

GCSE Combined Science: Trilogy

Worksheet: Cell differentiation

TIME 30 min	TOTAL 29 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Cell differentiation

NAME	CLASS	DATE
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

As an organism develops, its cells differentiate.

0 1 . 1 What is meant by **cell differentiation**?

.....

.....

[1 mark]

0 1 . 2 When do most types of animal cell differentiate?

Tick (✓) **one** box.

At an early stage of development

☐

Only after birth

☐

Throughout the life of the animal

☐

Only when the animal is injured

☐

[1 mark]

0 1 . 3 In mature animals, cell division is mainly restricted to two purposes.
Name **one** of these purposes.

.....

.....

[1 mark]

0 1 . 4

Which statement about plant cells is correct?

Tick (✓) **one** box.

Many types of plant cell keep the ability to differentiate throughout life.

☐

Plant cells can only differentiate inside seeds.

☐

Plant cells lose the ability to differentiate once the plant has leaves.

☐

Only root cells can differentiate.

☐

[1 mark]

0 2

A fertilised egg cell develops into an embryo and then into an adult animal.

0 2 . 1

Complete the flow chart.

Choose words from this list: **differentiation**, **fertilisation**, **mitosis**, **osmosis**, **tissues**.

fertilised egg → divides by _____ → a ball of unspecialised cells →
cells become specialised by _____ → groups of specialised cells form

.....

.....

.....

.....

.....

.....

[3 marks]

0 2 . 2

Which change happens as a cell differentiates into a sperm cell?

Tick (✓) **one** box.

It develops a cell wall.

☐

It develops a tail.

☐

It develops chloroplasts.

☐

It loses its cell membrane.

☐

[1 mark]

0 2 . 3

Name the tissue in plants in which cells keep dividing and differentiating throughout the life of the plant.

.....

.....

.....

.....

[1 mark]

0 3

Red blood cells are made from stem cells in the bone marrow. As a cell differentiates into a red blood cell:

- it fills with haemoglobin
- it loses its nucleus
- it loses its mitochondria.

A red blood cell survives in the blood for about 120 days.

0 3 . 1

Suggest why a mature red blood cell cannot divide.

.....

.....

[1 mark]

0 3 . 2

Explain why cells in the bone marrow must keep dividing and differentiating throughout life.

.....

.....

.....

.....

[2 marks]

0 3 . 3

Suggest why it is an advantage for a red blood cell to have no mitochondria.

.....

.....

.....

.....

[2 marks]

0 3 . 4

The bone marrow of an adult makes about 2.4×10^6 red blood cells every second.

Calculate the number of red blood cells made in one day.

Give your answer in standard form to 2 significant figures.

.....

.....

.....

.....

Number of red blood cells =

[2 marks]

0 4

A fertilised egg divides many times to form an embryo. The cells of the embryo then differentiate.

0 4 . 1

Explain why cell differentiation is important for a multicellular organism.

.....

.....

.....

.....

[2 marks]

0 4 . 2

When a cell in a young leaf differentiates into a palisade cell, it develops many chloroplasts.
Explain why.

.....

.....

.....

.....

[2 marks]

0 4 . 3

Compare the ability of cells to differentiate in mature animals and in mature plants.

.....

.....

.....

.....

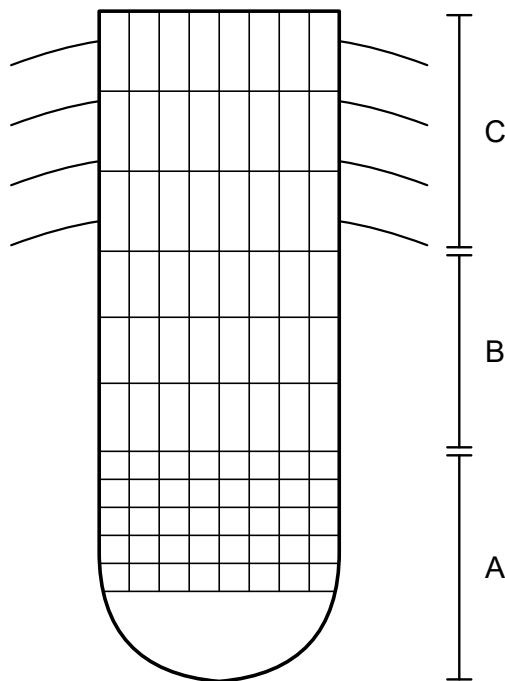
[2 marks]

.....

0 5

Figure 1 shows a drawing of a section through the tip of a root, made using a light microscope. The root is divided into three regions, **A**, **B** and **C**.

Figure 1



0 5 . 1

In which region, **A**, **B** or **C**, are cells dividing by mitosis?
Give **one** reason for your answer.

.....

.....

.....

.....

[2 marks]

0 5 . 2

In which region have cells differentiated?
Give the evidence from Figure 1.

.....

.....

.....

.....

[2 marks]

0 5 . 3

The drawing has a magnification of $\times 40$.
On the drawing, region **A** is 18 mm long.
Calculate the real length of region **A** in μm .

.....

.....

.....

.....

Real length = μm

[2 marks]

0 5 . 4

Name the plant tissue found in region **A**.

.....

.....

.....

.....

[1 mark]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Cell differentiation · 29 marks

Question 1 (4 marks)

01.1 [1 mark]

- the process by which a cell becomes specialised (to carry out a particular function) (1)

Notes: Allow 'a cell develops different sub-cellular structures to carry out a certain function'.

01.2 [1 mark]

Correct: At an early stage of development

01.3 [1 mark]

- repair / replacement (of cells) (1)
-

01.4 [1 mark]

Correct: Many types of plant cell keep the ability to differentiate throughout life.

Question 2 (5 marks)

02.1 [3 marks]

Answer: mitosis; differentiation; tissues

- mitosis (1)
 - differentiation (1)
 - tissues (1)
-

02.2 [1 mark]

Correct: It develops a tail.

02.3 [1 mark]

Answer: meristem

- meristem (tissue) (1)
-

Question 3 (7 marks)

03.1 [1 mark]

- it has no nucleus / no chromosomes / no genetic material to copy (1)

03.2 [2 marks]

- red blood cells only survive for about 120 days / wear out and die (1)
- so they must be replaced, and red blood cells cannot divide to make new red blood cells (1)

03.3 [2 marks]

- the cell does not carry out aerobic respiration (1)
- so it does not use up the oxygen it is carrying / more oxygen is delivered to the tissues (1)

Notes: Allow 'more space for haemoglobin' for 1 mark.

03.4 [2 marks]

Answer: 2.1×10^{11}

- $2.4 \times 10^6 \times 60 \times 60 \times 24 (= 2.07 \times 10^{11})$ (1)
- 2.1×10^{11} (1)

Notes: 2.07×10^{11} (not to 2 significant figures) or 210 000 000 000 (not in standard form) scores 1 mark.

Question 4 (6 marks)

04.1 [2 marks]

- it produces specialised cells / cells with different functions (1)
- so that the organism can form tissues / organs that carry out all of its life processes (efficiently) (1)

04.2 [2 marks]

- palisade cells carry out most of the photosynthesis (in the leaf) (1)
- chloroplasts contain chlorophyll which absorbs light (for photosynthesis) (1)

04.3 [2 marks]

- most animal cells differentiate at an early stage / in mature animals cell division is mainly for repair and replacement (1)
 - many types of plant cell keep the ability to differentiate throughout life (1)
-

Question 5 (7 marks)

05.1 [2 marks]

- A (1)
- the cells are small / closely packed / not yet specialised / it is at the tip of the root (1)

Notes: The reason mark can only be awarded if A is chosen.

05.2 [2 marks]

- C (1)
- root hair cells / root hairs are present (1)

Notes: The evidence mark can only be awarded if C is chosen.

05.3 [2 marks]

Answer: 450 μm

- $18 \div 40 = 0.45$ (mm) (1)
- 450 (μm) (1)

Notes: An answer of 450 scores 2 marks. 0.45 scores 1 mark.

05.4 [1 mark]

Answer: meristem

- meristem (tissue) (1)
-