Cell Biology part 16 AQA Combined Science

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Name: _____

Class: _____

Date: _____

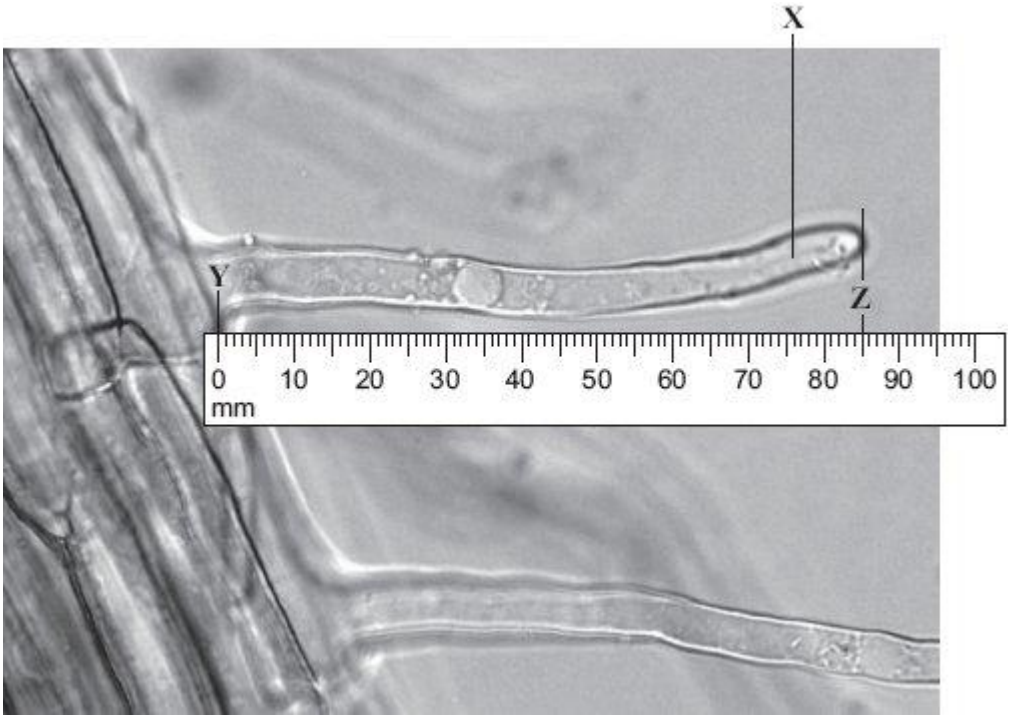
Time: **73 minutes**

Marks: **73 marks**

Comments:

Q1.

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)

Q2.

(a) The concentration of sulfate ions was measured in the roots of barley plants and in the water in the surrounding soil.

The table shows the results.

	Concentration of sulfate ions in mmol per dm^3
Roots of barley plants	1.4
Soil	0.15

Is it possible for the barley roots to take up sulfate ions from the soil by diffusion?

Draw a ring around your answer. **Yes / No**

Explain your answer.

_____

_____

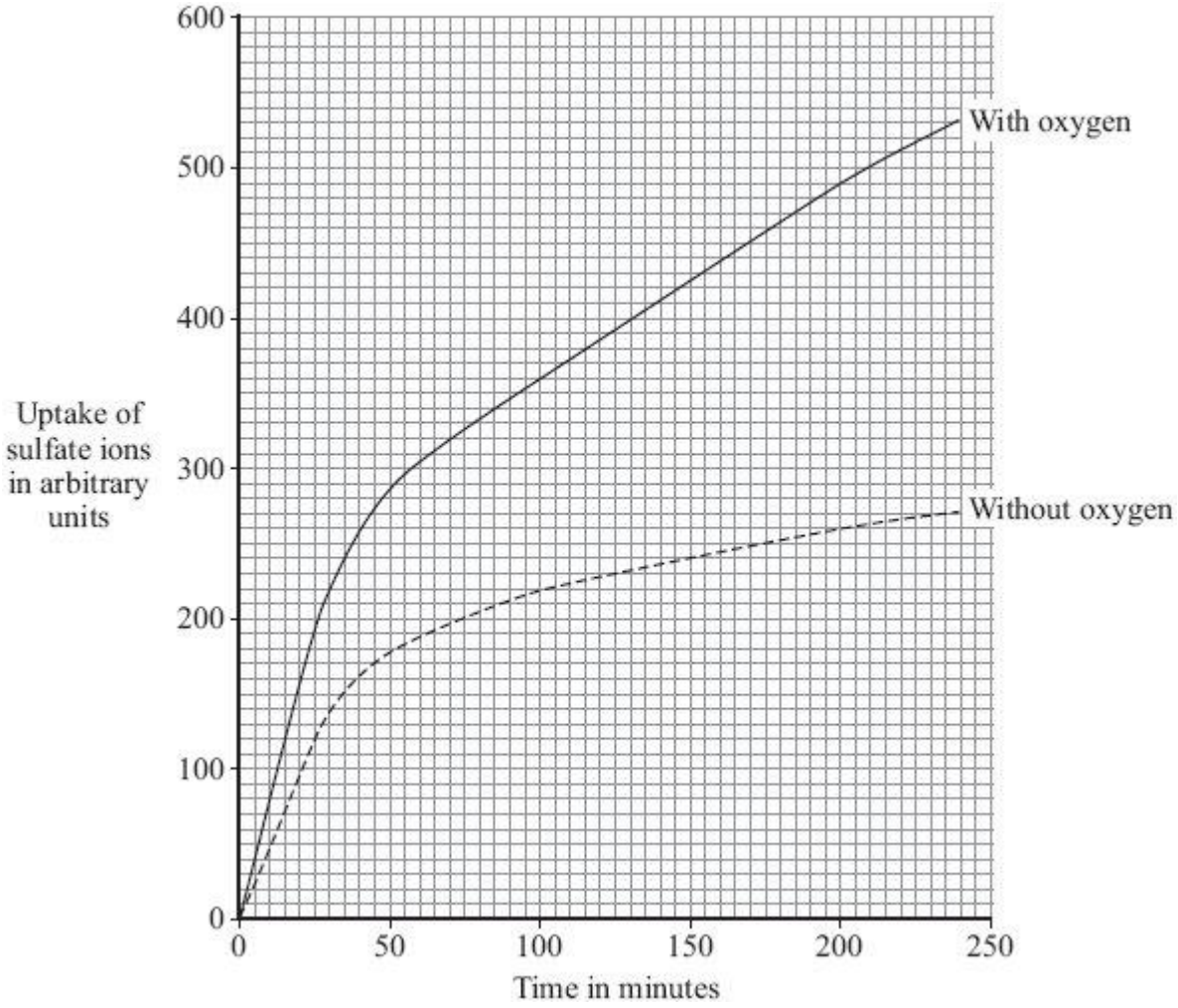
_____

_____

(2)

(b) Some scientists investigated the amounts of sulfate ions taken up by barley roots in the presence of oxygen and when no oxygen was present.

The graph below shows the results.



(i) The graph shows that the rate of sulfate ion uptake between 100 and 200 minutes, **without** oxygen, was 0.4 arbitrary units per minute.

The rate of sulfate ion uptake between 100 and 200 minutes, **with** oxygen, was greater.

How much greater was it? Show clearly how you work out your answer.

_____

_____

_____

Answer _____ arbitrary units

(2)

(ii) The barley roots were able to take up more sulfate ions with oxygen than without oxygen.

Explain how.

_____

_____

_____

_____

_____

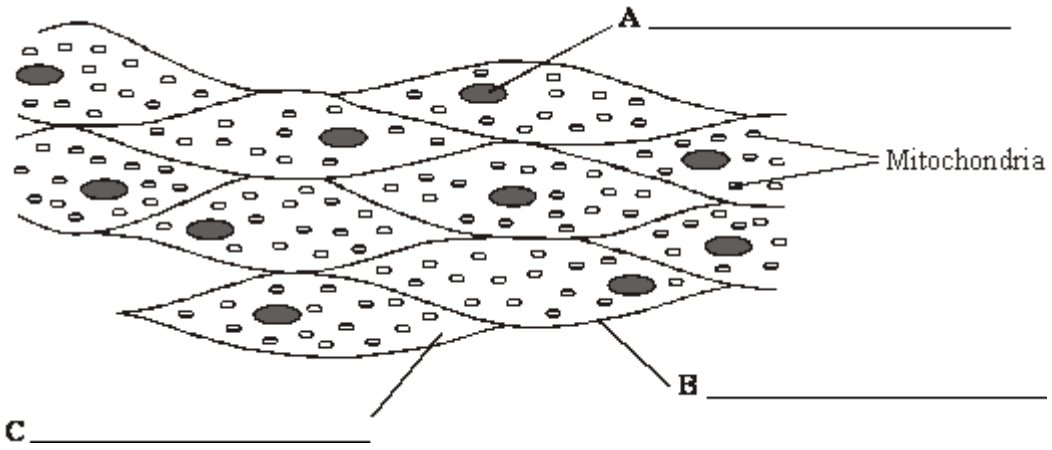
_____

(3)

(Total 7 marks)

Q3.

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)

Q4.

The pancreas is involved in digestion and controlling the internal conditions of the body.

(a) Name **two** digestive enzymes produced by the pancreas.

1. _____

2. _____

(2)

(b) Diabetes may be caused by a lack of insulin.

Part of the treatment for someone with diabetes is to pay careful attention to the diet.

(i) Give **one** symptom of diabetes.

_____

_____

(1)

(ii) Give **one** way in which a diabetic may be advised to change their diet.

_____

_____

(1)

(iii) How does this change in diet help the diabetic?

_____

_____

(1)

(iv) State **one** other way in which the symptoms of diabetes may be treated.

_____

(1)

(c) Many of the cells in the pancreas contain large numbers of ribosomes.

What is the function of ribosomes in a cell?

_____

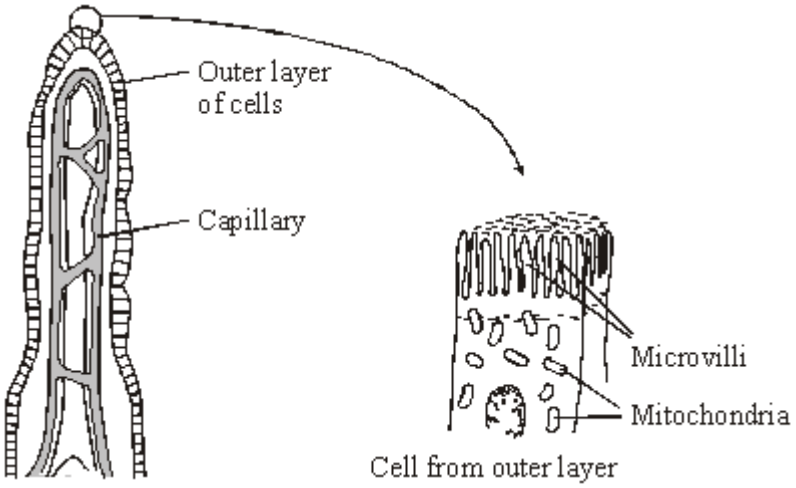
_____

(1)

(Total 7 marks)

Q5.

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 _____

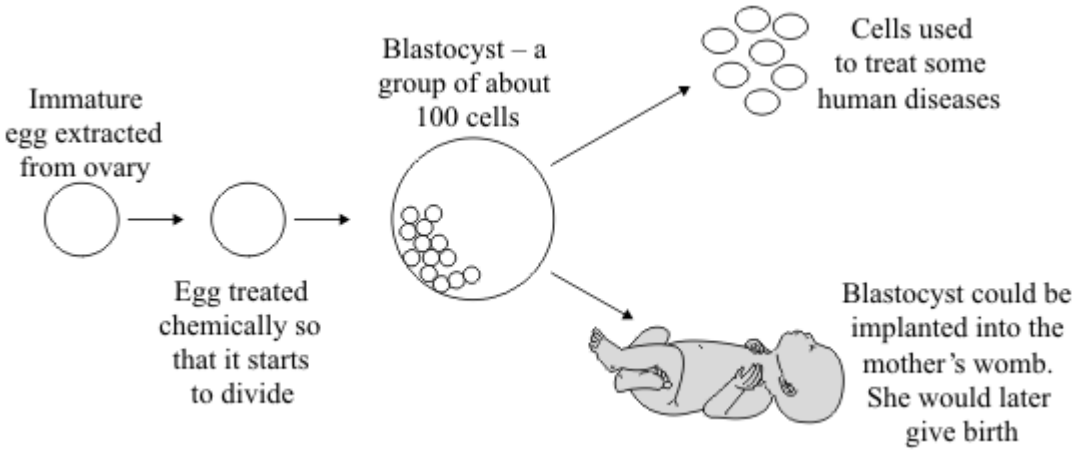
_____

(2)

(Total 4 marks)

Q6.

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



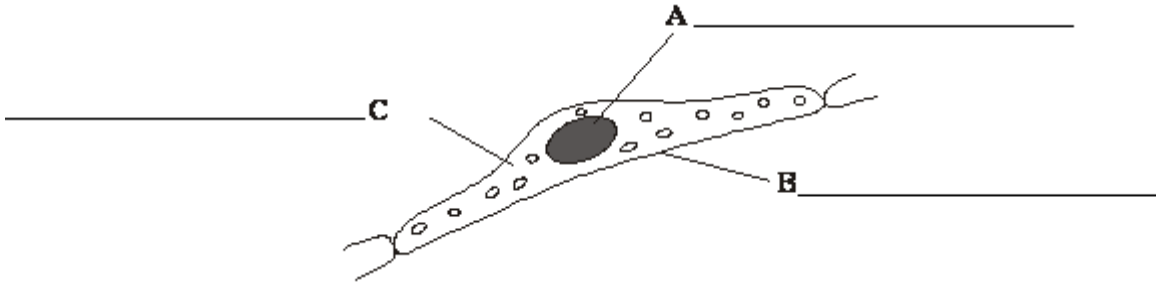
Scientists may be allowed to use this technique to produce cells to treat some human diseases, but not to produce babies.

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

(Total 4 marks)

Q7.

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

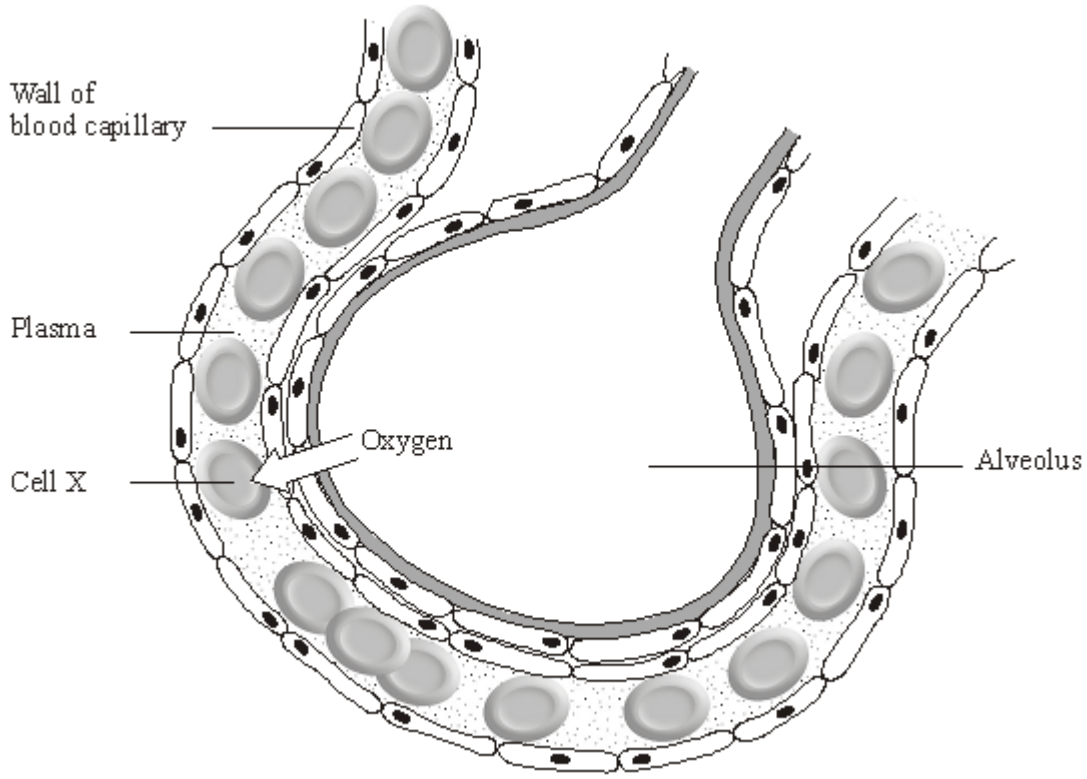
respiration

(1)

(Total 5 marks)

Q8.

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.

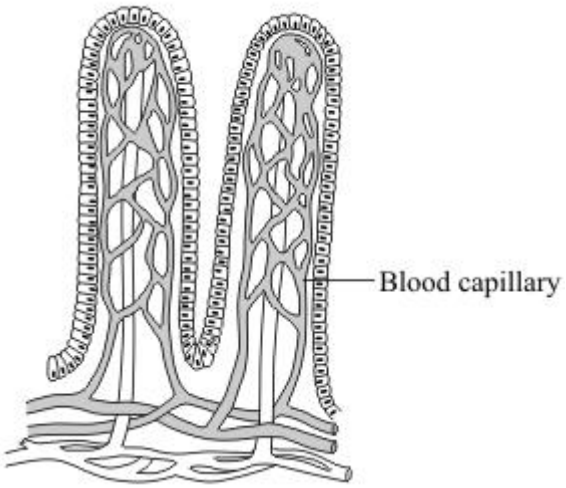
(1)

(Total 5 marks)

Q9.

Diagram 1 shows two villi in the small intestine of a healthy person.

Diagram 1



(a) Describe **two** features of the villi which help the small intestine to function.

1. _____

_____

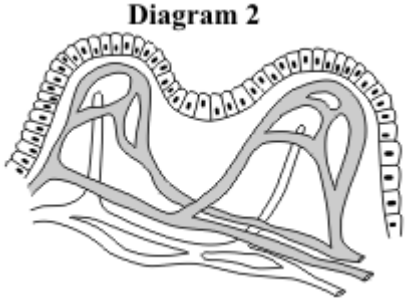
2. _____

_____

(2)

(b) **Diagram 2** shows two villi in the small intestine of a person with coeliac disease.

Diagram 2



(i) How do the villi of the person with coeliac disease differ from those of a healthy person?

_____

_____

(1)

(ii) Suggest how this difference might affect how well the small intestine functions.

_____

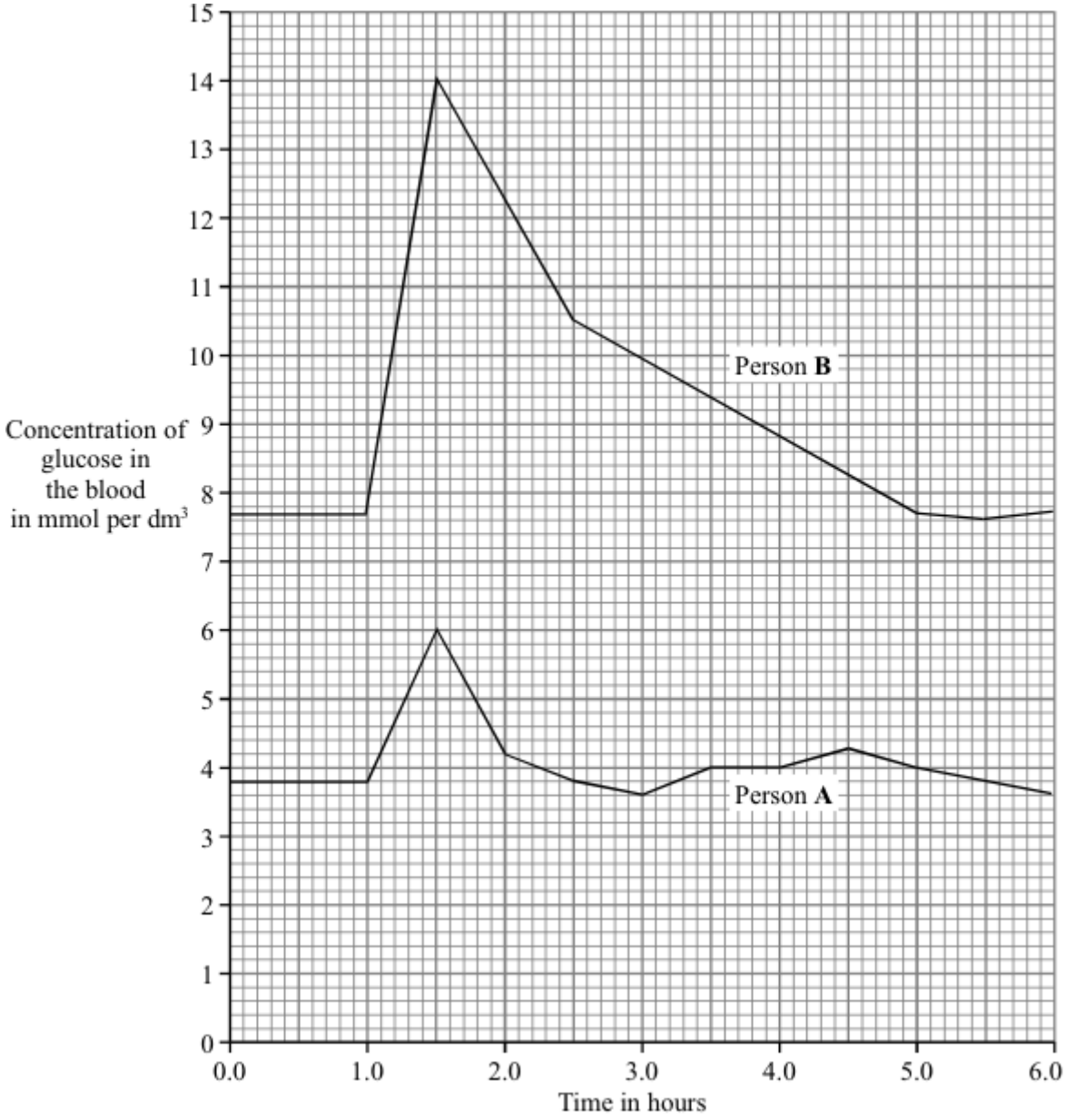
_____

(1)

(Total 4 marks)

Q10.

The graph shows the concentration of glucose in the blood of two people. Person **A** is a non-diabetic. Person **B** has diabetes. Each person ate 75 grams of glucose at 1.0 hours.



(a) (i) What was the maximum concentration of glucose in the blood of Person **A**?

_____ mmol per dm^3

(1)

(ii) After eating the glucose, how long did it take for the concentration of glucose in the blood of Person **B** to return to normal?

_____ hours

(1)

(b) A diabetic person does not produce enough insulin.

(i) Which organ produces insulin?

_____

(1)

(ii) Write the letter **X** on the graph to show one time when the blood of Person **A** would contain large amounts of insulin.

(1)

(c) A high concentration of glucose in the blood can harm body cells as a result of osmosis.
Explain why.

_____

_____

_____

_____

_____

_____

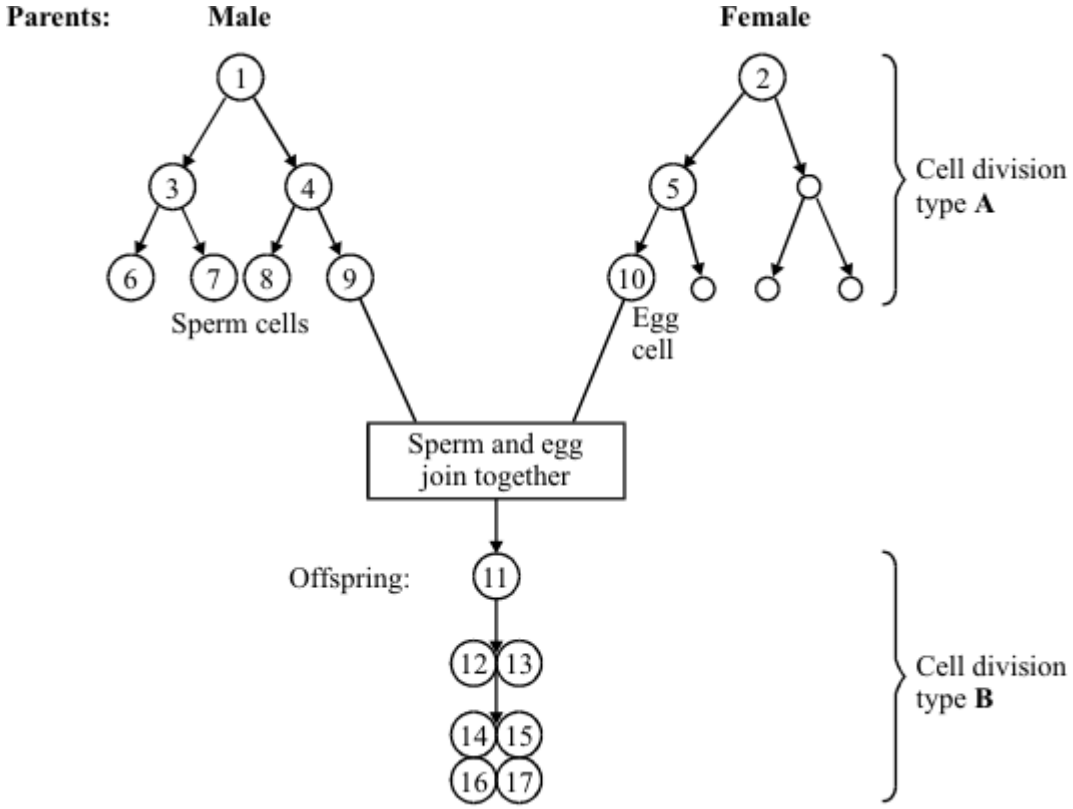
_____

(4)

(Total 8 marks)

Q11.

The diagram shows two patterns of cell division. Cell division type **A** is used in gamete formation. Cell division type **B** is used in normal growth.



(a) Name the two types of cell division, **A** and **B**, shown in the diagram.

Type **A** _____

Type **B** _____

(2)

(b) Name the process in which an egg and sperm join together.

_____

(1)

(c) Cell **1** contains 46 chromosomes. How many chromosomes will there be in:

(i) cell **10**; _____

(1)

(ii) cell **14**? _____

(1)

(Total 5 marks)

Q12.

The table shows the concentrations of some mineral ions in the cells of a pond plant and in the surrounding pond water.

	Concentration in mmol per dm^3		
	Potassium	**Calcium**	**Sulphate**
Plant cells	49.0	7.0	7.0
Pond water	0.5	0.7	0.4

(i) The plant cells would not have been able to absorb these mineral ions from the pond water by diffusion. Explain why not.

_____

_____

(2)

(ii) Suggest a process which would allow these ions to be absorbed from the pond water by the plant cells.

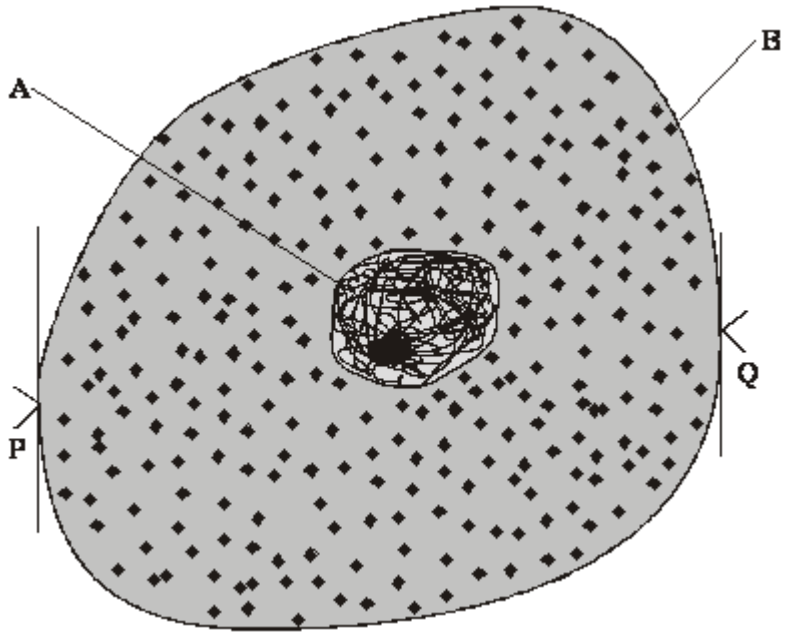
_____

(1)

(Total 3 marks)

Q13.

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.

_____

_____

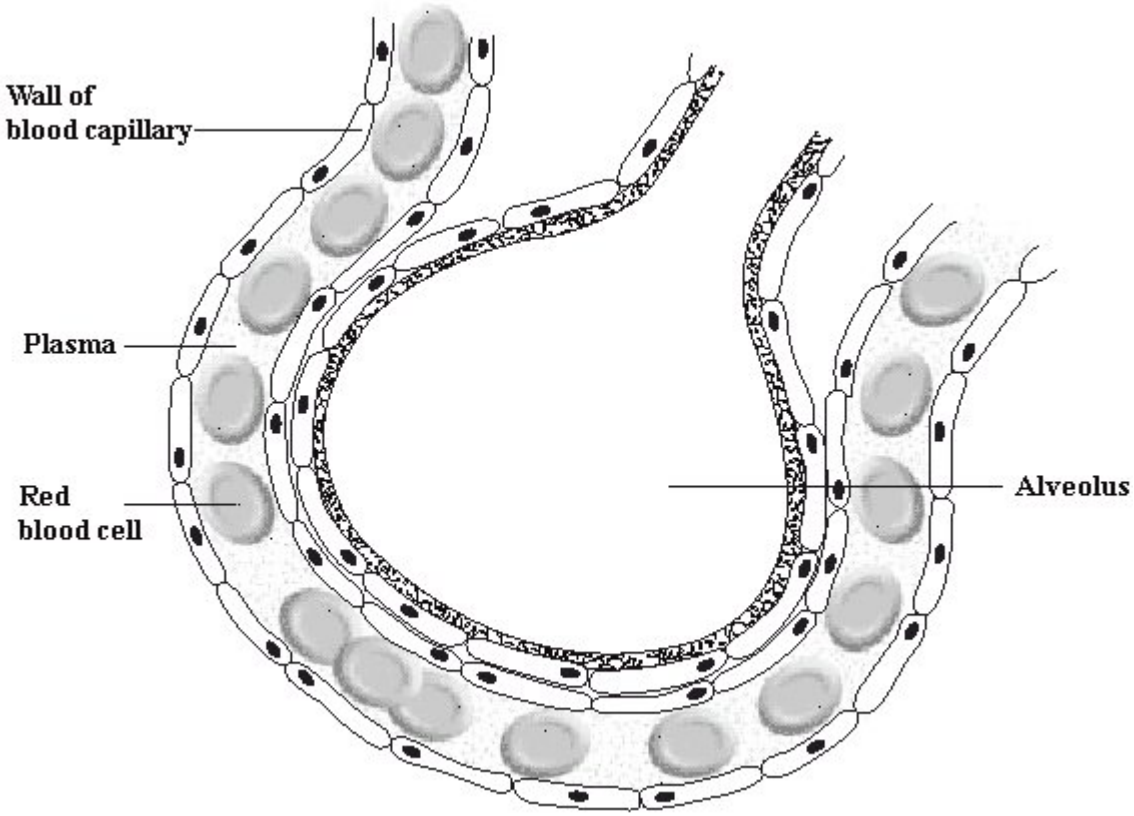
Average diameter = _____ micrometres

(2)

(Total 5 marks)

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)

Q1.

(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]

Q2.

(a) No

no mark
if yes max 1 for correct statement

diffusion is down the concentration gradient

accept by diffusion ions would leave the root

1

to enter must go up / against the concentration gradient
or concentration higher in the root
or concentration lower in the soil

1

(b) (i) 0.9 **or** 3.25

for correct answer with or without working

if answer incorrect 1.3 ***or*** *their rate – 0.4 gains 1 mark*
or *130 – 40* ***or*** *90 gains 1 mark*

2

(ii) (uptake) by active transport

1

requires energy

more energy from aerobic respiration

1

or

more energy when oxygen is present

1

[7]

Q3.

(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]

Q4.

(a) any **two** from:

- amylase / carbohydrase
- protease
  allow trypsin
- lipase

2

(b) (i) high / above normal blood sugar
or cannot control blood sugar
allow other symptoms
eg frequent / plentiful urination ***or*** *sugar in urine* ***or*** *thirst* ***or*** *weight loss* ***or*** *coma*
ignore consequential effects eg blood pressure / circulation / glaucoma / tiredness

1

(ii) any **one** from:

- small / regular meals
- low sugar (meals) or low GI / GL **or** carbohydrates as starch

allow high fibre

ignore reference to low carbohydrate

1

(iii) any **one** from:

- keep constant(blood) sugar **or** prevent high (blood) sugar **or** reduces surge / rush of sugar into blood
- reduce the need for insulin

1

(iv) (take) insulin

allow pancreas transplant

1

(c) protein / hormone / enzyme synthesis **or** synthesis of named example **or** combine amino acids

1

[7]

Q5.

(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]

Q6.

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]

Q7.

(a) **A** nucleus **1**

B (cell) membrane **1**

C cytoplasm **1**

(b) (i) it is thin **1**

(ii) diffusion **1**

[5]

Q8.

(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]

Q9.

(a) any **two** from:

- large surface / area **or** many villi **or** have microvilli
  accept big surface / area
- thin surface **or** thin wall **or** surface 1-cell thick **or** capillaries near surface **or** permeable **or** partially permeable
  accept they are thin
  *do **not** allow thin **cell** wall*
- many blood vessels **or** many capillaries **or** capillary network **or** good blood supply
  ignore 'constant blood flow' owtte
  ignore extras eg moist or reference to gases
- have enzymes
  ignore release enzymes
  - *accept reference to lacteal as 5th point*
  - *allow reference to having mitochondria*

2

(b) (i) small(er) (surface area) / flat(ter) / short(er) **or** not as folded **or** fewer capillaries owtte
allow small(er) lacteal
ignore references to wide / thick / spread out etc

1

(ii) less absorption (of digested food) / less digestion / diffusion
accept slower for less
accept description of less digestion
accept less food can get in
*do **not** allow zero absorption*
*do **not** allow 'collection' of nutrients*

1

[4]

Q10.

(a) (i) 6

1

(ii) 4

1

(b) (i) pancreas
ignore islets of langerhans

1

(ii) 'X' anywhere between >1 and ≤ 2 hours
anywhere in that column

1

(c) any **four** from:

water movement

*do **not** accept solution*

out of cells

dilute to concentrated solution

accept reference to correct gradient -
*high Ψ to low Ψ **or** high to low 'water concentration'*
*must be unambiguous – i.e. **not** 'high to low concentration'*
accept low to high concentration

reference to partially / selectively permeable membranes **or** described

cells shrink / get smaller

allow crenated
ignore plasmolysed / flaccid / floppy
etc

4

[8]

Q11.

(a) A = meiosis

accept 'mieosis'
*do **not** accept 'miosis'*

1

B = mitosis

*do **not** accept 'meitosis' etc*

1

(b) fertilisation allow conception

1

(c) (i) 23

1

(ii) 46

1

[5]

Q12.

(i) in diffusion: material moves high to low concentration

1

here: concentration in cells > concentration in water **or** uptake is against the concentration gradient **or** by diffusion ions would move out

1

(ii) active transport / active uptake

1

[3]

Q13.

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

1

B = (cell) membrane

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]

Q14.

(i) On diagram:

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]