

GCSE Biology

Worksheet: Cloning

TIME 35 min	TOTAL 32 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Cloning

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

A plant nursery uses tissue culture to grow chrysanthemum plants. From one parent plant, the nursery produces 200 small plants (plantlets) in the laboratory. When the plantlets are moved into compost, 30% of them die.

0 1 . 1

Calculate the number of plantlets from one parent plant that survive.

.....

.....

.....

.....

Number of plantlets =

[2 marks]

0 1 . 2

Name the type of cell division that produces the cells of the new plants.

.....

.....

.....

.....
[1 mark]

0 2

Plants and animals can be cloned in several ways.

0 2 . 1

Which cloning method involves splitting apart the cells of a developing animal embryo before they become specialised?

Tick (✓) **one** box.

Adult cell cloning

☐

Cuttings

☐

Embryo transplants

☐

Tissue culture

☐

[1 mark]

0 2 . 2

Which method is an older, simple way that gardeners use to produce many identical new plants from a parent plant?

Tick (✓) **one** box.

Adult cell cloning

☐

Cuttings

☐

Embryo transplants

☐

Selective breeding

☐

[1 mark]

0 2 . 3

Tissue culture uses small groups of cells from part of a plant to grow identical new plants.

Give **one** reason why tissue culture is important.

.....

.....

[1 mark]

0 2 . 4

In adult cell cloning, what is used to stimulate the egg cell to divide to form an embryo?

.....

.....

[1 mark]

0 3

Plants and animals can be cloned in several ways.

0 3 . 1

Which cloning method is used to grow many genetically identical plants from small groups of cells on sterile agar?

Tick (✓) **one** box.

Adult cell cloning

☐

Cuttings

☐

Embryo transplants

☐

Tissue culture

☐

[1 mark]

0 3 . 2

In adult cell cloning, from which type of cell is the nucleus removed?

.....

.....

.....

[1 mark]

0 4

A gardener takes cuttings from a parent rose bush and grows them into new rose bushes.

0 4 . 1

Explain why the new rose bushes grown from cuttings are genetically identical to the parent bush.

.....

.....

.....

.....

[2 marks]

0 4 . 2

Compare taking cuttings with tissue culture as methods of cloning a plant.
Give **one** similarity and **one** difference.

[2 marks]

0 5

The steps in adult cell cloning are given below, but they are in the wrong order.

- A The nucleus is removed from an unfertilised egg cell.
- B An electric shock stimulates the egg cell to divide and form an embryo.
- C A nucleus from a body (skin) cell of the animal to be cloned is inserted into the egg cell.
- D The embryo is inserted into the uterus of an adult female (a surrogate mother).

0 5 . 1

Write the letters in the correct order.

[2 marks]

0 6

A plant nursery uses tissue culture to grow rose plants. From one parent plant, the nursery produces 200 small plants (plantlets) in the laboratory. When the plantlets are moved into compost, 25% of them die. A gardener can take 10 cuttings from one parent plant of the same type each year. The nursery can produce one batch of plantlets from each parent plant each year.

0 6 . 1

Calculate how many times more plants the nursery produces from one parent plant each year than the gardener does.

Assume that all of the gardener's cuttings grow into plants.

.....

.....

.....

.....

.....

Number of times =

[3 marks]

0 6 . 2

Suggest **one** disadvantage of tissue culture compared with taking cuttings.

.....

.....

[1 mark]

0 7

Scientists used adult cell cloning to produce a lamb.

- The nucleus was removed from an unfertilised egg cell taken from sheep B.
- The nucleus from a skin cell of sheep A was inserted into this egg cell.
- The embryo that developed was placed in the uterus of sheep C.

0 7 . 1

Describe what was done to make the egg cell develop into an embryo after the nucleus from sheep A was inserted.

[2 marks]

0 7 . 2

Which sheep is the lamb genetically identical to?
Explain your answer.

[2 marks]

0 7 . 3

Explain why the nucleus was removed from the egg cell of sheep B.

[1 mark]

0 7 . 4

Give **one** possible benefit of adult cell cloning in agriculture.

[1 mark]

0 8

A plant nursery uses tissue culture to produce a rare orchid. Small groups of cells are taken from a parent plant and grown on sterile agar that contains nutrients and plant hormones.

0 8 . 1

Explain why all the orchids produced by tissue culture are genetically identical.

.....

.....

.....

.....

[2 marks]

0 8 . 2

Every 4 weeks, each small plant is divided into 5 pieces, and each piece grows into a new small plant.

The nursery starts with 20 pieces. Calculate the number of plants after 16 weeks.

.....

.....

.....

.....

.....

[2 marks]

0 8 . 3

Explain why the agar and equipment must be sterile.

.....

.....

[1 mark]

0 8 . 4

Give **one** advantage and **one** disadvantage of producing orchids by tissue culture rather than from seeds.

.....

.....

.....

.....

[2 marks]

END OF QUESTIONS

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

Mark scheme

GCSE Biology · Worksheet: Cloning · 32 marks

Question 1 (3 marks)

01.1 [2 marks]

Answer: 140

- $200 \times 70 \div 100$ (or $200 - 60$) (1)
- 140 (1)

Notes: Correct answer with no working scores 2 marks. 60 (the number that die) scores 1 mark.

01.2 [1 mark]

Answer: Mitosis

- mitosis (1)
-

Question 2 (4 marks)

02.1 [1 mark]

Correct: Embryo transplants

02.2 [1 mark]

Correct: Cuttings

02.3 [1 mark]

Answer: Preserving rare plant species / producing large numbers of identical plants commercially in nurseries

- preserving rare plant species / producing many identical plants for nurseries (commercially) (1)
-

02.4 [1 mark]

Answer: An electric shock

- an electric shock (1)
-

Question 3 (2 marks)

03.1 [1 mark]

Correct: Tissue culture

03.2 [1 mark]

Answer: An (unfertilised) egg cell

- an (unfertilised) egg cell (1)
-

Question 4 (4 marks)

04.1 [2 marks]

Answer: The cuttings contain cells from the parent plant, which divide by mitosis (not meiosis) to grow the new plant; mitosis produces genetically identical cells, and there is no fusion of gametes

- cuttings contain cells from the parent plant, which divide by mitosis (not meiosis) as the new plant grows (1)
 - mitosis produces genetically identical cells, and there is no fusion of gametes involved (1)
-

04.2 [2 marks]

Answer: Similarity: both produce plants genetically identical to the parent, by mitosis.

Difference: cuttings use a relatively large piece of the plant and simple equipment, while tissue culture uses tiny groups of cells, needs sterile laboratory conditions, and can produce far more plants

- similarity: both produce plants genetically identical to the parent, using mitosis, without needing seeds or fertilisation (1)
 - difference: cuttings use a (relatively large) piece of the parent plant and simple equipment, while tissue culture uses tiny groups of cells, needs sterile laboratory conditions, and can produce far more plants from much less starting material (1)
-

Question 5 (2 marks)

05.1 [2 marks]

Answer: A, C, B, D

- A first and D last (1)
 - C before B (1)
-

Question 6 (4 marks)

06.1 [3 marks]

Answer: 15

- plants that survive from one parent = $200 \times 75 \div 100 = 150$ (1)
- $150 \div 10$ (1)
- = 15 (1)

Notes: Correct answer with no working scores 3 marks. 20 (ignoring the plantlets that die) scores 2 marks.

06.2 [1 mark]

Answer: It needs sterile laboratory conditions, expensive equipment and skilled staff

- it needs sterile laboratory conditions / expensive equipment / skilled staff (so it costs more) (1)
-

Question 7 (6 marks)

07.1 [2 marks]

Answer: An electric shock stimulated the egg cell to divide (by mitosis) to form an embryo, a ball of cells

- an electric shock (was given) (1)
 - to stimulate the egg cell to divide / to form an embryo (a ball of cells) (1)
-

07.2 [2 marks]

Answer: Sheep A, because the nucleus containing the genetic information came from sheep A

- sheep A (1)
 - the nucleus / genetic information / DNA came from sheep A (1)
-

07.3 [1 mark]

Answer: So that the embryo only contains the genetic information from sheep A

- so the embryo contains only the genetic information of sheep A / so there are not too many chromosomes (1)
-

07.4 [1 mark]

Answer: Many copies of an animal with a desirable characteristic, e.g. high milk yield, can be produced

- produce many animals with a desirable characteristic (e.g. high milk yield) / copy the best animals (1)
-

Question 8 (7 marks)

08.1 [2 marks]

Answer: They all come from the same parent plant, and the cells divide by mitosis, which produces genetically identical cells

- all come from the same parent (plant) (1)
 - (cells divide by) mitosis, which produces genetically identical cells (1)
-

08.2 [2 marks]

Answer: 12 500

- 16 weeks = 4 cycles / $20 \times 5 \times 5 \times 5 \times 5$ (1)
- 12 500 (1)

Notes: Correct answer with no working scores 2 marks.

08.3 [1 mark]

Answer: To stop microorganisms growing on the agar and damaging or killing the plants

- to prevent microorganisms / bacteria / fungi growing (and competing with or killing the plants) (1)
-

08.4 [2 marks]

Answer: Advantage: large numbers of identical plants with the desired characteristics are produced quickly. Disadvantage: there is no variation, so all could be killed by the same disease

- advantage: many plants quickly / all have the desired characteristics / rare species can be preserved / can be done all year (1)
 - disadvantage: no (genetic) variation so all are susceptible to the same disease / expensive / needs sterile laboratory conditions (1)
-