Reproduction in plants

(a) define *mitosis* as cell division giving rise to genetically identical cells in which the chromosome number
is maintained and state the role of mitosis in growth, repair of damaged tissues, replacement of worn out cells and asexual reproduction
(b) define *asexual reproduction* as the process resulting in the production of genetically identical offspring from
one parent and describe **one named**, commercially important application of asexual reproduction in plants
(c) define *meiosis* as a reduction division in which the chromosome number is halved from diploid to haploid
(d) state that gametes are the result of meiosis (reduction division)
(e) define *sexual reproduction* as the process involving the fusion of haploid nuclei to form a diploid zygote
and the production of genetically dissimilar offspring
(f) identify and draw, using a hand lens if necessary, the sepals, petals, stamens and carpels of **one**, locally
available, **named**, insect-pollinated, dicotyledonous flower, and examine the pollen grains under a light
microscope
(g) state the functions of the sepals, petals, anthers and carpels
(h) use a hands lens to identify and describe the anthers and stigmas of **one**, locally available, **named**,
wind-pollinated flower, and examine the pollen grains under a light microscope
(i) outline the process of pollination and distinguish between self-pollination and cross-pollination
(j) compare, using fresh specimens, an insect-pollinated and a wind-pollinated flower
(k) describe the growth of the pollen tube and its entry into the ovule followed by fertilisation (production of
endosperm and details of development are **not** required)
(l) investigate and describe the structure of a non-endospermic seed in terms of the embryo (radicle, plumule and cotyledons) and testa, protected by the pericarp (fruit wall)
(m) state that seed and fruit dispersal by wind and by animals provides a means of colonising new areas
(n) describe the external features of **one**, locally available, **named** example of a wind-dispersed fruit or
seed and of **one named** example of an animal-dispersed fruit or seed
(o) investigate and state the environmental conditions that affect germination of seeds: suitable temperature, water and oxygen
(p) describe the uses of enzymes in the germination of seeds

O/N18/21/Q1

The diagram shows the parts of a plant growing above ground.

(a) (i) State the type of reproduction that takes place using the flower shown in the diagram.

.....

[1]

(ii) Describe the events that must take place for the flower to develop into a fruit.

.....

.....

.....

.....

.....

.....

.....

..... [5]

(b) The plant may also reproduce without using a flower, to produce new plants from plantlets.

State the type of reproduction that produces the plantlets.

.....

[1]

(c) Suggest the advantages to the plant of reproducing by each of the following methods:

using flowers, ...

.....

.....

using plantlets. .....

.....

.....

[3]

[Total: 10]

O/N18/21/Q2

The diagram shows a seed (Fig. 1) and a plant developing from this seed (Fig. 2).

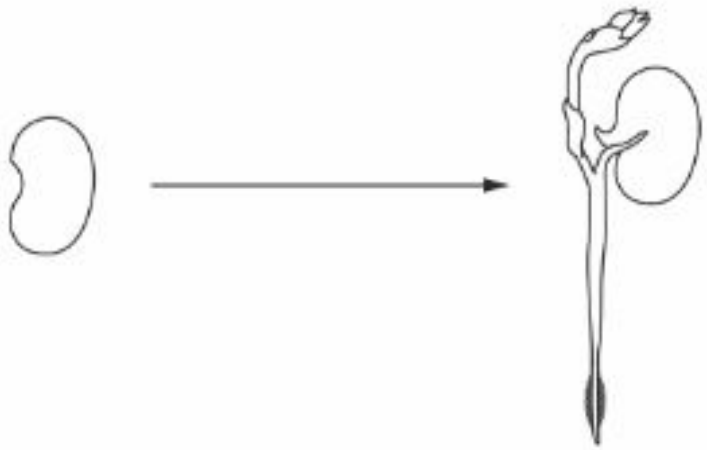


Fig. 1 Fig. 2

(a) (i) Name **two** structures visible in Fig. 2 that are **not** visible in Fig. 1.

1 .....

2 ..... [2]

(ii) Name the process represented by the arrow drawn between Fig. 1 and Fig. 2.
Describe the use of enzymes in this process.

name of process .....

use of enzymes .....

.....

.....

..... [4]

(b) In an experiment, the growth of a plant from a seed is found to be faster as temperatures increase up to 35 °C.

Explain how the development of a plant from a seed would be affected by a temperature much higher than 35 °C.

.....

.....

..... [2]

[Total: 8]

O/N18/22/Q3

The diagram shows a pollen grain with a pollen tube growing from it.

Pollen grains from the same type of plant were placed in sucrose solutions of different concentrations for a fixed amount of time. After this time, the pollen grains and tubes were examined using a microscope. The following observations were made for each concentration of sucrose:

- the number of pollen grains that had germinated to produce a pollen tube,
- the length of each pollen tube.

The table shows the results of the investigation.

% sucrose concentration	% of pollen grains germinated	mean pollen tube length/mm
1	6	0.005
2	13	0.008
4	25	0.015
8	56	0.040
10	31	0.030
20	25	0.018
40	13	0.006

(a) (i) A total of 12 pollen grains were placed in the 20% sucrose solution.

Use the information in the table to calculate the number of pollen grains that germinated to produce a pollen tube in the 20% sucrose solution.

.....[1]

(ii) Suggest why the **mean** pollen tube length was calculated for each sucrose concentration.

.....

.....[1]

(iii) Use the information in the table to suggest the optimum (best) concentration of sucrose solution for pollen tube germination and growth.

..... %

Explain how the information in the table enabled you to reach this conclusion.

.....

.....

.....

[3]

(iv) The germination of a pollen grain to form a pollen tube requires the movement of water into the pollen grain from its surroundings.

Suggest why placing a pollen grain in a solution with a higher sucrose concentration than in your answer to **(a)(iii)** may result in a lower percentage of germination.

.....

.....

.....

.....

.....[3]

(b) Describe the route taken by a growing pollen tube in a plant and explain its importance in plant reproduction.

.....

.....

.....

.....

.....

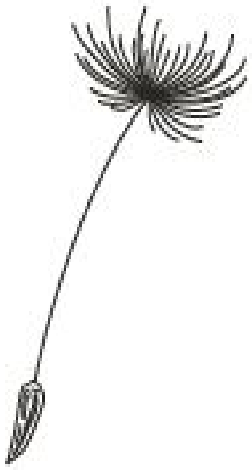
.....

.....[4]

[Total: 12]

M/J18/21/Q3

The diagram shows the fruit of a plant.



(a) Suggest why this fruit is most likely to be wind-dispersed.

.....

.....

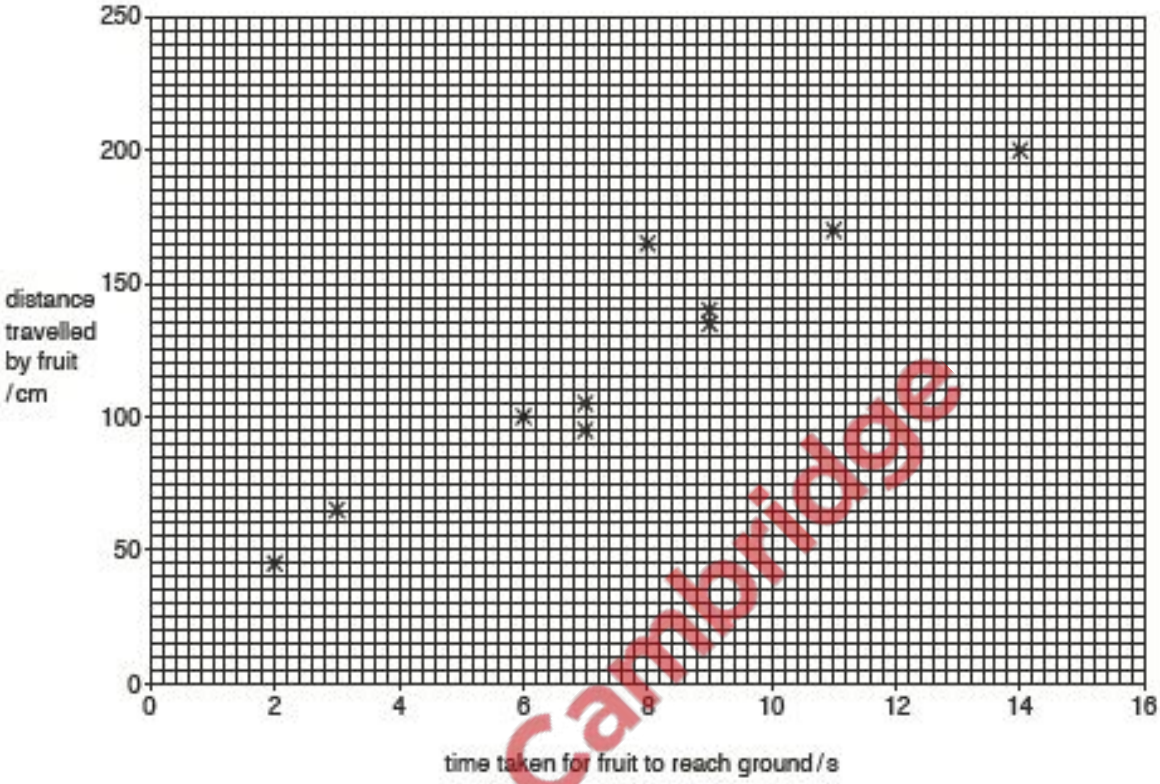
.....

.....

.....[3]

(b) An investigation was carried out to find the time taken for several of these fruits to reach the ground when dropped from the same height. The horizontal distance travelled by each fruit in that time was also measured.

The results of the investigation are shown in the graph.



(i) Describe the pattern shown by the results in the graph.

.....

.....[1]

(ii) State the number of fruits in the investigation that took between 4 and 10 seconds to reach the ground.

..... [1]

(iii) Suggest and explain advantages to the plant of its fruits taking a longer time to reach the ground.

.....

.....

.....

.....

.....

.....[4]

(c) When a fruit of the plant reaches the ground, the process of germination to form a new plant may take place.

State one environmental condition that affects germination and explain the importance of this condition.

environmental condition .....

explanation .....

.....

[2]

[Total: 11]

Reproduction in plants P2 questions 5090

M/J18/22/Q1

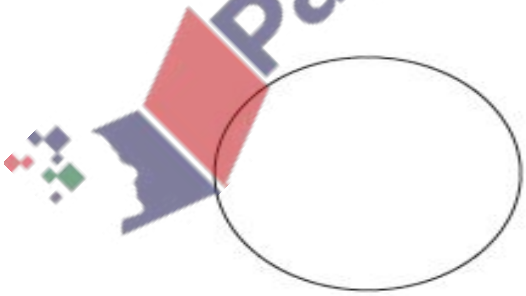
The diagrams show the bud of an insect-pollinated flower and a magnified transverse section through the same flower bud. The transverse section was taken at the position shown by the dotted line.

(a) Complete the table to show the name of each of structures A to D and to state one function of each structure.

letter	name of structure	function
A		
B		
C		
D		

[8]

(b) The diagram shows an incomplete transverse section through the stem of this plant.



(i) Complete the diagram by drawing and labelling the positions of each of the following tissues:

- xylem,
- phloem. [2]

(ii) State one function of xylem tissue.

.....

.....[1]

[Total: 11]

Reproduction in plants P2 questions 5090

O/N17/21/Q5

Fig. 5.1 shows the fruits of two plants, **A** and **B**. Both fruits are animal-dispersed.

fruit A fruit B

Fig. 5.1

With reference to the features shown in Fig. 5.1, describe how these fruits are dispersed.

.....

.....

.....

.....

.....

.....

.....

.....[5]

[Total: 5]

M/J17/21/Q5

The statements **E** to **K** relate to the process of reproduction.

E produces genetically identical offspring

F produces more individuals of the same species

G involves only one parent

H involves fusion of nuclei

I requires gametes

J forms a diploid zygote

K involves only cell division by mitosis

Table 5.1 shows a comparison of sexual and asexual reproduction.

Table 5.1

sexual reproduction only	asexual reproduction only	both sexual and asexual reproduction
	E	

Complete Table 5.1 by writing each letter in the correct box to match it to sexual reproduction only, asexual reproduction only, or to both.

The first letter has been written in the correct box for you. Use each letter **once** only. [6]

[Total: 6]

M/J17/22/Q3

Fig. 3.1 shows flowers from the same species of plant at different stages, D and E, in their development.

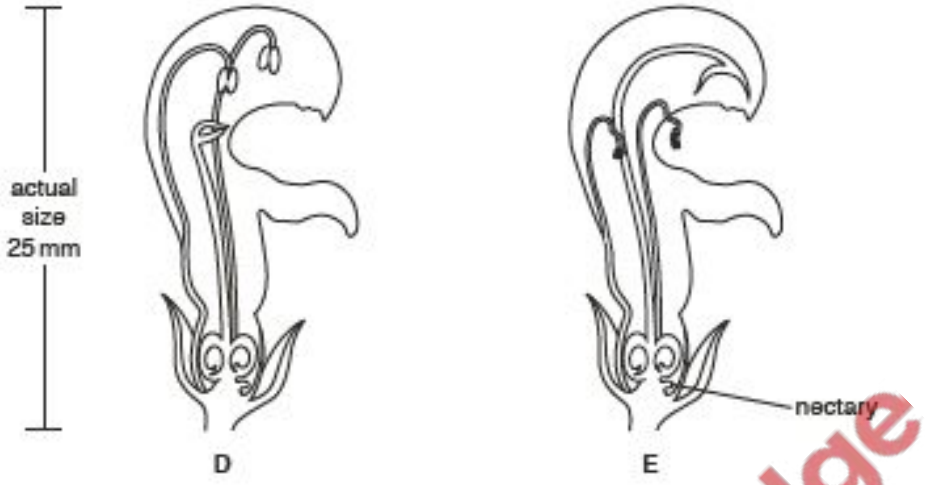


Fig. 3.1

(a) On Fig. 3.1, use lines labelled S and C to label a sepal (S) and a carpel (C). [2]

(b) The flowers are cross-pollinated by an insect. Explain why the insect must visit flower D before visiting flower E.

.....

.....

.....

.....[3]

(c) Suggest how flowers of this species are adapted to be pollinated by an insect such as a bee.

.....

.....

.....

.....

.....

.....[4]

[Total: 9]

M/J17/22/Q7

(a) Fig. 7.1 shows a section through a fruit.

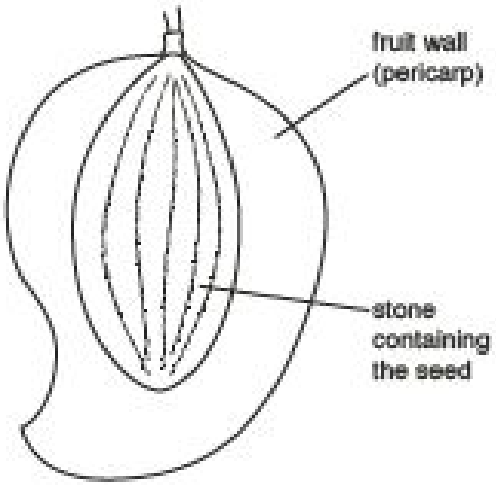


Fig. 7.1

The seed and the fruit wall are genetically different. Explain how this difference is produced.

.....

.....

.....

.....

.....

.....[4]

(b) Describe and explain the differences between wind-dispersed and animal-dispersed fruits.

.....

.....

.....

.....

.....

.....

.....

.....

.....[6]

[Total: 10]

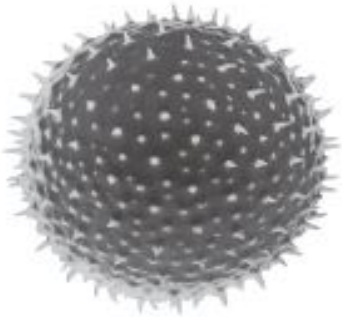
Reproduction in plants P2 questions 5090

O/N16/21/Q2

Fig. 2.1 shows a magnified pollen grain from each of two plant species, **A** and **B**.

magnification ×830

pollen grain from plant species **A**



magnification ×200

pollen grain from plant species **B**

Fig. 2.1

(a) (i) Use the information in Fig. 2.1 and your biological knowledge to describe **three** differences between the pollen grains from species **A** and species **B**.

Write your answers in Table 2.1.

Table 2.1

pollen grain from species **A**	pollen grain from species **B**

[3]

(II) Cross-pollination takes place in both species **A** and species **B**.

Describe what is meant by the term *cross-pollination*.

.....

.....

.....

.....

.....

.....

..... [3]

(III) Using the information provided by Fig. 2.1, describe how cross-pollination is most likely to occur in species **A** and in species **B**.

species **A**

.....

.....

.....

.....

species **B**

.....

.....

.....

.....[3]

(b) Fig. 2.2 is a photograph of the flowers of species **A**.

Fig. 2.2

List **two** features that would be present in the flowers of species **B** that are **not** present in those of species **A**.

1 .....

2 ..... [2]

[Total: 11]

Reproduction in plants P2 questions 5090

M/J16/21/Q2

Dry mass is the mass of all chemicals, excluding water, present in an organism.

Fig. 2.1 shows the stages of germination of a seed. Fig. 2.1 also shows the changes in dry mass of the plant during these stages of germination.

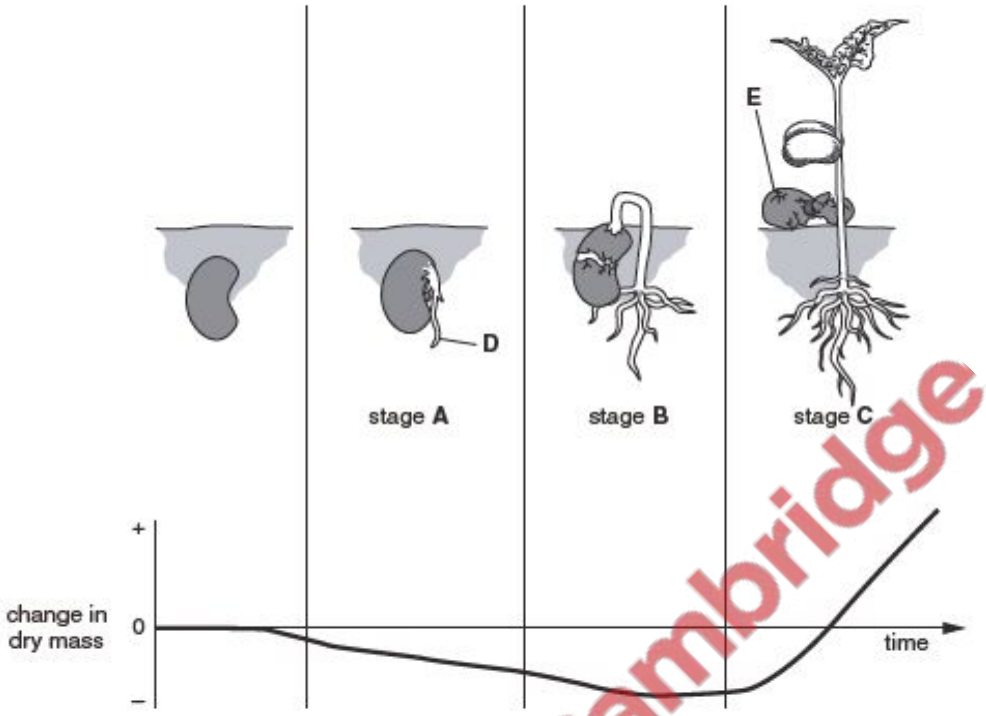


Fig. 2.1

(a) Name the parts labelled **D** and **E** in Fig. 2.1.

D .....

E ..... [2]

(b) Describe and explain the changes in dry mass shown during each of the stages **A**, **B** and **C** in Fig. 2.1.

stage **A** .....

.....

.....

.....

.....

stage **B** .....

.....

.....

.....

.....

stage **C** .....

.....

.....

.....

..... [6]

(c) Water is needed for germination of seeds.

State **two** other conditions needed for germination. Explain why each condition is needed.

condition .....

explanation .....

.....

.....

condition .....

explanation .....

.....

..... [4]

[Total: 12]

Reproduction in plants P2 questions 5090

M/J16/22/Q1

The grape plant has many flowers clustered together on each flowering head. Fig. 1.1 shows the structure of one mature grape flower.

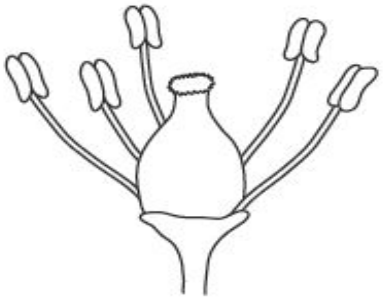


Fig. 1.1

(a) **(i)** Name **two** parts, normally found in other flowers, that are missing from this mature flower.

1 .....

2 ..... [2]

(ii) Suggest the type of pollination found in the grape plant and give a reason for your choice.

type of pollination .....

reason .....

.....[2]

(b) Fig. 1.2 shows a section through a fruit that develops from the same flower.

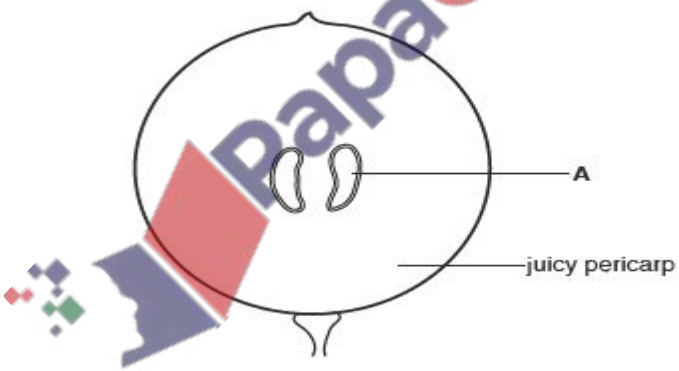


Fig. 1.2

(i) Name the structure labelled **A** in Fig. 1.2. ..... [1]

(ii) Suggest how part **A** is dispersed and give reasons for your answer.

.....

.....

.....

.....

.....

.....

.....[3]

Reproduction in plants P2 questions 5090

O/N15/22/Q1

Fig. 1.1 shows a carpel of a flower with two pollen grains on top.

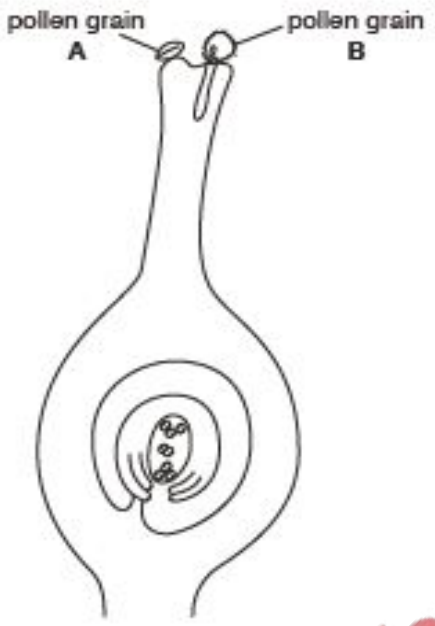


Fig. 1.1

(a) Name each of the following:

(i) the process that has brought the pollen grains to the carpel

.....[1]

(ii) the part of the carpel to which the pollen grains are attached.

.....[1]

(b) On Fig. 1.1, draw a line to show the route taken by the pollen tube up to the point at which male and female gametes fuse. [3]

(c) Name each of the following:

(i) a part of the carpel where the nuclei are all **diploid**

.....[1]

(ii) a part of the carpel that contains **haploid** nuclei.

.....[1]

(d) Suggest why pollen grain A has not developed a pollen tube.

.....

.....[1]

[Total: 8]

Reproduction in plants P2 questions 5090

O/N15/22/Q9

(a) Outline the processes of *mitosis* and *meiosis*, including references to where they occur.

.....

.....

.....

.....

.....

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.....

.....[7]

(b) Describe the advantages of asexual reproduction in plants with reference to a **named** commercially important application.

.....

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.....

.....

.....

.....

.....[3]

[Total: 10]

Reproduction in plants P2 questions 5090

M/J15/21/Q8

(a) Describe the external features of **one named** example of a wind-dispersed fruit or seed. State the importance to the plant of this method of dispersal.

.....

.....

.....

.....

.....

.....

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.....

..... [5]

(b) State **two** environmental conditions that affect the germination of seeds. Describe the importance of each condition.

.....

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.....

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.....

.....

.....

.....

..... [5]

[Total: 10]

Reproduction in plants P2 questions 5090

M/J15/22/Q6

(a) For a **named** fruit or seed, describe how it is adapted for animal dispersal.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(b) A student planted seeds from different types of plant in the same area of soil.

(I) Suggest why some of the seeds did not germinate.

.....

.....

.....

..... [2]

(II) Explain why several of the seedlings were unable to survive after a few weeks.

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 10]

Reproduction in plants P2 questions 5090

O/N14/21/Q8

(a) (I) Explain how meiosis is involved in the formation of gametes.

.....

.....

.....

..... [2]

(II) Explain how two plants, one with red flowers and one with white flowers, can produce seeds that will grow into plants with either red or white flowers in the ratio of 1:1.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

(b) Suggest how two plants, of a different species, one with red and one with white flowers, could produce seeds that will grow into plants with pink flowers.

.....

.....

.....

.....

..... [2]

[Total: 10]

Reproduction in plants P2 questions 5090

O/N14/22/Q6

(a) Describe the differences between an ovule, a seed and a fruit.

.....

.....

.....

.....

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.....

.....

.....

.....

.....

.....

..... [6]

(b) Explain how fruits or seeds may be modified for dispersal by wind.

.....

.....

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.....

.....

.....

.....

..... [4]

[Total: 10]

Reproduction in plants P2 questions 5090

M/J14/21/Q7

(a) Compare the processes of mitosis and meiosis.

.....

.....

.....

.....

.....

.....

.....

.....[4]

(b) Use your knowledge of how sex is inherited to explain which parent determines the sex of a child.

.....

.....

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.....

.....

.....

.....

.....

.....

.....

.....

.....[6]

[Total: 10]

Reproduction in plants P2 questions 5090

M/J14/22/Q3

Fig. 3.1 shows a flowering head of wheat, and individual flowers before and after opening.

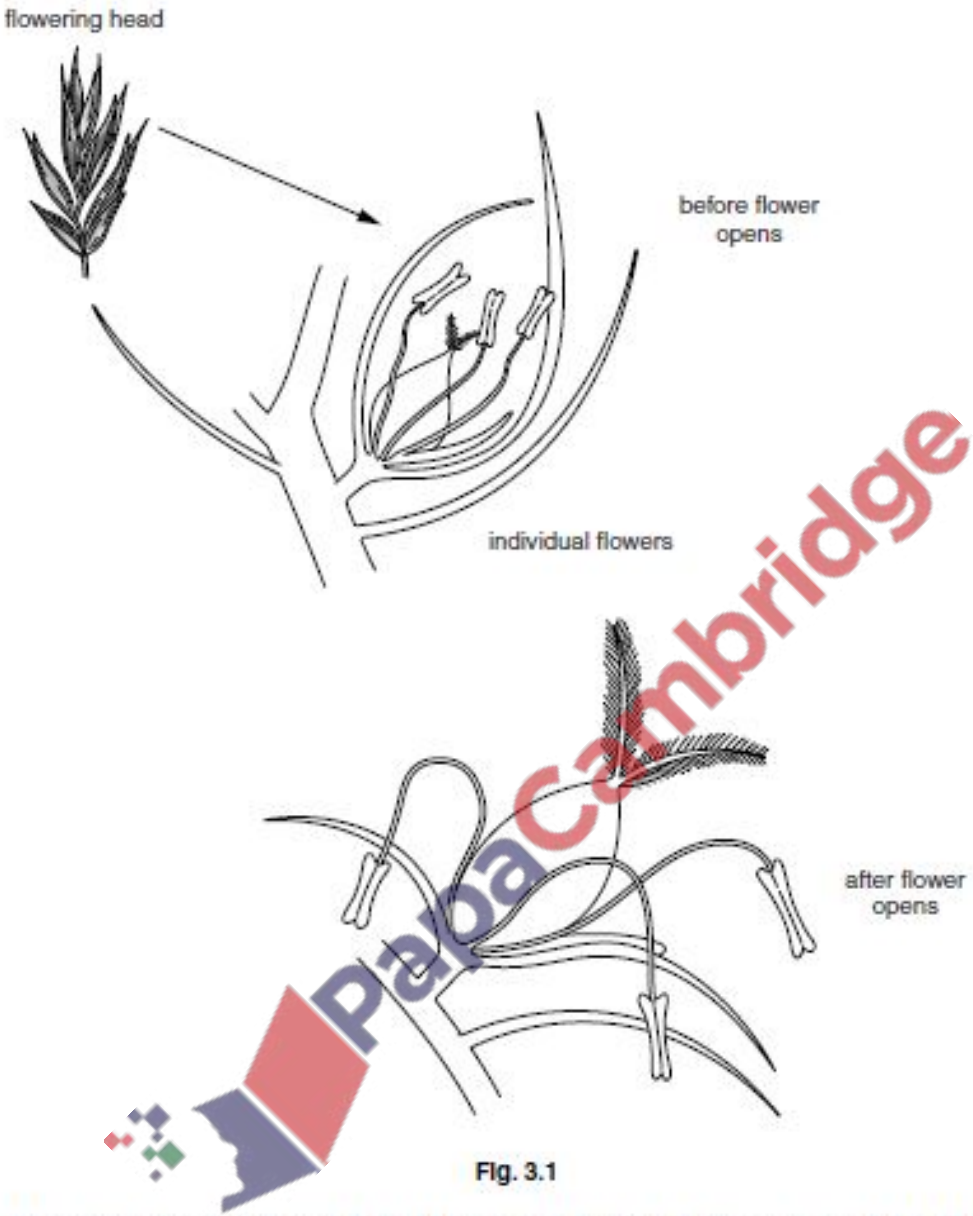

Fig. 3.1

The anthers release most of their pollen before the flower opens. The rest is released after the flower opens.

Reproduction in plants P2 questions 5090

(a) Name the type of pollination found in the wheat plant before the flower opens.

.....

[1]

(b) **(I)** Using the information provided by Fig. 3.1, describe pollination in the wheat plant after the flower opens.

.....

.....

.....

.....

.....[3]

(II) Wheat pollen is relatively heavy and is released for only a few hours after the flowers open.

Suggest **two** disadvantages of this.

.....

.....[2]

(c) Scientists are working to introduce genes into wheat plants to make them resistant to attack by insect pests (greenfly) and to encourage root nodule bacteria from pea and bean plants to live in their roots.

(I) Name the type of experimental work in which these scientists are involved.

.....

[1]

(II) Suggest how the growth of root nodule bacteria on the roots of wheat plants could reduce the amount of fertiliser required by a growing wheat crop.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[5]

[Total:12]

Reproduction in plants P2 questions 5090

O/N13/21/Q8

(a) Explain the importance of *meiosis* in sexual reproduction.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(b) Fruits and seeds may be dispersed by the wind.

Describe the features of a **named** wind-dispersed fruit or seed and explain the importance of these features in the process of dispersal.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

[Total: 10]

Reproduction in plants P2 questions 5090

O/N13/22/Q8(a)

(a) Describe the part played by an ovule in the reproduction of a plant.

.....

.....

.....

.....

.....

.....

.....

..... [4]

Reproduction in plants P2 questions 5090

M/J13/21/Q3

(a) Fig. 3.1 shows how pollination takes place in two different species of plant, species **P** and species **Q**.

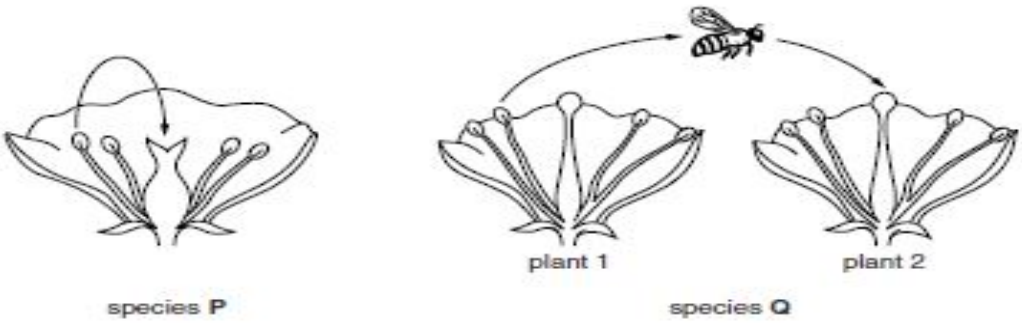

Fig. 3.1

(i) Using the information in Fig. 3.1, suggest and explain how each of these species of plant is pollinated.

species **P**

.....

.....

species **Q**

.....

.....

[4]

(ii) Suggest **two** ways in which a flower from a plant of species **Q** in Fig. 3.1 may be adapted to increase the likelihood of pollination taking place.

1. .....

2. .....

[2]

(b) State why species **Q** shows more variation in its phenotype than species **P**.

.....

..... [1]

(c) Describe the events that take place in a flower after pollination until fertilisation has taken place.

.....

.....

.....

.....

.....

..... [3]

[Total: 10]

Reproduction in plants P2 questions 5090

M/J13/22/Q6

(a) Crops can be grown under controlled conditions in large buildings.

Describe and explain how such buildings can provide the conditions needed for maximum crop production.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[7]

(b) Suggest why seeds from crops grown in this way may produce fewer offspring and only small variations compared with crops grown naturally.

.....

.....

.....

.....

.....[3]

[Total: 10]

Reproduction in plants P2 questions 5090

MARK SCHEME

Mark schemes will use these abbreviations:

; separates marking points

/ alternatives

() contents of brackets are not required but should be implied

R reject

A accept (for answers correctly cued by the question, or guidance for examiners)

Ig ignore (for incorrect but irrelevant responses)

AW alternative wording (where responses vary more than usual)

AVP alternative valid point (where a greater than usual variety of responses is expected)

ORA or reverse argument

underline actual word underlined must be used by candidate

+ statements on both sides of the

+ are needed for that mark

0/N18/21/Q1

1(a)(i) sexual ; 1

1(a)(ii) pollen + stigma ;

pollen tube ;

style ;

ovary / ovule ;

female gamete / ovum ;

fertilisation or described ;

growth of pericarp / ovary wall ;

petals fall off / stamens or stigma or style withers AW ;

5 Ig self- or cross-pollination

1(b) asexual / vegetative ; 1

1(c) (using flowers) maximum 2 marks from

variation AW ;

population more likely to survive environmental change / disease ;

more widely dispersed ;

reduction of competition ;

(using plantlets) maximum 2 marks from

quick / only one plant needed / no other organism needed ;

supply of water / nutrition from parent plant ;

higher survival rate ;

new plants in environment to which plant is well suited AW

O/N18/21/Q2

2(a)(i) radicle / root ;

root hairs ;

plumule / shoot / stem ;

leaves ;

hypocotyl ;

2(a)(ii) (name of process)

germination / growth ; (use of enzymes) maximum 3 marks from

digest / breakdown / hydrolysis ; amylase ;

starch + to maltose / glucose ;

protease ;

protein

+ to amino acids ;

lipase ;

fats + to fatty acids and glycerol ;

4

2(b) development AW slower / would not germinate / would not grow ;

denature ; reactions / digestion / hydrolysis / breakdown + slow / don't occur ;

O/N18/22/Q3

3(a)(i) 3 ; 1 R 3%

3(a)(ii) some may not germinate / some may not produce a pollen tube ;

accuracy / precision / reliability / validity / reduce error ;

Reproduction in plants P2 questions 5090

3(a)(iii) 8 ;

highest AW + % / number ;

highest AW

+ length OR longest ;

3(a)(iv) water

+ concentration / potential ;

less / no

+ water enters OR water leaves ;

osmosis / diffusion ;

3(b) stigma ;

style ovary / ovule / ovum / embryo sac / female gamete ;

movement of AW + male gamete / male nucleus / pollen nucleus ; fertilisation / fusion of gametes ;

M/J18/21/Q3

3(a) reference to structures on top of fruit **;**

increases surface area **;**
delays descent **/** wind catches beneath structures / floats **AW ;**

3(b)(i) time taken increases **+** distance travelled increases **OR** proportional **;**
3(b)(ii) 6 **; 1**
3(b)(iii) (fruits / seeds) will travel further **;**
away from plant **;**
away from other fruit / seeds / scattered **;**
colonise other areas **;**
reduced competition / prevent overcrowding **;**
competition for light / water / nutrients **;**
increased chance of **+** new plant / reproduction / germination **AW ;**
3(c) *environmental condition* temperature / water / oxygen **;**
explanation **;**
- (temperature) reference to enzyme activity
- (water) reference to solution / softening / rupture of testa / enzyme activity / transport
- (oxygen) reference to respiration

M/J18/22/Q1

1(a)
letter name of structure function
(A) sepal / calyx **;** protect **;**
(B) petal / corolla **;** attract / landing platform **;**
(C) stamen / anther **; or**
filament **;**
produces / contains **AW +**

pollen / male gamete / male nucleus **;**
support anther **;**
(D) ovary / carpel / pistil **;** produces / contains **AW +**
ovum / ovule / egg / female gamete **;**
or
forms **AW** fruit / site of fertilisation **;**
1(b)(i) **1** one or more vascular bundles **+** each oval shaped **+** location correct **;**
'xylem' labelled on inside **+** 'phloem' labelled separately on outside of at least one oval vascular bundle **;**
1(b)(ii) **1** transports / carries **AW +** water / ions / minerals **;**
support **;**

O/N17/21/Q5

5 (*fruit A*)
hooks / spikes **AW ;**
on animal / fur **;**
falls off / rubbed off / leaves animal **AW ;**
(*fruit B*)
edible / eaten / food **;**
colour / taste / juicy / sweet **;**
thrown away / discarded / faeces / egested **AW ;**
(*for A or B*)
new location / away from parent plant **;**

M/J17/21/Q5

5 *(sexual only)*
H ;
I ;
J ;
3 R letters in more than one box
Ig letters in incorrect box
(asexual only)
(**E**)
G ;
K ;
2
(both)
F ;

Reproduction in plants P2 questions 5090

M/J17/22/Q3

(a) line ending either on or in sepal **+** labelled either '**S**' or 'sepal' **;**
line ending either on or in carpel **+** labelled either '**C**' or 'carpel' **;**
3(b) (flower **D**)
anther(s) / stamen(s) **;**
pollen **+** mature / produced / present / released / collected **;**
stigma **+** closed / immature **AW** / does not receive pollen **;**
(flower **E**)
stigma **+** open / mature / receives pollen **;**
anthers **+** withered **AW OR** reference to no pollen produced / present / released / to be collected **;**
3
3(c) large **+** petal(s) **;**
reference to insect / bee landing **AW** on petal **;**
colour(ful) **+** petal(s) **;**
reference to scent / smell **;**
reference to nectar(ies) / (nectar) guides **;**
pollen **+** stick(y) / hooked (to attach to insect / bee) **;**
insect / bee makes contact **AW** with anther / stigma **+** while collecting nectar **;**

M/J17/22/Q7

7(a) (seed)
1 seed **+** results from fertilisation **AW** / sexual reproduction **;**
2 (fusion / fertilisation of) gametes **OR** pollen nucleus **+** egg /ovum / ovule **;**
3 reference to (gametes often) from different plants / flowers **;**
4 (gametes produced by) meiosis / reduction division **;**
5 combination **AW** of (different) genes / alleles **;**
(fruit)
6 fruit (wall) **+** results from mitosis **;**
7 reference to (genetically) identical / clones **;**
4 A maximum of **three** of marking points **1** to **5**
(i.e. for 'seed')
7(b) (wind) (animal)
1 small **OR** large **;**
2 light / buoyant **OR** heavy **;**
3 wings / parachutes **OR** hooks / hairs **;**
4 large surface area **OR** attachment (to animal) **;**
5 large number **OR** small number **;**
6 not coloured / dull **OR** colour / named colour / bright **;**
7 not sweet/juicy/flesh(y)/scented **OR** sweet / juicy / flesh(y) / scented **;**
8 reference to food / eaten / digested **;**
9 seed **+** enzyme resistant / cannot be digested / is egested / is lost in faeces / is thrown away **;**

O/N16/21/Q2

2(a)(i) **A** small **+ B** large / **A** smaller / **B** larger **;**
A smooth **+ B** spikes **AW ;**

Reproduction in plants P2 questions 5090

A wind dispersal / **B** animal dispersal **;**
A light / **B** heavy **;**
2(a)(ii) transfer / movement **+** of pollen **;**
from anther **;**
to stigma **;**
of another plant (of same species) **;**
A stamen / pollen sac
R another species

2(a)(iii) (plant species **A**) wind **;**
reference to light / small / carried (by wind) **;**
(plant species **B**) insect **;**
reference to attachment (to insect) / carried (by insect)
moving between flowers **;**
2(b) large (petals) **;**
(brightly) coloured / patterned (petals) **;**
anthers enclosed in flower / not hanging out / erect **;**
scent **;**
nectar **;**

M/J16/21/Q2

2 (a) radicle / root ;
testa / seed coat ;
[2]
(b) stage A:
decreases ;
stage B:
decreases ;
explanation for A / B:
food store used ;
reference to respiration ;
reference to enzyme / named
enzyme action ;
stage C:
increases ;
explanation for C:
reference to photosynthesis ;
reference to production of
named food compound ;
reference to more cells
made / tissue growth ;
maximum 3 marks for A / B and
maximum 3 marks for C
[max 6]
(c) oxygen ;
reference to respiration ;
energy + for growth ;
suitable / correct temperature ;
reference to enzyme ;
breaks down food store AW ;

M/J16/22/Q1

1 (a) (i) sepals / calyx ;

petals / corolla ;
nectaries ;
[max 2]
(ii) type of pollination: self / wind ;
reason for wind: exposed / large +
stamens / anthers ;
reason for self: position of anthers
relative to stigma / carpel ;
reason for either : no petals / nectaries
to attract insects ;
[1]
[max 1]
(b) (i) seed / cotyledon ; [1]
(ii) bird / animal / herbivore ;
sweet / sugary / coloured
(skin) / juicy / succulent / taste / smell ;
eaten / consumed / food ;
spits out or drops / undigested / passes
out with faeces ;
at a distance from parent
plant / elsewhere AW ;
R reference to excretion
[max 3]
(ii) sugar (or named) / correct formula ;
fermenter/ fermentation / anaerobic
respiration (or description of) ;
reference to suitable
temperature / warmth ;
reference to enzymes ;
(c) (i) yeast / fungus ;

O/N15/22/Q1

1 (a) (i) pollination ; [1] I insect / wind / cross / self
(ii) stigma ; [1]
(b) line (continuing) down style ;
entering micropyle ;
touching / entering embryo sac ;
[3]
(c) (i) stigma / style / ovary wall ; [1]
(ii) ovary / ovule / embryo sac / ovum / ova / egg (cell) / gamete ; [1]
(d) from a different species / type / kind of plant ;
ref. chemicals on stigma unsuitable ;
couldn't germinate / not viable / infertile AW ;
not there long enough / grain immature / wrong enzymes ;

O/N15/22/Q9

9 (a)
both cell division ;
(mitosis)
in body cells or named ;
for growth / repair / replacement ;
chromosome number retained AW ;
ref. asexual reproduction / single parent ;

produces copy / identical / similar ;
produces two cells ;
(meiosis)
in ovaries* / ovule ;
testes* / anthers ;
ref. gamete / sex cell production ;
chromosome number halved / cells become haploid ;
sexual reproduction ;
genetically different ;
produces four cells ;
[max 7]
max 4 marks for mitosis or meiosis
A in zygote
I growth / repair within a cell
* OR A gonads for one mark
I fertilisation
(b) name of correct organism / crop / technique ;
always an exact / similar copy ;
known characteristics / flavour AW ;
more certain outcome / can be conducted in controlled conditions;
not reliant on pollination (agent) ;
only one parent needed ;
quick(er) ;
less expensive / greater profit / higher yield / more offspring ; A cutting, micro-propagation, tubers, bulbs, layering, runners

M/J15/21/Q8

8 (a) example named ;
large surface area ;
related adaptation, e.g. wing, air
bladder, etc. ;
allows plant to colonise new areas ;
reduces competition ;

(b) water ;
softening testa / seed coat ;
activation of enzymes ;
solvent ;
oxygen ;
ref. respiration* ;
energy (for germination / growth)* ;
suitable temperature ;
ref. enzyme / named enzyme action ;
break down food store ;
ref. respiration* ;
energy (for germination / growth)* ;

M/J15/22/Q6

6 (a) 1. name of fruit or seed ;
2. adaptation that brings animal and
plant into contact ;
3. how fruit or seed as carried away ;
4. how fruit or seed is discarded by

animal ;
5. ref to distance from parent
plant / another location ;
1. must fit the description if one is
given
2. e.g. taste, colour, hooks, etc.
3. e.g. internally, in intestine,
eaten, attached to fur
4. e.g. defaecation, scratched off /
falls off / spat out
[max 4]
(b) (i) 1. seeds not viable / dormant / AW ;
2. temperature not suitable ;
3. (amount of) water ;
4. some of the seeds may require
light ;
5. pH ;
[max 2]
(ii) 1. ref. to competition ;
2. accept two from (for) light /
nutrients / water ;;
4. ref. unsuitable temperature / pH ;
5. diseases ;
6. eaten (by herbivores / insects /
pests) / damage by animals ;
7. toxins in soil ; 1. A overcrowding 2. Ig refs to too much Ig CO_2 and O_2

O/N14/21/Q8

8 (a) (i) in testes / anthers / ovaries ;
cell division ;
halving of chromosome numbers / haploid ;
so that diploid number is restored on fertilisation ;
[max. 2]
(ii) one (either) colour is controlled by a dominant allele;
one by a recessive allele ;
one parent heterozygous – (or described, e.g. Rr) ;
one is homozygous recessive (or described) ;
correct ref. to gametes ;
gametes correctly identified for both parents ;
how gametes pair to produce offspring in 1:1 ratio ;
[max. 6]
(all points acceptable on an
annotated genetic diagram)
(b) mutation ;
ref to a named mutagen ;
possible co-dominance ;
ref. to heterozygous plants having pink flowers ;
ref. availability of certain ions (as in Hydrangea) ;

O/N14/22/Q6

(a) ovule:
in ovary ;
contains female gamete ;

ref. to haploid ;
seed:
ovule after fertilisation ;
ref. diploid (or with ref. fruit) ;
(grows) larger than ovule ;
stores food / ref. cotyledons ;
contains (rest of) embryo / radicle + plumule ;
(surrounded by) testa ;
ref. dispersal ;
fruit:
seed(s) + ovary (wall) / pericarp ;
ref. dispersal ;

(b) dry ;
light ;
(may be) winged / hairy / feathery / helicopter / parachute ;
large surface area ;
to allow wind to detach it from parent plant ;
to delay its descent ;
(allow it to be carried) long distance AW / away from parent plant ;

M/J14/21/Q6

7 (a) Mitosis Meiosis
2 daughter cells 4 daughter cells
haploid diploid
chromosome number
maintained
chromosome number
halved
occurs in all organs / body
cells
occurs in gamete producing
organs / named
produces body cells / used in
growth
produces gametes / named
ref. asexual reproduction ref. sexual reproduction
no genetic variation in
offspring AW
genetic variation in offspring
AW
[4]
All points must be comparative to gain credit.
(b) Father ;
Max 5 from the following:
father is XY / contains Y chromosomes ;
mother is XX / does not contain Y chromosomes ;
father produces sperm with either X or Y (chromosomes) ;
mother produces eggs only with X (chromosomes) ;
sex depends on which sperm fertilises the egg ;
1:1 male : female in offspring / AW ;

Reproduction in plants P2 questions 5090

M/J14/22/Q3

3 (a) self (–pollination) ; [1]
(b) (i)
(carried by) wind ;
pollen to stigma ;
of another (wheat) plant / flower ;
correct ref. to cross-pollination (now being possible) ;
[3] Ig ref. to animals
(ii) wind can't carry / can't be carried far / reduced dispersal ;
too much dependence on self-pollination / lack of (genetic)
variation AW ;
wind may not be blowing (over short time period) ;
reduces chances of pollination / fertilisation ;

(c) (i) genetic engineering / genetic modification ;
[1] Ig gene transfer / biotechnology
(ii) (bacteria) fix / convert / change / turn ;
atmospheric / soil nitrogen ;
(to) ammonium ;
(to) nitrates ;
(to make) amino acids / proteins ;
(nitrates) absorbed / (amino acids or proteins) used by plants

O/N13/21/Q8

8 (a) cell division;
ref. to chromosomes;
diploid to haploid;
gamete formation/ named gametes;
all gametes genetically different;
fertilisation restores chromosome number / AW;
leads to variation in population;
[max 4]
A halving of chromosome
number
(b) name of fruit / seed (not linked to following marks);
structural feature of fruit/seed that is a wind-dispersal
adaptation;
ref. large surface area / buoyancy;
*wind removes fruit / seed from parent plant;
*seed relatively light in mass;
*to delay descent of seed AW;
spread over large area / prevent overcrowding /
competition ;
[max 6]
Accept * points for descriptions
of pollen for max 3
e.g. floats for long time /
increases air resistance

O/N13/22/Q8(a)

8 (a) contains female gamete / female nucleus / egg cell;
in ovary;

fertilized / fuse;
(by the) male gamete / male nucleus;
(to form) zygote / embryo;
surrounded by integuments/testa;
seed + germinates (to form new plant);

M/J13/21/Q3

3 (a) (i) (species P)
self / insect / wind ;
(pollen) from anther to stigma*;
of same flower;
(species Q)
Cross;
(by) insect (pollination);
(pollen) from anther to stigma*;
of different plant;
[max 4]
* accept once only in either P or Q
Accept plausibly named insect eg
bee, wasp
(ii) brightly coloured petals;
large petals;
scent;
nectar;
sticky pollen or stigma;
[max 2]
(b) Cross pollination / has 2 parents / ref genes / alleles; [1] Accept "exchange of traits"
(c) pollen tube;
grows / digests + down style;
to ovule / embryo sac / micropyle;
male + female gametes /egg / nuclei fuse;

M/J13/22/Q6

(a) 1. addition / availability of carbon dioxide;
2. controlled / optimum AW temperature (or any reasonable stated temperature);
3. ref. light (intensity);
4. ref. blinds during day / artificial lights (at night time);
5. keep well supplied with water / ref. irrigation / humidity control;
6. addition of fertiliser / any named ion / pH control / hydroponic techniques ;
7. nitrate + protein manufacture / magnesium + chlorophyll production;
8. photosynthesis (A anywhere relevant);
9. growth;
10. maximum rate / day and night / 24 hrs per day ;
11. pest control;
12. protection from (adverse) climatic factors or any named AW; Max 7
Ignore refs. to O_2
A any named ion + function
R chloroplasts

Must be ref. P/S or growth
(b) isolation from other varieties of the species;
limited genetic variation;
can pollinate only with plants in the building / cannot cross pollinate with plants outside;
exclusion from agents of pollination / wind / insects;
seeds less viable;