

This is the **Higher Combined Science** version. Higher Tier questions (★) are included. Some Separate-only content has been omitted.

Photosynthesis and Leaf Structure (6.1–6.3)

Specification reference: 6.1

Q1. Explain how the structure of a leaf is adapted for efficient photosynthesis.

[4 marks]

Q2. Describe how a student could investigate the effect of light intensity on the rate of photosynthesis, including how to control variables.

[3 marks]

Transpiration and Plant Hormones (6.4–6.7)

Specification reference: 6.4

Q3. Explain how guard cells control the opening and closing of stomata.

[3 marks]

★ HIGHER TIER

Q4. ★ Explain how auxin causes a plant shoot to show positive phototropism.

[4 marks]

★ HIGHER TIER

Q5. ★ Describe TWO commercial uses of plant hormones, naming the hormone and its application.

[3 marks]

Total: 17 marks

Photosynthesis and Leaf Structure (6.1–6.3)

Q1 (4 marks)

Explain how the structure of a leaf is adapted for efficient photosynthesis.

- Palisade cells at top, packed with chloroplasts — close to light for maximum absorption [1]
- Transparent epidermis — allows light through to palisade cells [1]
- Spongy mesophyll with air spaces — allows CO₂ to diffuse to palisade cells [1]
- Stomata allow gas exchange; xylem supplies water; phloem removes sugar products [1]

Q2 (3 marks)

Describe how a student could investigate the effect of light intensity on the ra...

- Use pondweed (Elodea); count O₂ bubbles per minute at different distances from lamp [1]
- Control variables: temperature (water bath), CO₂ (add NaHCO₃), use same piece of pondweed [1]
- Take multiple repeats at each distance and calculate mean — increases reliability [1]

Transpiration and Plant Hormones (6.4–6.7)

Q3 (3 marks)

Explain how guard cells control the opening and closing of stomata.

- In light/water-plentiful conditions, guard cells absorb water by osmosis → become turgid → bow outward → stoma opens [1]
- In drought/darkness, guard cells lose water → become flaccid → stoma closes [1]
- This regulates gas exchange and water loss — balancing photosynthesis needs against water conservation [1]

Q4 (4 marks) [★ HT]

★ Explain how auxin causes a plant shoot to show positive phototropism.

- Auxin is produced at the shoot tip [1]
- Unilateral light causes auxin to migrate to the shaded side [1]
- Higher auxin concentration on shaded side → cells elongate more on that side [1]
- Differential elongation causes the shoot to curve towards the light [1]

Q5 (3 marks) [★ HT]

★ Describe TWO commercial uses of plant hormones, naming the hormone and its app...

- Auxins: used as rooting powder — promotes root growth in cuttings [1]
- Auxins as selective weedkillers — broadleaf weeds absorb more → overgrowth → die; narrow-leaf crops unaffected [1]
- Ethene: used to ripen fruit commercially — bananas transported unripe then ripened on demand [1] — accept: gibberellins for larger/seedless fruit