

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

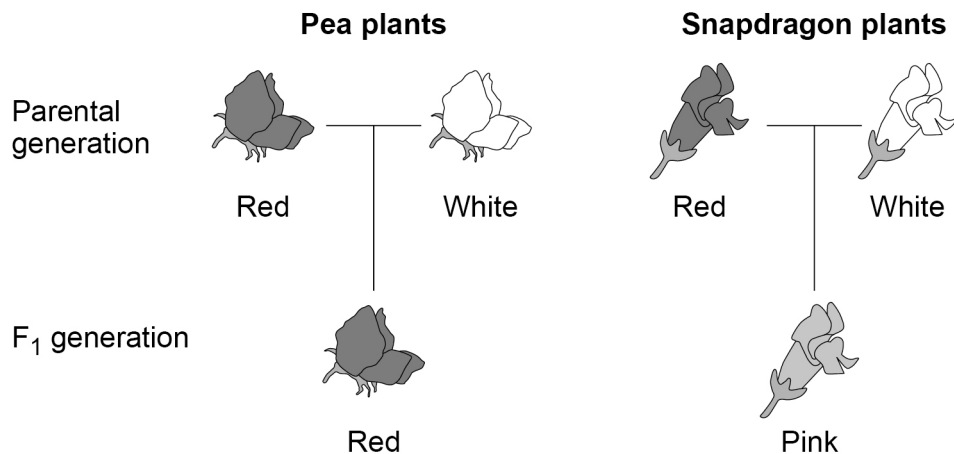
Species 1 and 3 are the most closely related.

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]

A gardener crossed two pink-flowered snapdragon plants.

0 5 . 4

Draw a Punnett square diagram to show why only some of the next generation plants had pink flowers.

Identify the phenotypes of all the offspring plants.

[3 marks]

0 5 . 5

What percentage of the offspring would you expect to have pink flowers?

[1 mark]

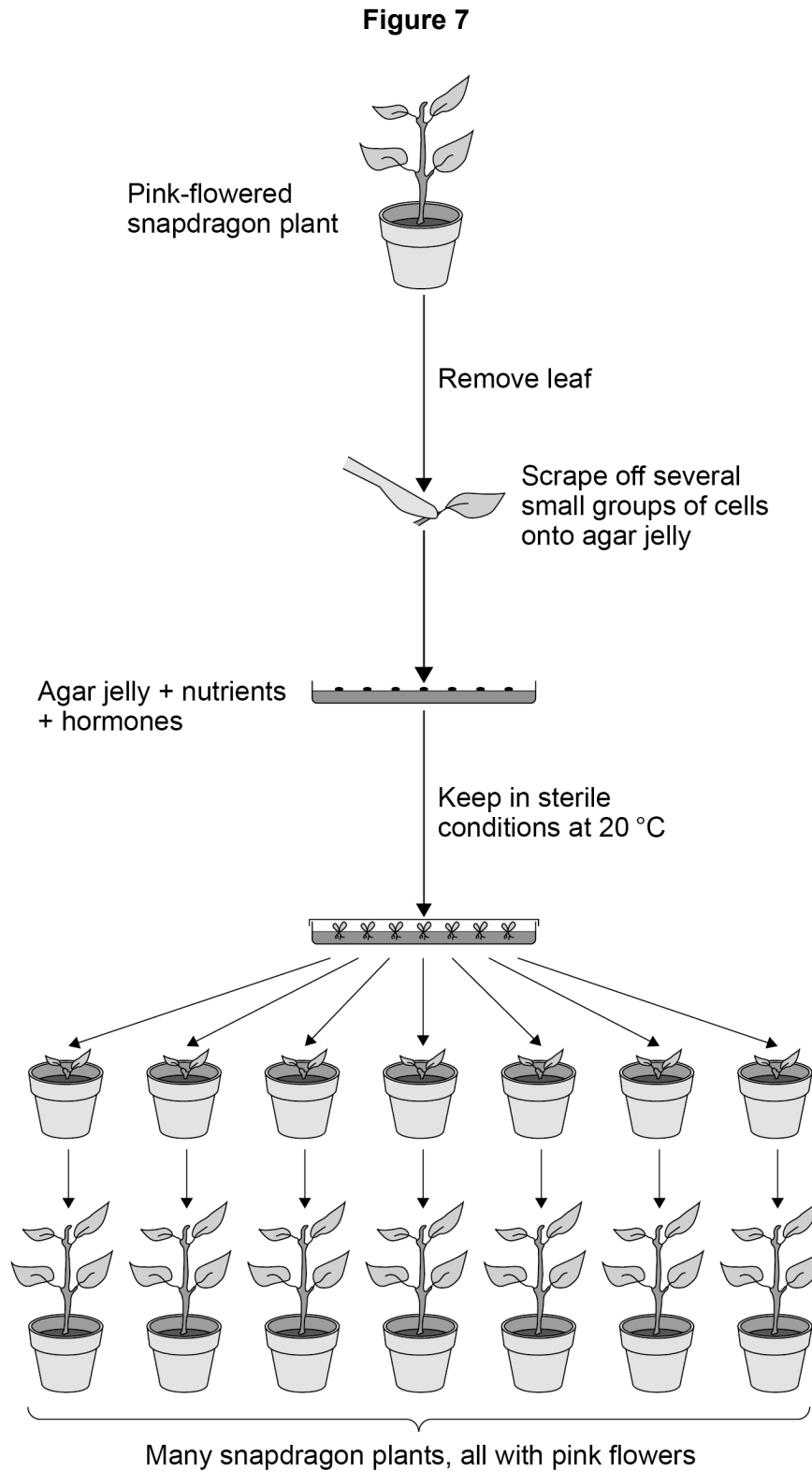
Percentage = _____ %

Turn over ►



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]

14

Turn over ►



Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	same kingdom + phylum + class + order or same order or they have the top four groups the same	allow both Poales	1	AO3 4.6.4
05.2	Rr / rR	do not accept RR or rr ignore heterozygous do not accept homozygous	1	AO3 4.6.1.6 4.6.3.3
05.3	$C^W C^W$		1	AO3 4.6.1.6
05.4	parental genotypes / gametes correct for both parents: $C^R C^W$ $C^R C^W$ / C^R and C^W genotypes of offspring correctly derived in a Punnett square: $C^R C^R$ $C^R C^W$ $C^W C^W$ correct identification of phenotypes from their cross: $C^R C^R$ = red $C^R C^W$ = pink $C^W C^W$ = white	allow R and W throughout allow own symbols if defined allow correctly derived genotypes from incorrect gametes allow colours correctly identified from different offspring, only if pink and other colour(s) are given	1 1 1	AO2 4.6.1.6
05.5	answer correctly derived from Question 05.4 to match stated phenotypes	allow 50(%) if no offspring given in Question 05.4 allow to match genotypes if no phenotypes given	1	AO2 4.6.1.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	(several groups) so many / several plants can be produced	allow each (group) will give a new plant	1	AO1 4.1.2.3 4.6.1.3 4.6.2.5
	(nutrients) for making protein / amino acids or for making chlorophyll or for providing energy or for respiration	allow other examples do not accept making energy ignore for growth	1	
	(add hormones) so differentiation occurs or so roots / shoots develop	allow for the formation of different tissues / organs / named allow to stimulate cell division	1	
	(sterile conditions) to prevent growth / entry of microorganisms / named type or prevent decay / disease	ignore to kill microorganisms ignore contamination unqualified	1	
	(temperature = 20 °C) so optimum / good growth	allow reference to enzymes working well ignore enzymes not denatured ignore reference to pathogens / microorganisms	1	
05.7	(all new plants have been) produced by asexual reproduction / mitosis or produced without (fusion of) gametes	ignore produced from one parent	1	AO2 4.1 4.1.2.2 4.6.1.1 4.6.2.5
	(so) all are genetically identical / clones or all are $C^R C^W$ / heterozygous	allow all are the same genotype / alleles / genes / DNA	1	
Total			14	