AQA GCSE Biology | 8461

SPECIFICATION POINT 4.1.1.4

# Cell differentiation

## Past-paper questions

| | |
|---|---|
| Tier | **Foundation** |
| Question groups | **7** |
| Available paper years | **2009–2023** |

## 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.

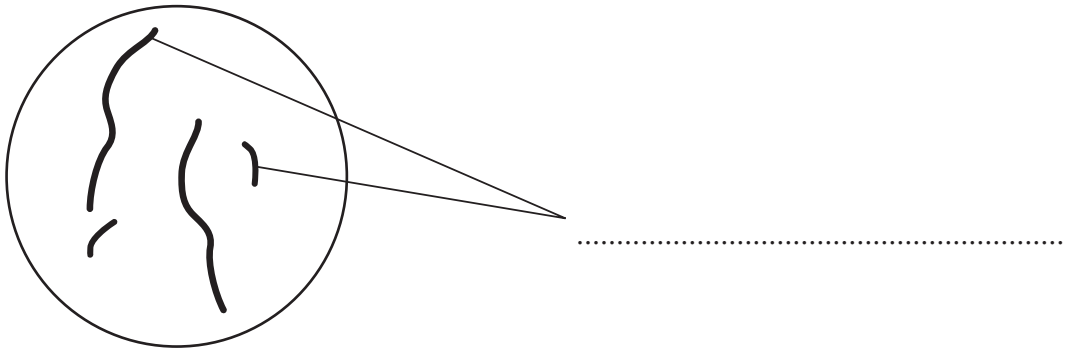
**4.1.1.4 Cell differentiation**

**Question 01**

June 2009 | BLY2F | Original Q5 | Legacy

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

**Diagram 1**



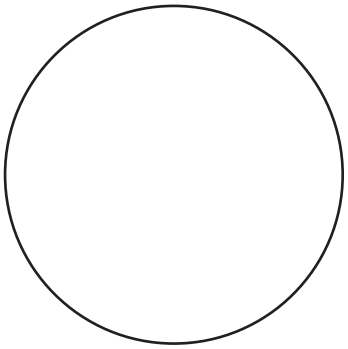

**5** (a) Use a word from the box to label **Diagram 1**.

| | | |
|---|---|---|
| **alleles** | **chromosomes** | **gametes** |

*(1 mark)*

**5** (b) Complete **Diagram 2** to show what the nucleus of one of the cells produced by this mitosis would look like.

**Diagram 2**



*(1 mark)*

**4.1.1.4 Cell differentiation**

**Question 01 · continued**



*for mark*

**5** (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.

**5** (c) (i) Give **two** advantages of using stem cells.

1 .....

.....

2 .....

.....

*(2 marks)*

**5** (c) (ii) Give **two** disadvantages of using stem cells.

1 .....

.....

2 .....

.....

*(2 mark)*

**6**

### 4.1.1.4 Cell differentiation

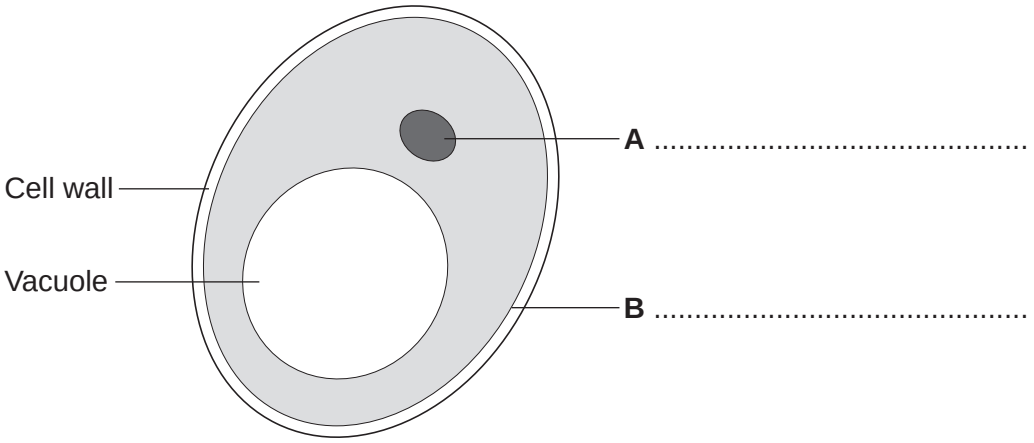
**Question 02**

June 2015 | BL2FP | Original Q1 | Legacy

**1** Human cells and yeast cells have some parts that are the same.

**1 (a)** **Figure 1** shows a yeast cell.

**Figure 1**




Parts **A** and **B** in **Figure 1** are found in human cells and in yeast cells.
On **Figure 1**, label parts **A** and **B**.

**[2 marks]**

**1 (b)** Many types of cell can divide to form new cells.

Some cells in human skin can divide to make new skin cells.

Why do human skin cells need to divide?

**[1 mark]**

.....

.....

4.1.1.4 Cell differentiation

Question 02 · continued



**1 (c)** Human stem cells can develop into many different types of human cell.

**1 (c) (i)** Use the correct answer from the box to complete the sentence.

**[1 mark]**

| | | |
|---|---|---|
| **embryos** | **hair** | **nerve cells** |

Human stem cells may come from ..... .

**1 (c) (ii)** Use the correct answer from the box to complete the sentence.

**[1 mark]**

| | | |
|---|---|---|
| **cystic fibrosis** | **paralysis** | **polydactyly** |

Human stem cells can be used to treat ..... .

5

**Turn over for the next question**

4.1.1.4 Cell differentiation

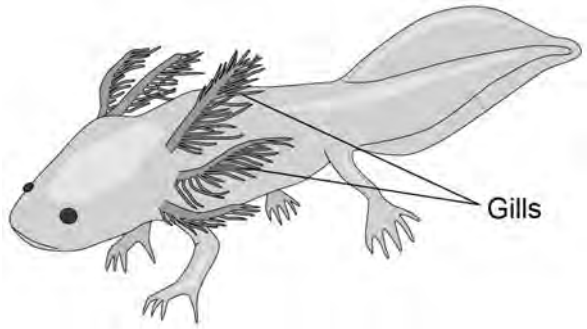
Question 03

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 _____

_____

_____

4.1.1.4 Cell differentiation

Question 03 · 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 ☐

4.1.1.4 Cell differentiation

Question 03 · 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. ☐

4.1.1.4 Cell differentiation

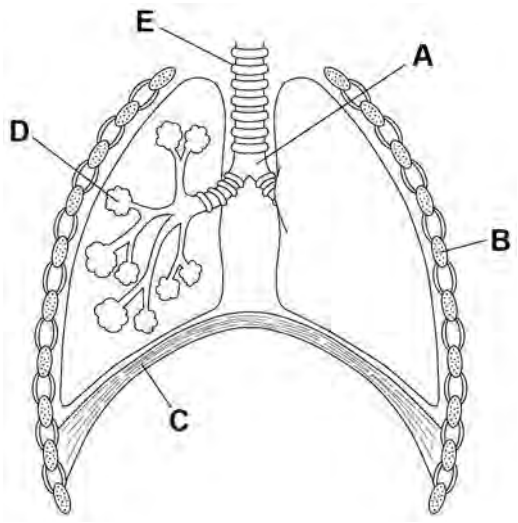
Question 03 · continued



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 ☐

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4.1.1.4 Cell differentiation

Question 04

November 2020 | 8461/1F | Original Q2

**0 2** This question is about cell division.

**0 2 . 1** Which process makes two identical new body cells for growth and repair?

**[1 mark]**

Tick (✓) **one** box.

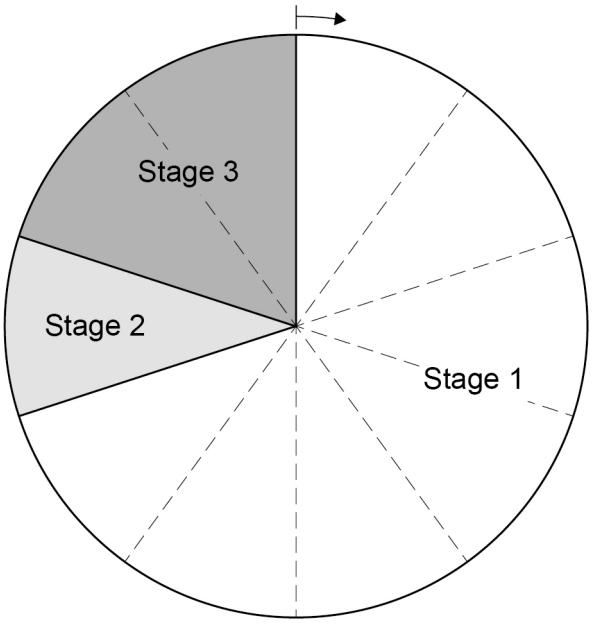
Differentiation ☐

Fertilisation ☐

Mitosis ☐

**Figure 5** shows the three stages of a cell cycle.

**Figure 5**



4.1.1.4 Cell differentiation

Question 04 · continued



**0 2 . 2** Draw **one** line from each stage of the cell cycle to what happens during that stage.

**[2 marks]**

| Stage of cell cycle | What happens during that stage |
|---|---|
| Stage 1 | One set of chromosomes is pulled to each end of the cell |
| Stage 2 | The cytoplasm and cell membrane divide to form two new cells |
| Stage 3 | The cell grows and the chromosomes replicate |

**0 2 . 3** What percentage of the total time for the cell cycle is taken by stage 1?

**[2 marks]**

Percentage = _____ %

**0 2 . 4** A cell divides to form two new cells every 24 hours.

How many days will it take for the original cell to divide into 8 cells?

**[1 mark]**

Tick (✓) **one** box.

1 ☐ 3 ☐ 6 ☐ 8 ☐

4.1.1.4 Cell differentiation

Question 04 · continued



**0 2 . 5** The chromosomes contain the genetic material.

Name the chemical which the genetic material is made from.

**[1 mark]**

**0 2 . 6** The genetic material is made of many small sections.

Each section codes for a specific protein.

What is one section of genetic material on a chromosome called?

**[1 mark]**

Tick (✓) **one** box.

A gamete ☐

A gene ☐

A nucleus ☐

**0 2 . 7** Stem cells are cells which have **not** yet been specialised to carry out a particular job.

Bone marrow cells are one example of stem cells.

Explain how a transplant of bone marrow cells can help to treat medical conditions.

**[2 marks]**

10

### 4.1.1.4 Cell differentiation

**Question 05**

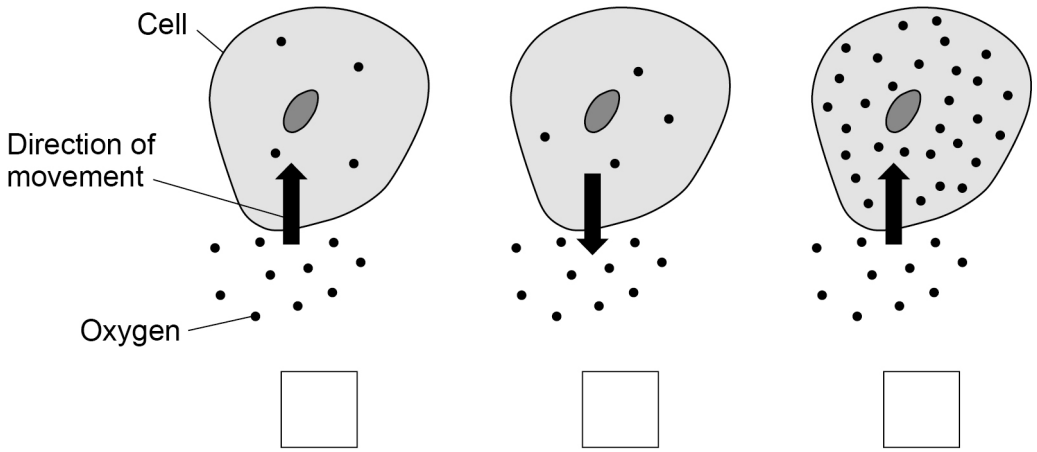
November 2021 | 8461/1F | Original Q1

**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 _____.

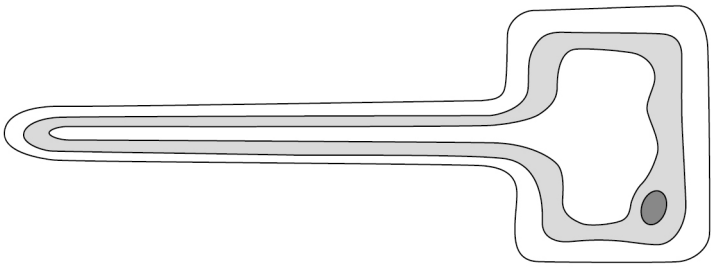
4.1.1.4 Cell differentiation

Question 05 · 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**

4.1.1.4 Cell differentiation

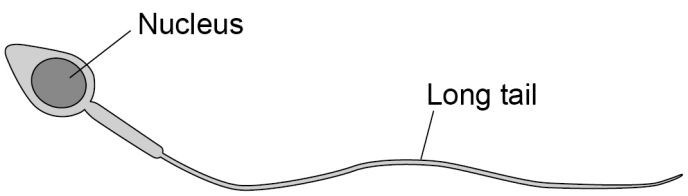
Question 05 · continued



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 |

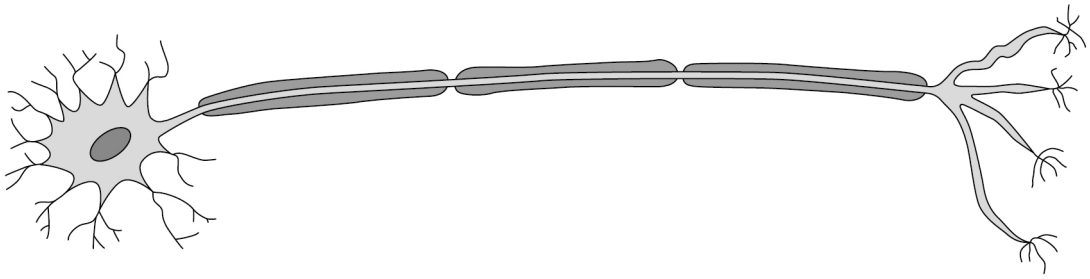
4.1.1.4 Cell differentiation

Question 05 · 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

### 4.1.1.4 Cell differentiation

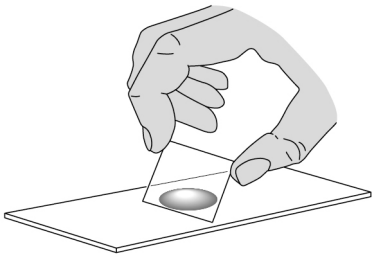
**Question 06**

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 _____

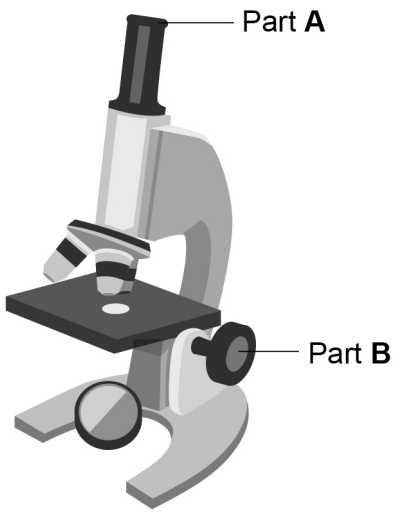
4.1.1.4 Cell differentiation

Question 06 · 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**

4.1.1.4 Cell differentiation

Question 06 · 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

### 4.1.1.4 Cell differentiation

**Question 07**

June 2023 | 8461/1F | Original Q6

**0 6** A root is a plant organ.

Plant roots contain many different types of tissue.

**0 6 . 1** What is a tissue?

**[1 mark]**

**0 6 . 2** Tissue in the tip of a plant root contains stem cells.

Stem cells can differentiate into any type of cell.

Name the type of tissue in plants that contains stem cells.

**[1 mark]**

In the past many drugs were extracted from plants.

**0 6 . 3** Aspirin is a painkiller.

Which plant does aspirin originate from?

**[1 mark]**

**Question 6 continues on the next page**

4.1.1.4 Cell differentiation

Question 07 · continued



Scientists have extracted chemical **A** from the deadly nightshade plant.

Chemical **A** can be used as a painkiller.

**Table 5** shows information about where chemical **A** is found.

**Table 5**

| Part of deadly nightshade plant | Mass of chemical A in 100 g of plant tissue in grams |
|---|---|
| Roots | 1.3 |
| Leaves | 1.2 |
| Berries | 0.7 |

**0 6 . 4** The scientists usually extract chemical **A** from the berries of the deadly nightshade plant.

Suggest **one** reason why berries are used instead of leaves or roots.

**[1 mark]**

4.1.1.4 Cell differentiation

Question 07 · continued



A deadly nightshade plant has chlorosis (yellow leaves).

The mass of chemical **A** found in the **leaves** of the plant is 60% of the mass shown in **Table 5**.

**0 6 . 5** Calculate the mass of chemical **A** in 200 g of the **leaves** with chlorosis.

Give your answer in mg.

**[4 marks]**

Mass of chemical **A** = _____ mg

**0 6 . 6** Suggest **one** reason why the leaves of the deadly nightshade plant have chlorosis.

**[1 mark]**

**Question 6 continues on the next page**

4.1.1.4 Cell differentiation

Question 07 · continued



Chemical **A** has **not** been tested in large-scale clinical trials in the UK.

**0 6 . 7** It is important for drugs to be tested in clinical trials before the drugs are approved for use by the public.

Give **two** reasons why.

**[2 marks]**

1 _____

_____

2 _____

_____

There are many online reports making claims about the effects of chemical **A**.

Some of these reports are biased.

**0 6 . 8** Suggest **one** reason why a report making claims about the effects of chemical **A** may be biased.

**[1 mark]**

_____

_____

4.1.1.4 Cell differentiation

Question 07 · continued



**0 6 . 9** How can scientists be sure that claims about new drugs are valid?

**[1 mark]**

Tick (✓) **one** box.

- Advertise the claims on social media. ☐
- Ask an international company to produce the drug. ☐
- Have the claims peer reviewed. ☐
- Publish the claims in a newspaper. ☐

13

**Turn over for the next question**