Question: 1

**(a)** Fig. 3.1 is an electron micrograph of a chloroplast from a tobacco leaf.

**(i)** Identify the structures labelled **W** to **Z**.

**W**

**X**

**Y**

**Z**

**[**

**(ii)** In addition to the structures seen in Fig. 3.1, a chloroplast also contains DNA and ribosomes.

Suggest the role of DNA and ribosomes **in** **this** **organelle.**

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**(b)** The table below contains statements that refer to the light-dependent stage of photosynthesis.

Complete the table, indicating with the letters **C,** **N** or **B**, whether each statement applies to:

• cyclic photophosphorylation only (**C**)

or

• non-cyclic photophosphorylation only (**N**)

or

• both cyclic and non-cyclic photophosphorylation (**B**)

The first one has been completed for you.

**[**



|  |  |
| --- | --- |
| statement | letter |
| ATP is produced | **B** |
| an electron leaves photosystem I |  |
| electrons are passed along an electron carrier chain |  |
| electrons leave both photosystem I and photosystem II |  |
| an electron from a water molecule replaces the electron lost from the photosystem |  |
| the same electron returns to the photosystem |  |

**[Total:** **1**

Question: 2

The molecules listed below are all associated with photosynthesis.

From these molecules, identify:

**(a)** the enzyme.

**[1]**

**(b)** a product of the light-dependent reaction that is **used** in the light-independent reaction.

**[1]**

**(c)** a 3-carbon compound.

**[1]**

**(d)** a compound that can be made from TP but is **not** part of the Calvin cycle.

**[1]**

**(e)** a 5-carbon compound.

**[1]**

**(f)** a product of the light-dependent reaction that **is** **not** used in the light-independent reaction.

**[1]**

 **[Total:** **6]**

Question: 3

One way to determine the rate of photosynthesis is to measure the uptake of carbon dioxide.

**(a)** Discuss why measuring carbon dioxide uptake may or may not give a better indication of photosynthetic activity than measuring oxygen production.

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**[2]**

**(b)** Fig. 4.1 shows the relationship between light intensity and the relative carbon dioxide uptake and production in a plant.

**(i)** State the factor that is limiting the rate of photosynthesis at **A** on the graph.

**[1]**

**(ii)** Suggest **one** factor that may limit the rate of photosynthesis at **B**.

**[1]**

**(iii)** Carbon dioxide is given off by the plant when the light intensity is lower than **X**.

Name the process that **produces** carbon dioxide in the plant.

**[1]**

**(iv)** With reference to Fig. 4.1, explain the biochemical processes that are occurring in the plant:

• as light intensity increases from 0 (zero) to **X**.

• at light intensity **X**.

• at light intensities greater than **X**.

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**[3]**

**(c)** **(i)** Name the products of the light-dependent stage of photosynthesis.

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**[3]**

**(ii)** Paraquat is a weedkiller. It binds with electrons in photosystem I.

Suggest how paraquat results in the death of a plant.

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**[2]** **[Total:** **13]**

Question: 4

**(a)** The Calvin cycle is the stage of photosynthesis during which carbon dioxide is fixed. The Calvin cycle uses the products of the light dependent stage.

**(i)** Name the products of the light dependent stage that are used in the Calvin cycle.

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**[2]**

**(ii)** Discuss the fate of triose phosphate (TP) in the Calvin cycle.

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**[3]**

**(b)** A process known as **photorespiration** also takes place in photosynthetic cells. In this process, oxygen competes with carbon dioxide for the active site of the enzyme RuBP carboxylase (Rubisco).

Fig. 3.1 (a) and Fig. 3.1 (b) outline the processes of photosynthesis and photorespiration.

**(i)** Suggest why the process outlined in Fig. 3.1 (b) is known as photorespiration.

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**[2]**

**(ii)** Using Fig. 3.1 (a) and Fig. 3.1 (b), describe and explain the likely effect on photosynthesis of an increase in the oxygen concentration.

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**[3]**

**(iii)** Some plants, known as C4 plants, use an enzyme called PEP carboxylase, instead of Rubisco, to fix carbon dioxide.

Suggest why these plants do **not** show photorespiration.

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**[1]** **[Total:** **11]**