the bacterial cell is different from the structure of the yeast cell.

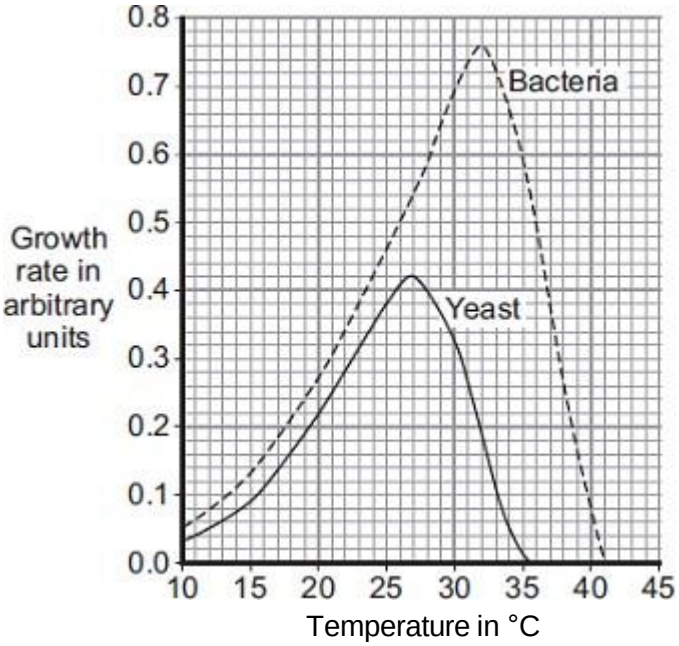
_____

_____

(1)

(b) Sourdough bread is light in texture and tastes slightly sour. The bread is made using two types of microorganism, a yeast and a bacterium. The bacterium can make acids such as lactic acid. The acid makes the bread taste sour.

The graph shows how the growth rates of the yeast and the bacteria change with temperature.



(i) Sourdough bread rises fastest at 27°C.

Use information from the graph to explain why.

_____

_____

_____

_____

(2)

(ii) The bread tastes most sour if it rises at 32°C.

Use information from the graph to explain why.

_____

_____

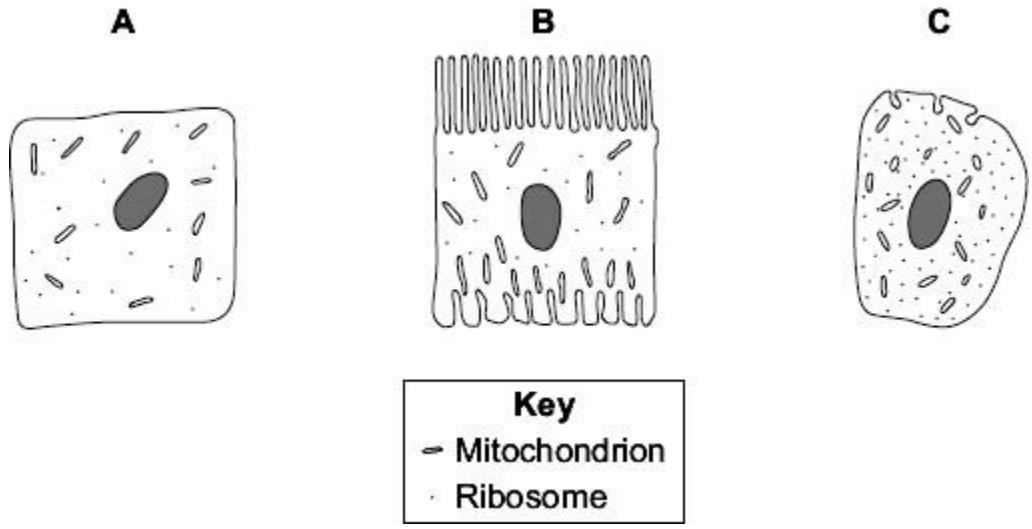
_____

_____

(2)

(Total 7 marks)

5 Diagrams **A**, **B** and **C** show cells from different parts of the human body, all drawn to the same scale.



(a) Which cell, **A**, **B** or **C**, appears to have adaptations to increase diffusion into or out of the cell? ☐

Give **one** reason for your choice.

_____

_____

(1)

(b) (i) Cell **C** is found in the pancreas.

Name **one** useful substance produced by the pancreas.

_____

(1)

(ii) Use information from the diagram to explain how cell **C** is adapted for producing this substance.

_____

_____

_____

_____

(2)

(Total 4 marks)

6 Cells contain a solution of salts and sugars.

A student is investigating how cells change when they are put into water.

(a) The student:

- looks at a plant cell using a microscope
- adds water to the cell.

The plant cell swells up.

Explain why, as fully as you can.

_____

_____

_____

_____

_____

_____

(3)

(b) When **animal** cells are put in water, they swell up, and then burst.
When **plant** cells are put in water, they swell up, but do **not** burst.

How does the structure of plant cells prevent them from bursting?

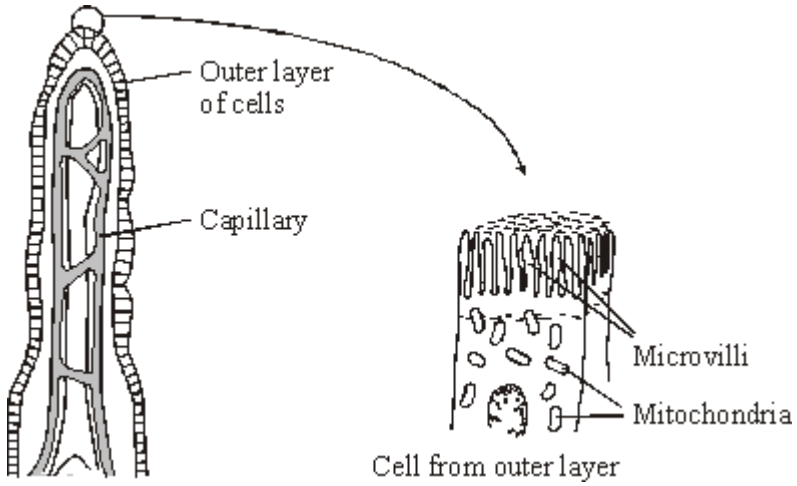
_____

_____

(1)

(Total 4 marks)

7 The small intestine is lined with millions of villi.
The diagram shows the structure of a villus.



In the small intestine, some of the products of digestion are absorbed into the blood by *active transport*.

(a) Explain what is meant by *active transport*.

_____

_____

_____

_____

(2)

(b) How do microvilli and mitochondria help in the active transport of the products of digestion from the small intestine into the blood?

Microvilli _____

_____

Mitochondria _____

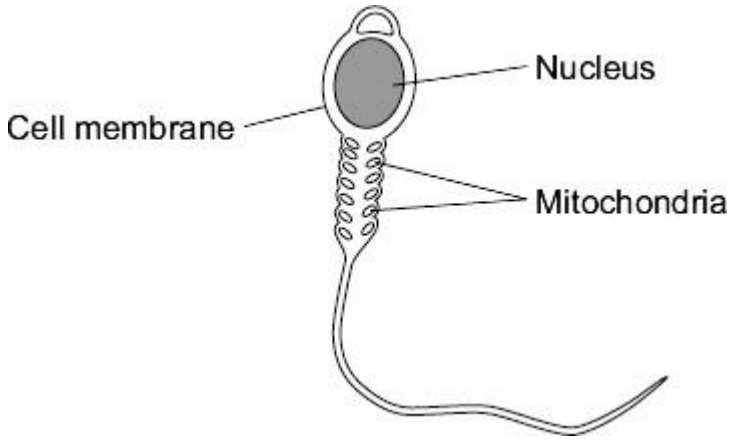
_____

(2)

(Total 4 marks)

8 Cells in the human body are specialised to carry out their particular function.

(a) The diagram shows a sperm cell.



The sperm cell is adapted for travelling to, then fertilising, an egg.

(i) How do the mitochondria help the sperm to carry out its function?

_____

_____

(1)

(ii) The nucleus of the sperm cell is different from the nucleus of body cells.

Give **one** way in which the nucleus is different.

_____

_____

(1)

(b) Stem cells from human embryos are used to treat some diseases in humans.

Explain why.

_____

_____

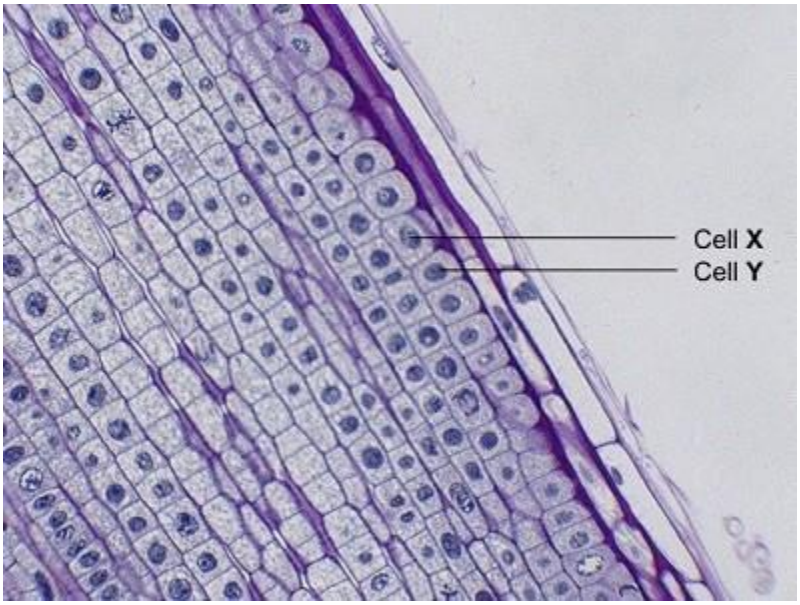
_____

_____

(2)

(Total 4 marks)

9 The photograph shows some cells in the root of an onion plant.



By UAF Center for Distance Education [CC BY 2.0], via Flickr

(a) Cells **X** and **Y** have just been produced by cell division.

(i) Name the type of cell division that produced cells **X** and **Y**.

_____

(1)

(ii) What happens to the genetic material before the cell divides?

_____

(1)

(b) A gardener wanted to produce a new variety of onion.

Explain why sexual reproduction could produce a new variety of onion.

_____

_____

_____

_____

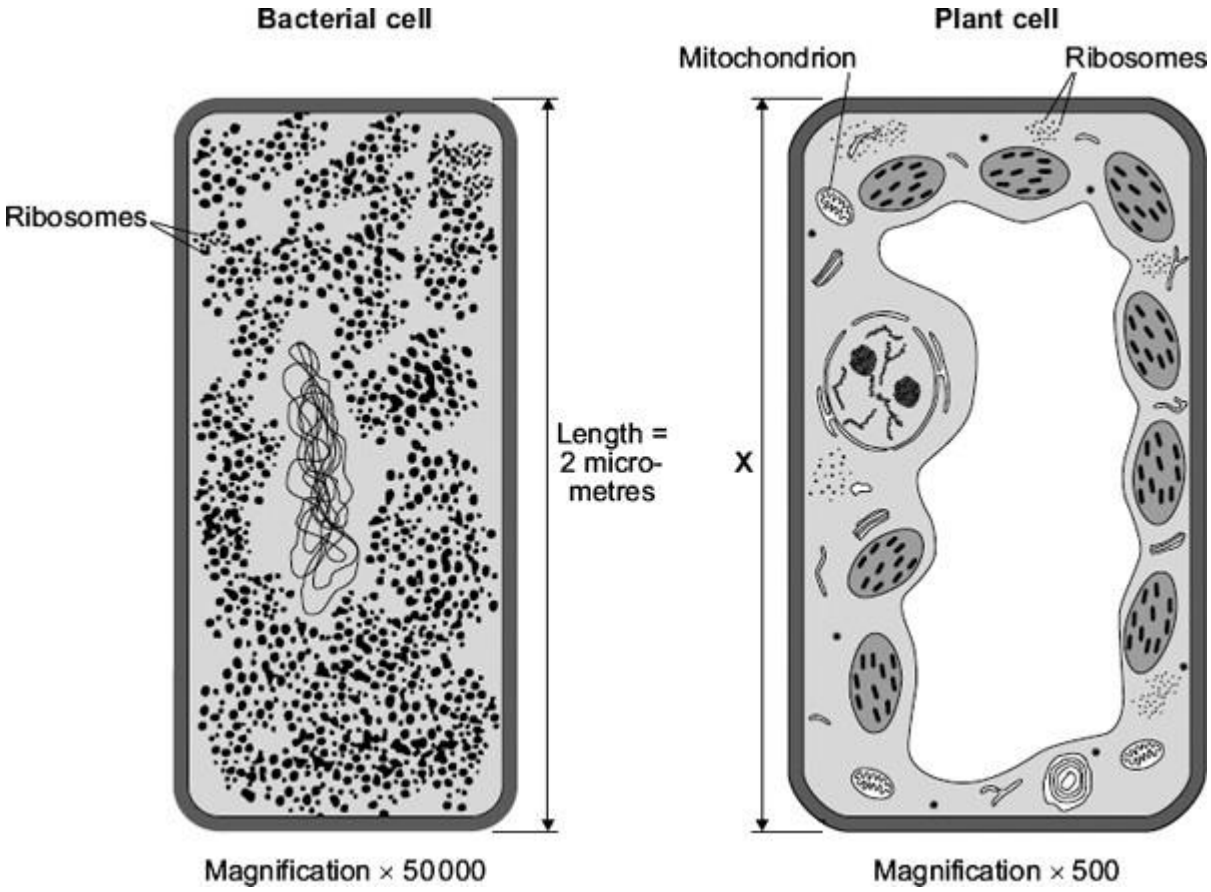
_____

_____

(3)

(Total 5 marks)

10 The diagram shows two cells, a bacterial cell and a plant cell.



(a) (i) Both the bacterial cell and the plant cell contain ribosomes.

What is the function of a ribosome?

_____

_____

(1)

(ii) The plant cell contains mitochondria but the bacterial cell does **not** contain mitochondria.

Give **one** other way in which the plant cell is different from the bacterial cell.

_____

_____

(1)

(b) (i) Both cells are drawn the same length, but the magnification of each cell is different.

The real length of the bacterial cell is 2 micrometres.
Calculate the real length, **X**, of the plant cell. Give your answer in micrometres.

Show clearly how you work out your answer.

_____

_____

_____

X =_____micrometres

(2)

(ii) Most mitochondria are about 3 micrometres in length.

The plant cell contains mitochondria but the bacterial cell does **not** contain mitochondria.

Use your answer to part (b)(i) and the information in the diagram to suggest why.

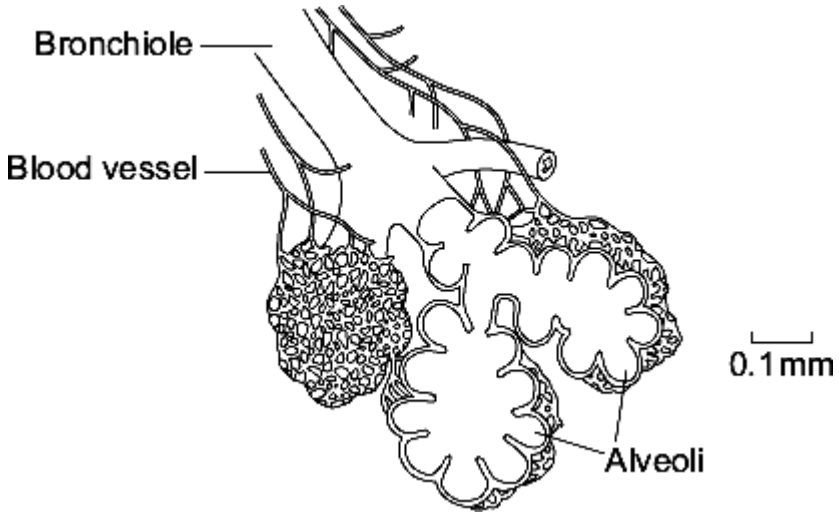
_____

_____

(1)

(Total 5 marks)

11 The human lung has about 80 million alveoli.
The diagram shows some alveoli in a human lung.



(a) Give **three** features of the alveoli that allow large amounts of oxygen to enter the blood.

1. _____

_____

2. _____

_____

3. _____

_____

(3)

(b) (i) Name the process by which oxygen passes from the air into the blood.

_____

(1)

(ii) Breathing allows large amounts of oxygen to enter the blood.

Explain how breathing does this.

_____

_____

_____

_____

(2)

(Total 6 marks)

Mark schemes

1 (a) movement of water [1]

from high concentration (of water) to low concentration (of water)
or
from (an area of) dilute solution to an area of concentrated solution [1]

through a differentially **or** partially **or** selectively **or** semi permeable membrane [1]

3

(b) (i) it will rise

1

(ii) water enters visking tubing [1]

because the concentration of water outside is greater than the concentration inside
or
because the concentration of salt **or** solute is greater inside the tubing than outside [1]
or
to equalise concentration water has to enter visking tubing [2]

2

[6]

2 (a) **A** = nucleus

accept phonetic spelling only

1

B = (cell) membrane

accept plasma membrane

1

(b) any **one** from:

photosynthesis

<u>makes</u> sugar / starch / carbohydrate / organic material

accept '<u>makes</u>food'
*do **not** accept makes chlorophyll*
ignore stores starch / food / light / chlorophyll

traps or absorbs light

1

(c) any **two** from:

Plant cell	Animal cell
• (has) vacuole **or** has cell sap	• no vacuole **or** small/temporary vacuole **or** no cell sap
• (has) wall/cellulose	• no wall/cellulose **or** <u>only</u> membrane
• (stores) starch **or** doesn't store glycogen	• doesn't store/have starch **or** stores glycogen

ignore reference to shape
must be clear indication in all four boxes
ignore reference to chlorophyll

2

[5]

3 (a) A cytoplasm

1

where (chemical) reactions take place

*do **not** accept where cell functions take place*

1

or

carries/holds the organelles/named organelles / named chemicals (including nutrients)

*do **not** accept keeps the shape of the cell*

or

contains water

or

presses out on the membrane

allow: keeps cell turgid
allows transport through the cell

B membrane

*do **not** accept by themselves:*
protects cell
gives shape

1

controls what enters/leaves the cell

1

or

contains the cell/holds the cell together

*do **not** accept keeps harmful substances out*

or

allows movement into and out of the cell C nucleus

1

contains the genetic material/DNA/genes/chromosomes

*do **not** accept:*
brain of the cell
stores information/instructions
tells cell what to do

or

controls (the activity) of the cell

1

(b) (i) one mark for each correctly labelled part

cell wall
*do **not** accept anything inboard of the inner edge vacuole*
accept anything inboard of transplant

chloroplast: site of photosynthesis/ for photosynthesis

*accept word equation **or** balanced equation*

1

cell wall: supports the cell/keeps the shape/keeps it rigid

*do **not** accept protects the cells*

2

(ii) vacuole: acts as reservoir for water / chemicals/(cell)/sap

3

or

keeps cell turgid/pushes content to edge

or

maintains concentration gradient

or

allows cell elongation (not growth)

1

[12]

4 (a) (i) A = (cell) wall

ignore cellulose

1

B = cytoplasm

1

(ii) any **one** from:

accept has DNA instead of a nucleus, but not just has DNA

- bacterial cell / it has no nucleus
  allow no mitochondria
- DNA free in cytoplasm
  ignore size
- has no vacuole / no vesicles
  ignore strands of DNA

1

(b) (i) yeast grows best / better / well **or** optimum temperature for yeast / more yeast present

allow yeast works best / better / well

1

(yeast) makes CO_2 **or** respires / respiration

allow fermentation

1

(ii) bacterium grows best / better / well / more bacteria present **or** optimum temperature for bacterium

ignore microorganisms / microbes

allow works / respires best / better / well

1

(bacterium) makes (lactic) acid

*do **not** allow wrong acid*

1

[7]

5 (a) B

no mark for "B", alone

large(r) surface / area **or** large(r) membrane

accept reference to microvilli

accept reasonable descriptions of the surface

*do **not** accept wall / cell wall*

ignore villi / hairs / cilia

1

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

- insulin / hormone
  if named hormone / enzyme must be correct for pancreas
- enzyme / named enzyme

1

(ii) many ribosomes

1

(ribosomes) produce protein

accept insulin / hormone / enzyme named is (made of) protein

or

allow many mitochondria (1)

provide energy to build protein **or** to make protein (1)

accept ATP for energy

1

[4]

6 (a) because water enters (the cell / it / named cell)

*do **not** accept salt / sugar / solution entering*

1

by osmosis / diffusion

if osmosis / diffusion not given accept concentration inside cell greater than outside cell

assume concentration refers to solute concentration unless answer indicates otherwise

allow water goes up the concentration gradient

allow water goes down its concentration gradient

*do **not** accept if diffusion of salt / sugar*

1

through a partially permeable membrane

*allow semi / selectively permeable membrane **or** description*

1

(b) (plant cells) have (cell) wall

accept animal cells have no (cell) wall

ignore reference to cell membrane

*do **not** accept reference to other organelles **or** any implication that animal cells have a cell wall eg plant cells have a thicker cell wall*

1

[4]

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

- transport up / against concentration gradient / low to high concentration
- uses energy
- use of protein / carrier

2

(b) microvilli – large(r) surface area

accept have carriers

1

mitochondria – release energy **or** make ATP

*do **not** accept 'makes energy'*

1

[4]

8 (a) (i) release energy

allow provide / supply / give energy

*do **not** accept produce / create / generate / make energy*

*do **not** allow release energy for respiration*

1

(ii) contain half the (number of) chromosomes **or** contains one set of chromosomes **or** contains 23 chromosomes

allow genetic information / DNA / genes / alleles instead of chromosomes

accept haploid

1

(b) any two from:

- (stem cells) are unspecialised / undifferentiated

  allow description eg 'no particular job'

- are able to become differentiated **or** can form other types of cell / tissue / organ

- stem cells can / able to divide / multiply

2

[4]

9 (a) (i) mitosis

correct spelling only

1

(ii) replicates / doubles / is copied / duplicates

accept cloned

ignore multiplied / reproduced

1

(b) fertilisation occurs / fusion (of gametes)

accept converse for asexual, eg none in asexual / just division in asexual

1

so leading to mixing of genetic information / genes / DNA / chromosomes

genes / DNA / chromosomes / genetic information comes from 1 parent in asexual

ignore characteristics

1

<u>one</u> copy (of each allele / gene / chromosome) from each parent
or
gametes produced by meiosis
or
meiosis causes variation

meiosis must be spelt correctly

1

[5]

10 (a) (i) makes / produces / synthesises protein / enzyme

1

(ii) plant cell has nucleus / vacuole / chloroplasts / chlorophyll
or plant cell is <u>much</u> larger

'It' = plant cell

allow correct reference to DNA or chromosomes

allow plant cell has fewer ribosomes

allow cellulose (cell wall)

1

(b) (i) 200

*correct answer with or without working gains **2** marks*

*if answer incorrect, allow **1** mark for* $\frac{2 \times 50,000}{500}$ ***or*** $\frac{100,000}{500}$

***or** 100*

2

(ii) bacterial cell is too small / bacterial cell about same size as a mitochondrion / 'no room'

ignore references to respiration

1

[5]

11 (a) <u>large</u> surface / <u>large</u> area

1

thin / short distance (from air to blood) / one cell thick / two cells thick

1

<u>good</u> blood supply / <u>many</u> capillaries / capillary <u>network</u> / <u>many</u> blood vessels

ignore moist surface

1

(b) (i) diffusion

ignore gaseous exchange

1

(ii) brings (more) oxygen / air into the lungs / alveoli

1

keeps O_2 level high in alveoli

or

maintains concentration difference (between alveoli and blood) / keeps O_2 concentration in alveoli > O_2 concentration in blood gains **2** marks

1

[6]