1.5 Energy Transfers in and between Organisms: 10-minute Pack

AQA 7402 · Calculator allowed · about 10 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Photosynthesis begins with the light-dependent reactions, which take place on and across the thylakoid membranes of the chloroplast.

(a) State the two products of the light-dependent reactions that are required for the light-independent reactions (the Calvin cycle). **(2)**

(b) Describe how a proton (H^+) gradient is generated across the thylakoid membrane during non-cyclic photophosphorylation. **(3)**

(c) Explain how ATP synthase uses the proton gradient described in part (b) to produce ATP. **(3)**

(Total for Question 1 is 8 marks)

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Mark scheme · 1.5 Energy Transfers in and between Organisms: 10-minute Pack

Question 1

(a) ATP **B1**

(a) reduced NADP (NADPH) **B1**

(a) Answer: ATP and reduced NADP

(b) photoactivation of chlorophyll at photosystem II releases (excited) electrons **B1**

(b) electrons pass along the electron transport chain, releasing energy that is used to actively pump H^+ into the thylakoid space (lumen) **B1**

(b) photolysis of water also releases H^+ (and electrons and O_2) directly into the thylakoid space, adding to the gradient **B1**

(b) Answer: Electron transport chain pumps H^+ into the thylakoid lumen; photolysis of water also releases H^+ into the lumen, both increasing H^+ concentration compared with the stroma.

(c) protons diffuse down their concentration (electrochemical) gradient through ATP synthase, from the thylakoid space into the stroma **B1**

(c) this process is called chemiosmosis **B1**

(c) energy released as protons flow through the enzyme is used to bond ADP and inorganic phosphate (Pi) together, forming ATP **B1**

(c) Answer: Chemiosmosis: H^+ diffuse through ATP synthase down their gradient, and the energy released drives ADP + Pi -> ATP.

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