

This is the **Foundation Combined Science** version. Only Foundation-level content is included. Higher Tier and Separate-only questions have been removed.

Photosynthesis (4.4.1.1)

Specification reference: 4.4.1.1

Q1. Write the balanced symbol equation for photosynthesis.

[2 marks]

Q2. State where in the cell photosynthesis occurs, and describe the role of chlorophyll.

[3 marks]

Q3. List FOUR ways in which plants use the glucose produced by photosynthesis.

[4 marks]

Limiting Factors of Photosynthesis (4.4.1.2)

Specification reference: 4.4.1.2

Q4. Name the THREE main limiting factors of photosynthesis.

[1 mark]

Q5. A student increases the light intensity on a pondweed but the rate of photosynthesis stops increasing after a certain point. Explain this observation and suggest what the student could do to increase the rate further.

[4 marks]

Aerobic and Anaerobic Respiration (4.4.2)

Specification reference: 4.4.2

Q6. Write the word equation for aerobic respiration and state where in the cell this takes place.

[2 marks]

Q7. Write the word equation for anaerobic respiration (a) in human muscle cells and (b) in yeast.

[2 marks]

Q8. A sprinter finishes a 100 m race and continues to breathe heavily for several minutes afterwards. Explain this observation using the term oxygen debt.

[4 marks]

Total: 22 marks

Photosynthesis (4.4.1.1)

Q1 (2 marks)

Write the balanced symbol equation for photosynthesis.

- $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ [2] — award 1 mark if correct but unbalanced or missing light energy notation

Q2 (3 marks)

State where in the cell photosynthesis occurs, and describe the role of chlorophyll.

- Photosynthesis occurs in the chloroplasts [1]
- Chlorophyll is a green pigment in the chloroplasts [1]
- Chlorophyll absorbs light energy (red and blue light) which drives the photosynthesis reactions [1]

Q3 (4 marks)

List FOUR ways in which plants use the glucose produced by photosynthesis.

- Respiration — releases energy (ATP) for plant processes [1]
- Converted to starch — for storage (insoluble, no osmotic effect) [1]
- Converted to cellulose — for cell walls [1]
- Used to make amino acids (with nitrates) → proteins / converted to lipids for seed storage / sucrose for transport [1] — any four valid uses

Limiting Factors of Photosynthesis (4.4.1.2)

Q4 (1 mark)

Name the THREE main limiting factors of photosynthesis.

- Light intensity, CO_2 concentration, temperature [1] — all three required

Q5 (4 marks)

A student increases the light intensity on a pondweed but the rate of photosynthesis does not increase.

- Another factor is now limiting the rate of photosynthesis — not light [1]
- This is likely CO_2 concentration or temperature [1]
- Student could increase CO_2 concentration (e.g. add NaHCO_3 to water) [1]
- Or increase temperature (up to the enzyme optimum) to increase rate of photosynthesis reactions [1]

Aerobic and Anaerobic Respiration (4.4.2)

Q6 (2 marks)

Write the word equation for aerobic respiration and state where in the cell this occurs.

- Glucose + oxygen → carbon dioxide + water (+ energy/ATP) [1]
- Occurs in the mitochondria [1]

Q7 (2 marks)

Write the word equation for anaerobic respiration (a) in human muscle cells and (b) in yeast.

- (a) Glucose → lactic acid (+ small amount of energy) [1]
- (b) Glucose → ethanol + carbon dioxide (+ small amount of energy) [1]

Q8 (4 marks)

A sprinter finishes a 100 m race and continues to breathe heavily for several minutes.

- During the sprint, muscles could not receive O_2 fast enough → anaerobic respiration occurred [1]
- Lactic acid accumulated in muscles [1]
- After the race, extra oxygen is needed to break down the lactic acid (convert to glucose in the liver) — this is the oxygen debt [1]
- Heavy breathing repays the oxygen debt by supplying the extra O_2 needed [1]