

Coleoptiles with tips covered – no bending, since light does not reach the region behind the tip and auxin remains evenly distributed either side of the shoot (you could argue that bending may still occur if the covers are not long enough down the coleoptiles to prevent this). Untreated coleoptiles – bend towards the right, because auxin is produced by the tip and diffuses away from the light on the left, stimulating growth on that side.

- c** Each coleoptile is a different starting length. Therefore to make for a fair comparison between treatments we need to find the increase in length in comparison to the starting length. We can do this by calculating a percentage increase.

CHAPTER 13

1 ► B 2 ► A 3 ► D 4 ► D

5 ► **a** Stigma.

- b** By the coloured petals, scent and nectar.
c Pollen tube should be shown growing down through the rest of the style and entering the ovary.

6 ► **a** Independent: temperature

Dependent: height of seedlings and % of seeds that germinated

- b** $(3.4 + 4.5 + 2.5 + 3.7 + 2.8 + 4.4 + 4.3 + 2.9 + 2.1 + 3.7) / 10 = 3.43$ cm
c Higher temperatures (20 °C or 30 °C) are needed for germination to take place. At a low temperature (4 °C) few seeds germinated or grew. Growth of seedlings was greater at 30 °C than at 20 °C.
d Temperature affects the activity of enzymes and the rate of metabolic reactions. It increases the kinetic energy of molecules, so that there are more collisions between enzyme and substrate molecules, resulting in an increase in successful reactions. Germination depends on metabolic reactions, so temperature affects germination.

e The light intensity is not controlled. Tube A is in the light, while B and C are in the dark. All three tubes should be in the light (or all three in the dark).

7 ► **a** This method of reproduction does not involve flowers / seeds / pollen and ovules, so is not sexual. It involves the tubers growing from body cells of the parent plant.

- b** The tubers grow from body cells of the parent plant by mitosis, which produces cells that are genetically identical.
c Growth may be affected by the environment of the plants, e.g. different soil minerals or different light intensity.
d Sexual reproduction produces offspring that show genetic variation, allowing them to survive if the environment changes.

8 ► **a** A = stigma, B = ovary, C = anther, D = filament.

- b** Any three of:
- lack of large petals (no need to attract insects)
 - lack of brightly coloured petals (no need to attract insects)

- exposed stamens (to catch the wind and blow pollen away)
- exposed stigma (to catch windborne pollen)
- stigma feathery (to catch pollen).

c The pollen grain produces a pollen tube, which grows down through the tissue of the style and into the ovary. The pollen tube enters an opening in an ovule. The tip of the pollen tube breaks down and the pollen grain nucleus moves out of the pollen tube into the ovule, where it fertilises the nucleus of the egg cell (ovum).

d Any four of:

- large petals
- brightly coloured petals
- stamens enclosed within flower
- stigma enclosed within flower
- stigma sticky
- nectaries present
- large, sticky pollen grains.

9 ► **a** Method A. Fruits are produced by flowers via sexual reproduction, which introduces genetic variation.

b Insect-pollinated. The flower has large, brightly coloured petals to attract insects.

10 ► **a** The banana plants reproduce asexually, so they are all genetically identical. Therefore all the plants are susceptible to the fungus, none is resistant to it.

b If the plants reproduced sexually, this would introduce genetic variation. Some of the plants might then have resistance to the fungus, and would be able to survive.

c Asexual reproduction is faster than sexual reproduction; so more banana plants can be produced more quickly. (Also, if the plants are resistant to a disease, they all will be, so won't be killed by it.)

END OF UNIT 3 QUESTIONS

1 ► **a i** Any four points from:

As light intensity increases, the rate of photosynthesis increases (1). The rate of increase is faster at high CO₂ concentration than at low CO₂ concentration (1).

(At both CO₂ concentrations) the rate of photosynthesis reaches a plateau / maximum / levels off (1). At low CO₂ concentration this happens below light intensity X (1) whereas at high CO₂ concentration it happens at / above light intensity X (1).

The maximum rate of photosynthesis is higher at high CO₂ concentration than at low CO₂ concentration (1).

ii Up to X the limiting factor is light (1), because increasing light intensity increases the rate of photosynthesis (1). Beyond X the limiting factor is CO₂ (1), as increasing light intensity has no effect on the rate of photosynthesis (1) whereas increased CO₂ increases the rate (1).

b i Temperature, water availability.