

Answers for support worksheet – Chapter 8

- 1 **a** A = chloroplast, B = mitochondrion (2)
- b** X = oxygen, Y = carbon dioxide (2)
- c** ATP is used to regenerate RuBP. Reduced NADP ($\text{NADPH} + \text{H}^+$) supplies hydrogen ions for the production of triose phosphate. (2)
- d** Glycolysis occurs in the cytoplasm; the Krebs cycle occurs in the matrix of the mitochondrion. (2)

2 (10)

| Process | Mitochondrion | Chloroplast |
|---|---------------|-------------|
| photons excite electrons | false | true |
| electrons pass through carrier molecules | true | true |
| oxidative phosphorylation occurs | true | false |
| ATP is produced from ADP and P_i | true | true |
| takes place in both light and darkness | true | false |

- 3 **a** At the compensation point, uptake and release of carbon dioxide are equal, therefore the rate of photosynthesis and rate of respiration are equal. (2)
- b** Up until point Q, the rate at which carbon dioxide uptake increases with light intensity is at its greatest, indicating that the rate at which photosynthesis increases with light intensity is also at its greatest up to this point. Beyond point Q, the rate of increase starts to drop (the graph becomes less steep and begins to plateau). (2)
- c** ATP and reduced NADP ($\text{NADPH} + \text{H}^+$) (2)
- d** This indicates that another factor, other than light intensity, is now limiting the rate of photosynthesis (for example, temperature). (1)
- 4 **a** Water is required for photosynthesis and this enters the plant through its roots. (1)
- b** Chlorophyll *a* and chlorophyll *b* are both found in chloroplasts. Chlorophylls absorb mainly **blue** and **red** wavelengths of light. In the process of *cyclic photophosphorylation*, light displaces an electron from a chlorophyll molecule. This electron is returned to the chlorophyll via a series of **electron carriers**, each of which is at a lower energy level. **ATP** is synthesised as the electrons flow. **ATP** is used in the light-independent reactions, which occur in the **grana** of the chloroplast. In the process of *non-cyclic photophosphorylation*, the electrons are combined with **hydrogen ions**, which are produced from the photolysis of **water**. (8)

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(5 – 1 mark for each correctly filled box)

| | Photosynthesis | Respiration |
|--|---|---|
| Place where H⁺ ions accumulate | in thylakoid space in grana | between inner and outer membranes of mitochondria |
| Source of H⁺ ions | photolysis of water molecules | hydrogen acceptors such as NADH + H ⁺ |
| Source of energy | light from the Sun | glucose |
| Use of ATP formed | used in the stroma to reduce CO ₂ in light-independent reactions | used in metabolic reactions in cytoplasm |