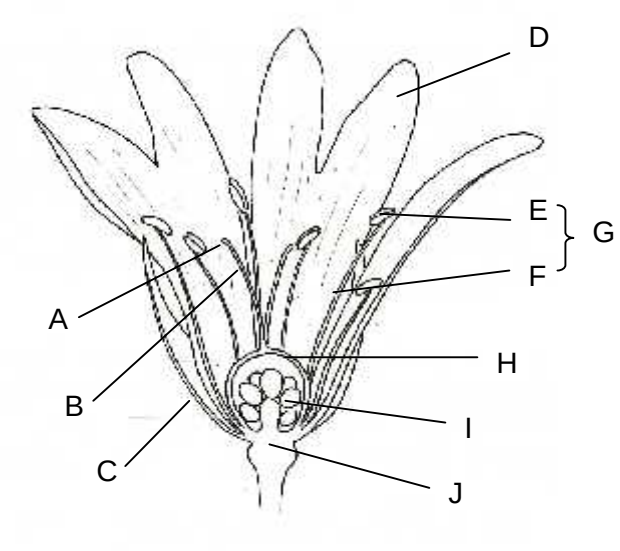
8 Reproduction in flowering plants

1 Which is the most accurate statement?
The principal role of a flower in the life cycle of a plant is:
(a) attracting insects
(b) producing seeds
(c) producing pollen
(d) producing nectar

2 Name the parts A-J shown on this drawing of a half-flower of a Stitchwort.



3 What is (a) the male gamete, and (b) the female gamete in a flowering plant?

4 Complete the following paragraph selecting words from the list below. Pollination is the transfer of ……. from the …….. to the ……. in a flower. In cross-pollination, the ……. from a flower on one …….is transferred to the …….of another ……. of the same species.

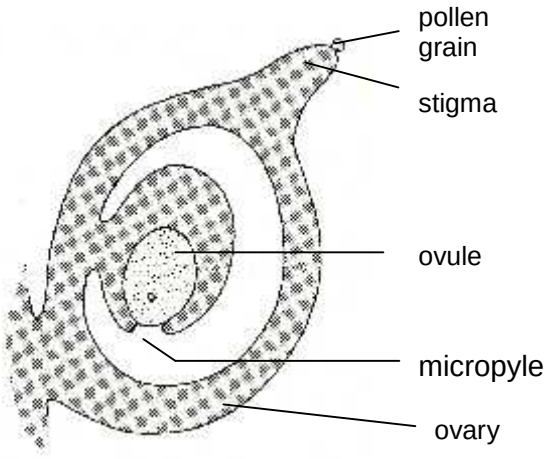
anthers, ovule, stigma, plant, flower, pollen, ovary, petal, style, receptacle, stamens

5 Complete the following sentences:
In a flowering plant fertilisation occurs when the ……..of the ……. fuses with the …….of the …… . After fertilisation , the ……. becomes the ……. and the ……. becomes the ……. .

6 Which of the following statements is correct? In flowering plants:
(a) pollination can take place without fertilisation
(b) fertilisation can take place without pollination
(c) pollination and fertilisation are the same
(d) pollination and fertilisation must occur at the same time

7 Some species of plant are strongly adapted to pollination by certain insects. Which of the following characteristics would you regard as adaptations to pollination by bees:
(a) white or coloured petals
(b) light, smooth pollen grains
(c) spiky or sticky pollen grains
(d) anthers and stigma inside the flower
(e) anthers and stigma protruding from the flower
(f) small green petals
(g) production of nectar
(h) production of pollen
(i) production of scent?

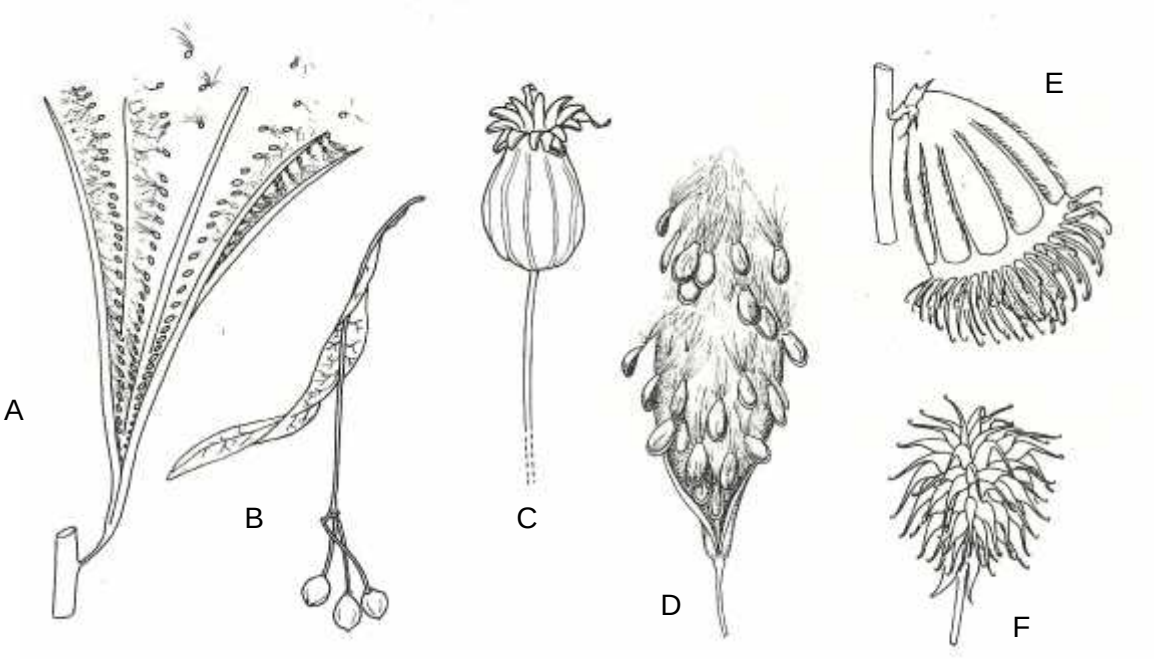
8 A bee visits several flowers in succession on a single willow herb plant. In doing so, the bee transfers pollen from the younger flowers, near the top of the inflorescence (group of flowers) to the older flowers near the base of the inflorescence. Is this an example of self-pollination or cross-pollination?



9 Complete the drawing to show what has to happen before fertilisation can occur

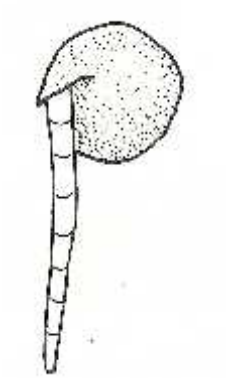
Reproduction in flowering plants (continued)

10 The drawings show seeds or fruits of different plants.
(a) From the appearance of the structures, make a guess at how each one is dispersed giving reasons for your answers.
(b) What are the advantages to a plant of an effective method of seed dispersal?



11 The root of the pea seedling is marked with equally spaced lines as shown here. Draw what you would expect to see in two days' time if the root

(a) grew only from the tip
(b) grew uniformly along its length
(c) grew only at the top
(d) did not grow.



12 (a) What conditions do most seeds need in order to begin germination?
(b) What other condition do the seedlings need to continue growth to mature plants?

13 How would you design, in principle, an experiment to test the hypothesis that a variety of lettuce seed needed daylight in order to germinate?

14 Figure 1 represents a pea seed split open to show its structure. Name the parts A-C and state the function of each.
Figure 2 represents a pea seedling-5 days after germination. Name the parts D-H.

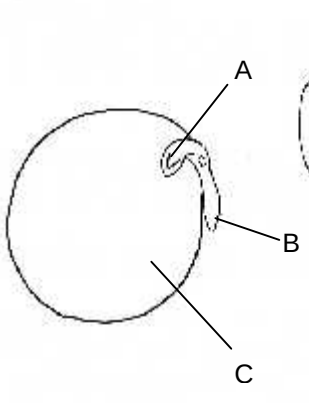


Figure 1

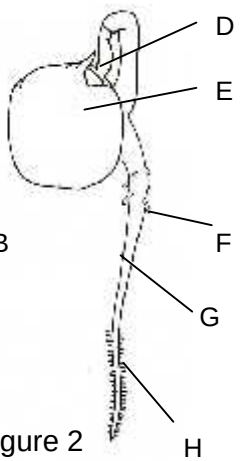


Figure 2

15 The early stages of germination take place in the soil where there is little or no light for photosynthesis. How does the seedling obtain materials for its growth and energy during needs during this time?

Reproduction in flowering plants (continued)

16 You are asked to set up an experiment to investigate the effect of temperature on the rate of germination. You place ten soaked peas in each of three flower pots containing moist sand. One pot is placed in a refrigerator at 4°C, one is placed in a cupboard at room temperature (about18°C) and the third is placed in an incubator at 25°C. You leave them for a week, checking each day that the sand is kept moist.

(a) How would you judge the results?

(b) Why was the pot, at room temperature, kept in a cupboard rather than on the laboratory bench?

17 Starch is one of the most common storage product in seeds. What happens to the starch before it can be used by the germinating seed?

18 The diagram represent an experiment to test the hypothesis that seeds need oxygen in order to germinate.

(a) What is the liquid in A and what does it do?

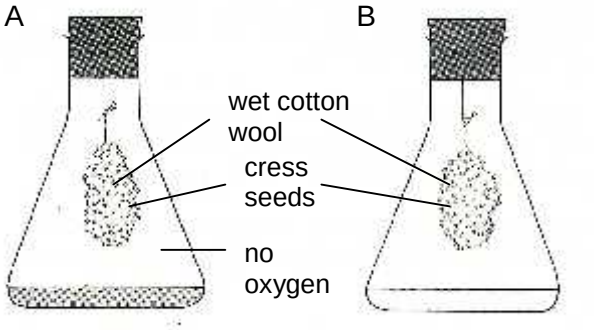
(b) What is the liquid in B and what does it do?

(c) Which of the two flasks represents the control and what is its purpose?

(d) What results would you expect

(i) if oxygen is necessary for germination

(ii) if oxygen is not necessary for germination?



19 What differences would you expect to see between pea seedlings grown for 10 days in total darkness and pea seedlings grown in the light for the same period of time?

8 Reproduction in flowering plants - answers

1 The most accurate statement is (b). A flower's principal role is seed production. Statements (a), (c) and (d) are true of many plants but these are functions which may help bring about seed production.

2 A-stigma, B-style, C-sepal, D-petal, E-anther, F-filament, G-stamen, H-ovary, I-ovule, J-receptacle.

3 (a) The male gamete in a flowering plant is the pollen grain (strictly, the gamete is the male nucleus in the pollen grain).
(b) The female gamete is the egg cell in the ovule.

4 Pollination is the transfer of *pollen* from the *anthers (or stamens)* to the *stigma* in a flower. In cross-pollination, the *pollen* from a flower on one *plant* is transferred to the *stigma* of another *plant* of the same species.

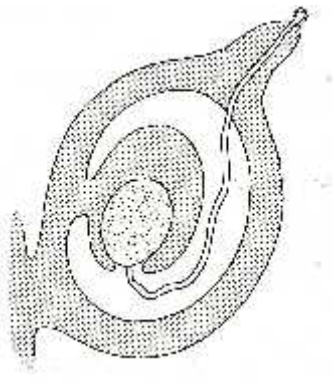
5 In a flowering plant, fertilisation occurs when the *nucleus* of the *pollen grain* fuses with the *nucleus* of the *egg cell*. After fertilisation, the *ovule* becomes the *seed* and the *ovary* becomes the *fruit*.

6 Statement (a) is correct, though normally fertilisation will follow pollination if the pollen and stigma are compatible.

7 Characteristics which are regarded as adaptations to pollination by bees are: (a) white or coloured petals, (c) spiky or sticky pollen grains, (d) anthers and stigma inside the flower, (g) production of nectar, (i) production of scent. Some of these features could equally well be adaptations to pollination by butterflies.

8 Transfer of pollen between flowers on the same plant is self-pollination; so is transfer of pollen within the same flower.

9 The drawing should show a pollen tube growing from the pollen grain to reach the micropyle of the ovule.



10 A (willow herb) and D (Asclepias) have seeds dispersed by the wind. The fine fluffy hairs act as parachutes. E (Agrimone) and F (herb bennet) are dispersed by animals.. The fruits have hooks which catch in the animal's fur. B (lime) and C (campion) are also wind dispersed. The lime has a bract which functions as a wing, slowing down the fruit's rate of fall. The campion is an example of the censer mechanism in which seeds are shaken out of the fruit capsule when the wind sways the long stalk.

Reproduction in flowering plants - *answers* (continued)

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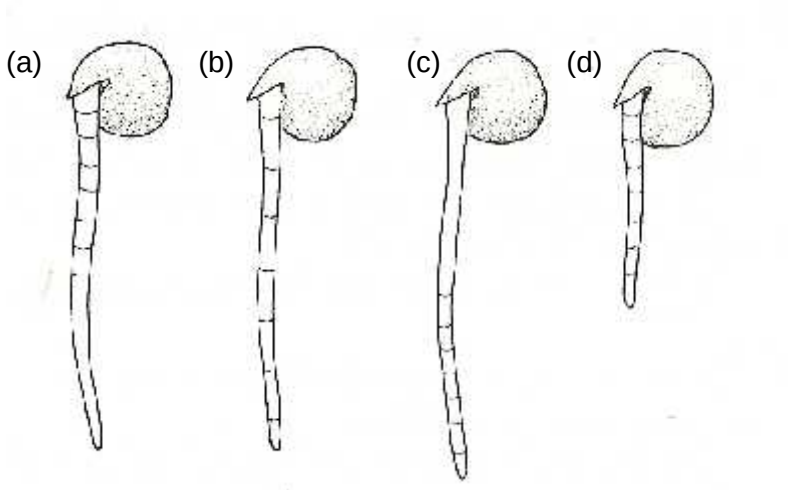

12 (a) Most seeds need water, oxygen and a certain minimum temperature (warmth) to start germinating.

(b) To grow to maturity the seedlings will also need mineral salts from the soil and sunlight for photosynthesis.

13 You would need as large a sample of seeds as was convenient for counting, say 30. The seeds would be provided with water and a suitable temperature. The seeds, in a suitable container, would be placed in a light-proof box or cupboard for a period long enough to allow germination. The box or cupboard would not be opened during this period.
The same number of seeds, from the same batch (same packet), would be given identical conditions of moisture and temperature but placed in daylight for the same period of time.
At the end of this period the numbers of seeds which germinated in each case would be counted and compared.

14 Figure 1: A-plumule, will form the plant's shoot;
B-radicle, will form the plant's first root; C- cotyledon, stores food, mainly starch and protein.
Figure 2: D-plumule, E-testa, F-lateral root, G-radicle (root), H-root hairs.

15 In the early stages of germination, the seedling derives the materials for its growth and energy from food stored in the cotyledons (for dicotyledonous plants).

16 (a) To compare the extent of germination at each temperature you would need to measure the height of the shoots and the lengths of the roots of the seedlings from each pot. The measurements for each temperature would then be averaged and compared. You could also count the number of leaves and lateral roots, if any.

(b) Because the seeds in the refrigerator and incubator would be in darkness, it was necessary to keep the ones at room temperature in darkness as well; otherwise, any difference in germination might be attributed to a difference in light rather than to a difference in temperature.

Reproduction in flowering plants - answers (continued)

17 Starch is insoluble and has to be converted, by enzymes, to soluble sugars before it can be transported and used in the seedling.

18(a) The liquid in flask A is a mixture of pyrogallic acid and sodium hydroxide in water (a solution of sodium pyrogallate). This solution absorbs oxygen (and carbon dioxide) from the air in the flask.

(b) The liquid in B is sodium hydroxide solution. It absorbs carbon dioxide from the air in the flask.
(Some experiments may use water rather than sodium hydroxide solution, but this is less satisfactory.)

(c) Flask B represents the control. It shows that, if oxygen is present, cress seeds can germinate even in these artificial conditions and also in the absence of carbon dioxide (if sodium hydroxide is used).

(d) (i) If oxygen is necessary for germination the cress seeds should germinate in B but not in A.

(ii) If oxygen is unnecessary, the cress seeds should germinate in both flasks.

19 The seedlings grown in darkness will have long, thin, white stems (long internodes) and small, unopened leaves.

The seedlings grown in the light will have shorter, thicker greenish stems (short internodes). The leaves will have opened up and will be green, and larger than those of the seedlings in darkness.