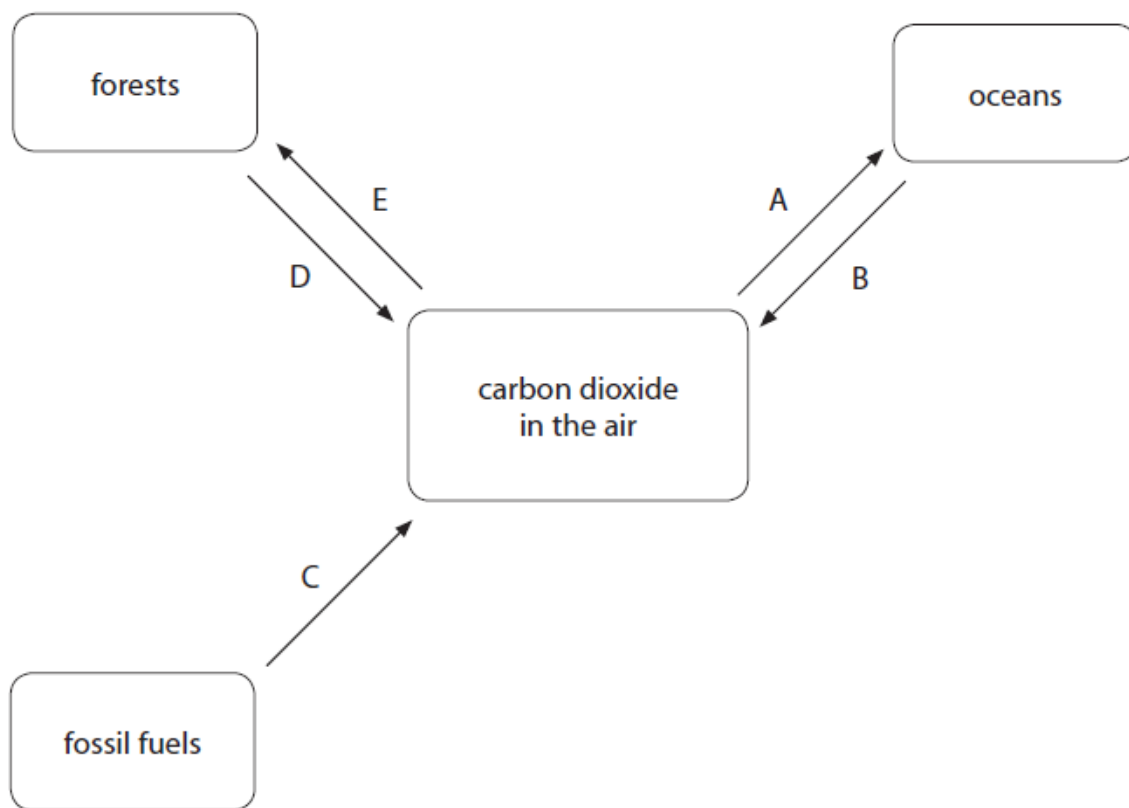


Q2.

The diagram below shows part of the carbon cycle. The processes A, B, C, D and E, transfer carbon.



Explain how carbon dioxide is removed from the air into the oceans by process A.

(2)

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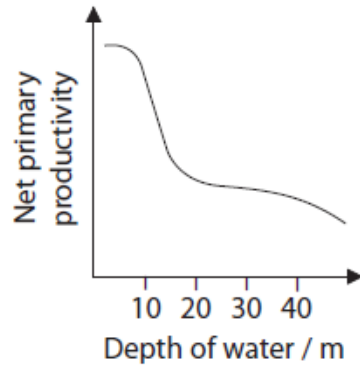
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Q3.

The graph below shows how the depth of water in a freshwater lake affects the net primary productivity (NPP).



Suggest an explanation for the effect of depth of water on the NPP in this freshwater lake.

(4)

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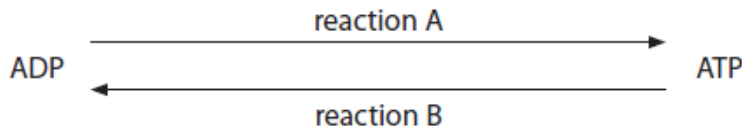
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Q4.

Phagocytosis requires a source of energy in the form of ATP.

The diagram below shows the relationship between ATP and ADP.



Place a cross in the box next to the name of reaction A and reaction B.

(2)

Reaction	Name of reaction				
	autolysis	decarboxylation	hydrolysis	phosphorylation	polymerisation
A	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
B	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Q5.

A student investigated the light-dependent reactions of photosynthesis in spinach leaves.

The leaves were cut into pieces and ground in a cold solution of sucrose and a buffer.

The mixture was filtered and centrifuged. The liquid in the tube was poured off and kept in an ice water bath.

The pellet at the bottom of the tube was suspended by mixing with fresh sucrose and buffer and stored in an ice water bath.

Four tubes were then set up as follows:

Tube	Liquid poured off after centrifuging / cm ³	Resuspended pellet / cm ³	Sucrose and buffer solution / cm ³
1	–	0.5	–
2	–	–	0.5
3	–	0.5	–
4	0.5	–	–

The tubes had 5 cm³ of DCPIP added to them. Tube 3 was kept in the dark and the others kept in the light.

After twenty minutes, the colour in each tube was recorded. The results are shown in the table below.

Tube	Colour in tube
1	pale green
2	blue
3	blue
4	blue

(a) (i) Give **two** reasons why a cold solution containing sucrose and a buffer was used in this investigation.

(2)

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(ii) Give a reason why tube 3 was used in this investigation.

(1)

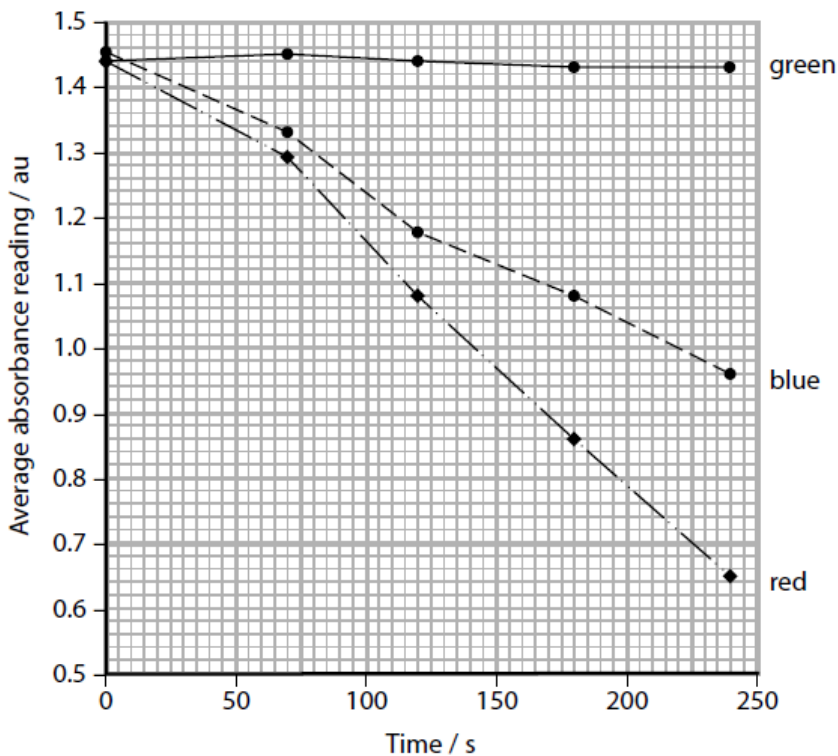
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(iii) In another investigation, the student wanted to determine the effect of different wavelengths of light on the light-dependent stage of photosynthesis.

The student modified her first investigation to obtain results.

The graph shows the results of her modified investigation.



Explain how the student modified the practical procedure of the first investigation to enable these results to be obtained.

(4)

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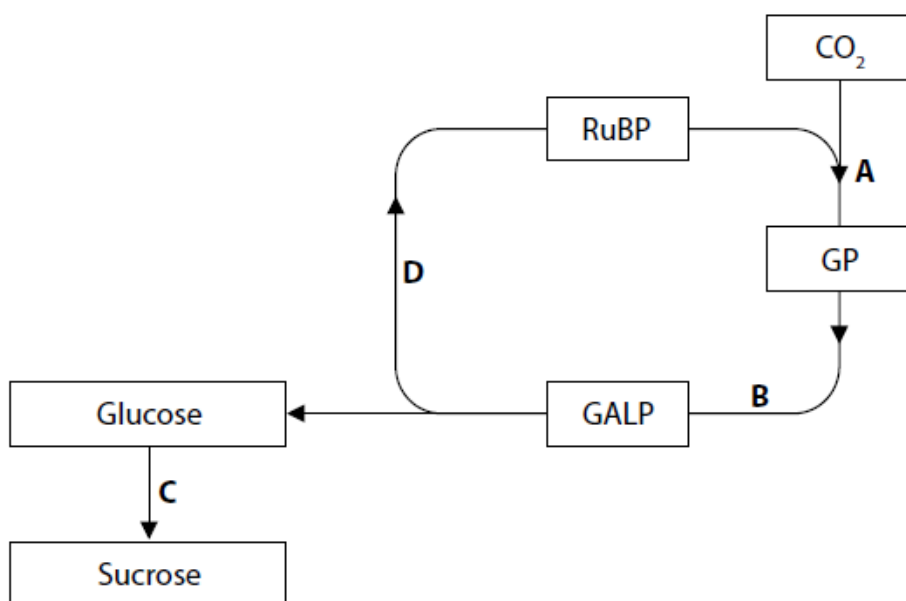
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(b) The diagram shows part of the Calvin cycle (light-independent reactions) of photosynthesis.



Place a cross in the box which indicates the correct stage (A - D) for the following statements.

(i) The stage which involves a condensation reaction and fructose.

(1)

- A
- B
- C
- D

(ii) The stage where the enzyme RUBISCO is involved.

(1)

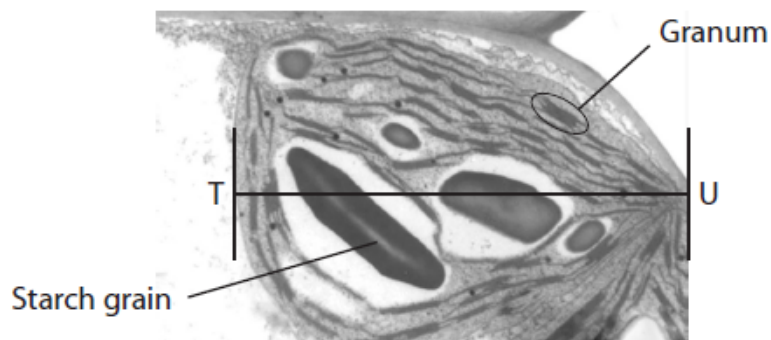
- A
- B
- C
- D

(Total for question = 9 marks)

Q6.

Photosynthesis is a process that occurs in all green plants.

The electron micrograph shows part of a chloroplast in a plant cell.



(i) The labelled starch grain in the chloroplast is $2.2 \mu\text{m}$ long.

Calculate the width of this chloroplast between T and U.

(2)

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(ii) Explain the relationship between the structure and functions of a granum in photosynthesis.

(3)

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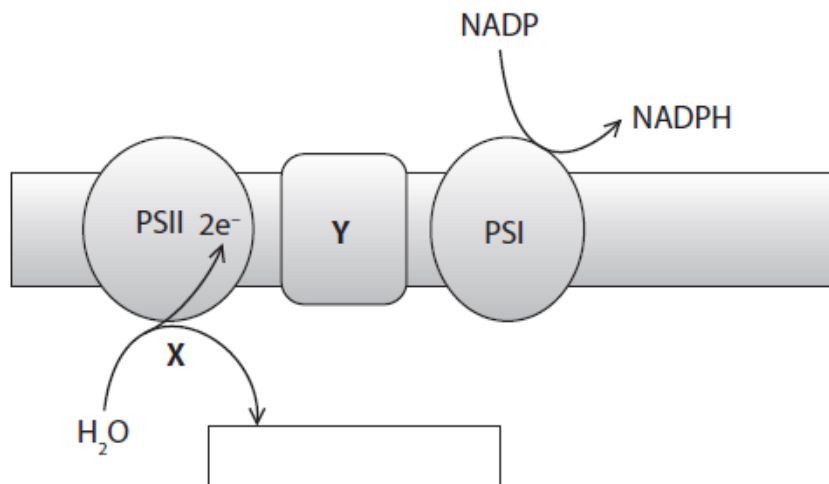
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(Total for question = 5 marks)

Q7.

Photosynthesis is the process by which plants fix carbon.

The diagram shows some of the light dependent reactions of photosynthesis.



(i) Complete the box with the products of the reaction at PSII.

(1)

(ii) Which of the following is the type of reaction taking place at **X**?

(1)

- A** condensation
- B** hydrolysis
- C** photolysis
- D** reduction

(iii) Which of the following molecules are found in the PSI and PSII?

(1)

- A** ATP
- B** ATP synthase
- C** chlorophyll
- D** RUBISCO

(iv) In which part of the chloroplast does the reduction of NADP take place?

(1)

- A** chloroplast outer membrane
- B** chloroplast stroma
- C** granum
- D** thylakoid lumen

(v) Describe the role of the group of membrane proteins represented **Y** in the diagram.

(2)

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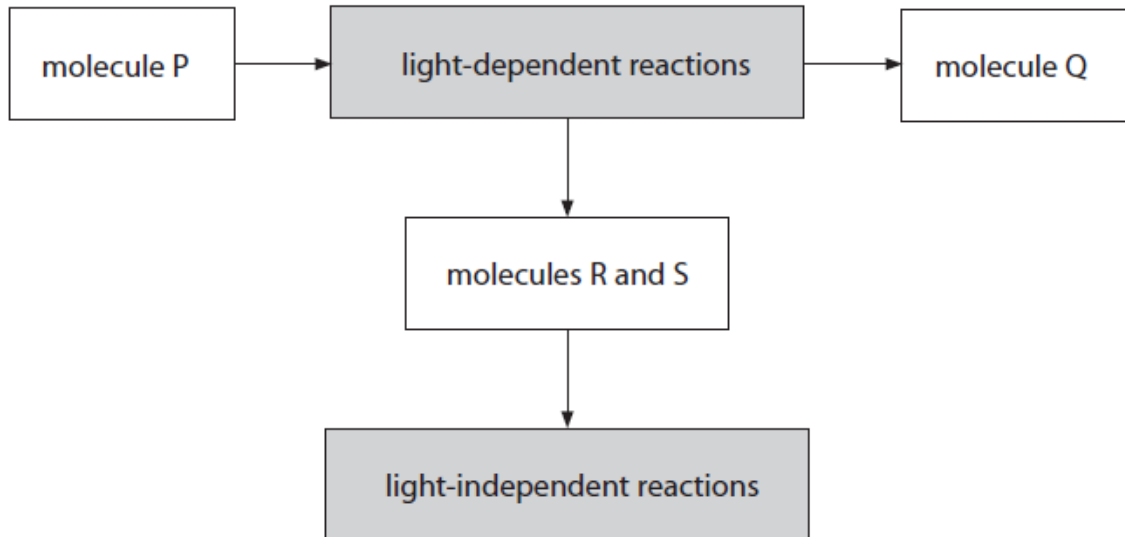
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Q8.

(a) The diagram below shows some of the steps in the process of photosynthesis.



(i) Name molecules **P** and **Q** in the diagram.

(1)

molecule P

molecule Q

(ii) Place a cross ☒ in the box next to the names of molecules **R** and **S** in the diagram.

(1)

- A** ADP and oxidised NADP
- B** ADP and reduced NADP
- C** ATP and oxidised NADP
- D** ATP and reduced NADP

(iii) Describe the role of RUBISCO in the production of GALP in the light-independent reaction.

(4)

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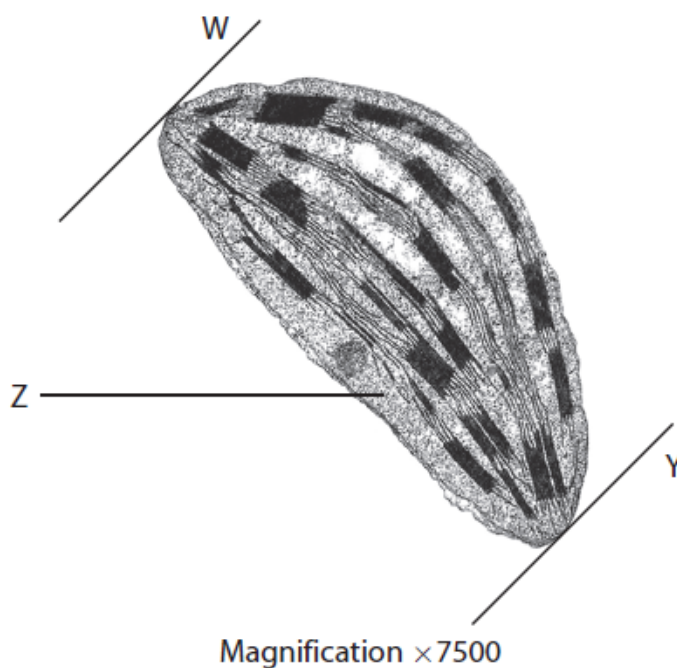
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(b) The electronmicrograph below shows a chloroplast.



(i) Place a cross in the box next to the name of the part labelled **Z**.

(1)

- A** cytoplasm
- B** matrix
- C** stroma
- D** thylakoid

(ii) The equation below can be used to calculate the magnification of this chloroplast.

$$\text{magnification} = \text{image length} \div \text{actual length}$$

Use this equation to calculate the actual length of this chloroplast, between the lines labelled **W** and **Y**.

Show your working.

(3)

(iii) Describe how the membranes inside the chloroplast are involved in photosynthesis.

(3)

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(Total for question = 13 marks)