

GCSE
BIOLOGY

Biology Test 4: Inheritance, variation and evolution (Higher)

Total number of marks: 34

0 5

Table 2 gives the classification of four plant species.

Table 2

Group	Species 1	Species 2	Species 3	Species 4
Kingdom	<i>Plantae</i>	<i>Plantae</i>	<i>Plantae</i>	<i>Plantae</i>
Phylum	<i>Spermatophyta</i>	<i>Spermatophyta</i>	<i>Spermatophyta</i>	<i>Spermatophyta</i>
Class	<i>Monocotyledonae</i>	<i>Dicotyledonae</i>	<i>Monocotyledonae</i>	<i>Dicotyledonae</i>
Order	<i>Poales</i>	<i>Fabales</i>	<i>Poales</i>	<i>Scrophulariales</i>
Family	<i>Cyperaceae</i>	<i>Fabaceae</i>	<i>Poaceae</i>	<i>Scrophulariaceae</i>
Genus	<i>Eriophorum</i>	<i>Pisum</i>	<i>Poa</i>	<i>Antirrhinum</i>
Species	<i>angustifolium</i>	<i>sativum</i>	<i>annua</i>	<i>majus</i>

0 5

1

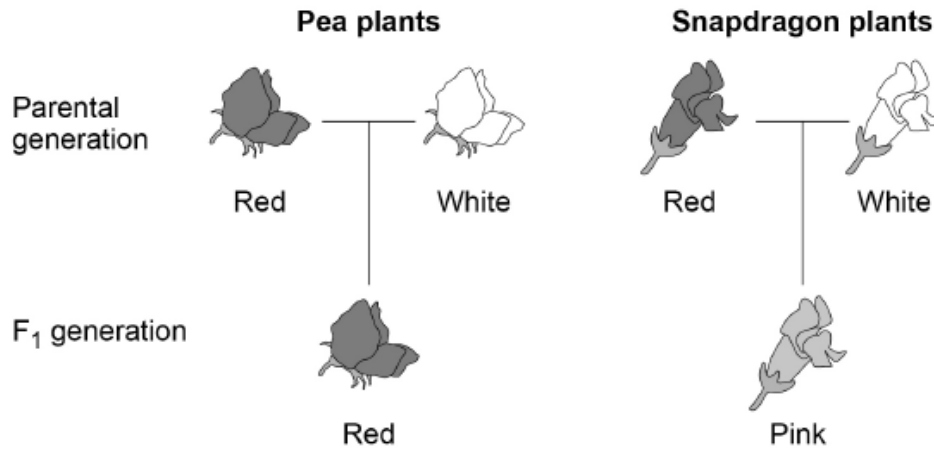
Species **1** and **3** are the most closely related.

What information in **Table 2** gives evidence for this?

[1 mark]

Figure 6 shows the inheritance of flower colour in two species of plant.

Figure 6



- In pea plants and in snapdragon plants, flower colour is controlled by one pair of alleles.
- In **Figure 6** the parental generation plants are homozygous for flower colour.
- In heterozygous **pea** plants, the allele for red flower colour is dominant.
- In heterozygous **snapdragon** plants, the alleles for flower colour are both expressed.

Use the following symbols for alleles in your answers to Questions **05.2** to **05.4**:

Pea plants

R = allele for red flowers
r = allele for white flowers

Snapdragon plants

C^R = allele for red flowers
C^W = allele for white flowers

0 5 . 2

What is the genotype of the red-flowered pea plants in the F₁ generation?

[1 mark]

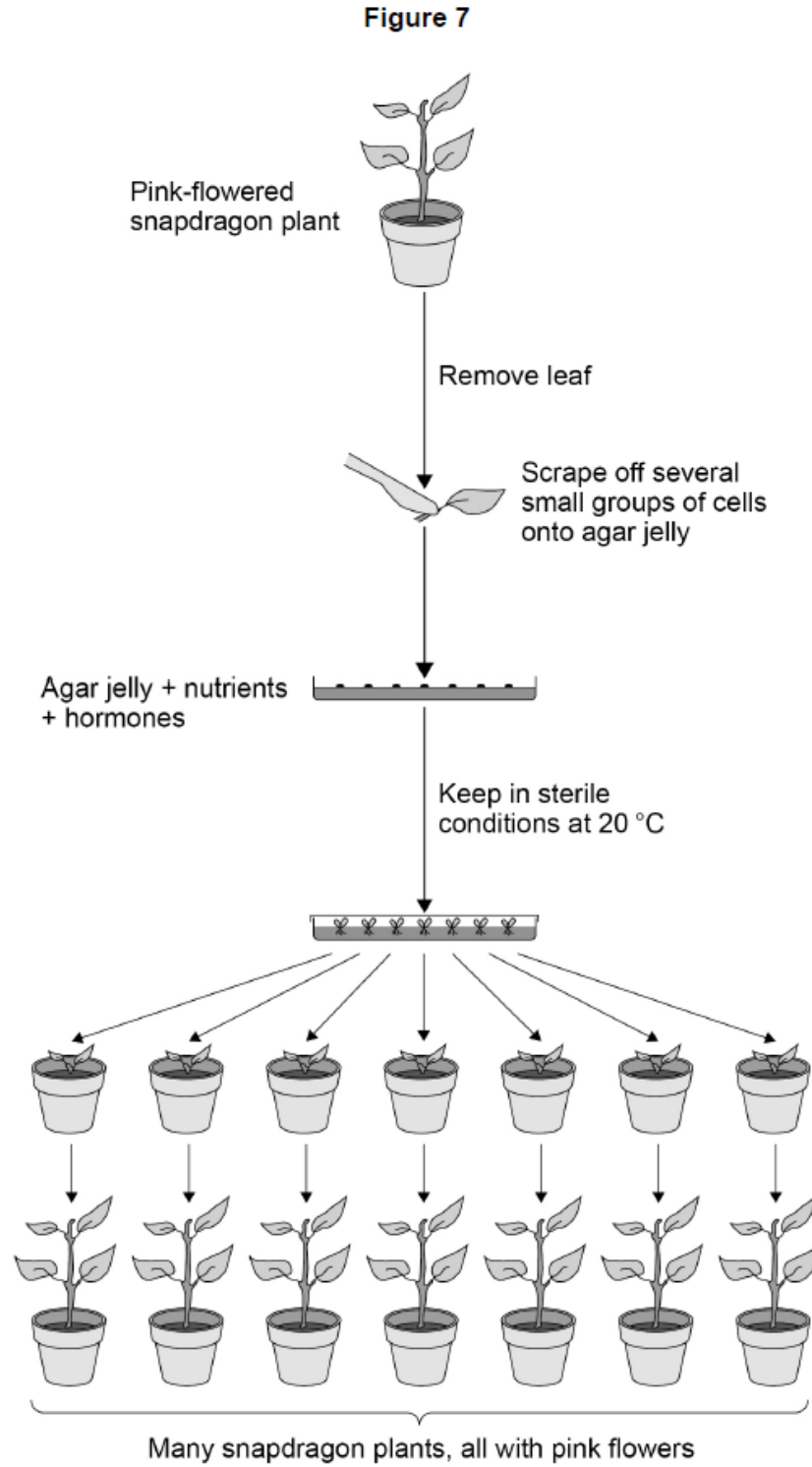
0 5 . 3

What is the genotype of a white-flowered snapdragon plant?

[1 mark]

Commercially, hundreds of pink-flowered snapdragon plants can be produced from one pink-flowered plant.

Figure 7 shows a tissue culture technique used for producing many plants from one plant.



0 5 . 6

Give a reason for each of the following steps shown in **Figure 7**.**[5 marks]****Several** groups of cells are scraped off the leaf: __________
_____**Nutrients** are added to the agar jelly: __________
_____**Hormones** are added to the agar jelly: __________
_____The plant cells are kept in **sterile** conditions: __________
_____The plant cells are kept at **20 °C**: __________

0 5 . 7

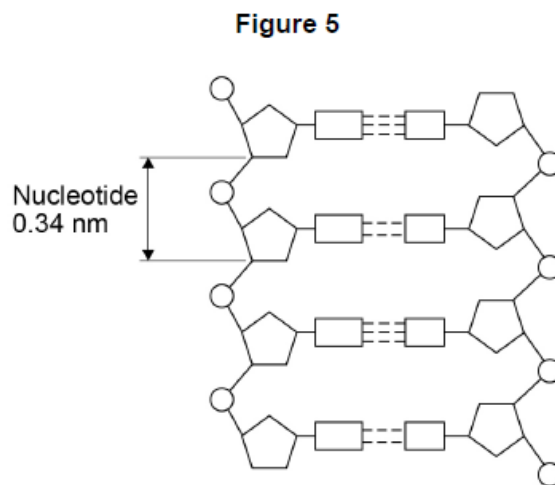
Explain why the method shown in **Figure 7** produces **only** pink-flowered plants.**[2 marks]**

0 4 DNA is a polymer of nucleotides.

0 4 . 1 Why is DNA described as a polymer?

[1 mark]

Figure 5 shows part of a DNA molecule.



0 4 . 2 Describe the structure of a nucleotide.

[4 marks]

0 4 . 3

The length of a DNA double helix increases by 0.34 nm for every pair of nucleotides.

The total number of nucleotides in a human body cell is 1.2×10^{10} .

Calculate the total length of double helix in a human body cell.

Give your answer in metres. Use information from **Figure 5**.

[5 marks]

Total length = _____ m

0 4 . 4

Some parts of DNA do **not** code for proteins.

Describe how non-coding parts of DNA can affect the expression of genes.

[1 mark]

0 5

There are two types of cell division: mitosis and meiosis.

0 5 . 1

Describe **three** differences between the processes of mitosis and meiosis.

[3 marks]

1 _____

2 _____

3 _____

0 5 . 2

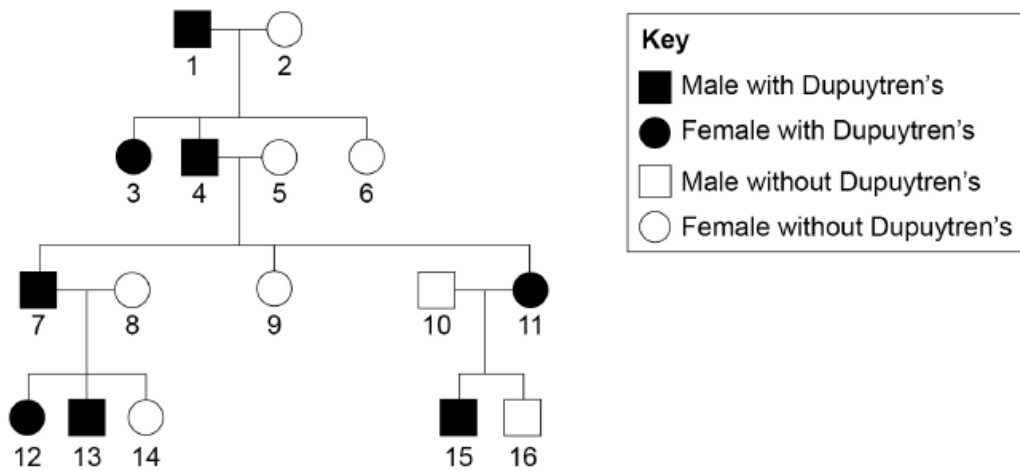
Describe **one** similarity between the processes of mitosis and meiosis.

[1 mark]

Dupuytren's is a disorder that affects the hands.

Figure 6 shows the inheritance of Dupuytren's in one family.

Figure 6



Dupuytren's is caused by a dominant allele in this family.

D = dominant allele

d = recessive allele

0 5 . 3 Give the genotype of person 1.

Explain your answer.

[2 marks]

Genotype _____

0 5 . 4 Person 7 and person 8 in **Figure 6** are expecting a fourth child.

What is the probability of the child having Dupuytren's?

You should:

- draw a Punnett square diagram
- identify which offspring have Dupuytren's

[5 marks]

Probability = _____

0 5 . 5 Explain how **Figure 6** shows the allele for Dupuytren's is **not** on the Y chromosome.

[2 marks]