AQA GCSE Biology | 8461

SPECIFICATION POINT 4.1.1.3

Cell specialisation

Past-paper questions

Tier	**Foundation**
Question groups	**24**
Available paper years	**2008–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

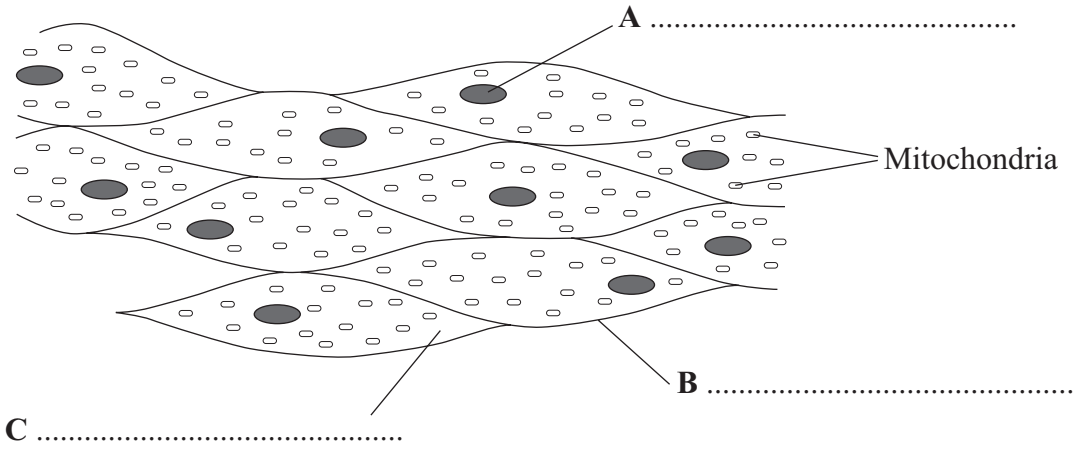
Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.1.1.3 Cell specialisation

Question 01

January 2008 | BLY2F | Original Q1 | Legacy

1 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 marks)

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

.....

.....

.....

(2 marks)

5

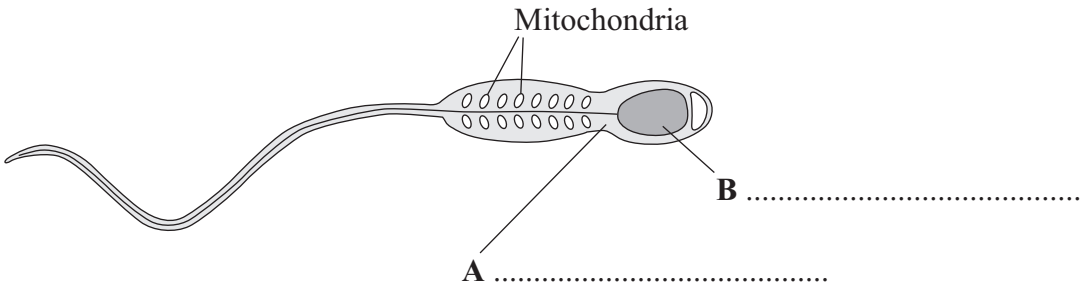
4.1.1.3 Cell specialisation

Question 02

January 2009 | BLY2F | Original Q1 | Legacy

1 This question is about cells.

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

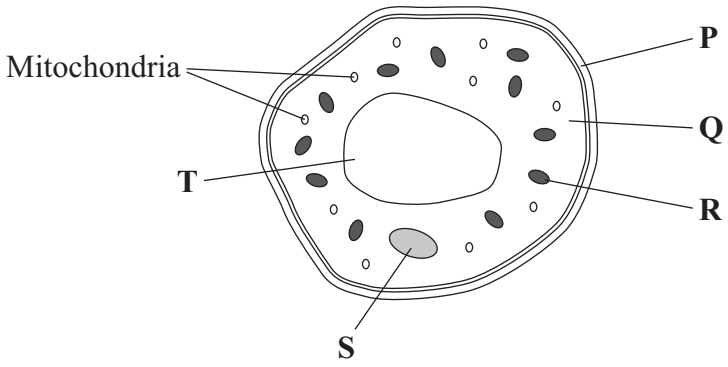


Use words from the box to label parts **A** and **B**.

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

(2 marks)

1 (a) (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 mark)

4.1.1.3 Cell specialisation

Question 02 · continued

for mark

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 mark)

4

Turn over for the next question

4.1.1.3 Cell specialisation

Question 03

March 2010 | BLY1BP | Original Q5 | Legacy

QUESTION FIVE

Tasmanian tigers are similar to Tasmanian devils. Tasmanian tigers became extinct in the 20th century.

The picture shows a Tasmanian tiger.



Scientists are trying to create living Tasmanian tigers. They are using cells from the well-preserved remains of a pregnant Tasmanian tiger. They are trying several methods.

Match methods, **A**, **B**, **C** and **D**, with the descriptions **1–4** in the table.

A sexual reproduction

B tissue culture

C embryo transplants

D adult cell cloning

	Description
1	Splitting cells from the Tasmanian tiger embryo and transplanting them into the womb of a Tasmanian devil.
2	Joining female gametes from the Tasmanian tiger with male sperm cells from a Tasmanian devil.
3	Growing small groups of cells in a special nutrient solution.
4	Transferring the nucleus from a Tasmanian tiger skin cell into a Tasmanian devil egg cell. After the cell is given an electric shock, it is transferred to the womb of a female Tasmanian devil.

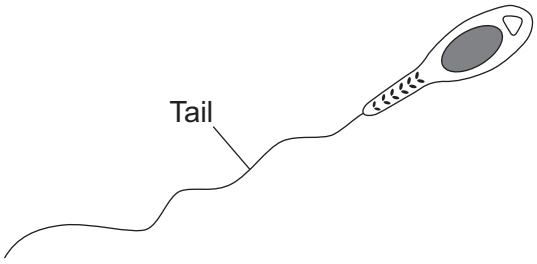
4.1.1.3 Cell specialisation

Question 04

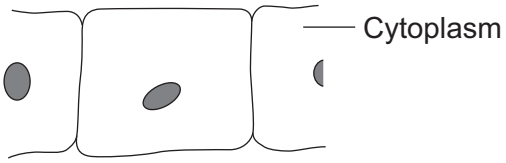
June 2010 | BLY2F | Original Q1 | Legacy

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

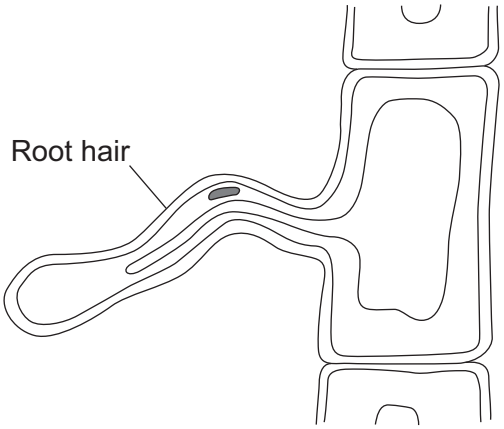
A



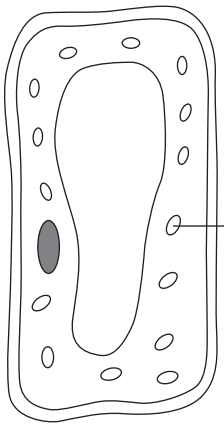
B



C



D



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

Tick (✓) **one** box.

A and **B** ☐

A and **D** ☐

C and **D** ☐

(1 mark)

4.1.1.3 Cell specialisation

Question 04 · continued

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

Draw a ring around **one** answer.

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

(1 mark)

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

(1 mark)

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

(1 mark)

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 mark)

5

4.1.1.3 Cell specialisation

Question 05

June 2012 | BL1FP | Original Q4 | Legacy

4 When animals die, they usually fall to the ground and decay.
In 1977 the body of a baby mammoth was discovered.
The baby mammoth died 40 000 years ago and its body froze in ice.

The picture shows the mammoth.



© Ria Novosti/Science Photo Library

4 (a) Explain why the body of the baby mammoth did **not** decay.

.....

.....

.....

.....

(2 marks)

4.1.1.3 Cell specialisation

Question 05 · continued

4 (b) Mammoths are closely related to modern elephants.
The pictures show these two animals.

What scientists think a mammoth looked like



© Christian Darkin/Science Photo Library

Modern elephant



Mammoths are *extinct*. What does *extinct* mean?

.....

.....

(1 mark)

Question 4 continues on the next page

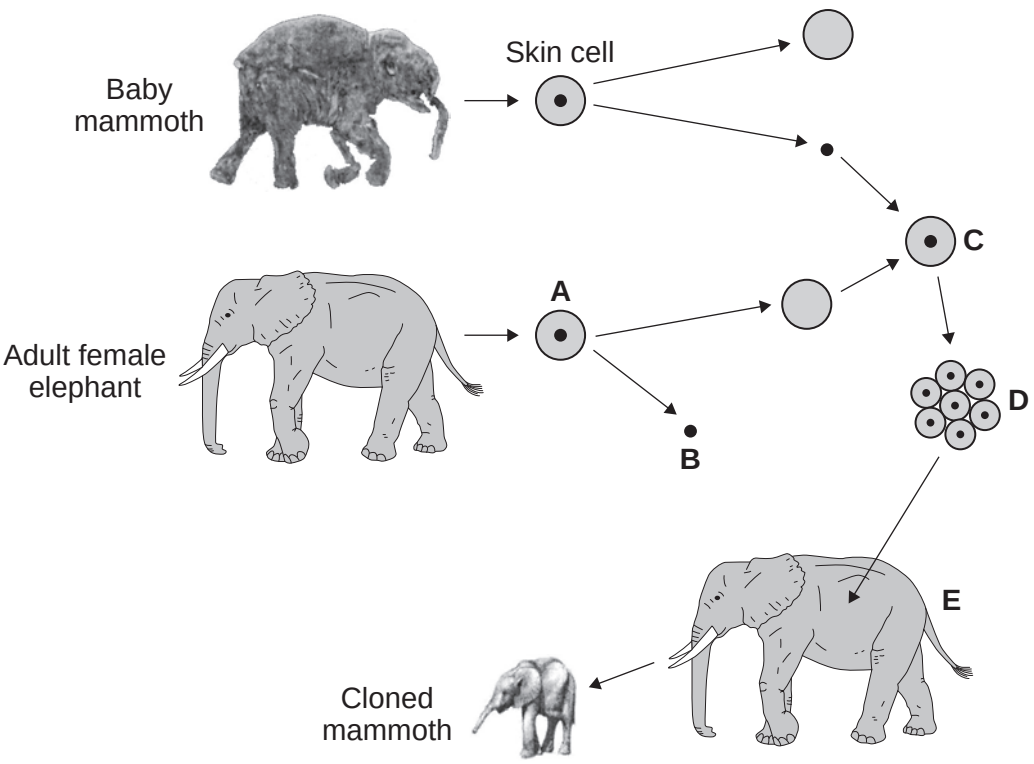
4.1.1.3 Cell specialisation

Question 05 · continued

4 (c) Scientists believe they may be able to use adult cell cloning to recreate a living mammoth.

The scientists will use a skin cell from the baby mammoth.

The diagrams show how the skin cell will be used.



In each question, draw a ring around the correct answer.

4 (c) (i) What type of cell is cell **A**?

skin cell **egg cell** **sperm cell**

(1 mark)

4 (c) (ii) Part **B** is removed from cell **A**.

What part of the cell is part **B**?

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

(1 mark)

4.1.1.3 Cell specialisation

Question 05 · continued

4 (c) (iii) After cell **C** is formed, it divides into embryo cells.

What is done to cell **C** to make it divide?

Cell **C** is

- treated with enzymes.
- mixed with sperm cells.
- given an electric shock.

(1 mark)

4 (c) (iv) The embryo cells form a ball of cells. The ball of cells will be put into female elephant, **E**.

Which part of elephant **E** is the ball of cells put into?

womb **stomach** **ovary**

(1 mark)

4 (d) The scientists expect any offspring of the adult cell cloning to look like a mammoth and **not** like an elephant.

Why?

.....

.....

(1 mark)

8

4.1.1.3 Cell specialisation

Question 06

June 2012 | BL2FP | Original Q4 | Legacy

4 (a) Human body cells contain 46 chromosomes.

4 (a) (i) How many chromosomes are there in a human sperm cell? ☐

(1 mark)

4 (a) (ii) Name the part of the sperm cell that contains the chromosomes.

.....

(1 mark)

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

4 (b) (i) In human females, the sex chromosomes are

X and **X**.

X and **Y**.

Y and **Y**.

(1 mark)

4 (b) (ii) In human males, the sex chromosomes are

X and **X**.

X and **Y**.

Y and **Y**.

(1 mark)

4 (c) A man might release 300 million sperm cells at a time.

How many of these sperm cells would contain an **X** chromosome?

.....

(1 mark)

5

4.1.1.3 Cell specialisation

Question 07

June 2013 | BL2FP | Original Q5 | Legacy

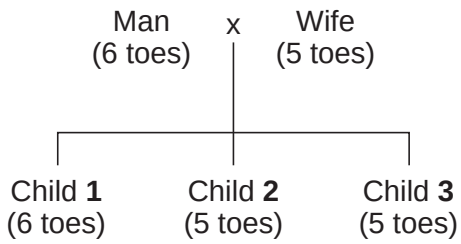
5 Polydactyly is an inherited condition. Polydactyly is controlled by a dominant allele.

The photograph shows the foot of a baby with polydactyly.



A man and his wife have three children. The man has polydactyly.

The diagram shows the inheritance of polydactyly in this family.
The diagram also shows the number of toes each person has on each foot.



In the rest of this question, the following symbols are used to represent alleles.

D = allele for polydactyly (6 toes on each foot)
d = allele for 5 toes on each foot

5 (a) (i) How many alleles for the number of toes will there be in **one** sperm cell? ☐

(1 mark)

5 (a) (ii) Complete the sentence.

A sperm cell joins with an egg cell in a process called ..... .

(1 mark)

4.1.1.3 Cell specialisation

Question 07 · continued

5 (b) (i) What combination of alleles does the man have?

Tick (✓) **one** box.

DD ☐

Dd ☐

dd ☐

(1 mark)

5 (b) (ii) What combination of alleles does the man's wife have?

Tick (✓) **one** box.

DD ☐

Dd ☐

dd ☐

(1 mark)

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

5 (c) (i) The man and his wife plan to have a fourth child.

The probability that this child will have 6 toes on each foot is

1 in 2.

1 in 3.

1 in 4.

(1 mark)

5 (c) (ii) When Child **2** grows up, he marries a woman with 5 toes on each foot.

The probability that their first child will have 6 toes on each foot is

0.

1 in 2.

1 in 4.

(1 mark)

6

4.1.1.3 Cell specialisation

Question 08

June 2014 | BL1FP | Original Q5 | Legacy

5 Most cows produce milk with a fat content of 3.4%.

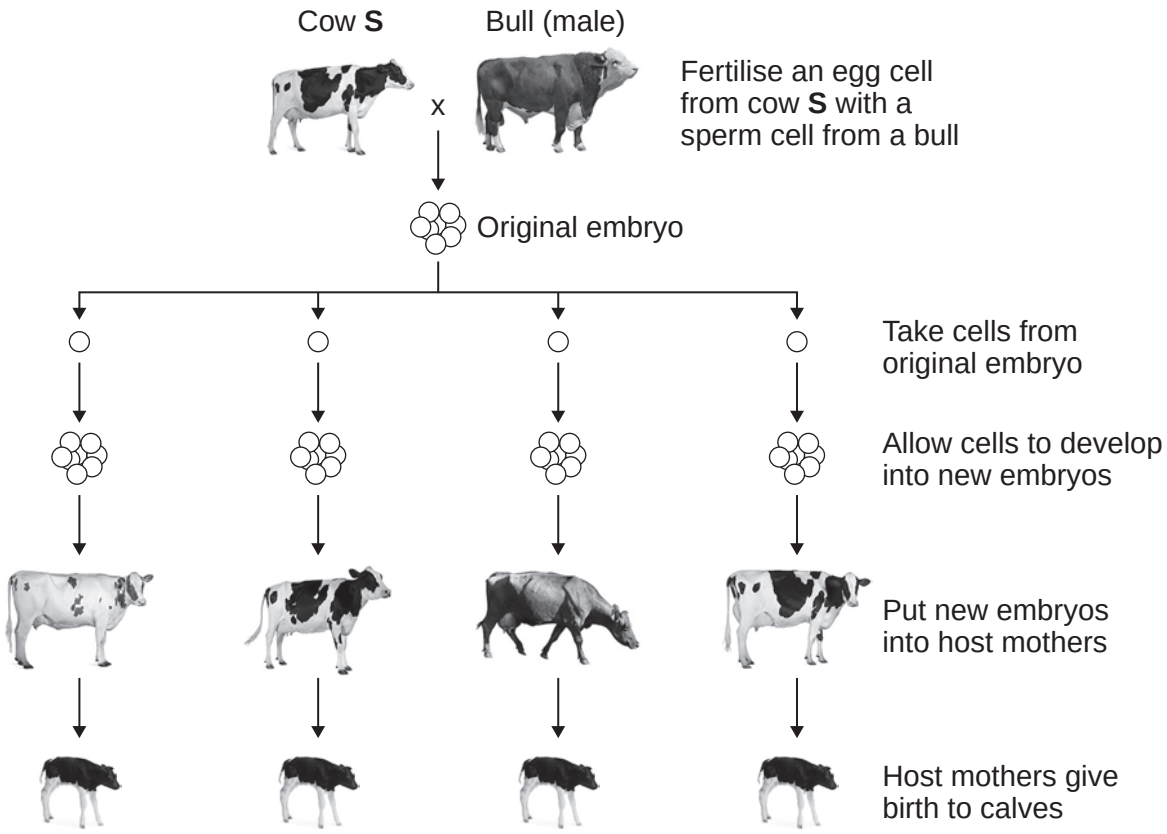
Cow **S** produces milk with a fat content of 1.2%.

Only cow **S** has the gene to produce this low-fat milk.

5 (a) A farmer plans to develop more cows like cow **S**.

Figure 6 shows how the farmer plans to do this.

Figure 6



5 (a) (i) An egg cell from cow **S** is fertilised by a sperm cell from a bull. This is part of sexual reproduction.

What is the scientific name for sex cells such as egg cells and sperm cells?

[1 mark]

.....

4.1.1.3 Cell specialisation

Question 08 · continued

5 (a) (ii) After fertilisation, cells are taken from the original embryo.

These cells develop into new embryos.

Which part of the host mother's body should each new embryo be put into?

[1 mark]

.....

5 (b) (i) The calves born to all of the host mothers are genetically identical to each other.

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

[1 mark]

The calves are genetically identical to each other because

they

- are formed from the same original embryo.
- have the same host mother.
- have the same two parents.

5 (b) (ii) What term is used to describe the method of producing calves shown in **Figure 6**?

Tick (✓) **one** box.

[1 mark]

- Adult cell cloning ☐
- Embryo transplantation ☐
- Genetic modification ☐

5 (b) (iii) Why are the calves born to the host mothers **not** genetically identical to cow **S**?

[1 mark]

.....

.....

5

4.1.1.3 Cell specialisation

Question 09

June 2014 | BL2FP | Original Q5 | Legacy

5 In sexual reproduction, an egg fuses with a sperm.

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

[1 mark]

An egg and a sperm fuse together in the process of

cloning.

fertilisation.

mitosis.

5 (a) (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.

[2 marks]

1 ..... (smallest)

2 .....

3 ..... (largest)

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

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

[1 mark]

The genetic material is made of

carbohydrate.

DNA.

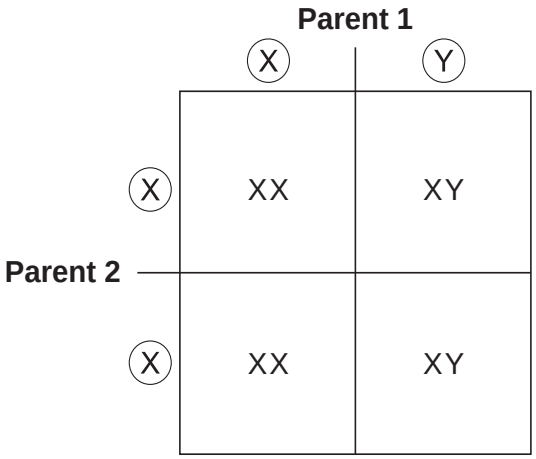
protein.

4.1.1.3 Cell specialisation

Question 09 · continued

5 (b) **Figure 8** shows the inheritance of **X** and **Y** chromosomes.

Figure 8



5 (b) (i) **On Figure 8**, draw a tick (✓) on the part of the diagram that shows a sperm cell.

[1 mark]

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

Give the reason for your answer.

[2 marks]

.....

.....

.....

.....

7

4.1.1.3 Cell specialisation

Question 10

June 2016 | BL3FP | Original Q7 | Legacy

7 Cells, tissues and organs are adapted to take in different substances and get rid of different substances.

Table 1 shows the concentration of four ions outside cells and inside cells.

Table 1

Ion	Concentration outside cells in mmol per dm^3	Concentration inside cells in mmol per dm^3
Sodium	140	9
Potassium	7	138
Calcium	2	27
Chloride	118	3

7 (a) Use information from **Table 1** to complete the following sentences.

[2 marks]

Sodium ions will move into cells by the process

of _____ .

Potassium ions will move into cells by the process

of _____ .

7 (b) Some students investigated the effect of the different concentrations of sugar in four drinks, **A**, **B**, **C** and **D**, on the movement of water across a partially permeable membrane.

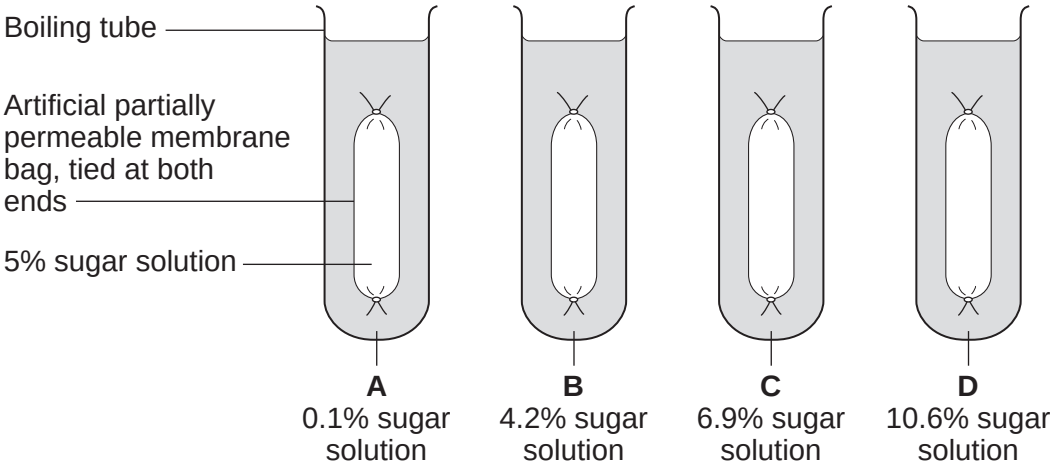
The students:

- made four bags from artificial partially permeable membrane
- put equal volumes of 5% sugar solution in each bag
- weighed each bag containing the sugar solution
- placed one bag in each of the drinks, **A**, **B**, **C** and **D**
- after 20 minutes removed the bags containing the sugar solution and weighed them again.

Question 10 · continued

Figure 9 shows how they set up the investigation.

Figure 9



7 (b) (i) The bag in drink **A** got heavier after 20 minutes.

Explain why.

[3 marks]

7 (b) (ii) In which drink, **A**, **B**, **C** or **D**, would you expect the bag to show the smallest change in mass?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

7 (b) (iii) Explain why you think the bag you chose in part **(b)(ii)** would show the smallest change.

[2 marks]

8

4.1.1.3 Cell specialisation

Question 11

June 2018 | 8461/1F | Original Q2

0 2 Plants are made up of cells, tissues and organs.

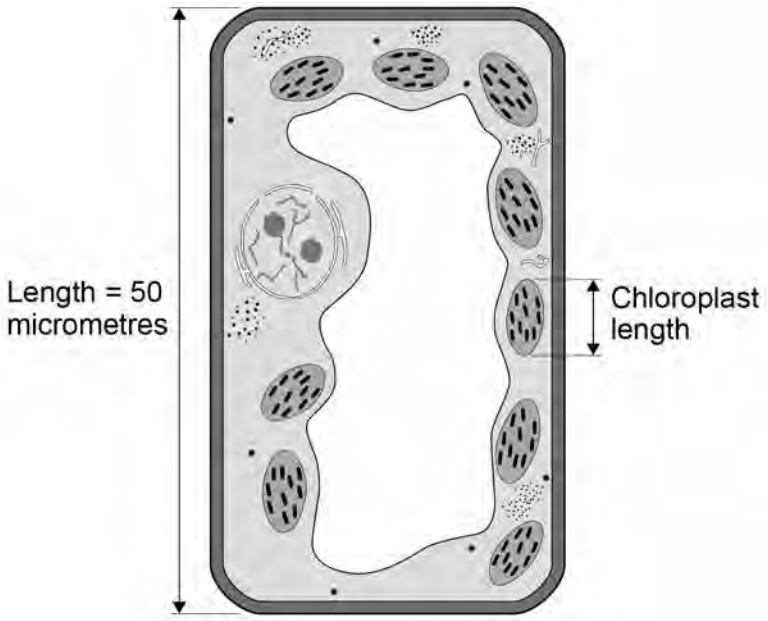
0 2 . 1 Draw **one** line from each level of organisation to the correct plant part.

[2 marks]

Level of organisation	Plant part
	Leaf
Organ	Root hair
	Spongy mesophyll
Tissue	Vacuole
	Xylem cell

Figure 3 shows a plant cell drawn to scale.

Figure 3



4.1.1.3 Cell specialisation

Question 11 · continued

0 2 . 2 Where in a plant would the cell in **Figure 3** be found?

[1 mark]

Tick **one** box.

- Epidermis ☐
- Palisade mesophyll ☐
- Phloem ☐
- Xylem ☐

0 2 . 3 Calculate the length of the chloroplast labelled in **Figure 3**.

[2 marks]

Length = _____ micrometres

0 2 . 4 Cells in plant roots do **not** photosynthesise.

Give **one** reason why.

[1 mark]

4.1.1.3 Cell specialisation

Question 11 · continued

0 2 . 5 As a plant grows, new root hair cells are formed from unspecialised cells.

How does an unspecialised cell become a new root hair cell?

[1 mark]

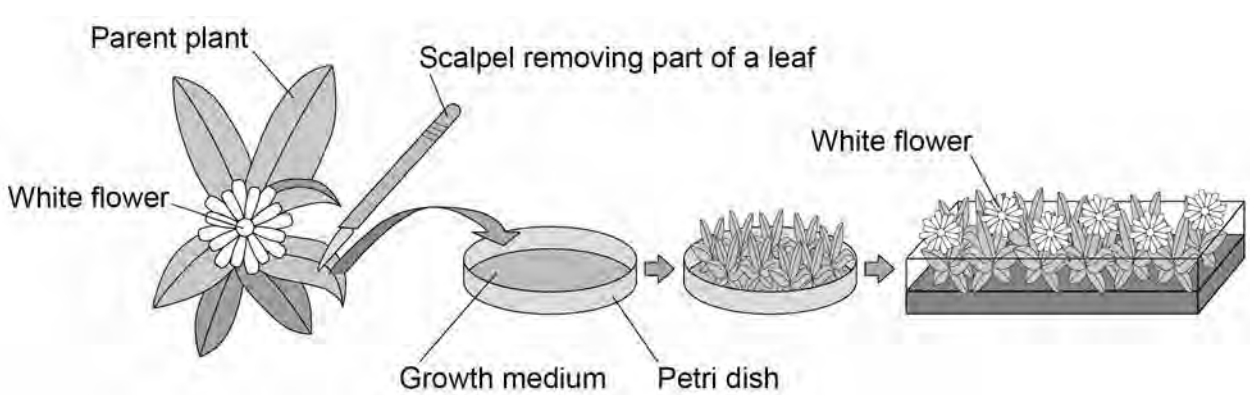
Tick **one** box.

- Differentiation ☐
- Metabolism ☐
- Transpiration ☐
- Transport ☐

Scientists can clone plants using tissue culture.

Figure 4 shows the process of tissue culture.

Figure 4



4.1.1.3 Cell specialisation

Question 11 · continued

0 2 . 6 Why might scientists want to clone plants?

[1 mark]

Tick **one** box.

- To create new species of plants. ☐
- To introduce variation into plants. ☐
- To protect endangered plants from extinction. ☐
- To reduce disease resistance in plants. ☐

0 2 . 7 What is the advantage of cloning plants using tissue culture?

[1 mark]

Tick **one** box.

- No special equipment is needed. ☐
- Plants can be produced quickly. ☐
- The flowers are all different colours. ☐
- The offspring are all genetically different. ☐

0 2 . 8 The growth medium in **Figure 4** helps the plants to grow.

Name **one** substance in the growth medium.

[1 mark]

_____

_____

10

4.1.1.3 Cell specialisation

Question 12

June 2018 | 8461/1F | Original Q6

0 6 Earthworms are small animals that live in soil. Earthworms have no specialised gas exchange system and absorb oxygen through their skin.

0 6 . 1 What is the name of the process in which oxygen enters the skin cells?

[1 mark]

Tick **one** box.

Active transport ☐

Diffusion ☐

Osmosis ☐

Respiration ☐

Table 3 shows information about four skin cells of an earthworm.

Table 3

Cell	Percentage of oxygen	
	Outside cell	Inside cell
A	9	8
B	12	8
C	12	10
D	8	12

0 6 . 2 Which cell has the smallest difference in percentage of oxygen between the outside and the inside of the cell?

[1 mark]

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

4.1.1.3 Cell specialisation

Question 12 · continued

0 6 . 3 Which cell will oxygen move **into** the fastest?

[1 mark]

Tick **one** box.

A		B		C		D	

0 6 . 4 Earthworms have a large surface area to volume ratio.

Suggest why a large surface area to volume ratio is an advantage to an earthworm.

[1 mark]

0 6 . 5 The earthworm uses enzymes to digest dead plants.

Many plants contain fats or oils.

Which type of enzyme would digest fats?

[1 mark]

Question 6 continues on the next page

4.1.1.3 Cell specialisation

Question 12 · continued

0 6 . 6 Earthworms move through the soil.

This movement brings air into the soil.

Dead plants decay faster in soil containing earthworms compared with soil containing **no** earthworms.

Explain why.

[3 marks]

0 6 . 7 When earthworms reproduce, a sperm cell from one earthworm fuses with an egg cell from a different earthworm.

Name the process when an egg cell and a sperm cell fuse.

[1 mark]

0 6 . 8 Some types of worm reproduce by a process called fragmentation.

In fragmentation, the worm separates into two or more parts. Each part grows into a new worm.

What type of reproduction is fragmentation?

[1 mark]

10

4.1.1.3 Cell specialisation

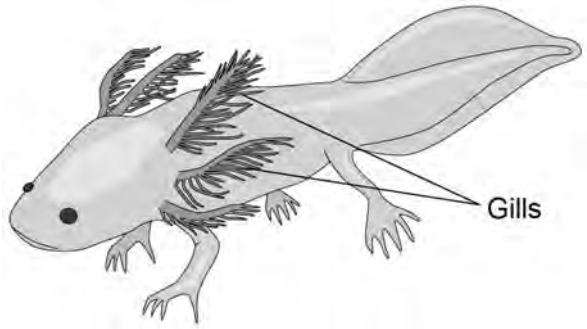
Question 13

June 2019 | 8461/1F | Original Q2

0 2 An animal called an axolotl lives in water.

Figure 3 shows an axolotl.

Figure 3



Oxygen enters the axolotl's bloodstream through the gills by diffusion.

0 2 . 1 What is diffusion?

[1 mark]

Tick (✓) **one** box.

The movement of particles from a high concentration to a low concentration ☐

The movement of particles from a low concentration to a high concentration ☐

The movement of water from a concentrated solution to a more dilute solution ☐

0 2 . 2 Describe how **one** feature of the axolotl's gills increases the rate of diffusion of oxygen.

Use information from **Figure 3**.

[2 marks]

Feature _____

Description _____

_____

_____

4.1.1.3 Cell specialisation

Question 13 · continued

If a gill of an axolotl is removed, stem cells in the damaged area will divide and a new gill will grow.

0 2 . 3 Complete the sentence.

[1 mark]

Choose the answer from the box.

adaptation	**differentiation**	**evolution**	**variation**

When stem cells specialise to produce gill cells, this process is known as _____.

0 2 . 4 Complete the sentence.

[1 mark]

Choose the answer from the box.

binary fission	**mitosis**	**mutation**

To grow a new gill the stem cells divide by _____.

0 2 . 5 Which **one** of the following does **not** contain stem cells?

[1 mark]

Tick (✓) **one** box.

- Bone marrow ☐
- Embryos ☐
- Hair ☐
- Meristem tissue ☐

4.1.1.3 Cell specialisation

Question 13 · continued

0 2 . 6 Axolotls are small animals. Axolotls are used in stem cell research.

What are **two** advantages of using axolotls in stem cell research?

[2 marks]

Tick (✓) **two** boxes.

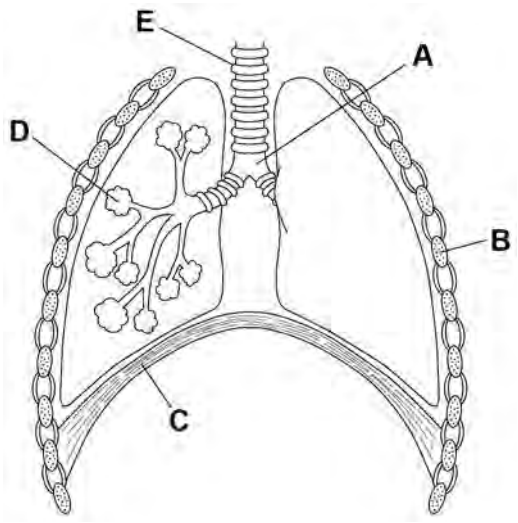
- Axolotls are cheap to feed. ☐
- Axolotls are easy to breed. ☐
- Axolotls are endangered. ☐
- Axolotls live in water. ☐
- Axolotl research is cruel. ☐

Question 13 · continued

Oxygen uptake in humans takes place in the lungs.

Figure 4 shows the human breathing system.

Figure 4



0 2 . 7 Where does oxygen enter the bloodstream?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 2 . 8 Name part **E** on **Figure 4**.

[1 mark]

0 2 . 9 Which blood vessel carries blood to the lungs?

[1 mark]

Tick (✓) **one** box.

Aorta ☐

Pulmonary artery ☐

Vena cava ☐

11

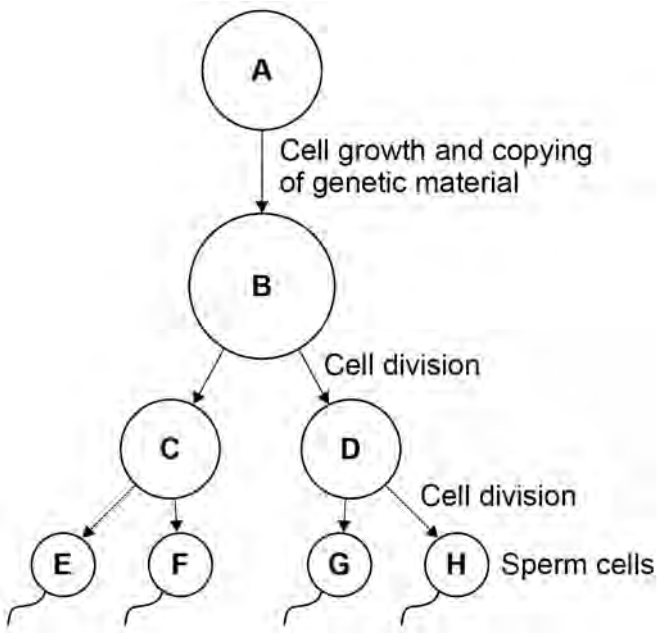
4.1.1.3 Cell specialisation

Question 14

June 2019 | 8461/2F | Original Q3

0 3 **Figure 6** shows the production of sperm cells in humans.

Figure 6



0 3 . 1 Cell **A** is a normal body cell.

How many chromosomes are there in cell **A**?

[1 mark]

Tick (✓) **one** box.

23 ☐ 46 ☐ 48 ☐ 92 ☐

0 3 . 2 What is the mass of DNA in cell **E**?

[1 mark]

Tick (✓) **one** box.

A quarter of the mass of the DNA in cell **A** ☐

Half the mass of the DNA in cell **A** ☐

The same mass as the DNA in cell **A** ☐

Twice the mass of the DNA in cell **A** ☐

4.1.1.3 Cell specialisation

Question 14 · continued

0 3 . 3 What type of cell division produces sperm cells?

[1 mark]

Tick (✓) **one** box.

- Binary fission ☐
- Differentiation ☐
- Meiosis ☐

0 3 . 4 Sometimes there are errors in copying the genetic material.

What term describes an error in the genetic material?

[1 mark]

Tick (✓) **one** box.

- Absorption ☐
- Fertilisation ☐
- Mitosis ☐
- Mutation ☐

0 3 . 5 A woman has three children, aged 4, 6 and 9 years.

Why are the children **not** genetically identical?

[2 marks]

4.1.1.3 Cell specialisation

Question 14 · continued

In sexual reproduction, a sperm cell fuses with an egg cell to form a new single cell.

An embryo develops from the single cell.

The cell divides three times to produce the embryo.

0 3 . 6 How many cells are there in the embryo after three cell divisions?

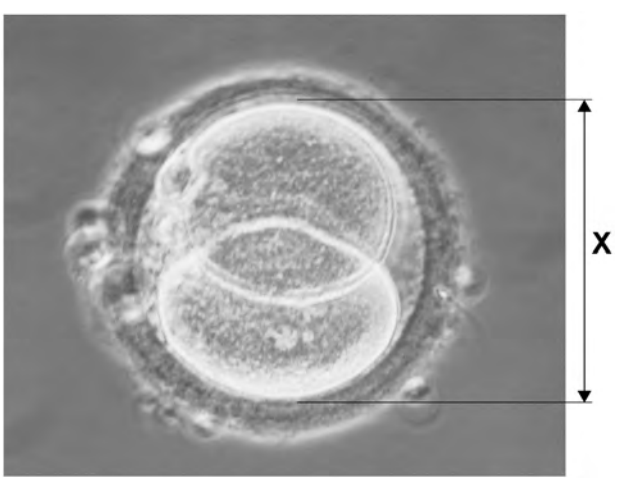
[1 mark]

Tick (✓) **one** box.

3 ☐ 6 ☐ 8 ☐ 9 ☐

Figure 7 shows a different human embryo.

Figure 7



0 3 . 7 Measure image length **X** on **Figure 7**.

[1 mark]

Give your answer in millimetres (mm).

X = _____ mm

4.1.1.3 Cell specialisation

Question 14 · continued

0 3 . 8 The image in **Figure 7** has been magnified ×500

Calculate the real length of the embryo.

Use the equation:

$$\text{real length of the embryo} = \frac{\text{image length}}{\text{magnification}}$$

Give your answer in micrometres (μm).

1 mm = 1000 μm

[3 marks]

Real length of the embryo = _____ μm

0 3 . 9 The embryo may **not** implant in the lining of the uterus.

The embryo will then be lost from the woman's body several days later.

Explain why the woman may **not** notice this has happened.

[2 marks]

13

4.1.1.3 Cell specialisation

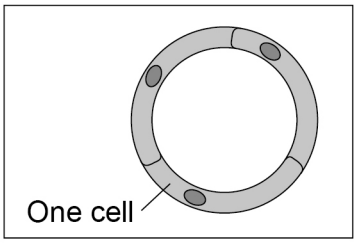
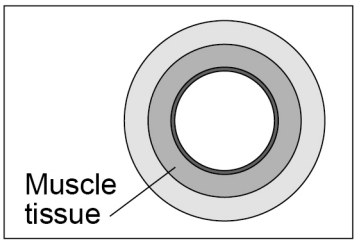
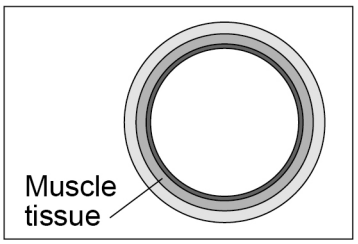
Question 15

November 2020 | 8461/1F | Original Q6

0 6 Blood is transported around the body in blood vessels.

0 6 . 1 Draw **one** line from each type of blood vessel to the structure of the blood vessel.

[2 marks]

Type of blood vessel	Structure of blood vessel
Artery	
Capillary	
Vein	

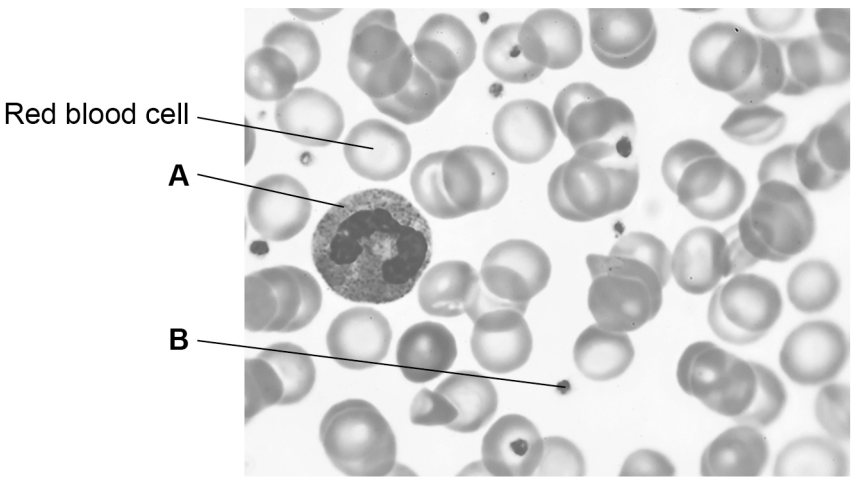
0 6 . 2 Explain how the structure of an artery is related to its function.

[2 marks]

Question 15 · continued

Figure 9 shows blood viewed through a microscope.

Figure 9



0 6 . 3 Name **A** and **B** in **Figure 9**.

[2 marks]

A _____

B _____

0 6 . 4 A red blood cell:

- has no nucleus
- contains a red pigment called haemoglobin.

Suggest how these adaptations help the red blood cell carry out its function.

[2 marks]

No nucleus _____

_____

Haemoglobin _____

_____

4.1.1.3 Cell specialisation

Question 15 · continued

0 6 . 5 The blood components are carried around the body in the liquid part of the blood.

What is the liquid part of the blood called?

[1 mark]

Tick (✓) **one** box.

Cell sap ☐

Plasma ☐

Saliva ☐

Urine ☐

Table 2 shows the results of a man's blood test.

Table 2

Blood component	Patient results	Normal range
Red blood cells	4.8	4.5 to 6.5
Lymphocytes	2.6	1.0 to 4.0
Neutrophils	5.1	1.8 to 7.5
Platelets	50	140 to 400

0 6 . 6 Which component of the man's blood is **not** within the normal range?

[1 mark]

0 6 . 7 Suggest a symptom the man might show.

[1 mark]

11

4.1.1.3 Cell specialisation

Question 16

November 2020 | 8461/1F | Original Q8

0 8 Diffusion is an important process in animals and plants.

0 8 . 1 What is meant by the term diffusion?

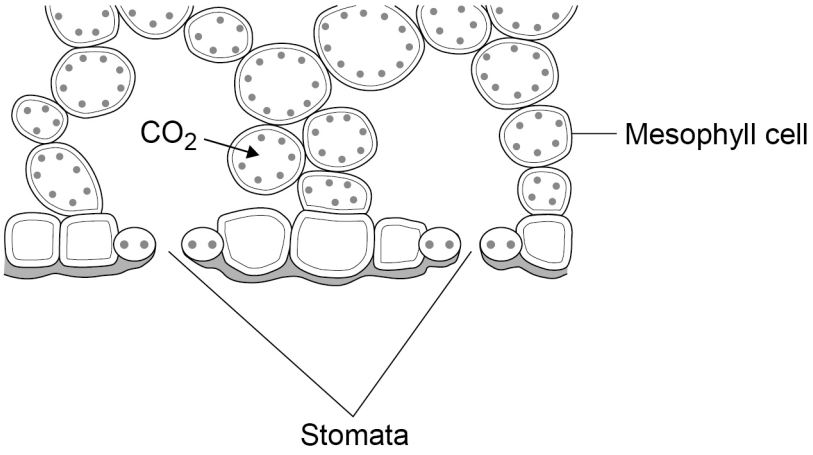
[2 marks]

4.1.1.3 Cell specialisation

Question 16 · continued

0 8 . 2 **Figure 11** shows part of a leaf.

Figure 11



Molecules of carbon dioxide diffuse from the air into the mesophyll cells.

Which **two** changes will increase the rate at which carbon dioxide diffuses into the mesophyll cells?

[2 marks]

Tick (✓) **two** boxes.

- Decreased number of chloroplasts in the cells ☐
- Decreased surface area of cells in contact with the air ☐
- Increased carbon dioxide concentration in the air ☐
- Increased number of stomata that are open ☐
- Increased oxygen concentration in the air ☐

Question 8 continues on the next page

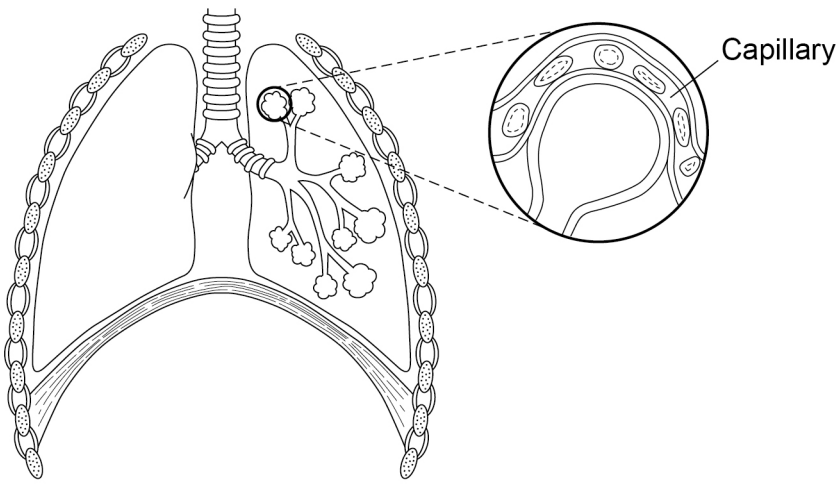
4.1.1.3 Cell specialisation

Question 16 · continued

0 8 . 3 Diffusion also happens in the human lungs.

Figure 12 shows the human breathing system.

Figure 12



Explain how the human lungs are adapted for efficient exchange of gases by diffusion.

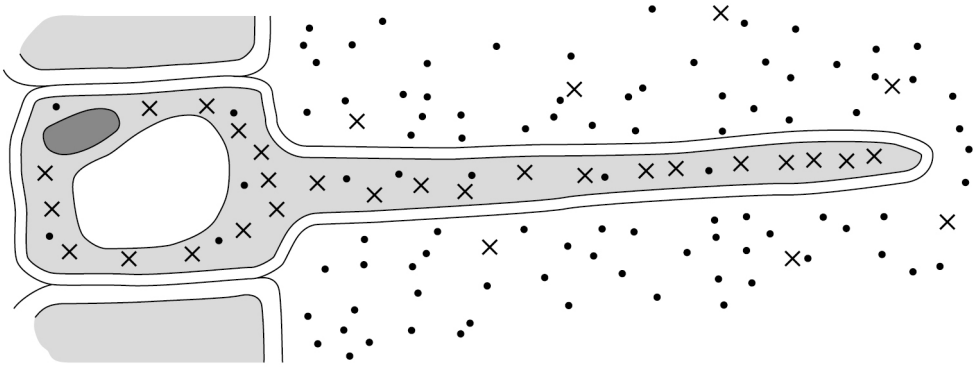
[6 marks]

4.1.1.3 Cell specialisation

Question 16 · continued

Figure 13 shows a root hair cell.

Figure 13



Key

Water molecules

Nitrate ions

0 8 . 4 Name the process by which water molecules enter the root hair cell.

[1 mark]

0 8 . 5 Nitrate ions need a different method of transport into the root hair cell.

Explain how the nitrate ions in **Figure 13** are transported into the root hair cell.

Use information from **Figure 13** in your answer.

[3 marks]

Name of process _____

Explanation _____

_____

_____

_____

_____

14

4.1.1.3 Cell specialisation

Question 17

November 2020 | 8461/2F | Original Q3

0 3 Sperm cells and egg cells are formed by meiosis.

0 3 . 1 During meiosis a cell divides twice.

How many sperm cells are formed when a cell divides by meiosis?

[1 mark]

0 3 . 2 Human body cells contain 46 chromosomes.

How many chromosomes are in each human egg cell?

[1 mark]

4.1.1.3 Cell specialisation

Question 17 · continued

Dupuytren's is a disorder that affects the hands.

One form of Dupuytren's is caused by a dominant allele (**D**).

The allele for **not** having Dupuytren's is recessive (**d**).

0 3 . 3 What is an allele?

[1 mark]

Tick (✓) **one** box.

- A different form of a chromosome ☐
- A different form of a gamete ☐
- A different form of a gene ☐

0 3 . 4 A man with Dupuytren's has the genotype **Dd**.

Which word describes the man's genotype?

[1 mark]

Tick (✓) **one** box.

- Heterozygous ☐
- Homozygous ☐
- Phenotype ☐

Question 3 continues on the next page

4.1.1.3 Cell specialisation

Question 17 · continued

The man with Dupuytren's (**Dd**) and a woman who does **not** have Dupuytren's (**dd**) plan to have a child.

0 3 . 5 Complete the genetic diagram in **Figure 4** to show the possible genotypes of the child.

[2 marks]

Figure 4

		Woman	
		d	**d**
Man	**D**	Dd	
	d		

0 3 . 6 Draw a ring around the genotype of a child in **Figure 4** who will have Dupuytren's.

[1 mark]

0 3 . 7 What is the chance of the child having Dupuytren's?

[1 mark]

Tick (✓) **one** box.

25% ☐ 50% ☐ 75% ☐ 100% ☐

4.1.1.3 Cell specialisation

Question 17 · continued

0 3 . 8 A genetic disorder develops as a result of a change in a gene.

What scientific term describes a change in a gene?

[1 mark]

0 3 . 9 People with a family history of some genetic disorders are offered embryo screening.

Suggest **one** way embryo screening can help people with a family history of a genetic disorder.

[1 mark]

10

Turn over for the next question

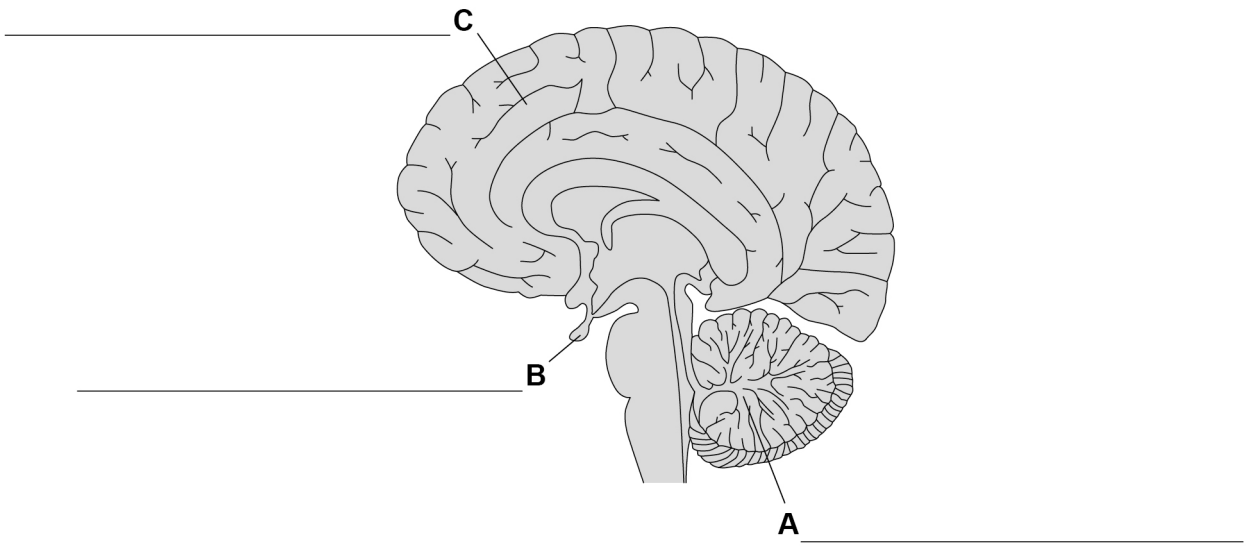
4.1.1.3 Cell specialisation

Question 18

November 2020 | 8461/2F | Original Q5

0 5 **Figure 6** shows the brain.

Figure 6



0 5 . 1 Label **A**, **B** and **C** on **Figure 6**.

[3 marks]

Choose answers from the box.

cerebellum	**cerebral cortex**	**medulla**	**pituitary gland**

0 5 . 2 Which part of the brain controls balance when riding a bicycle?

[1 mark]

Tick (✓) **one** box.

Cerebellum ☐

Medulla ☐

Pituitary gland ☐

Question 5 continues on the next page

4.1.1.3 Cell specialisation

Question 18 · continued

0 5 . 3 The ears send information about sound to the brain.

Which word describes the brain?

[1 mark]

Tick (✓) **one** box.

- Coordinator ☐
- Effector ☐
- Receptor ☐
- Stimulus ☐

0 5 . 4 What type of cell carries impulses from the ears to the brain?

[1 mark]

_____

0 5 . 5 Human eyes detect light.

Which part of the eye has cells that detect light?

[1 mark]

Tick (✓) **one** box.

- Iris ☐
- Lens ☐
- Retina ☐

4.1.1.3 Cell specialisation

Question 18 · continued

0 5 . 6 The eyes of some birds have specialised cells to detect ultraviolet (UV) light.

Some fruits reflect UV light.

Explain why it is an advantage for birds to be able to detect UV light.

[2 marks]

Question 5 continues on the next page

4.1.1.3 Cell specialisation

Question 18 · continued

Figure 7 shows a student reading a book.

Figure 7



There are trees on the far side of the field.

The student looks at the trees instead of looking at the book.

0 5 . 7 What process occurs in the eye when the student looks at the trees instead of looking at the book?

[1 mark]

Tick (✓) **one** box.

Accommodation ☐

Magnification ☐

Reflection ☐

4.1.1.3 Cell specialisation

Question 18 · continued

November 2020 | 8461/2F | Original Q5

0 5 . 8 What change happens in the student's eyes when they look up at the trees?

[1 mark]

Tick (✓) **one** box.

Light rays are refracted less ☐

More light is reflected ☐

The optic nerves move ☐

0 5 . 9 The student **cannot** see the trees in focus.

Name the common defect of the eye which causes distant objects to appear out of focus.

[1 mark]

_____

12

4.1.1.3 Cell specialisation

Question 19

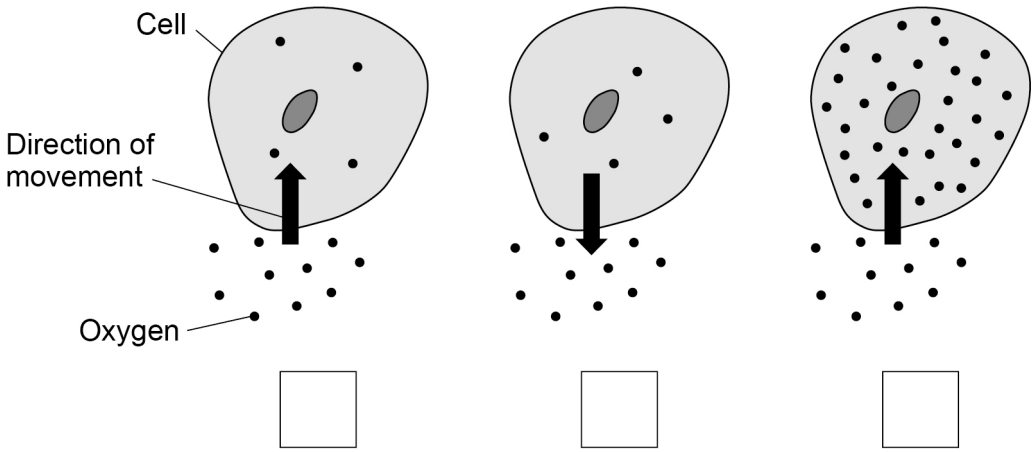
November 2021 | 8461/1F | Original Q1

0 1 This question is about cells.

0 1 . 1 Which diagram shows oxygen moving by diffusion?

[1 mark]

Tick (✓) **one** box.



0 1 . 2 Complete the sentences.

[3 marks]

Choose answers from the box.

carbon dioxide	**chlorophyll**	**energy**
light	**mineral ions**	**water**

Plant cells absorb substances from the soil.

Plant cells use osmosis to absorb _____.

Plant cells use active transport to absorb _____.

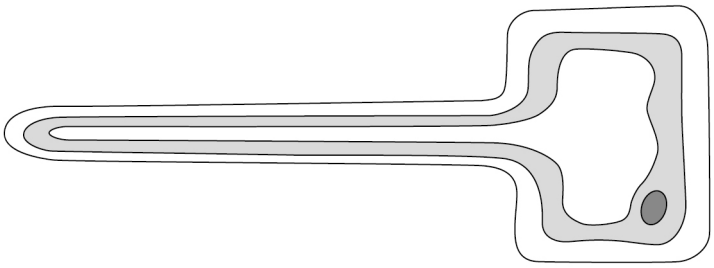
Active transport moves substances against the concentration gradient and needs _____.

4.1.1.3 Cell specialisation

Question 19 · continued

Figure 1 shows a specialised cell that absorbs substances from the soil.

Figure 1



0 1 . 3 Name the type of specialised cell in **Figure 1**.

[1 mark]

0 1 . 4 Describe how the cell in **Figure 1** is adapted to increase the absorption of substances from the soil.

[1 mark]

Question 1 continues on the next page

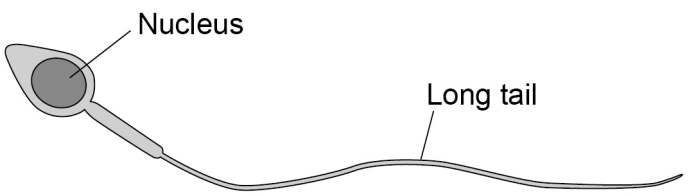
4.1.1.3 Cell specialisation

Question 19 · continued

A sperm cell is another specialised cell.

Figure 2 shows a sperm cell.

Figure 2



0 1 . 5 Draw **one** line from each feature to how the feature helps the sperm cell carry out its function.

[2 marks]

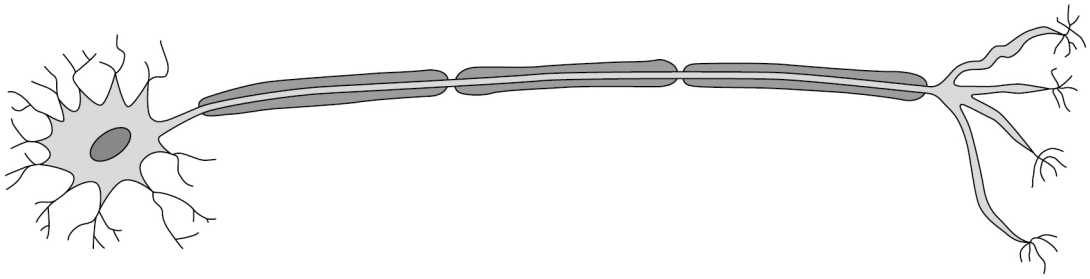
Feature of sperm cell	How the feature helps
Contains a nucleus	To break the outer layer of the egg
	To help the cell to swim to the egg
Has a long tail	To provide the chromosomes for fertilisation
	To release energy

4.1.1.3 Cell specialisation

Question 19 · continued

Figure 3 shows another specialised cell.

Figure 3



0 1 . 6 Name the type of cell in **Figure 3**.

Describe **one** feature of the cell that helps it to carry out its function.

[2 marks]

Name of the cell _____

Feature of the cell _____

_____

10

4.1.1.3 Cell specialisation

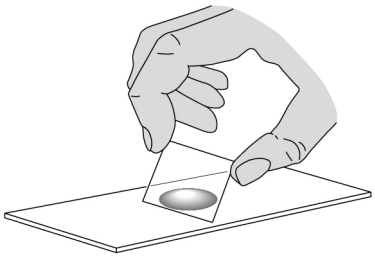
Question 20

November 2021 | 8461/1F | Original Q7

0 7 A student prepared some animal cells to view using a microscope.

Figure 14 shows the student preparing the cells.

Figure 14



0 7 . 1 Name **two** pieces of laboratory equipment the student could have used to **prepare** cells to view using a microscope.

[2 marks]

1 _____

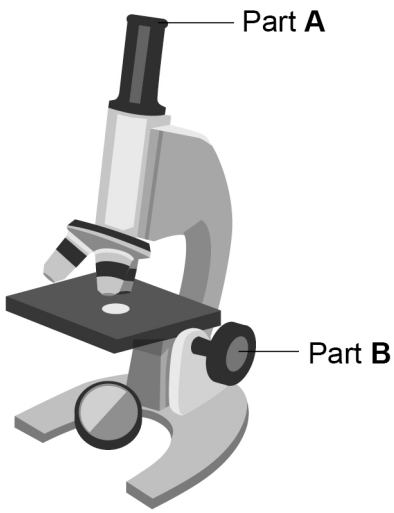
2 _____

4.1.1.3 Cell specialisation

Question 20 · continued

Figure 15 shows the student's light microscope.

Figure 15



0 7 . 2 Name part **A**.

[1 mark]

0 7 . 3 What is the function of part **B**?

[1 mark]

0 7 . 4 The student tried to look at the cells using the microscope.

Suggest **one** reason why the student could **not** see any cells when looking through part **A**.

[1 mark]

Question 7 continues on the next page

4.1.1.3 Cell specialisation

Question 20 · continued

0 7 . 5 Red blood cells are specialised animal cells.

Compare the structure of a red blood cell with the structure of a plant cell.

[6 marks]

0 7 . 6 When placed into a beaker of water:

- a red blood cell bursts
- a plant cell does **not** burst.

Explain why the red blood cell bursts but the plant cell does **not** burst.

[2 marks]

13

4.1.1.3 Cell specialisation

Question 21

November 2021 | 8461/2F | Original Q8

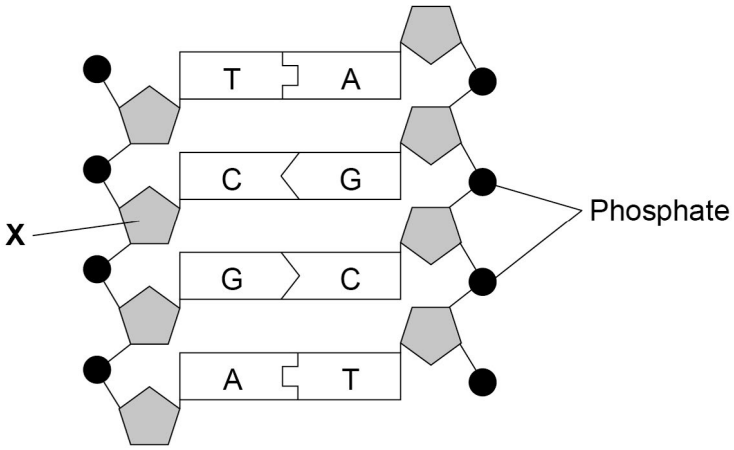
0 8 The nucleus of a cell contains DNA.

0 8 . 1 Name the structures inside the cell nucleus that contain DNA.

[1 mark]

Figure 13 shows part of a DNA molecule.

Figure 13



0 8 . 2 Name the part of the DNA molecule labelled **X**.

[1 mark]

0 8 . 3 What type of substances are labelled **A**, **C**, **G** and **T** in **Figure 13**?

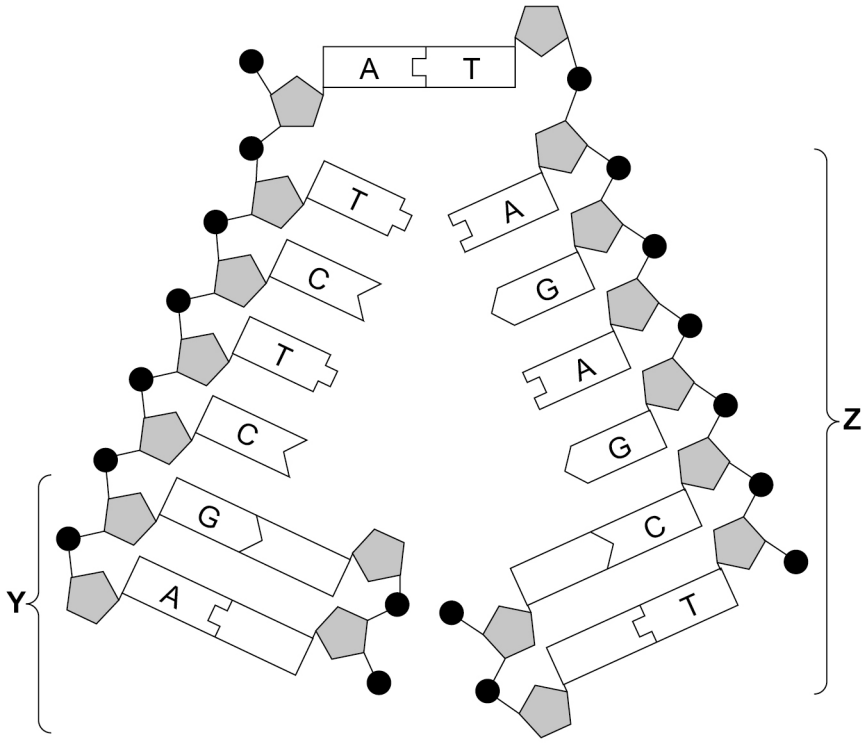
[1 mark]

4.1.1.3 Cell specialisation

Question 21 · continued

Figure 14 shows another section of a DNA molecule.

Figure 14



0 8 . 4 Four of the substances you named in Question **08.3** are **not** labelled in part **Y** of **Figure 14**.

Label each of these substances with the correct letter, **A**, **C**, **G** or **T**.

Use information from other parts of **Figure 14** to help you.

[1 mark]

0 8 . 5 What is happening to the DNA in part **Z** of **Figure 14**?

[1 mark]

Tick (✓) **one** box.

- Differentiation ☐
- Evolution ☐
- Fertilisation ☐
- Replication ☐

4.1.1.3 Cell specialisation

Question 21 · continued

0 8 . 6 A gene is a length of DNA.

What type of substance does a gene code for?

[1 mark]

0 8 . 7 Most human body cells contain 6×10^{-12} grams of DNA.

What mass of DNA will a human sperm cell contain?

[1 mark]

Tick (✓) **one** box.

- 6×10^{-6} grams ☐
- 6×10^{-12} grams ☐
- 3×10^{-6} grams ☐
- 3×10^{-12} grams ☐

0 8 . 8 What is the name of the type of cell division that produces sperm cells?

[1 mark]

Tick (✓) **one** box.

- Binary fission ☐
- Differentiation ☐
- Meiosis ☐
- Mitosis ☐

8

4.1.1.3 Cell specialisation

Question 22

June 2022 | 8461/2F | Original Q5

0 5 In the human female, an egg is released from one of the ovaries about once every four weeks.

During the four weeks, the lining of the uterus thickens and then breaks down.

This is called the menstrual cycle.

0 5 . 1 Which **two** hormones are female reproductive hormones?

[2 marks]

Tick (✓) **two** boxes.

- Adrenaline ☐
- Oestrogen ☐
- Progesterone ☐
- Testosterone ☐
- Thyroxine ☐

0 5 . 2 Follicle stimulating hormone (FSH) is another female reproductive hormone.

What is the function of FSH in the menstrual cycle?

[1 mark]

Tick (✓) **one** box.

- FSH causes an egg to mature in the ovary. ☐
- FSH causes breast development. ☐
- FSH causes the uterus lining to break down. ☐

4.1.1.3 Cell specialisation

Question 22 · continued

0 5 . 3 Sperm cells can survive inside a woman's reproductive organs for five days.

An egg cell can survive for one day after ovulation.

In one woman ovulation occurred on day 14.

Give the range of days on which sexual intercourse could result in fertilisation.

[1 mark]

From day _____ to day _____

0 5 . 4 If a man and a woman have sexual intercourse and do **not** want to produce a baby, they may use contraception.

Explain how different methods of contraception prevent pregnancy.

[6 marks]

10

4.1.1.3 Cell specialisation

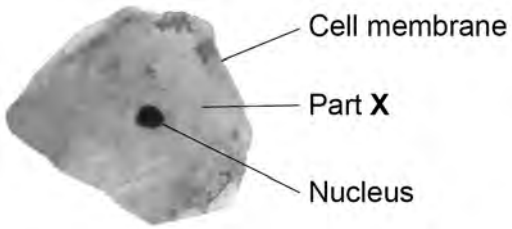
Question 23

June 2025 | 8461/1F | Original Q1

0 1 This question is about cells.

0 1 . 1 **Figure 1** shows an animal cell seen through a microscope.

Figure 1



What is part **X** in **Figure 1**?

[1 mark]

Tick (✓) **one** box.

Cytoplasm ☐

Mitochondrion ☐

Vacuole ☐

0 1 . 2 Name **one** structure found in the nucleus.

[1 mark]

_____

0 1 . 3 Name **one** cell part that is found in a plant cell but is **not** found in an animal cell.

[1 mark]

_____

4.1.1.3 Cell specialisation

Question 23 · continued

0 1 . 4 Root hair cells are found in plants.

Which substance do root hair cells absorb from the soil?

[1 mark]

Tick (✓) **one** box.

- Glucose ☐
- Protein ☐
- Water ☐

0 1 . 5 A sperm cell is a specialised cell.

What is the function of a sperm cell?

[1 mark]

Question 1 continues on the next page

4.1.1.3 Cell specialisation

Question 23 · continued

0 1 . 6 Draw **one** line from each specialised cell to the type of organism where the specialised cell is found.

[2 marks]

Specialised cell	Type of organism
Nerve cell	Animals
Xylem cell	Bacteria
	Fungi
	Plants

0 1 . 7 The cell membrane controls which substances move into and out of cells.

Which **two** processes move substances into and out of cells?

[2 marks]

Tick (✓) **two** boxes.

- Active transport ☐
- Diffusion ☐
- Mitosis ☐
- Mutation ☐
- Respiration ☐

4.1.1.3 Cell specialisation

Question 23 · continued

0 1 . 8 **Table 1** shows substances that are exchanged between the blood and muscle cells.

Complete **Table 1** to show the direction of movement of each substance.

[3 marks]

Tick (✓) **one** box in each row.

Table 1

Substance	Direction of movement of substance		
	ONLY from blood to muscle cells	**ONLY from muscle cells to blood**	**From blood to muscle cells AND from muscle cells to blood**
Carbon dioxide			
Oxygen			
Water			

12

4.1.1.3 Cell specialisation

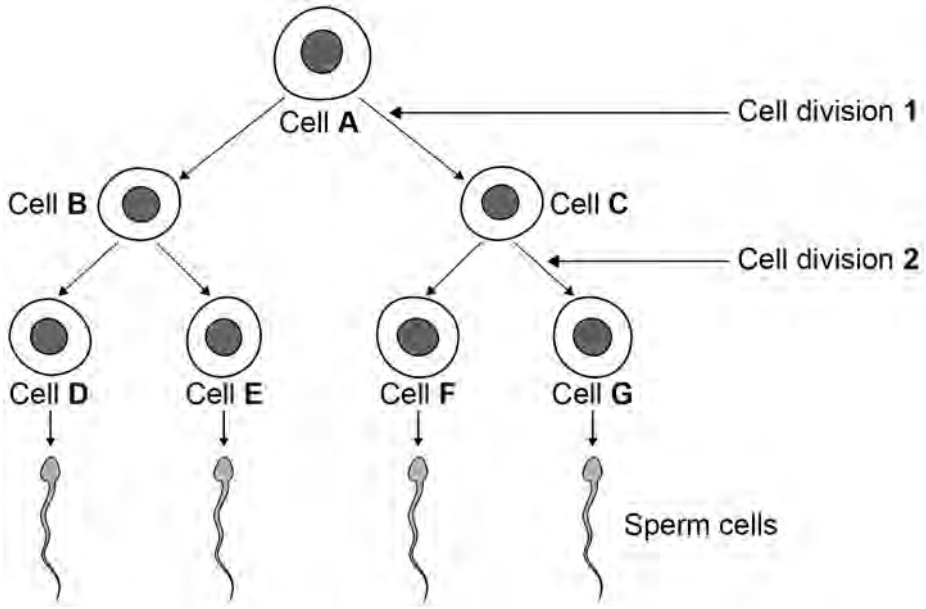
Question 24

June 2025 | 8461/2F | Original Q3

0 3 New cells are produced by cell division.

Figure 5 shows sperm formation in a human.

Figure 5



0 3 . 1 Where in the body are sperm cells produced?

[1 mark]

_____

0 3 . 2 How many chromosomes are there in cell **A** and in cell **D**?

Choose answers from the box.

[2 marks]

23	24	46	92

Cell **A** _____

Cell **D** _____

4.1.1.3 Cell specialisation

Question 24 · continued

0 3 . 3 Complete the sentence.

Choose the answer from the box.

[1 mark]

differentiation	evolution	fertilisation

A sperm cell joins with an egg cell in a process called _____.

Question 3 continues on the next page

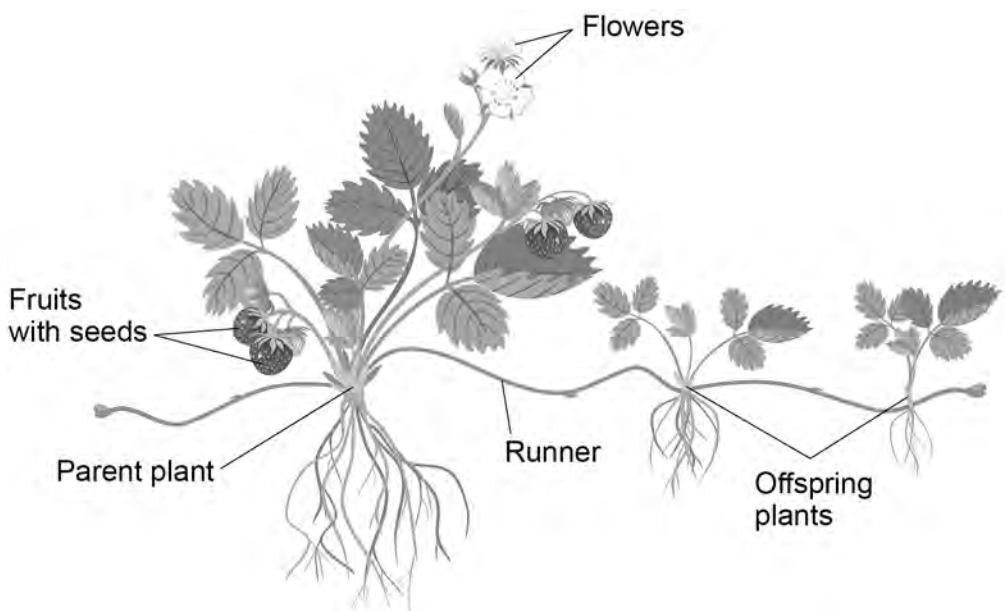
Question 24 · continued

Strawberry plants can reproduce both sexually and asexually.

Figure 6 shows a strawberry plant reproducing:

- sexually, using flowers, fruits and seeds
- asexually, using horizontal stems called runners.

Figure 6



0 3 . 4 Meiosis produces gametes.

What is the name of the male gamete in a flower?

[1 mark]

Tick (✓) **one** box.

Embryo ☐

Ovum ☐

Pollen ☐

4.1.1.3 Cell specialisation

Question 24 · continued

0 3 . 5 Which process produces new cells in runners?

[1 mark]

Tick (✓) **one** box.

- Binary fission ☐
- Evolution ☐
- Mitosis ☐

0 3 . 6 Substances used for growth pass through the runners from the parent plant to the offspring plants.

Which **two** substances pass through the runners?

[2 marks]

Tick (✓) **two** boxes.

- Carbon dioxide ☐
- DNA ☐
- Insulin ☐
- Sugar ☐
- Water ☐

Question 3 continues on the next page

4.1.1.3 Cell specialisation

Question 24 · continued

Sexual reproduction and asexual reproduction each have different advantages for the strawberry plant.

0 3 . 7 Give **one** advantage of reproducing **sexually**.

[1 mark]

0 3 . 8 Give **one** advantage of reproducing **asexually**.

[1 mark]

10