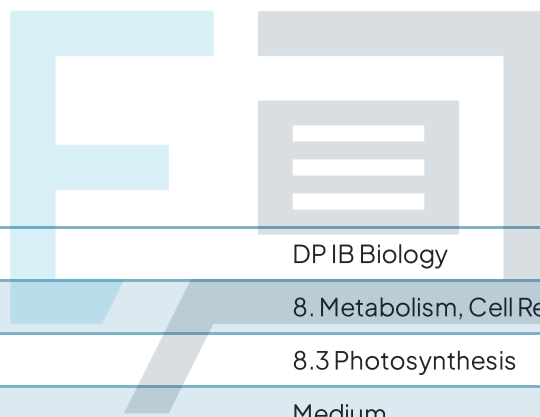


8.3 Photosynthesis

Mark Schemes



Course	DP IB Biology
Section	8. Metabolism, Cell Respiration & Photosynthesis (HL Only)
Topic	8.3 Photosynthesis
Difficulty	Medium

Exam Papers Practice

To be used by all students preparing for DP IB Biology HL
Students of other boards may also find this useful



1

The correct answer is A

The light dependent reaction takes place on the thylakoid membrane (3) and the light independent reaction takes place in the stroma (1).

2

The correct answer is B

I, II and III are the key events that take place during the light dependent stage of photosynthesis. ATP is produced during chemiosmosis as protons leave the thylakoid space. Protons and electrons, from the photolysis of water, are used to reduce NADP to NADPH. Statement IV is not correct as oxidation of NADPH happens during the light independent stage.

3

The correct answer is C

Electrons are excited from the photosystems as part of the electron transport chain. They are used to generate a proton gradient (along with the photolysis of water) and to reduce NADP to NADPH to be used in the light independent reactions of photosynthesis.

Statement II is incorrect because RuBP (ribulose biphosphate) is reformed from triose phosphate in the Calvin cycle.

Statement III is incorrect because G3P is reduced by ATP and NADPH.

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4

The correct answer is **D**

- **A** is not the answer because ATP is phosphorylated from ADP and P_i
- **B** is not the answer as reduced NADP is synthesised (NADH is part of respiration)
- **C** is not the answer as chemiosmosis takes place in the thylakoid membrane

5

The correct answer is **B**

Rubisco is the enzyme used to catalyse the reaction between RuBP (ribulose biphosphate) and carbon dioxide. Although it is recycled to be used in further reactions of the Calvin cycle, it is not regenerated from triose phosphate; RuBP is.

6

The correct answer is **A** because reduced NADP is needed to reduce glycerate-3-phosphate to triose phosphate, which is needed to regenerate RuBP, which can then be used to react with more carbon dioxide.

- **B** is not the correct answer as ATP is not able to build up due to its unstable nature
- **C** is not the answer because ribulose biphosphate is carboxylated by carbon dioxide
- **D** is not the answer because RuBP is not an enzyme, rubisco is the enzyme (catalyst) involved in the Calvin cycle



7

The correct answer is **C**

Calvin made use of the techniques of autoradiography (a type of X-ray to study botanical specimens), two-way paper chromatography and radioactive carbon dioxide to determine the detailed steps of the light independent reactions of photosynthesis. Thin layer chromatography was not used in his experiments.

8

The correct answer is **B** because this is formed from the reaction between the carbon dioxide (containing ^{14}C) and ribulose bisphosphate.

- **A** is not correct because ribulose bisphosphate will pick up the radioactive carbon dioxide and form glycerate-3-phosphate
- **C** is not correct because this is formed from glycerate-3-phosphate which will already contain the radioactive carbon
- **D** is not correct because rubisco is the enzyme used to catalyse the reaction between ribulose bisphosphate and carbon dioxide, so will not pick up ^{14}C at any point

9

The correct answer is **C** because ATP synthase is the enzyme found within the thylakoid membrane.

1 is the stroma, **2** is the intermembrane space and **4** is the lamellae.

10

The correct answer is **A**

- **B** is not the correct answer because the protons/hydrogen ions diffuse across the membrane through ATP synthase, not through the intermembrane space.
- **C** is not correct because electrons do not accumulate in the intermembrane space.
- **D** is not correct because reduced NADP is passed to the stroma for the light independent reactions, so does not accumulate.



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