

IGCSE and GCSE Biology. Answers to questions

Section 2. Flowering Plants. Chapters 6 - 9

Chapter 6 Plant structure and function

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1. **a** Epidermis. Helps maintain shape, reduces evaporation, resists entry of bacteria and fungi.
b Mesophyll. Photosynthesis.
2. No chloroplasts are present.
3. **a** Oxygen and water vapour.
b Carbon dioxide.
4. Grasses and plants such as daffodil, iris. (*See* Fig 30.20 on p. 278).
5. Closure of the stomata prevents excessive loss of water but has the disadvantage that it also prevents intake of carbon dioxide for photosynthesis.

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1. Vessels (xylem), sieve tubes (phloem), fibres.
2. The vascular bundles, particularly the vessels and lignified cells. The epidermis helps to maintain shape. (*See* Experiment 2 on p. 58).
3. Xylem consists of vessels. Lignified tubes formed from dead cells joined end to end. Phloem consists of living cells, also joined end to end but with a continuity of living cytoplasm. They are not lignified.
The function of xylem is to conduct water from roots to leaves. The function of phloem is to conduct food. The direction depends on the needs of the plant.

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1. Xylem conducts water and mineral ions from the roots to the rest of the plant.
Palisade cells make glucose by photosynthesis.
The root hair absorbs water and minerals from the soil.
The root cap protects the growing point of the root from damage as it grows through the soil.
A stoma controls the passage of water vapour from the leaf to the atmosphere. It also allows the passage of carbon dioxide and oxygen into or out of the leaf.
The epidermis helps maintain the shape of the leaf or stem, reduces evaporation and protects the inner tissues from bacteria and fungi.
2. A stem is likely to be green and to have buds. A root will be white with no buds but, possibly, lateral roots.
With the aid of a hand lens or microscope you would be able to see that the stem's vascular bundles were in a circle just beneath the epidermis. The root's vascular bundle would be in the centre.
3. **a** Stoma, air space, mesophyll cell.
b Root hair cell, xylem vessel, midrib, leaf 'vein'. mesophyll cell.
4. If root hairs appeared on the part of the root that was growing, (extending), they would be rubbed off as the root pushed through the soil.
5. A petal is a living structure and needs a supply of water, mineral ions and food, so you would expect vascular bundles to be present.

Chapter 7 Transport in plants

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1. The water molecule enters the root hair cell, passes through the root cortex to reach a vessel in the vascular bundle. It is carried up the vessel in the stem by the transpiration stream and enters a leaf via the midrib. It passes into the xylem of a leaf vein and enters a leaf cell by osmosis. It later diffuses through the cell wall into an air space and escapes as water vapour by diffusion through a stoma.

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1. A hot, dry (low humidity) climate with persistent wind will favour transpiration.
2. The leaves would wilt i.e. lose their turgidity and droop.
3. In sunlight the stomata will be open, allowing CO₂ to enter the leaves but also allowing water loss by evaporation. The sunlight will also warm the leaf and increase the rate of evaporation.
4. The transpiration stream will carry mineral ions ('mineral salts') as well as water.
5. The stem and flowers may also transpire.

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1. **a** Vessels carry water and mineral ions ('salts'). Sieve tubes carry food, (e.g. glucose).
b Vessels carry water and salts one way from the roots to the leaves, flowers and fruits. Sieve tubes carry food from the leaves to any part of the plant which is using or storing food.
2. The inside layers of the bark include the phloem. If this layer is removed, the food made in the leaves cannot reach the roots which consequently die, causing the death of the entire tree.
3. The roots; all the tissues in the shoot which do not contain chlorophyll (cortex, phloem, epidermis etc.); flowers, fruits and seeds.

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1. The root hairs would lose water by osmosis to the soil and would cease to function. Eventually the plant would wilt and die.
2. Active transport needs energy from respiration. A waterlogged soil will contain too little oxygen for adequate respiration.
3. A leafless tree offers very little surface for transpiration to take place. A small amount of water vapour may escape through openings in the bark (lenticels). (*See p. 64*).

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1. The plant and the water in the beaker lose 15 grams (275-260) in 2 hours. Of this, 3 grams is due to evaporation of water directly from the beaker. So, the plant was responsible for 12 grams due to transpiration. The rate of transpiration is, therefore, 6 grams per hour.
2. **a** The moisture from the fingers would change the colour of the cobalt chloride paper.
b The 'Sellotape' should prevent water in the atmosphere from reaching the cobalt chloride paper.
3. You would not expect air to escape from the stomata because there is no connection between the vessels and the air spaces in the leaf. If you cut away the top half of the leaves you would expect air bubbles to appear from the cut ends of the vascular bundles, which contain the xylem vessels.

Chapter 8 Reproduction in flowering plants

Page 69

1. Calyx, petals, stamens, carpels.
2. Colour, scent, nectar.
3. **a** Ovule
b Ovary.

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1. **e** anthers split. **d** bee visits young flower. **a** dusted with pollen. **c** bee visits older flower.
b pollen deposited on stigma.
2. Apple, cherry, horse chestnut (They all have flowers with conspicuous petals).
3. **a** Only a large insect, such as a bee, can push between the upper and lower petals to reach the nectary.
b The nectaries are at the end of a long spur. Only insects with long 'tongues' can reach them.
4. There seems no reason why insects should not also become adapted to pollination of certain flowers. You might expect the adaptations to include the development of longer mouthparts which reach distant nectaries, a bristly thorax to which pollen can stick, increased sensitivity to specific colours and scents, more acute vision.
- 5.

Insect pollinated	Wind pollinated
White or coloured petals. Scented. Nectar produced. Stamens and stigma wholly or partly protected or concealed by petals. Spiky pollen grains*	Small green petals. Not scented. No nectar. Stamens and stigma exposed to the air. Light, smooth pollen grains.

*Not described in the text

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1. **a** The stamens.
b The ovaries.
2. Pollination is the transfer of pollen from the anthers to the stigma.
Fertilisation is the fusion of male gametes from the pollen with the female gametes in the ovule.
3. **a** Yes.
b No.
4. **a** The ovary forms the fruit.
b The petals, the stamens, the stigma and style fall off after fertilisation.
c The calyx remains attached.
5. **a** Fruits. Runner beans, grapes, marrows, tomatoes.
b Seeds. Peas. baked beans.
c Neither. Rhubarb.

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1. The advantages of dispersal are (a) that the seedlings are less likely to compete with each other if the seeds are widely dispersed, (b) that new areas may be colonised.
The disadvantage is that a large proportion of seeds may land in situations where they cannot grow.
2. Seeds light enough to be carried on the wind are likely to be carried long distances before they fall to the ground. Seeds carried by animals are likely to be carried long distances depending on the normal range of the animal. Birds are likely to carry the seeds for the greatest distances.
3. Wind pollination refers to the transport in the air of pollen grains produced by the stamens of one plant to the stigma of another flower of the same species. Although the pollen grains may be carried anywhere, pollination does not occur unless the pollen reaches the stigma.
Wind dispersal involves the random distribution of a plant's seeds in air currents until they fall to the ground where they may germinate.

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1. **a** The function of the radicle is to produce a root which will anchor the plant in the soil and absorb water and minerals.
b The function of the plumule is to produce a shoot with a stem and leaves which will make food by photosynthesis.
c The function of the cotyledons is to provide food for the germinating seedlings. In some cases, the cotyledons protect the plumule as it grows through the soil.
2. This question is erroneous. The book deals with the French bean and not the broad bean. In the case of the French bean, **a** the plumule is protected by being enclosed between the cotyledons during its passage through the soil. **b** The radicle is protected by the root cap.
3. The seedling will use the stored food to provide energy from respiration to drive all the processes involved in germination. The food provides the raw materials (proteins, carbohydrates, lipids), for construction of new cytoplasm, new cells and new tissues, i.e. growth.
4. Once the first leaves appear in the seedling and start to produce food by photosynthesis, the seedling will become less and less dependent on the stored food.
5. The radicle will start to absorb water from the soil. Until the plumule has a supply of water to expand the cells, (by osmosis), it cannot extend and grow.

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1. Water, oxygen and a suitable temperature.
2. The question should read '...experiments 2-4....'
In Experiment 4, light was excluded from all the seeds but only the ones in the refrigerator failed to germinate properly. Light, therefore, was not necessary for germination.
3. This should refer to Experiment 4
a Remove the seeds from the refrigerator and leave them at room temperature. If they have not been 'killed' by the low temperature, they should begin to germinate.
b In theory, you could set up controlled environments in which the temperatures ranged from 0° to 15° C. You would have to decide how long to leave the seeds before interpreting the results.

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1. Warm, moist, well aerated soil.

By digging the soil, aeration and drainage are improved. The seeds must be kept watered.

Chapter 9 Asexual reproduction and cloning in plants

Page 80

1. Shoots have buds which can sprout to form new shoots.

2. Rhizomes grow below soil level and are unaffected by fire.

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