Cell Biology part 15 AQA Combined Science

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Name: _____

Class: _____

Date: _____

Time: **72 minutes**

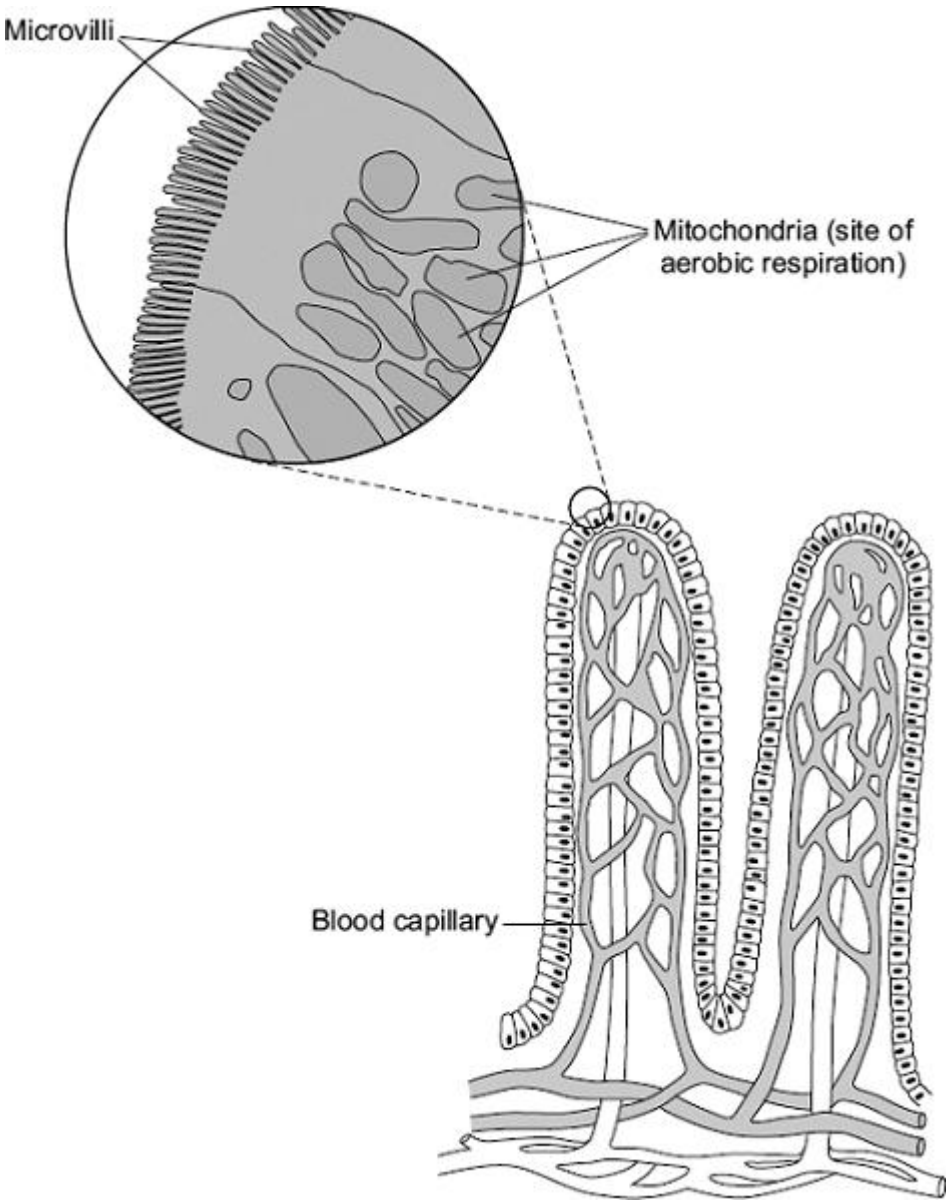
Marks: **72 marks**

Comments:

Q1.

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)

Q2.

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.

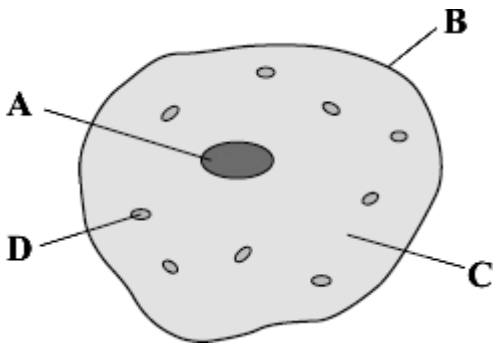
(i) A person who has cystic fibrosis has | two / three / four | copies of the cystic fibrosis allele.

(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)

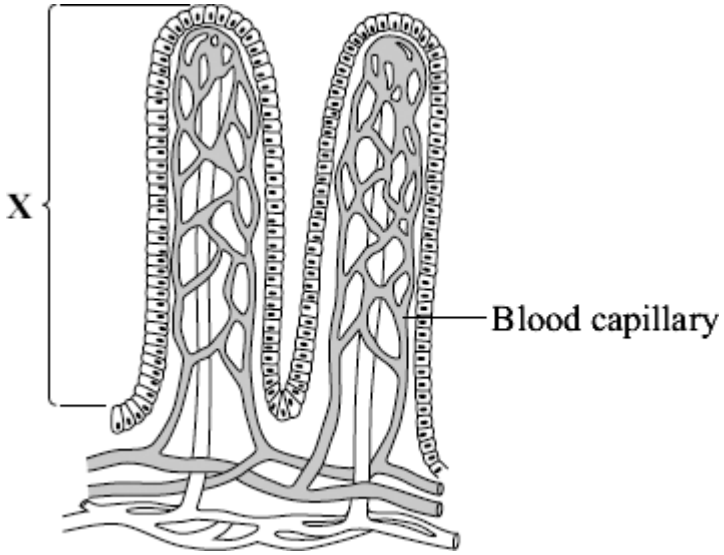
(ii) is affected by cystic fibrosis? ☐

(1)

(Total 8 marks)

Q3.

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.

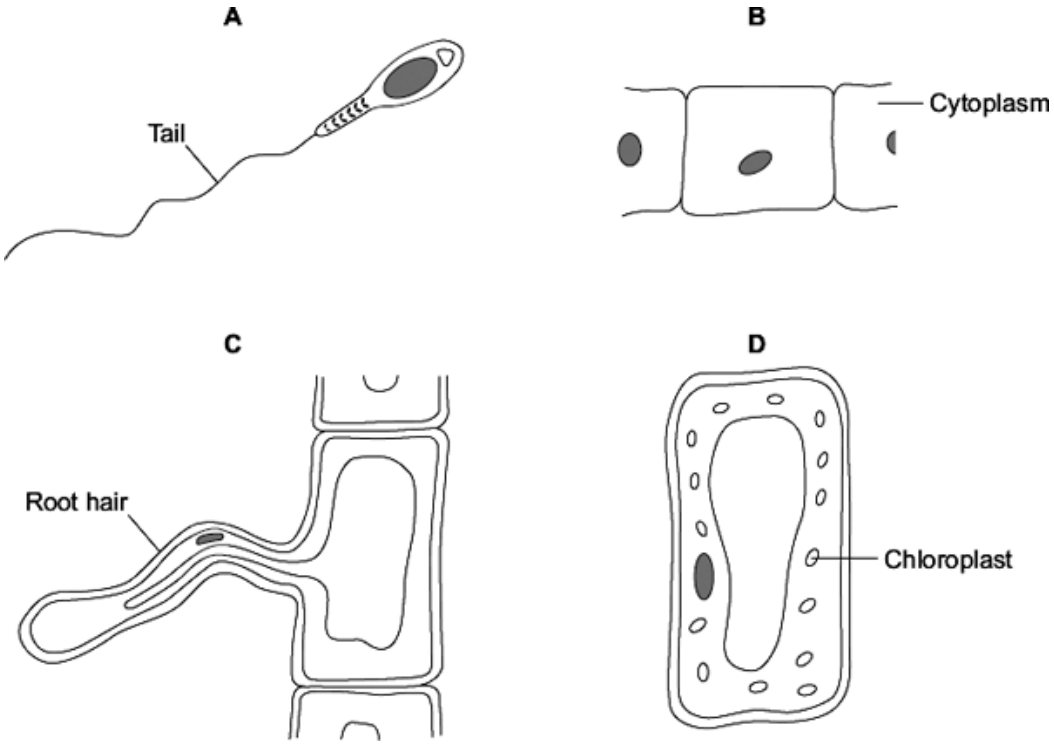
diffusion **fermentation** **transpiration**

(1)

(Total 5 marks)

Q4.

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.

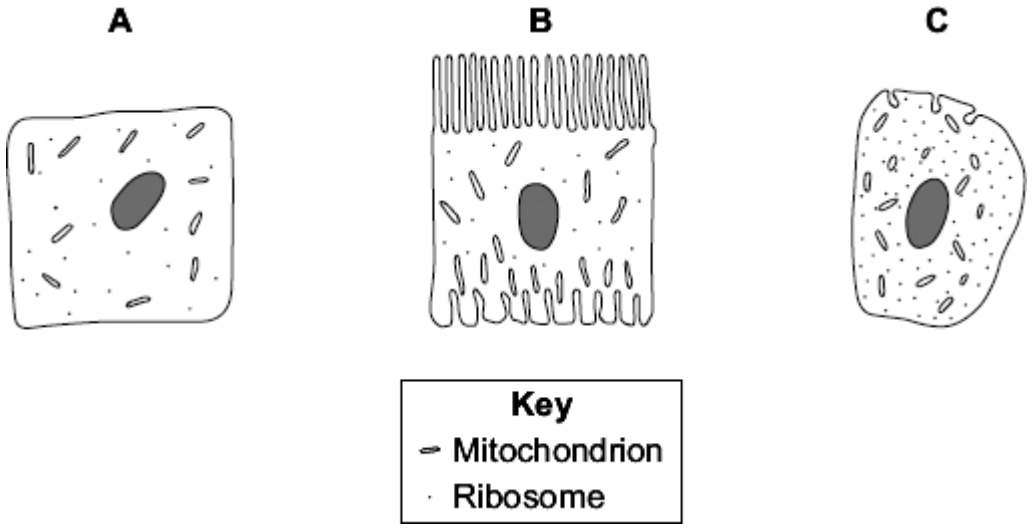
osmosis **photosynthesis** **respiration**

(1)

(Total 5 marks)

Q5.

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)

Q6.

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.

_____

_____

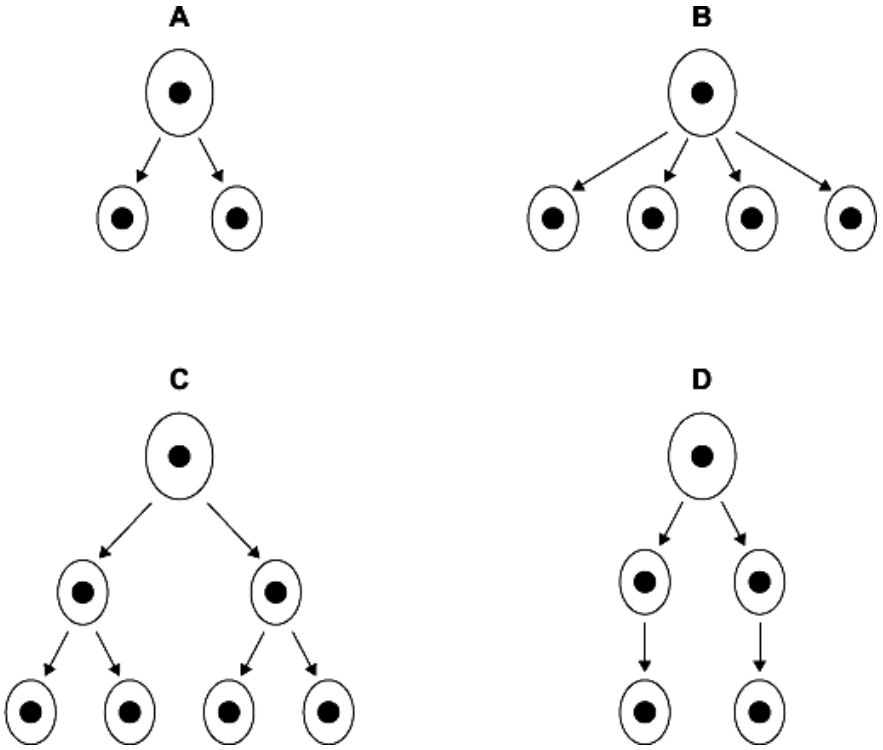
_____

_____

(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?

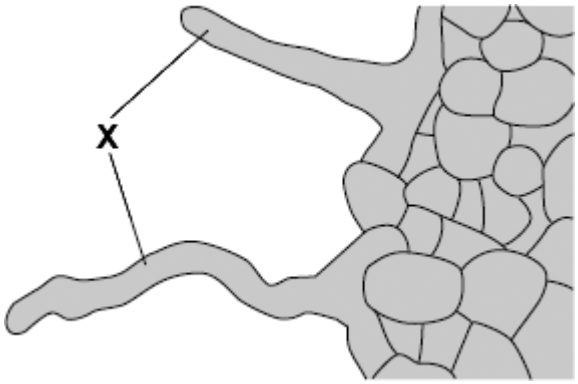
_____

(1)

(Total 7 marks)

Q7.

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.

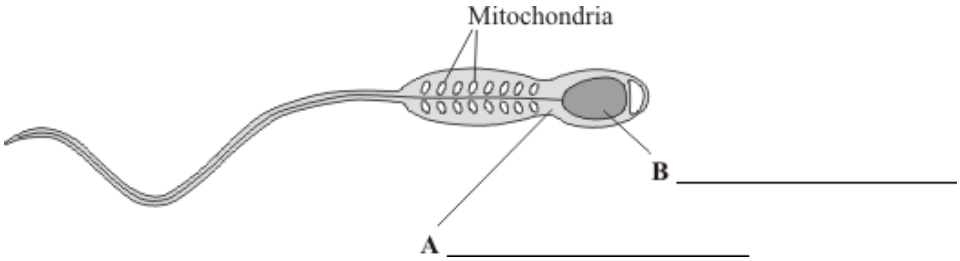
(1)

(Total 5 marks)

Q8.

This question is about cells.

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

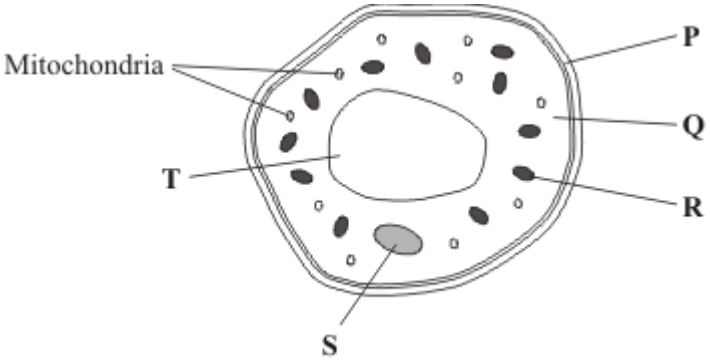


Use words from the box to label parts **A** and **B**.

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. ☐

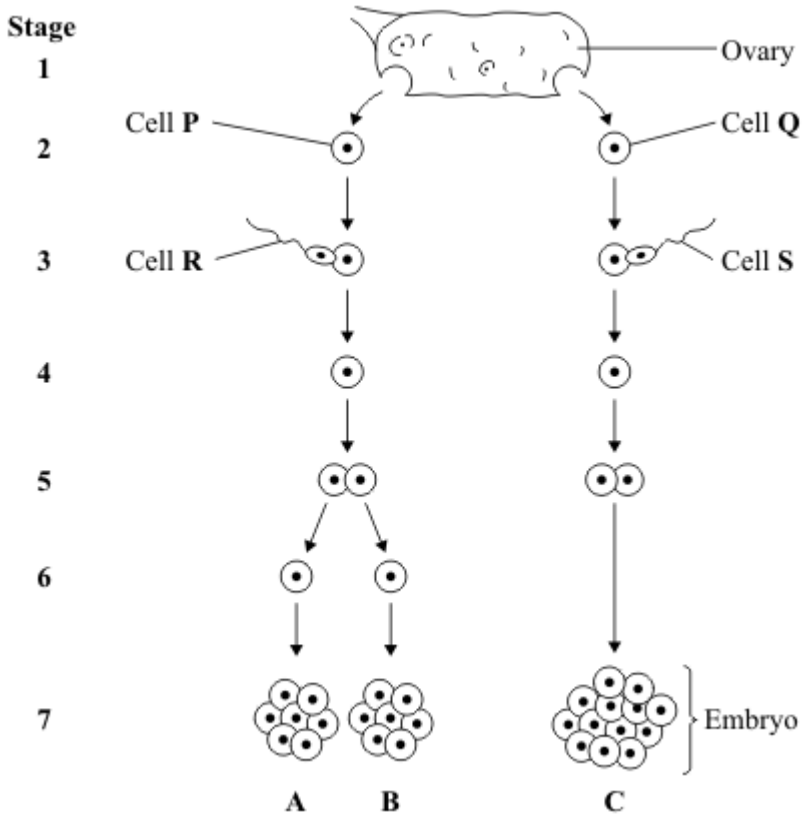
(1)

(Total 4 marks)

Q9.

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.

_____

_____

_____

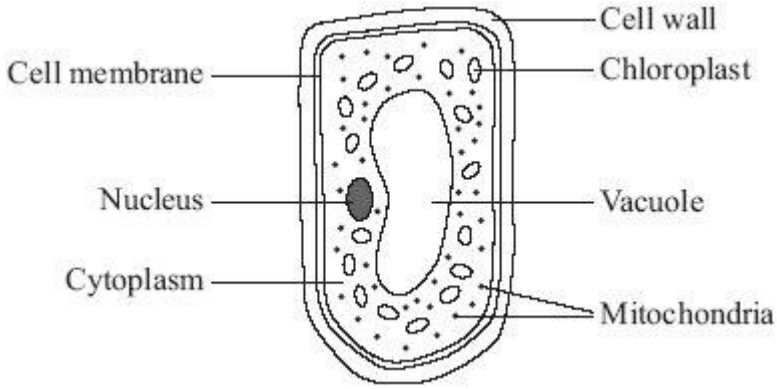
(1)

(Total 9 marks)

Q10.

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. ☐

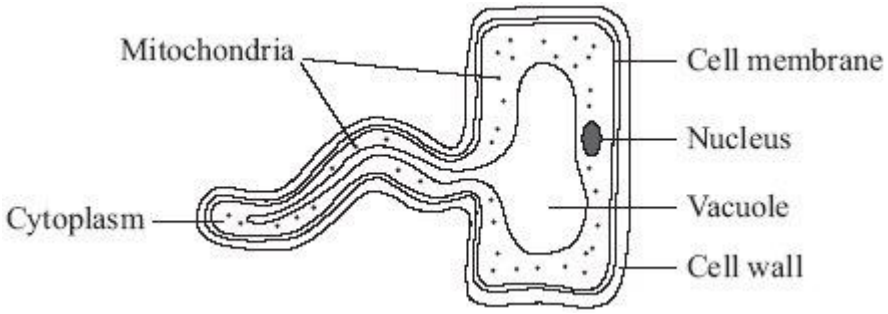
It has cytoplasm. ☐

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)

Q11.

(a) Some scientists investigated the rates of absorption of different sugars by the small intestine.

In one experiment they used a piece of normal intestine.
In a second experiment they used a piece of intestine poisoned by cyanide. Cyanide is poisonous because it prevents respiration.

The results are shown in the table.

	Relative rates of absorption	
Sugar	**Normal intestine**	**Intestine poisoned by cyanide**
Glucose	1.00	0.33
Galactose	1.10	0.53
Xylose	0.30	0.31
Arabinose	0.29	0.29

(i) Name **two** sugars from the table which can be absorbed by active transport.

1. _____

2. _____

(1)

(ii) Use evidence from the table to explain why you chose these sugars.

_____

_____

_____

_____

_____

(3)

(b) All of the sugars named in the table can be absorbed by diffusion.

Explain how information from the table provides evidence for this.

_____

_____

_____

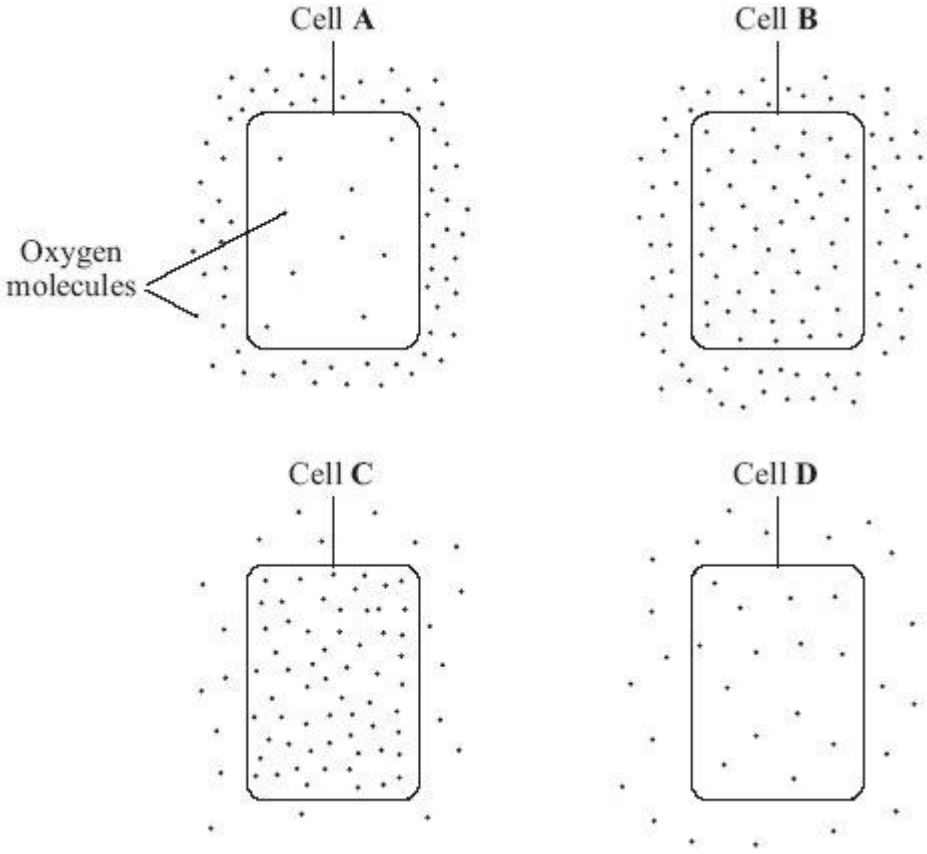
_____

(2)

(Total 6 marks)

Q12.

(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)

membranes

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

mitochondria
nuclei

.

(1)

(iv) Some cells produce oxygen in the process of

diffusion
photosynthesis
respiration

.

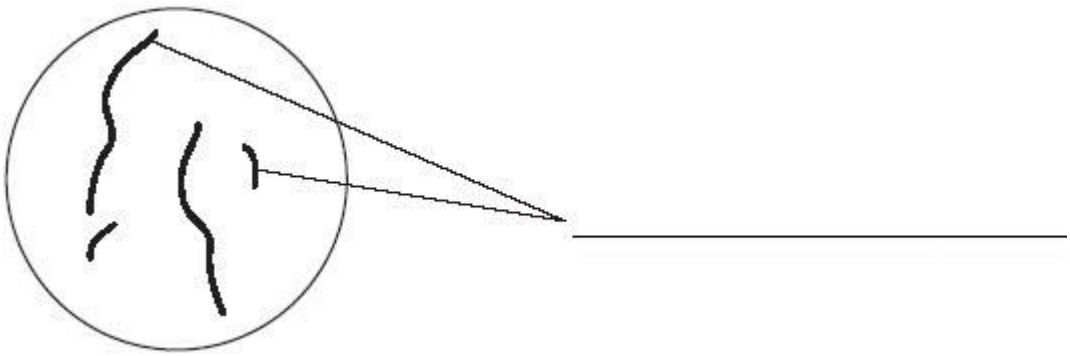
(1)

(Total 5 marks)

Q13.

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

Diagram 1



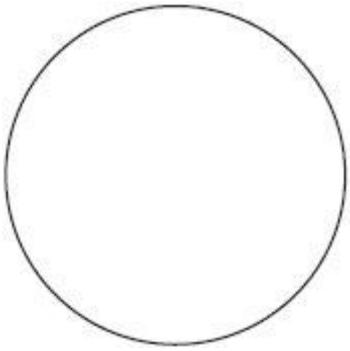
(a) Use a word from the box to label **Diagram 1**.

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)

Q1.

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]

Q2.

(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]

Q3.

(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]

Q4.

(a) (i) C and D

1

(ii) cell wall

1

(b) (i) A

1

(ii) D

1

(c) respiration

1

[5]

Q5.

(a) B

no mark for ÉBÉ, 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) <u>many</u> ribosomes

1

(ribosomes) produce protein

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

protein

or

allow <u>many</u> mitochondria (1)

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

accept ATP for energy

1

[4]

Q6.

(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:

- <u>code</u>
- 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]

Q7.

(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]

Q8.

(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]

Q9.

(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]

Q10.

(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]

Q11.

(a) (i) glucose **and** galactose

1

(ii) any **three** from:

Evidence:

- absorption reduced by cyanide
allow converse

- absorb faster (than other sugars)

Explanation:

- active transport needs <u>energy</u>
- less / no <u>energy</u> available / released if cyanide is there **or** less / no <u>energy</u> if no / less respiration

  allow <u>energy</u> produced

  ignore cyanide prevents respiration

3

(b) all / the sugars / they can be absorbed <u>when gut poisoned</u> / <u>with cyanide</u> **or** <u>when no respiration</u>

1

(diffusion) does not need an <u>energy</u> supply

1

[6]

Q12.

(a) A

1

(b) (i) diffusion

1

(ii) respiration

1

(iii) mitochondria

1

(iv) photosynthesis

1

[5]

Q13.

(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]