



IG.B1 Sexual Reproduction in Flowering Plants

EDEXCEL 4BI1 · Calculator allowed · about 70 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

1 State the function of each of the following flower parts.

Figure (to be drawn): A labelled diagram of a generalised flower in cross-section, showing (from outside in) sepals, petals, and the reproductive structures: the stamen (filament topped by an anther) and the carpel (stigma, style, and ovary containing ovules).

(a) Anther (1)

(b) Stigma (1)

(c) Ovary (1)

(d) Ovule (1)

(Total for Question 1 is 4 marks)

2 Define pollination.

(Total for Question 2 is 2 marks)

3 Insect-pollinated flowers and wind-pollinated flowers have very different adaptations for the same purpose: getting pollen from one flower to another. For each feature below, describe how it typically differs between an insect-pollinated flower and a wind-pollinated flower.

(a) Petals (2)

(b) Stigma (2)

(c) Pollen (2)

(d) Nectar (2)

(Total for Question 3 is 8 marks)

4 Define fertilisation in a flowering plant.

(Total for Question 4 is 2 marks)

5 Describe what happens between a pollen grain landing on a stigma and fertilisation taking place.

(Total for Question 5 is 3 marks)

6 State what the ovary and the ovule each develop into after fertilisation has taken place.

(i) The ovary develops into the (1)

(ii) The ovule develops into the (1)

(Total for Question 6 is 2 marks)

7 Name and describe one method by which seeds may be dispersed by wind, and one method by which seeds may be dispersed by animals.

(a) Wind dispersal (2)

(b) Animal dispersal (2)

(Total for Question 7 is 4 marks)

8 Explain why it is advantageous for a plant to disperse its seeds away from the parent plant.

(Total for Question 8 is 3 marks)

9 State three conditions needed for a seed to germinate, and briefly explain why each is needed.

(a) Water (2)

(b) Oxygen (2)

(c) A suitable (warm/optimum) temperature (2)

(Total for Question 9 is 6 marks)

10 In an experiment, 40 out of 50 cress seeds germinated after 7 days. Calculate the percentage of seeds that germinated.

(Total for Question 10 is 3 marks)

11 A student wants to investigate the effect of temperature on the percentage of cress seeds that germinate. Describe how the student could carry out this investigation, including how she should try to make it a fair test.

(Total for Question 11 is 5 marks)

12 Compare self-pollination and cross-pollination, stating one advantage of each.

(a) Define self-pollination, and state one advantage of it. (2)

(b) Define cross-pollination, and state one advantage of it. (2)

(Total for Question 12 is 4 marks)

13 Grass is wind-pollinated. Its flowers have large, feathery stigmas that hang outside the flower, and anthers that hang loosely on long filaments outside the petals. Explain how each of these two features helps the plant achieve pollination by wind.

Figure (to be drawn): A diagram of a single grass flower (floret), showing large feathery stigmas protruding from the top of the floret and three anthers hanging on long thin filaments below, all exposed outside the small green bracts (there are no showy petals).

(a) Explain how the large, feathery, exposed stigma helps. (2)

(b) Explain how the loosely hanging, exposed anthers help. (2)

(Total for Question 13 is 4 marks)

Mark scheme · IG.B1 Sexual Reproduction in Flowering Plants

Question 1

- (a) **B1** produces pollen (which contains the male gametes)
- (a) **Answer: Produces pollen (the male gametes)**
- (b) **B1** receives pollen grains during pollination (often sticky, to trap pollen)
- (b) **Answer: Receives pollen during pollination**
- (c) **B1** contains the ovule(s); develops into the fruit after fertilisation
- (c) **Answer: Contains the ovule(s); becomes the fruit**
- (d) **B1** contains the female gamete (egg cell); develops into the seed after fertilisation
- (d) **Answer: Contains the female gamete; becomes the seed**

Question 2

- **B1** the transfer of pollen
- **B1** from the anther (of one flower) to the stigma (of the same or another flower of the same species)
- **Answer: The transfer of pollen from an anther to a stigma**

Question 3

- (a) **B1** insect-pollinated: large, brightly coloured, and often scented, to attract pollinating insects
- (a) **B1** wind-pollinated: small and dull-coloured (e.g. green or brown), usually with no scent, since there is no insect to attract
- (a) **Answer: Insect: large, bright, scented. Wind: small, dull, unscented**
- (b) **B1** insect-pollinated: small and sticky, positioned inside the flower
- (b) **B1** wind-pollinated: large, feathery, and exposed, hanging outside the flower to catch airborne pollen
- (b) **Answer: Insect: small, sticky, inside flower. Wind: large, feathery, exposed**
- (c) **B1** insect-pollinated: produced in small quantities, with grains that are often spiky or sticky, so they cling to an insect's body
- (c) **B1** wind-pollinated: produced in very large quantities, with grains that are light and smooth, so they can be carried easily by the wind
- (c) **Answer: Insect: small amount, spiky/sticky. Wind: huge amount, light/smooth**
- (d) **B1** insect-pollinated: nectar is present, as a sugary food reward that attracts pollinating insects
- (d) **B1** wind-pollinated: nectar is absent, since there is no insect to reward or attract
- (d) **Answer: Insect: nectar present. Wind: nectar absent**

Question 4

- **B1** the fusion of the nucleus of a male gamete (from a pollen grain) with the nucleus of a female gamete (the egg cell in an ovule)
- **B1** to form a zygote
- **Answer: Fusion of a male gamete nucleus with a female gamete nucleus to form a zygote**

Question 5

- **B1** the pollen grain germinates and grows a pollen tube, which grows down through the style towards the ovary
- **B1** the male gamete nucleus travels down inside the pollen tube
- **B1** when the tube reaches an ovule, the male nucleus fuses with the female (egg cell) nucleus, which is fertilisation
- **Answer: A pollen tube grows down the style, carrying the male nucleus to an ovule, where it fuses with the egg cell nucleus**

Question 6

- (i) **B1** fruit
- (i) **Answer: Fruit**
- (ii) **B1** seed
- (ii) **Answer: Seed**

Question 7

- (a) **B1** names a valid wind-dispersed example, e.g. dandelion or sycamore/ash
- (a) **B1** correct adaptation described, e.g. dandelion seeds have a fluffy 'parachute' structure that catches the wind and carries the seed away from the parent plant; or sycamore/ash fruits have a wing-shaped structure that makes them spin and glide on the wind
- **(a) Answer: e.g. dandelion: fluffy parachute structure carried by the wind**
- (b) **B1** names a valid animal-dispersed example, e.g. burdock/goosegrass (hooked fruit) or a berry-producing plant such as blackberry
- (b) **B1** correct adaptation described, e.g. burdock fruits have hooks that catch on an animal's fur and are carried away before falling off; or berries are eaten by animals and the seeds pass through the digestive system unharmed, being deposited elsewhere in the animal's droppings
- **(b) Answer: e.g. burdock: hooked fruit catches on fur; or berries eaten and seeds excreted elsewhere**

Question 8

- **B1** reduces competition between the seedlings and the parent plant (and between the seedlings themselves) for a named resource, e.g. light, water, minerals/nutrients, or space
- **B1** explains that this means more resources are available per seedling, so more seedlings are likely to survive and grow to maturity
- **B1** a second distinct benefit, e.g. allows the species to colonise new areas, or reduces the spread of disease between crowded seedlings
- **Answer: Reduces competition for resources near the parent plant, and allows colonisation of new areas**

Question 9

- (a) **B1** water is needed
- (a) **B1** correct reason: activates enzymes inside the seed and allows the stored food reserves to be broken down and used (mobilised) for growth
- **(a) Answer: Water: activates enzymes so stored food reserves can be used**
- (b) **B1** oxygen is needed
- (b) **B1** correct reason: needed for (aerobic) respiration, which releases the energy the germinating seed needs for growth
- **(b) Answer: Oxygen: needed for respiration to release energy for growth**
- (c) **B1** a suitable/warm temperature is needed
- (c) **B1** correct reason: the enzymes involved in germination work fastest within a particular temperature range; too cold and reactions are too slow, too hot and enzymes may be denatured
- **(c) Answer: Suitable temperature: enzymes work best in an optimum range**

Question 10

- **M1** forms the fraction 40/50
- **M1** multiplies by 100
- **A1** 80% cao
- **Answer: 80%**

Question 11

- **B1** identifies the independent variable (temperature) and a method of varying it, e.g. placing dishes of seeds in incubators or water baths set to several different named temperatures
- **B1** identifies the dependent variable: the number (or percentage) of seeds that have germinated, measured after a fixed, stated number of days
- **B1** states a valid control variable, e.g. the same number of seeds used in each dish
- **B1** states a second valid control variable, e.g. the same amount of water, the same type/batch of seed, the same amount of light, or the same type of dish
- **B1** states a way of improving reliability, e.g. using a reasonably large sample of seeds per dish and/or repeating each temperature and taking a mean
- **Answer: Vary temperature (independent), measure % germinating (dependent), keep other variables constant, use a large/repeated sample**

Question 12

- (a) **B1** definition: pollen is transferred from the anther to the stigma of the same flower (or another flower on the same plant)
- (a) **B1** advantage: does not rely on a pollinator being present, so pollination is more reliable/certain, e.g. useful when few pollinators are available
- (a) **Answer: Self-pollination: pollen moves within the same plant; advantage is reliability without needing a pollinator**
- (b) **B1** definition: pollen is transferred from the anther of a flower on one plant to the stigma of a flower on a different plant of the same species
- (b) **B1** advantage: produces greater genetic variation among the offspring, which can help a population adapt to a changing environment or be more resistant to disease
- (b) **Answer: Cross-pollination: pollen moves between different plants; advantage is greater genetic variation**

Question 13

- (a) **B1** the large, feathery surface, positioned outside the flower where it is exposed to the air, gives it a large surface area for intercepting airborne pollen
- (a) **B1** this increases the chance that drifting pollen grains happen to land and stick on it
- (a) **Answer: Large surface area exposed to air increases the chance of catching drifting pollen**
- (b) **B1** hanging loosely outside the flower on long filaments lets the anthers move and shake freely in the wind
- (b) **B1** this makes it easy for large amounts of light pollen to be shaken loose and released into the air, so it can be carried away by the wind
- (b) **Answer: Loose, exposed anthers shake freely, releasing pollen easily into the wind**