Cell Biology part 5 AQA Triple Biology

Name: _____

Class: _____

Date: _____

Time: **66 minutes**

Marks: **66 marks**

Comments:

1. Plant roots obtain some of their mineral salts from the soil by active transport.

What is involved in *active transport*?

(Total 4 marks)

2. (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?

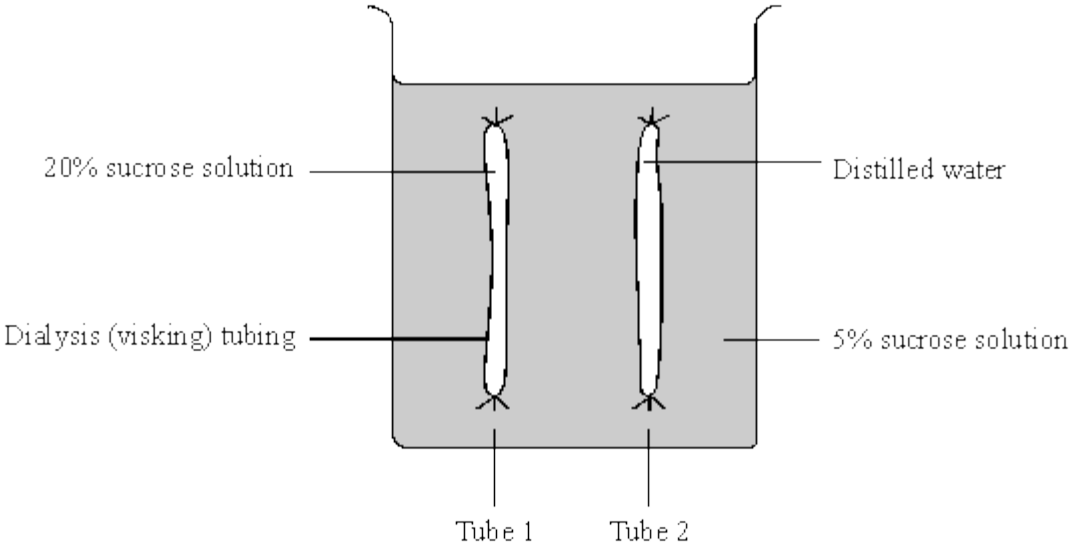
(1)

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

(2)

(Total 5 marks)

3. Some students set up this experiment to investigate osmosis. They filled two pieces of dialysis [visking] tubing with different liquids and left them both in a beaker of *5%* sucrose solution for an hour.



(a) Describe and explain the likely results after one hour.

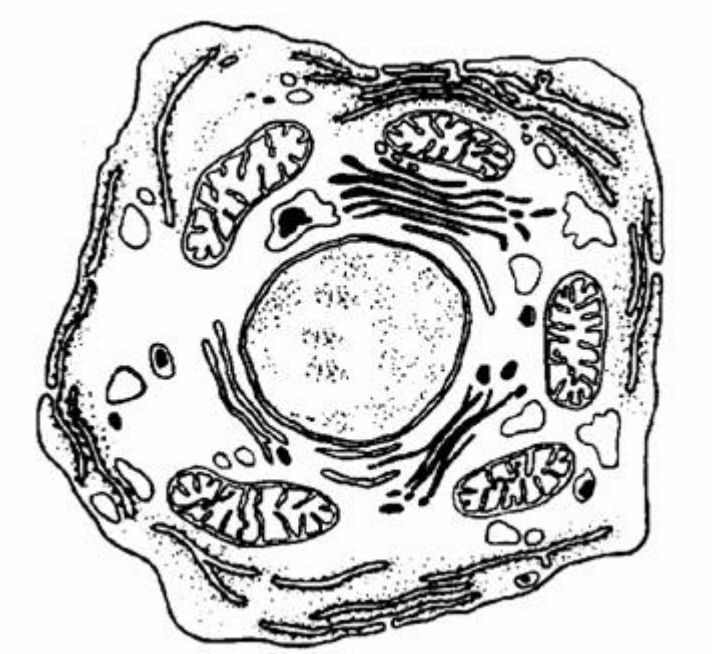
(6)

(b) Describe **two** examples where osmosis is used in living things.

(2)

(Total 8 marks)

4. The drawing shows an animal cell, seen at a very high magnification using an electron microscope.



(a) (i) Label a mitochondrion [plural = mitochondria].

(1)

(ii) What happens in the mitochondria?

_____

(1)

(b) (i) Name and label the structure where you would find chromosomes.

(1)

(ii) What are chromosomes made of?

_____

(1)

(c) What controls the rate of chemical reactions in the cytoplasm?

_____

(1)

(Total 5 marks)

5. (a) Microorganisms can be grown on agar jelly in a Petri dish.

List A gives three actions used when growing microorganisms.
List B gives four possible effects of these actions.

Draw a straight line from each action in **List A** to its effect in **List B**.

List A – Action	List B – Effect
	To reduce the growth of pathogens
The agar jelly is heated at 120 °C for 30 minutes	
	To kill unwanted microorganisms
Make sure the temperature for growing the microorganisms is no higher than 25 °C	
	To prevent microorganisms from the air getting into the Petri dish
The lid of the Petri dish is held on with tape	
	To prevent oxygen entering the Petri dish

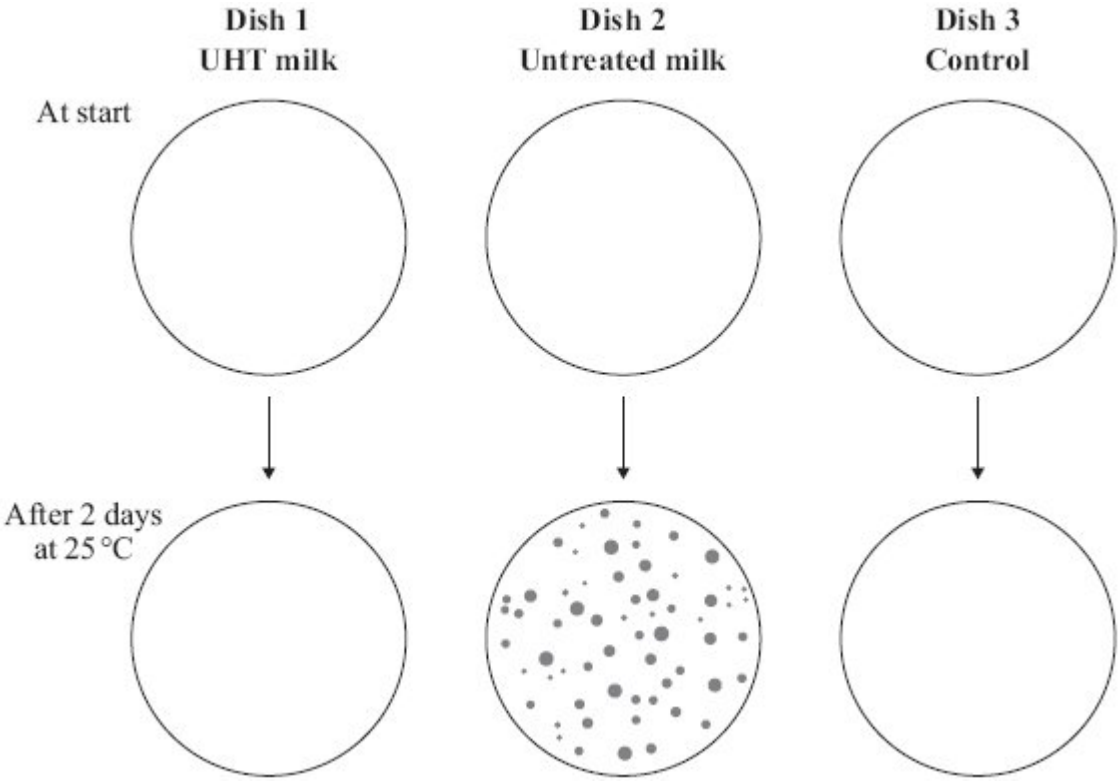
(3)

(b) UHT milk is milk that has been heated to 135 °C, then cooled.

In an investigation, three sterile Petri dishes containing sterile agar jelly were set up as follows.

- UHT milk was added to dish **1**.
- Untreated milk was added to dish **2**.
- Dish **3** was left unopened as a control.
- The dishes were kept at 25 °C for two days.

The results are shown in the diagram below.



(i) Describe the difference in appearance between dishes **1** and **2** after two days.

_____

_____

(1)

(ii) Give **one** reason for this difference.

_____

_____

(1)

(iii) There was no change in the appearance of dish **3** after two days.

Give **one** reason why.

_____

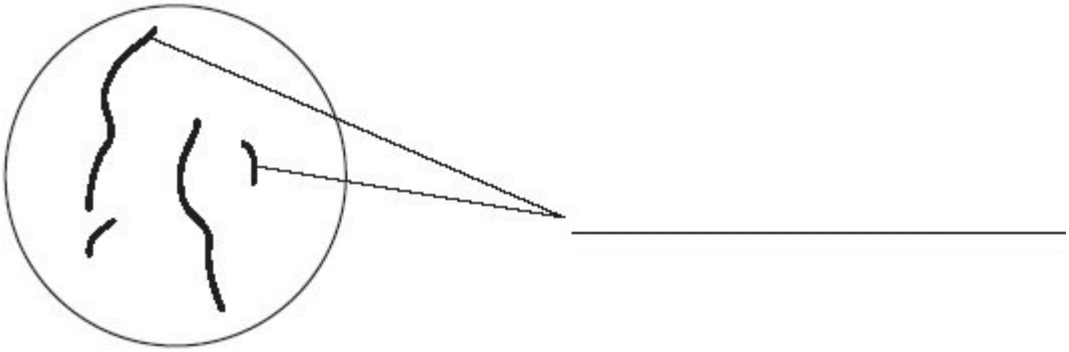
_____

(1)

(Total 6 marks)

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

Diagram 1



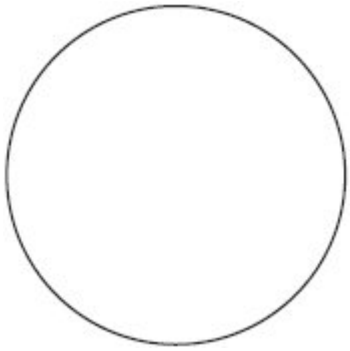
(a) Use a word from the box to label **Diagram 1**.

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)

7. The table shows the number of chromosomes found in each body cell of some different organisms.

Animals		Plants	
Species	**Number of chromosomes in each body cell**	**Species**	**Number of chromosomes in each body cell**
Fruit fly	8	Tomato	24
Goat	60	Potato	44
Human	46	Rice	24

(a) Nearly every organism on earth has an even number of chromosomes in its body cells.

Suggest why.

_____

_____

(1)

(b) Chromosomes contain DNA molecules.

Describe the function of DNA.

_____

_____

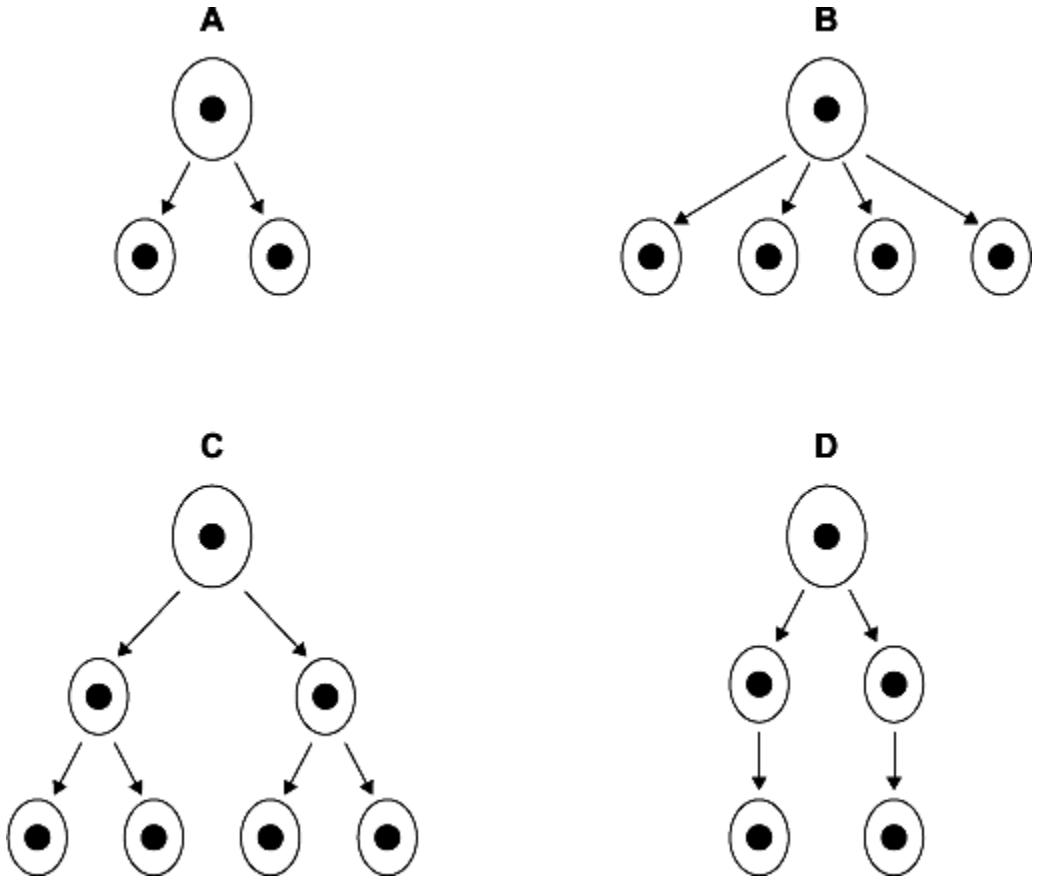
_____

_____

(2)

(c) Gametes are made in the testes by meiosis.

(i) Look at the diagrams.



Which diagram, **A**, **B**, **C** or **D**, represents how cell division by meiosis produces gametes in the testes? ☐

(1)

(ii) How many chromosomes will each goat gamete contain?

_____

(1)

(d) Body cells divide by mitosis.

(i) Why is the ability of body cells to divide important?

_____

_____

(1)

(ii) When a body cell of a potato plant divides, how many chromosomes will each of the new cells contain?

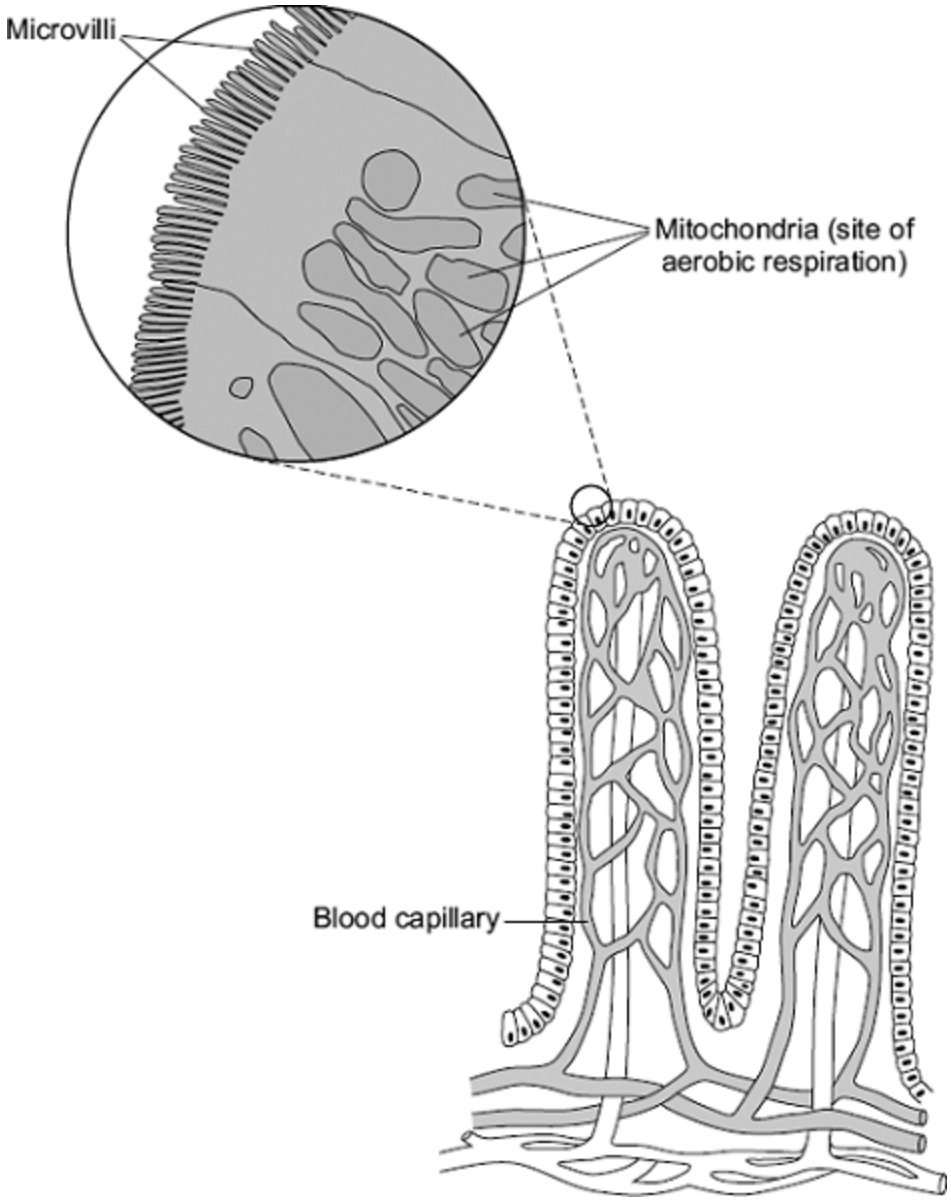
_____

(1)

(Total 7 marks)

8. The villi of the small intestine absorb the products of digestion.

The diagram shows two villi. It also shows parts of some of the surface cells of a villus, as seen with an electron microscope.



Describe and explain how the villi are adapted to maximise the rate of absorption of the products of digestion.

_____

_____

_____

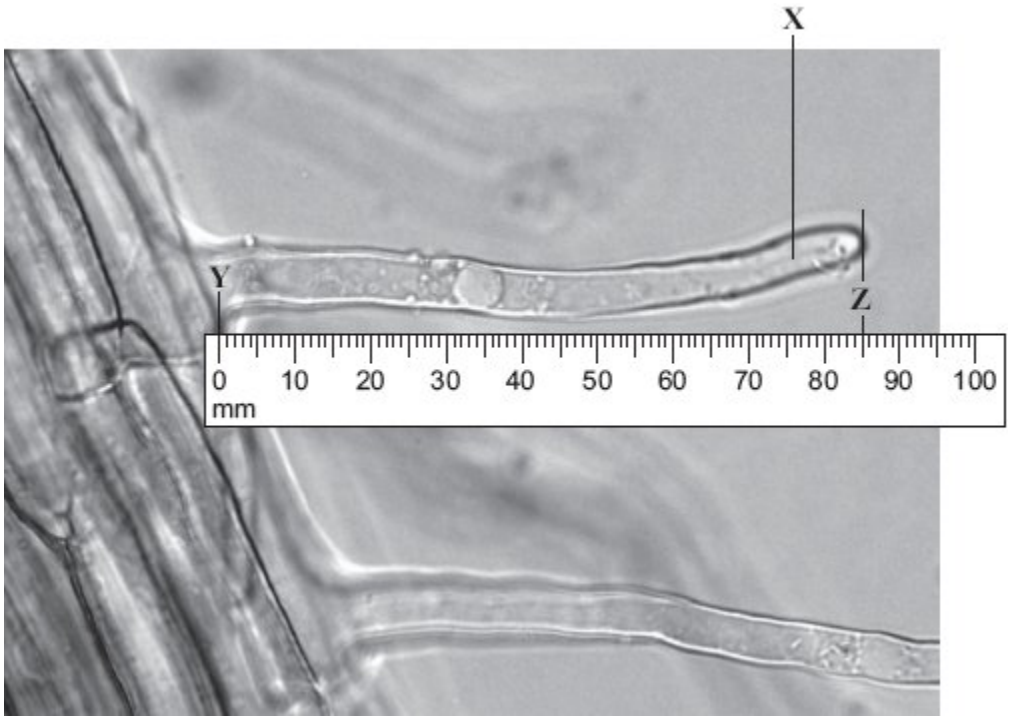
_____

_____

_____

(Total 5 marks)

9. 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?

_____

_____

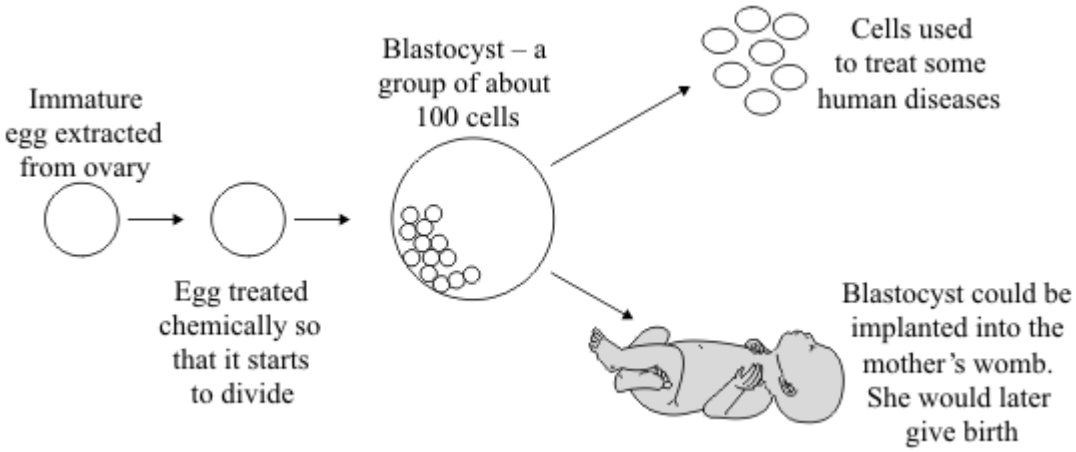
_____

_____

(2)

(Total 6 marks)

10. The diagram shows how an immature egg could be used either to produce cells to treat some human diseases or to produce a baby.

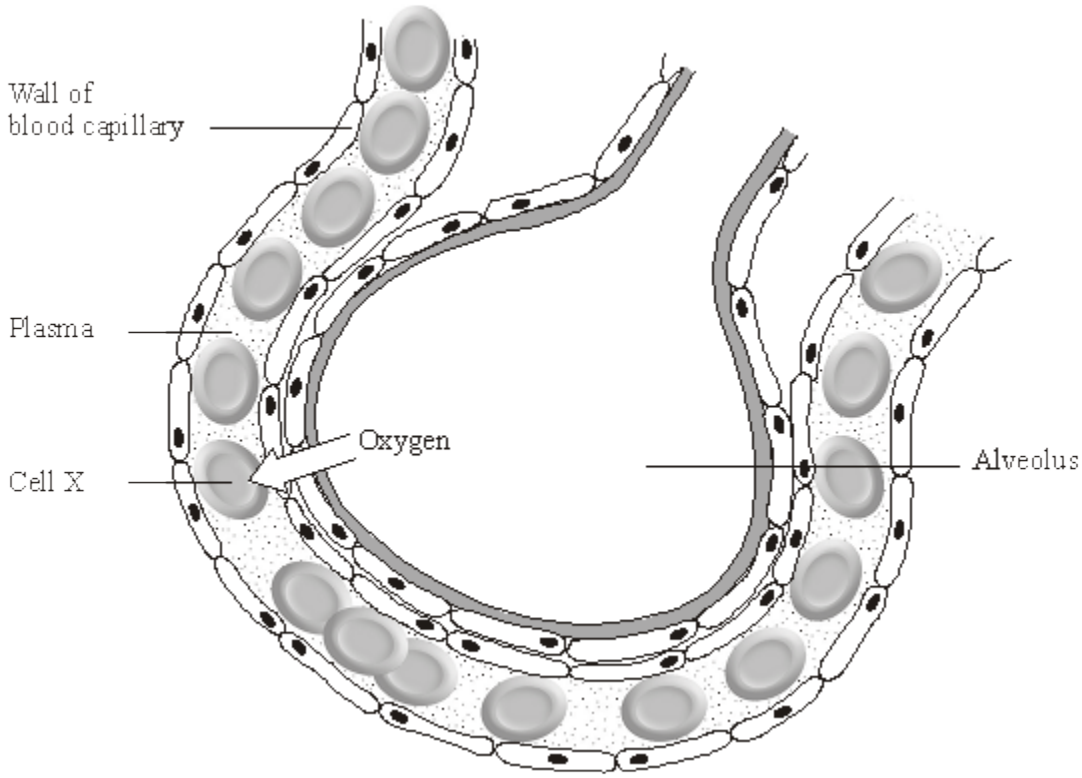


Scientists may be allowed to use this technique to produce cells to treat some human diseases, but not to produce babies.

Using information from the diagram, suggest an explanation for this.

(Total 4 marks)

11. 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)

12. In fish and chip shops, potatoes are cut into chips several hours before they are cooked.

The amount of water in the chips must be kept constant during this time.

To keep the water in the chips constant, the chips are kept in salt solution.

A student investigated the effect of different concentrations of salt solution on the mass of chips.

- He weighed each of five chips.
- He placed each chip into a different concentration of salt solution.
- After one hour he removed the chips, then reweighed them.

His results are shown in the table.

Concentration of salt solution	**0 M**	**0.5 M**	**1 M**	**2 M**	**3 M**
Mass of chip at start in grams	2.6	2.8	2.8	2.5	2.6
Mass of chip after one hour in grams	2.7	2.8	2.7	2.3	2.1

(a) (i) In which concentration of salt solution did the chip gain mass?

_____ M

(1)

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

The chip gained mass because water entered by

digestion
osmosis
respiration

(1)

(b) In which concentration of salt solution should the chips be kept?

_____ M

Give a reason for your answer.

_____

_____

(2)

(c) How could the student have made his investigation more reliable?

_____

_____

(1)

(Total 5 marks)

Mark schemes

1.

any **four** from

molecules / ions

do not credit mineral salts

move(d) through / across the cell

wall / membrane

against (a / the) concentration

gradient

by a series of chemical

reactions

(because) diffusion cannot occur

energy (required)

(supplied by) respiration

oxygen required for respiration (to occur)

[4]

2.

(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]

3.

(a) award **3** marks per tube for each key idea

for tube 1:

expands **or** gets firmer **or** bigger **or** inflates

it gains water

because the concentration of water is less than its surroundings

make sure answer is about water movement and not sucrose solution

3

for tube 2

gets floppy **or** flaccid **or** contracts

it loses water

because the concentration of water is greater than its surroundings

3

(b) any **2** from:

uptake of water by root (hair) **or** movement from cell to cell within plant

*do **not** credit references to diffusion unless it is clear that the candidate is referring to the diffusion of water*

guard cell function

maintain turgor

water absorption in the large intestine

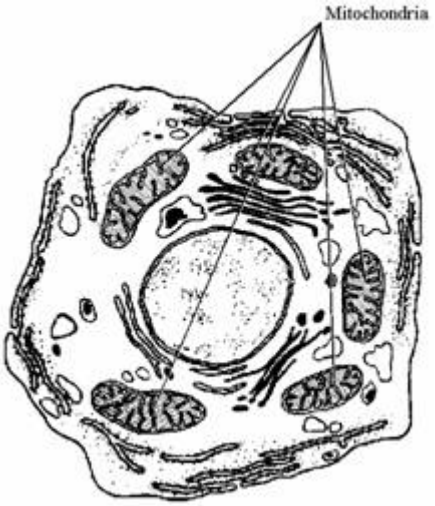
reabsorption of water from the nephron **or** collecting duct or in kidney **or** osmoregulation in kidney

allow osmosis in other animals if some use is shown

2

[8]

4. (a) (i)



award 1 mark for any of the mitochondria correctly labelled if a number are labelled and one is incorrect award 0 marks

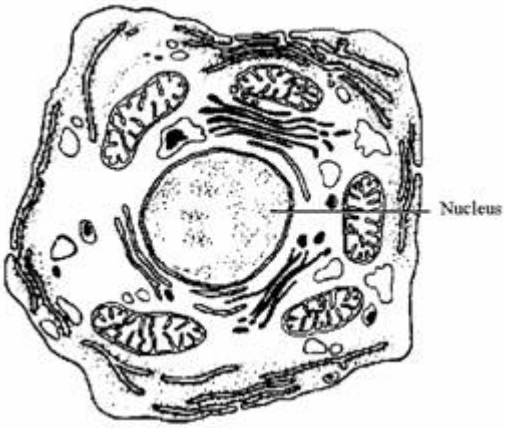
1

(ii) respiration **or** the release **or** transfer of energy **or** it contains the enzymes for respiration

*do **not** accept energy produced*

1

(b) (i) nucleus (named and correctly labelled)



*arrow **or** line must touch **or** go inside the nuclear membrane*

1

(ii) DNA **or** genes **or** nucleic acids

*accept protein **or** histones **or** nucleotides **or** ATGC*

1

(c) enzymes **or** nucleus

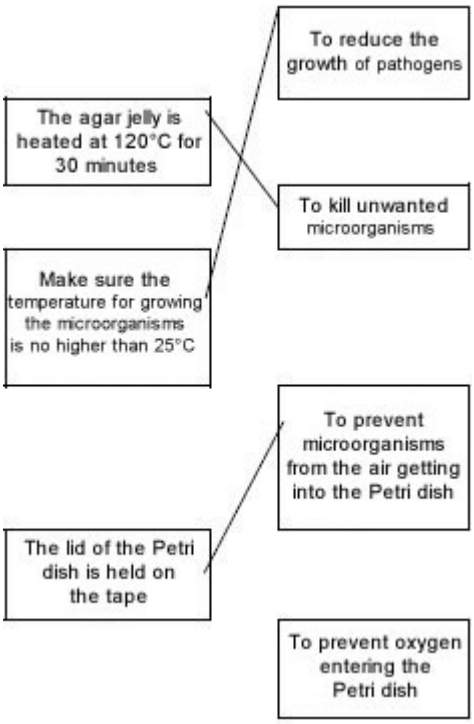
*do not accept factors that affect the rate rather than control it eg pH **or** temperature*

1

[5]

5.

(a) **Liast A – Action** **List B – Effect**



1 *mark per correct line*

each extra line cancels ***1*** *mark*

3

(b) (i) dish 2 has (colonies of) microorganisms / bacteria / (but there are none in dish 1)

allow fungi / pathogens / microbes / germs

allow more microorganisms in dish 2

1

(ii) untreated milk contains <u>living</u> microorganisms

or

microorganisms killed by UHT

or

no <u>living</u> microorganisms in UHT milk

ignore microorganisms enter from the air

1

(iii) dish 3 was not opened

*do **not** allow no growth of microorganisms because of lack of air / oxygen*

or

it was sterilised

ignore microorganisms cannot enter from the air

or

nothing / no milk was added

1

[6]

6. (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]

7.

(a) any **one** from

- chromosomes in pairs
- inherited one of each pair from each parent
- one of each pair in egg **and** one of each pair in sperm
- so sex cells / gametes can have half the number

allow need to pair during cell division / meiosis

1

(b) any **two** from:

- code
- combination / sequence of amino acids
- forming specific / particular proteins / examples

*If **no other mark** gained allow reference to controlling characteristics / appearance for **1** mark*

2

(c) (i) C

1

(ii) 30

1

(d) (i) for growth / repair / replacement / asexual reproduction

*do **not** accept incorrect qualification, eg growth of cells **or** repair of cells*

they equals cells therefore do not accept they grow etc

1

(ii) 44 **or** 22 pairs

1

[7]

8.

D – *many* microvilli (1)
Ex – provide large surface area (1)

five *points made*

max ***3*** *descriptions*

max ***3*** *explanations*

D – *many* capillaries / *good* blood supply (1)
Ex – maintain concentration / diffusion gradient **or** quickly removes food (1)

D – thin wall / one cell thick surface / capillaries near surface (1)

allow villi are thin

ignore villi are one cell thick

Ex – short distance for food to travel (1)

D – *many mitochondria (1)*
Ex – provide energy / ATP for active uptake / transport (1)

[5]

9.

(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 <u>more</u> 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

<u>large</u> surface area to absorb water / ions (2)

large surface area linked to incorrect function = 1

ignore small so short diffusion pathway

2

[6]

10. any **four** from:

- cells used to treat diseases do not go on to produce a baby
- produces identical cells for research
- cells would not be rejected
- allow cells can form different types of cells
- (immature) egg contains only genetic information / DNA / genes / chromosomes from mother **or** there is only one parent
- asexual / no mixing of genetic material / no sperm involved / no fertilisation **or** chemical causes development
- baby is a clone
- reference to ethical / moral / religious issues

  allow ethically wrong
  NB *<u>cloning</u> is illegal gains **2** marks*
  ignore unnatural

- risk of damage to the baby

  in correct context

[4]

11. (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]

12. (a) (i) 0

1

(ii) osmosis

1

(b) 0.5

1

no change in mass / weight

allow 'chip / it stays the same'

1

or

no (net) osmosis / same amount of water in <u>and</u> out

(c) repeat / use more chips in each solution

allow use of other people's results

*do **not** allow 'get more results' unqualified*

*do **not** allow leave longer / use more concentrations / better instrumentation*

1

[5]