Written to the specification from Speca's own topic maps, then independently rechecked for accuracy. These are original practice questions, not past-paper questions. Spotted a mistake? Tell us at hello@speca.co.uk.

SPECA

GCSE Combined Science (AQA Trilogy) · Biology

Bioenergetics · Mark Scheme

For use with the Tiered Worksheet. Marking points are indicative, not exhaustive: award equivalent correct answers.

Section A: Foundation (Q1 to 12)

1) carbon dioxide + water → glucose + oxygen (1 mark for correct reactants, 1 mark for correct products) [2]

2) $C_6H_{12}O_6$ (1); O_2 (1) [2]

3) Light transfers energy from the environment into the chloroplasts / the reaction takes in energy from the surroundings (1) [1]

4) Temperature (1); light intensity (1); carbon dioxide concentration (1); amount of chlorophyll (1) [4]

5) The number of bubbles per minute decreases (1); because light intensity is lower further from the lamp, and light intensity is a limiting factor for the rate of photosynthesis (1) [2]

6) Any three of: converted to starch for storage; converted to fat/oil for storage; converted to cellulose to strengthen cell walls; used (with nitrate ions) to make amino acids for proteins (1 mark each, max 3) [3]

7) glucose + oxygen → carbon dioxide + water (1 mark for correct reactants, 1 mark for correct products) [2]

8) Any two of: aerobic requires oxygen, anaerobic does not; aerobic transfers much more energy than anaerobic; aerobic fully oxidises glucose, anaerobic only partially oxidises it (1 mark each, max 2) [2]

9) glucose → lactic acid (1); glucose → ethanol + carbon dioxide (1) [2]

10) Making bread OR making alcoholic drinks (accept either, 1 mark) [1]

11) Heart rate increases, to deliver oxygenated blood to the muscles faster (1); breathing rate/depth increases, to take in more oxygen and remove carbon dioxide faster (1) [2]

12) If the oxygen supplied to the muscles is not enough to meet demand, the muscles respire anaerobically (1), producing lactic acid, which the body needs extra oxygen to remove afterwards, an oxygen debt (1) [2]

Section B: Higher (Q13 to 18)

13) At low light intensity, light intensity is the limiting factor at both temperatures, so the rate is the same for both (1); at high light intensity, light is no longer limiting, so temperature becomes the limiting factor instead (1); the higher temperature (25°C) allows a faster maximum rate (1) [3]

14) Intensity $\propto 1/d^2$; at 4 m, $d^2 = 16$ (relative to 1 m), so intensity = 80 ÷ 16 (1) = 5 units (1) [2]

15) Indicative content, mark holistically to a maximum of 3: whether light is currently the limiting factor (if not, adding light will not increase the rate); whether the resulting increase in yield/rate is large enough to cover the cost of installing and running the equipment; whether another factor (e.g. temperature, CO_2) would then become limiting instead. Accept other valid reasoning about limiting factors and cost-effectiveness. [3]

16) Lactic acid is transported by the blood to the liver (1), where it is converted back into glucose (1) [2]

Free from speca.co.uk/gcse-science-questions-by-topic. Original questions written by Speca, not past papers.
Speca is not affiliated with, endorsed by, or sponsored by AQA.

17) The extra oxygen the body needs after exercise to react with and remove the lactic acid that has built up (1) [1]

18) Mean rate during recovery = 4000 ÷ 8 = 500 cm^3/min (1); extra (debt) rate above resting rate = 500 − 300 = 200 cm^3/min (1); correct method/units shown throughout (1) [3]

Total: 25 marks (Section A) + 14 marks (Section B) = 39 marks

Speca is an independent product and is not affiliated with, endorsed by, or sponsored by AQA. This mark scheme is originally authored by Speca and is not an AQA document.