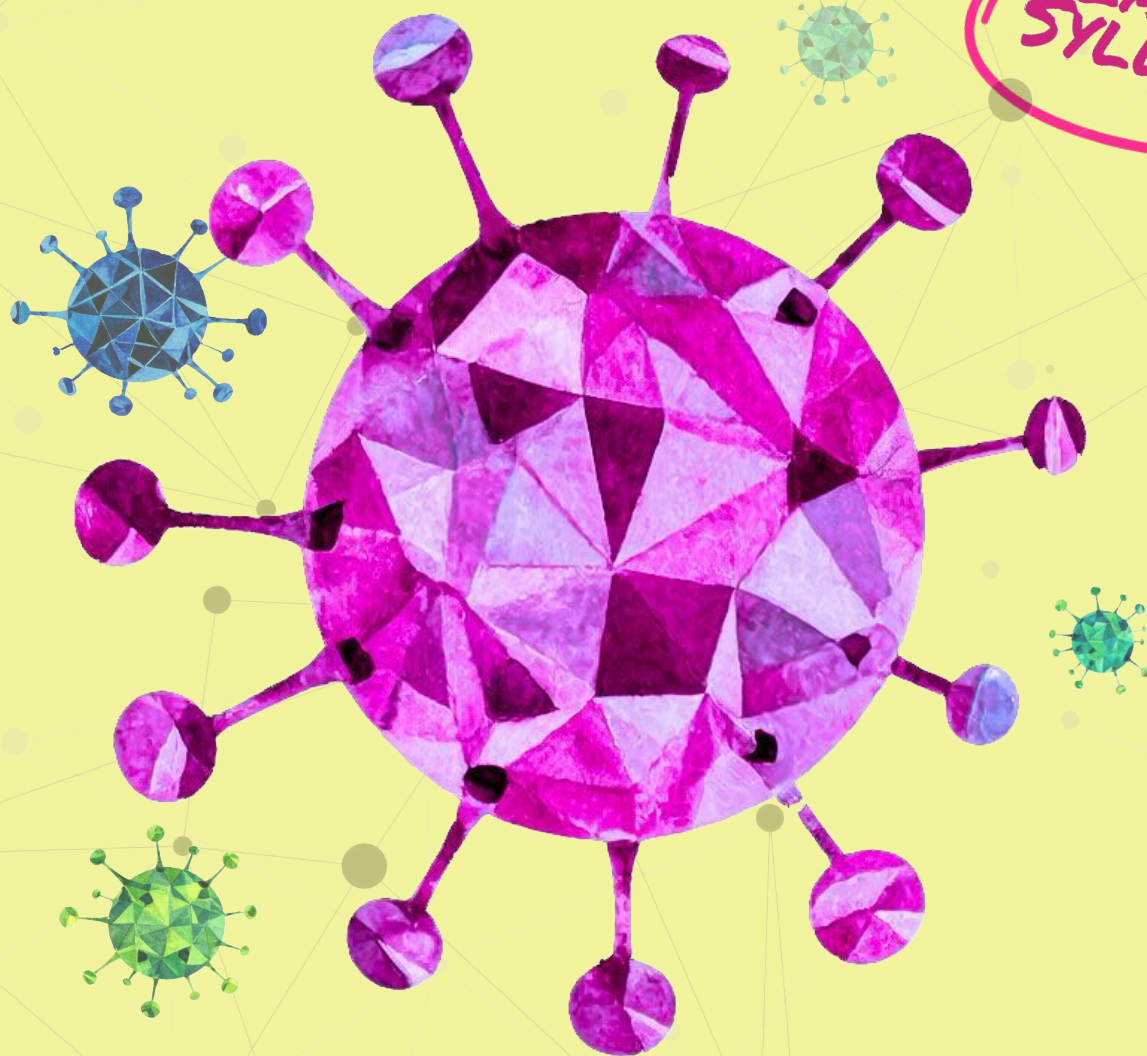


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A2

Biology



**LATEST
SYLLABUS**

Unit 4: Topical Questions

2019 - 2026

Examiner's Insights Edition

Edexcel IAL Biology

Unit 4 (WBI14/01) · Questions by Topic

Past-paper questions classified by topic · [click a chapter to jump](#)

1.	Photosynthesis: light-dependent reactions	15 questions
2.	Photosynthesis: light-independent reactions	6 questions
3.	Ecology: sampling & succession	21 questions
4.	Global warming	18 questions
5.	Evolution	6 questions
6.	DNA profiling	6 questions
7.	Forensics	6 questions
8.	Viruses & bacteria	12 questions
9.	Active immunity	18 questions
10.	Microbiology	19 questions

Chapter 1

Photosynthesis: light-dependent reactions

- | | |
|--|-------------|
| · Chloroplast structure | 6 questions |
| · Photosynthetic pigments & spectra | 5 questions |
| · Chromatography of pigments | 2 questions |
| · The light-dependent reactions & photophosphorylation | 2 questions |

Chloroplast structure

Edexcel IAL Biology - Solved Past Paper

June 2020 · Unit 4: Energy, Environment, Microbiology and Immunity (WBI14/01) · Question 1
The chloroplast, pigments & chromatography

● hard ● medium ● easy

● 1 (a)

Identify (multiple choice) · [1 mark]

Which row shows where the light-dependent and light-independent reactions take place?

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● 1 (b)

Draw · [3 marks]

Draw three labelled features found in a chloroplast, other than the stroma and thylakoid membranes.

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● 1 (c)

Identify (multiple choice) · [1 mark]

Which wavelength of light is absorbed the least by chloroplasts?

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● 1 (d)

State · [1 mark]

State what is meant by the term action spectrum.

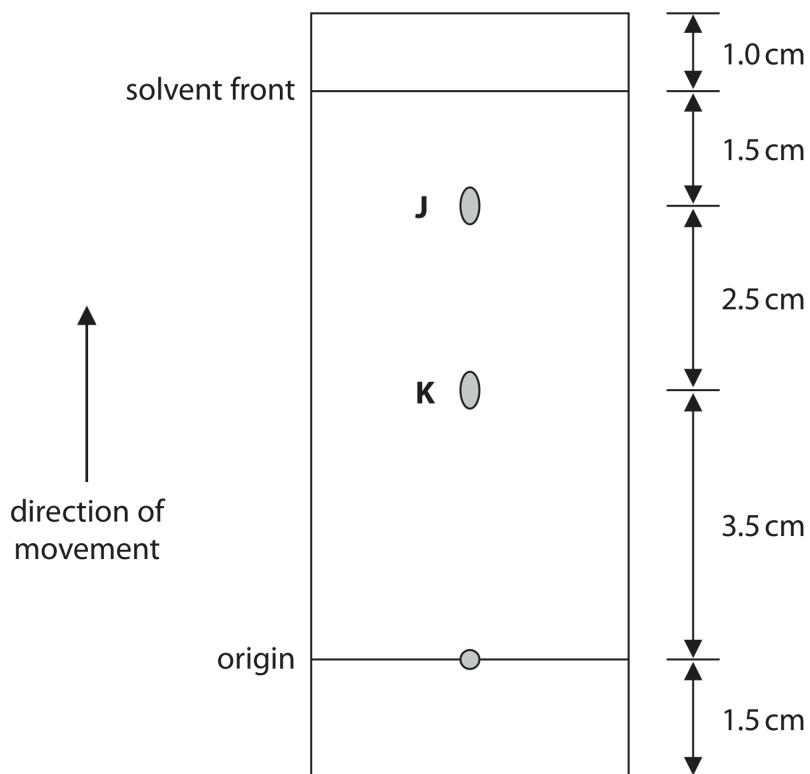
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● 1 (e)(i)

Identify (multiple choice) · [1 mark]

Which process can be used to separate chloroplast pigments?



● 1 (e)(ii)

Calculate · [1 mark]

What is the R_f value for chloroplast pigment J?

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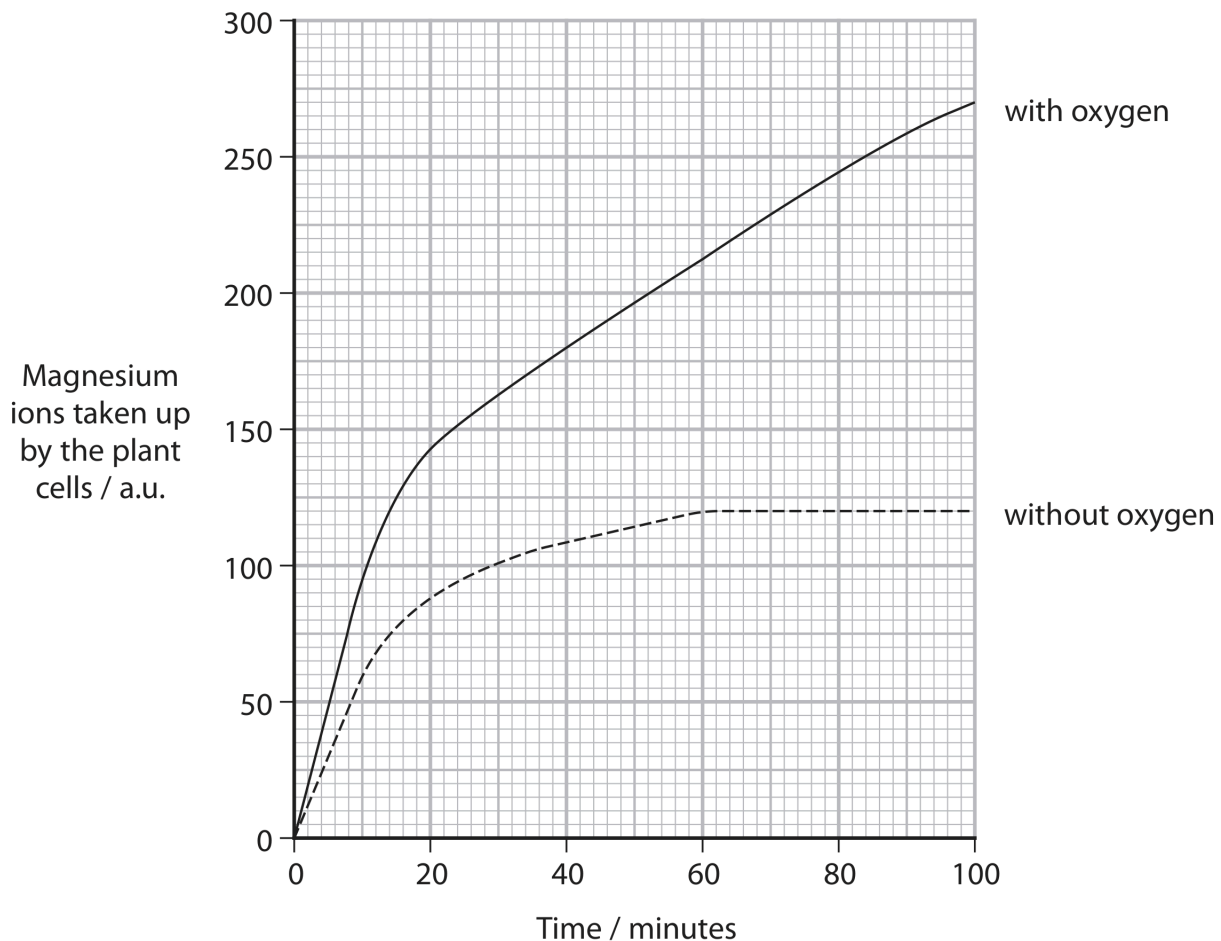
June 2023 · Unit 4: Energy, Environment, Microbiology and Immunity (WBI14/01) · Question 1
Magnesium ions & active transport

● hard ● medium ● easy

● 1 (a)

Explain · [2 marks]

Explain the importance of magnesium ions to a plant.



● 1 (b)

Explain · [4 marks]

Explain why the student concluded uptake is by active transport. Use the graph.

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Edexcel IAL Biology - Solved Past Paper

October 2021 · Unit 4: Energy, Environment, Microbiology and Immunity (WBI14/01)

Question 1 · Chloroplast structure & DNA replication

● hard ● medium ● easy

● 1 (a)(i)

Identify (multiple choice) · [1 mark]

Which row identifies structures P, Q and V?

P	Q	V
DNA	starch grain	ribosome
starch grain	DNA	ribosome
starch grain	ribosome	DNA
ribosome	starch grain	DNA

● 1 (a)(ii)

Identify (multiple choice) · [1 mark]

Which structure contains GALP?

● 1 (a)(iii)

Calculate · [1 mark]

The chloroplast is 7.5 μm long. Calculate the magnification of the diagram.

● 1 (a)(iv)

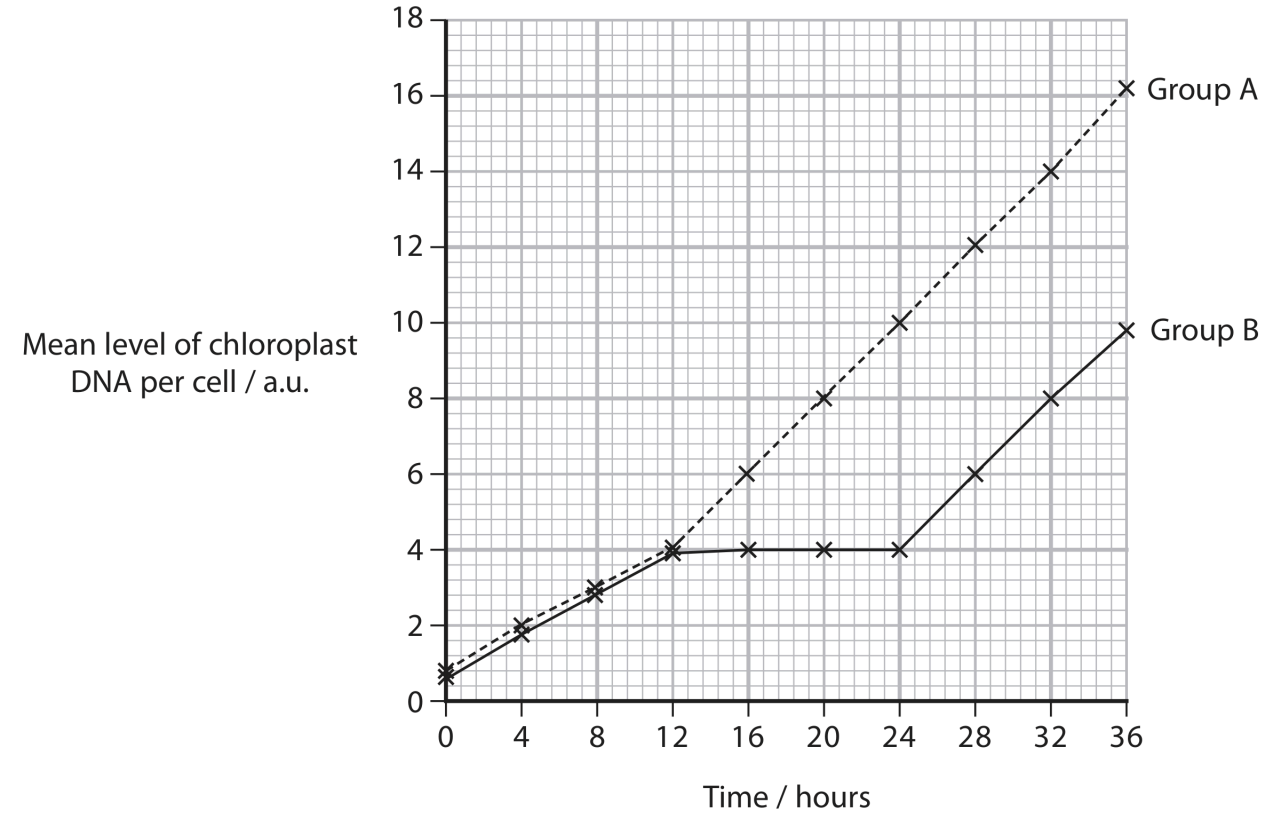
Compare and contrast · [3 marks]

Compare and contrast the structure of membranes T and U.

● 1 (b)

Describe · [2 marks]

Describe two conclusions about the replication of chloroplast DNA.



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Edexcel IAL Biology - Solved Past Paper

October 2022 · Unit 4: Energy, Environment, Microbiology and Immunity (WBI14/01)

Question 3 · The chloroplast & its membranes

● hard ● medium ● easy

● 3 (a)

Identify (multiple choice) · [1 mark]

Which row is correct for the two reactions?

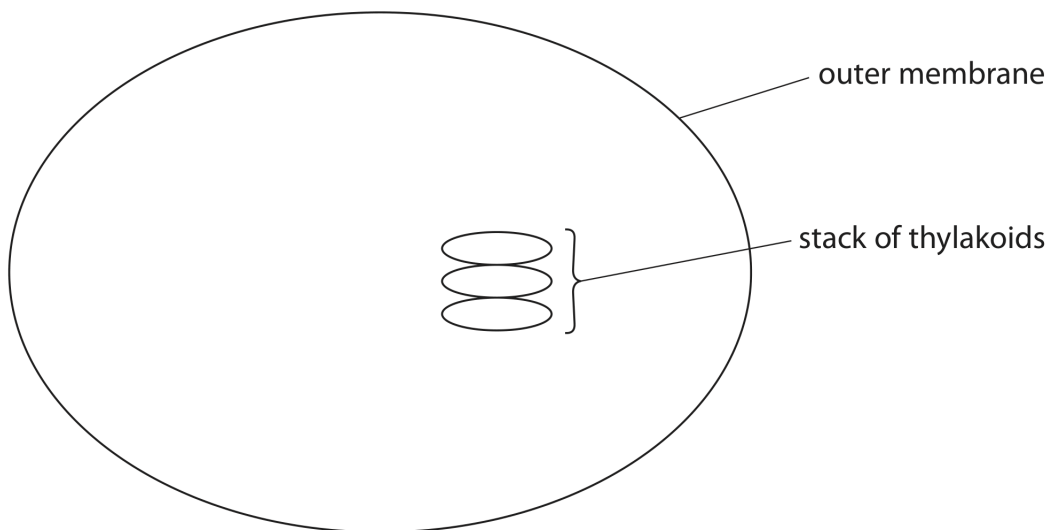
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● 3 (b)(i)

Complete (diagram) · [3 marks]

Complete the diagram to show three other labelled structures in a chloroplast.



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● 3 (b)(ii)

Compare and contrast · [4 marks]

Compare and contrast the structure of the outer membrane with the thylakoid membrane.

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October 2023 · Unit 4: Energy, Environment, Microbiology and Immunity (WBI14/01)

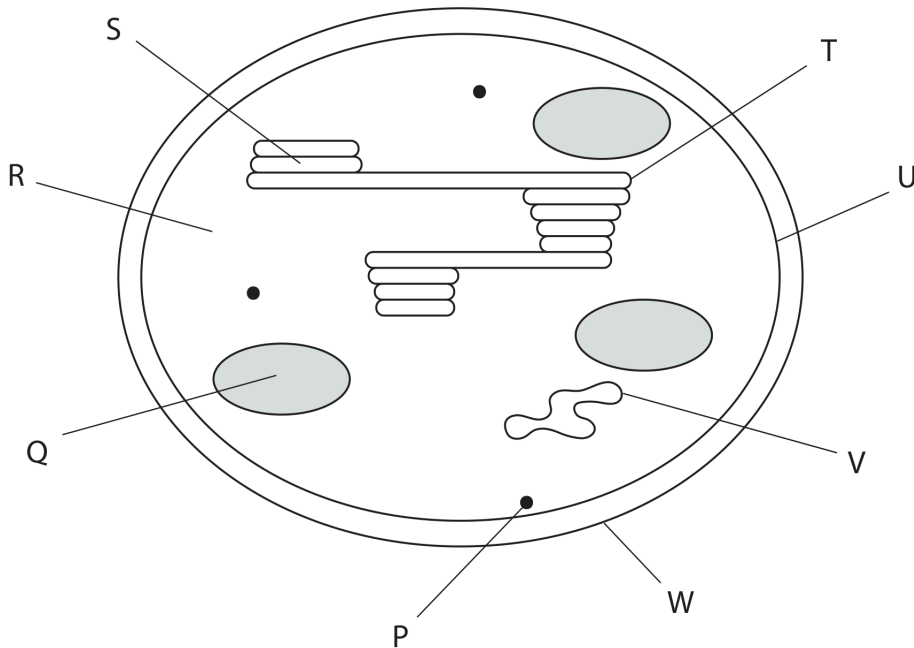
Question 1 · Chloroplast structure & photosynthesis

● hard ● medium ● easy

● 1 (a)

Identify (multiple choice) · [1 mark]

Which is the site of photolysis?



● 1 (b)

Identify (multiple choice) · [1 mark]

Which contains a gene coding for RUBISCO?

● 1 (c)

Identify (multiple choice) · [1 mark]

Where do hydrogen ions accumulate for use in photosynthesis?

● 1 (d)(i)

Identify (multiple choice) · [1 mark]

How many of P, T, U and W are made of phospholipids?

● **1 (d)(ii)**

Identify (multiple choice) · [1 mark]

Which describes a phospholipid?

● **1 (e)**

Calculate · [2 marks]

A cell is 0.0085 cm long; the cell : chloroplast length ratio is 11.7 : 1. Calculate the chloroplast length (μm , 2 s.f.).

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May 2025 · Unit 4: Energy, Environment, Microbiology and Immunity (WBI14/01) · Question 6

Chloroplast DNA & its proteins

● hard ● medium ● easy

● 6 (a)(i)

Identify (multiple choice) · [1 mark]

Where in the chloroplast is the DNA located?

.....

.....

● 6 (a)(ii)

Identify (multiple choice) · [1 mark]

Which other plant-cell structures contain DNA?

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.....

● 6 (b)(i)

Identify (multiple choice) · [1 mark]

150 000 base pairs code for proteins in 105 regions. Mean bases in the template strand of one region?

.....

.....

● 6 (b)(ii)

Suggest · [2 marks]

Suggest two reasons why this DNA contains more than 150 000 base pairs.

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● 6 (b)(iii)

Describe · [4 marks]

Describe the roles of RNA polymerase, ribosomal protein, RUBISCO and ATP synthetase.

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Photosynthetic pigments & spectra

Edexcel IAL Biology - Solved Past Paper

January 2020 · Unit 4: Energy, Environment, Microbiology and Immunity (WBI14/01)

Question 7 · Photosynthetic pigments & evaluating a food source

● hard ● medium ● easy

● 7 (a)(i)

Identify (multiple choice) · [1 mark]

Which row shows the colour of each seaweed?

Key



chlorophyll a



chlorophyll b



carotenoids

Key



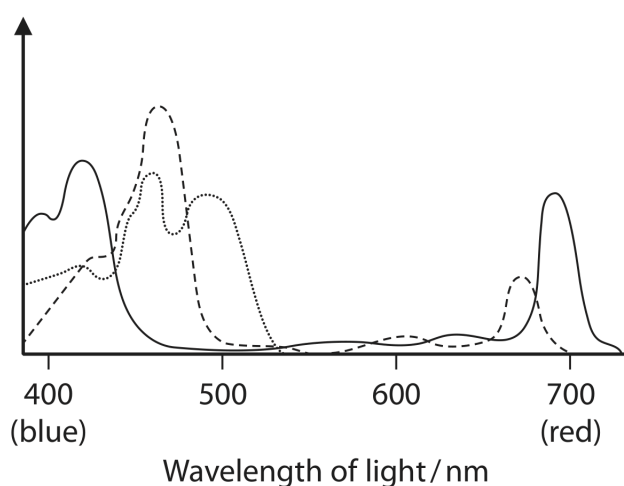
chlorophyll a



chlorophyll b



carotenoids



● 7 (a)(ii)

Explain · [2 marks]

Explain the role of chloroplast pigments in the light-dependent reactions.

● **7 (b)(i)**

Describe · [3 marks]

Describe how GALP, produced in chloroplasts, is converted into protein.

● ***7 (b)(ii)**

Comment (levels) · [6 marks]

Comment on the claim that these seaweeds are a healthy, environmentally-friendly and economic food source, using the table and your own knowledge.

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January 2022 · Unit 4: Energy, Environment, Microbiology and Immunity (WBI14/01)

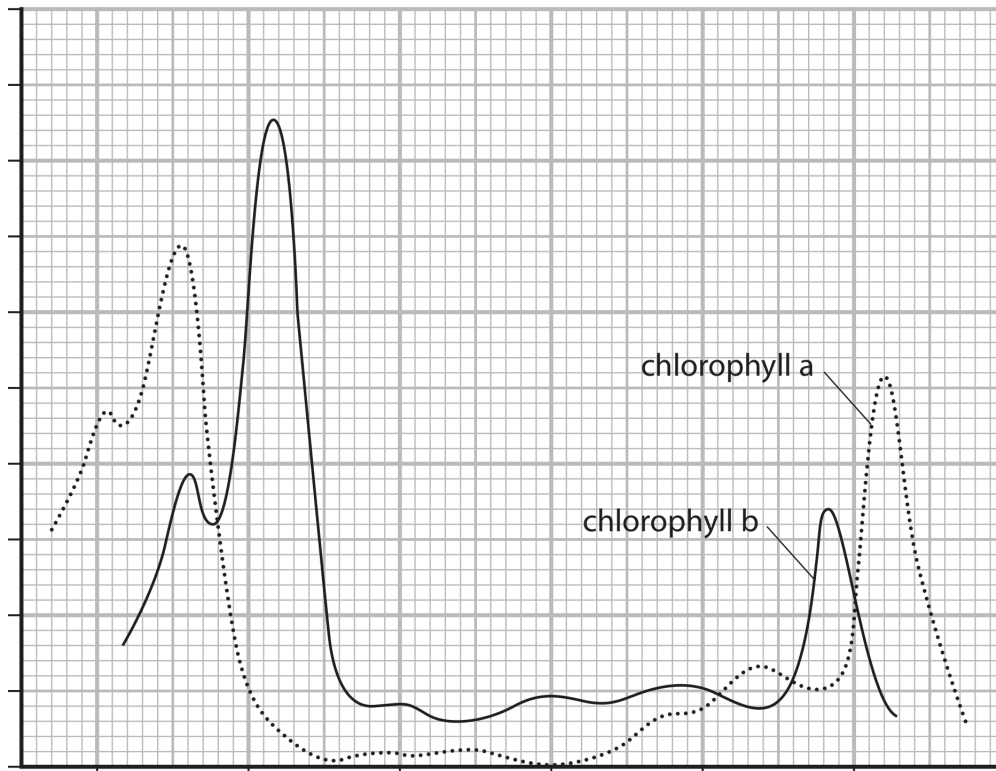
Question 2 · Action spectrum, pigments & amino acids

● hard ● medium ● easy

● 2 (a)(i)

Draw · [2 marks]

Draw the action spectrum for this plant.



● 2 (a)(ii)

Calculate · [1 mark]

Calculate how many times greater the maximum absorption of chlorophyll b is than that of chlorophyll a.

● 2 (a)(iii)

Explain · [2 marks]

Explain the advantage of having different types of chlorophyll pigment.

● **2 (b)(i)**

Identify (multiple choice) · [1 mark]

Which row describes the bonds between amino acids in a protein?

● **2 (b)(ii)**

Describe · [2 marks]

Describe how plants synthesise amino acids.

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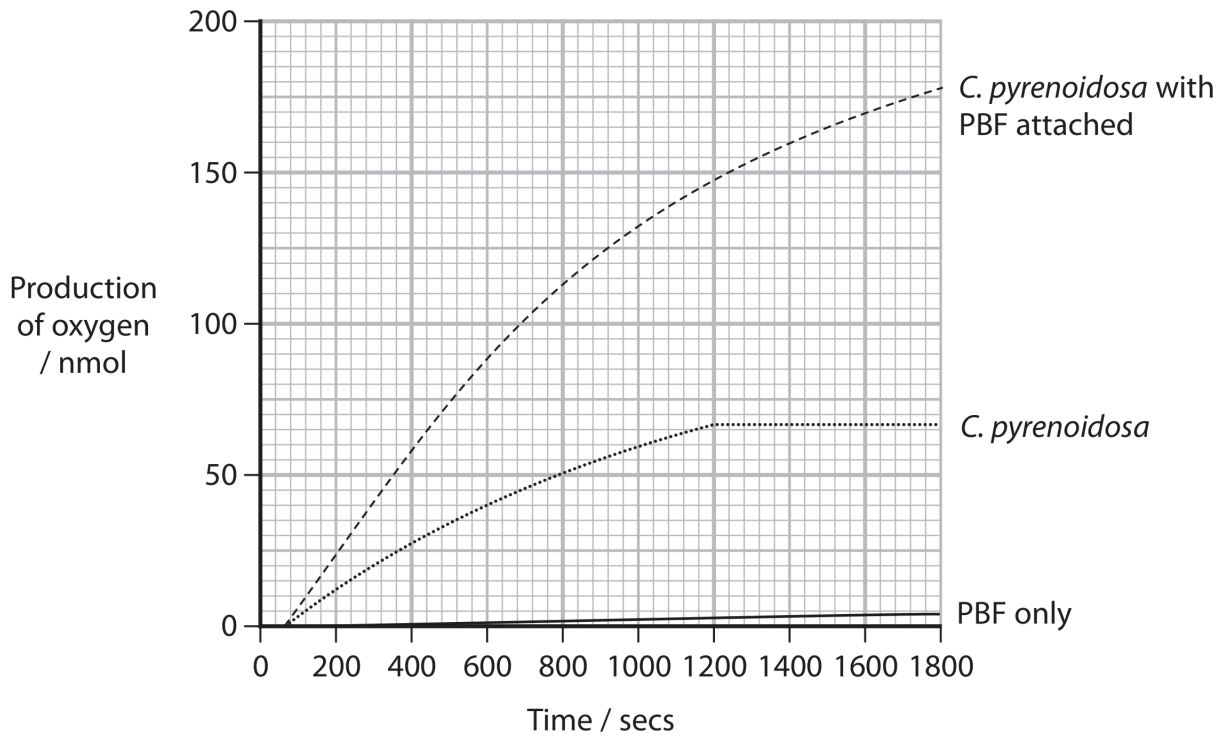
June 2023 · Unit 4: Energy, Environment, Microbiology and Immunity (WBI14/01) · Question 5
Photosynthesis in algae & light absorption

● hard ● medium ● easy

● 5 (a)(i)

Calculate · [3 marks]

Calculate the rate of oxygen production at 1200 s for *C. pyrenoidosa* with PBF.



● 5 (a)(ii)

Explain · [3 marks]

Explain the effect PBF has on oxygen production.

● 5 (b)

Explain · [3 marks]

Explain why *C. pyrenoidosa* with PBF gained more mass over 20 days.

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October 2021 · Unit 4: Energy, Environment, Microbiology and Immunity (WBI14/01)

Question 6 · Biodiversity, chlorophyll & pigment extraction

● hard ● medium ● easy

● 6 (a)

State · [2 marks]

State the meaning of the term biodiversity.

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● 6 (b)

Explain · [2 marks]

Explain the role of chlorophyll in the light-dependent reactions.

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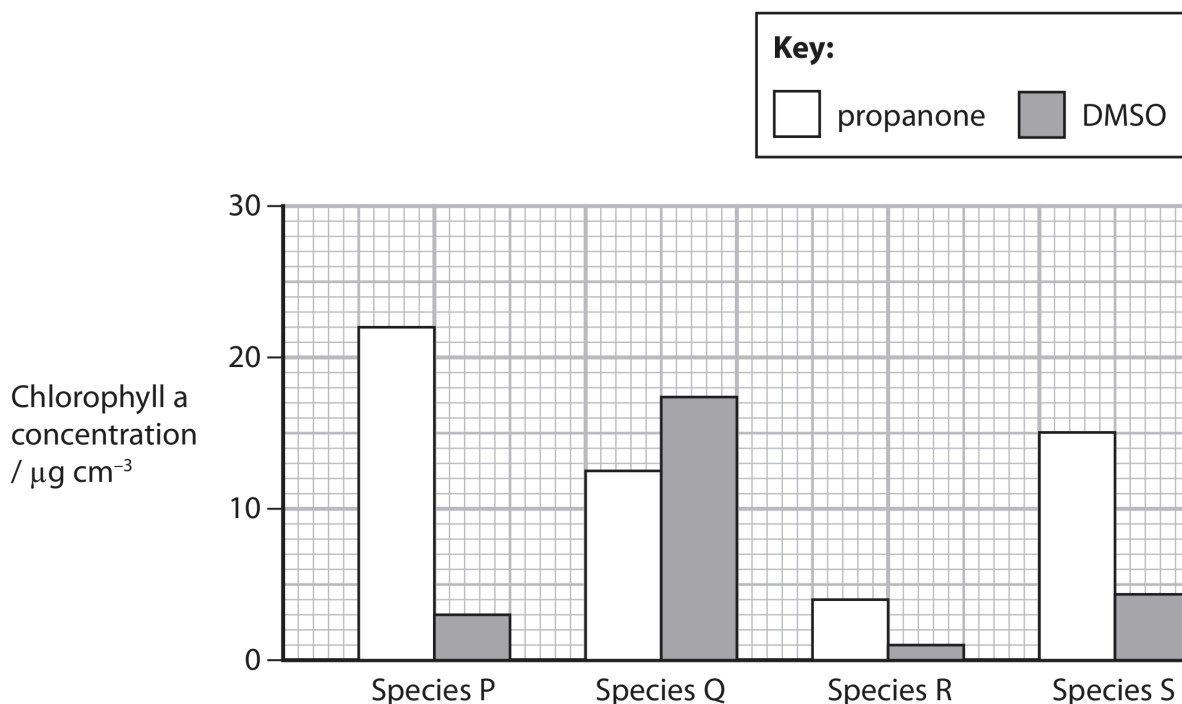
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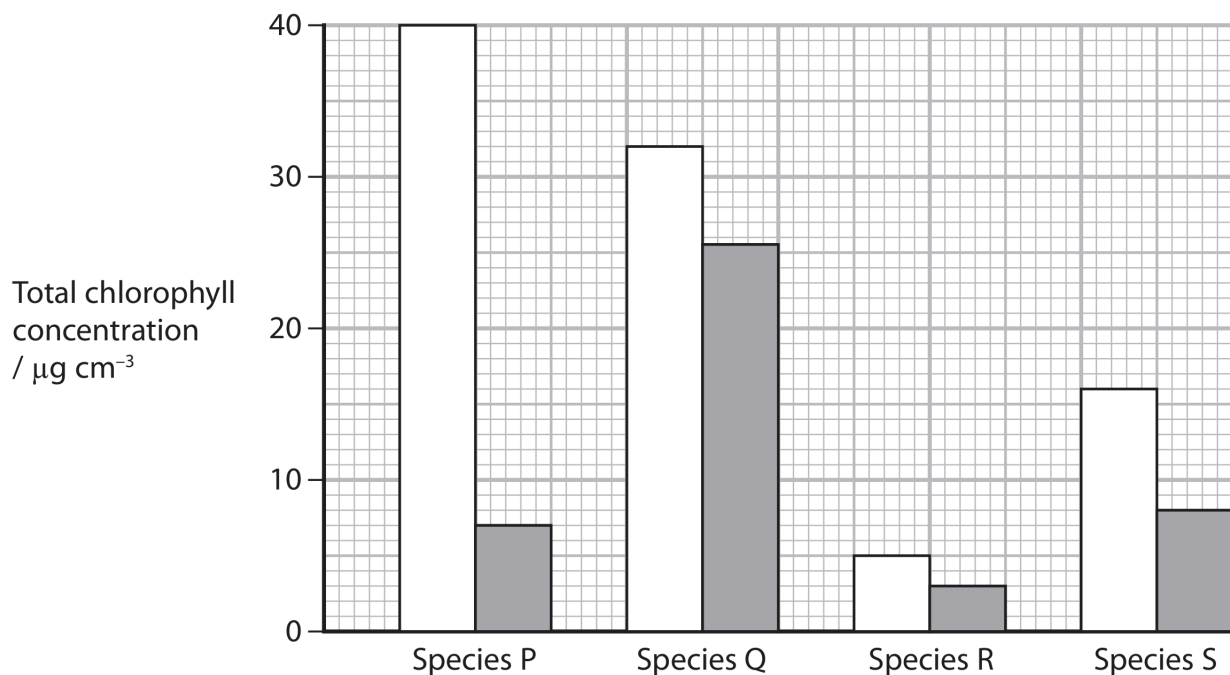
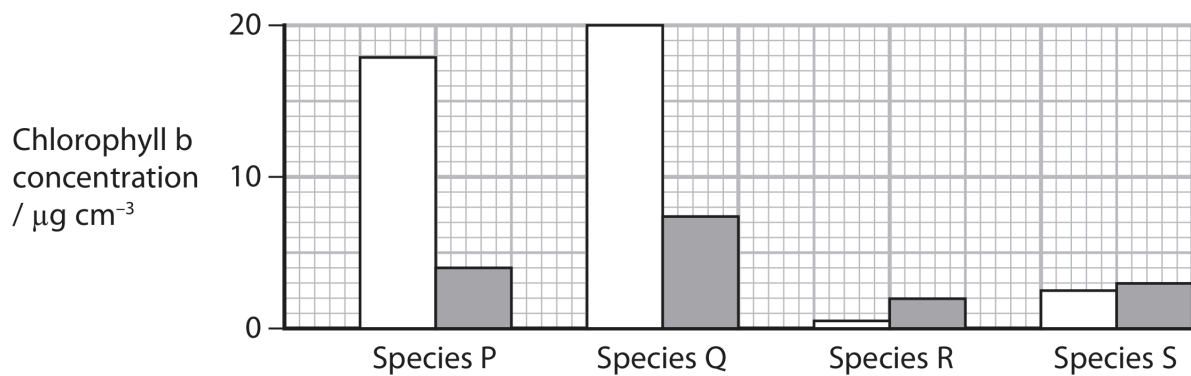
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● *6 (c)(i)

Discuss (levels) · [6 marks]

Discuss the effectiveness of these extraction methods in identifying the species. Use the graphs.





● 6 (c)(ii)

Suggest · [2 marks]

Suggest why different concentrations of chlorophyll were obtained with the two solvents.

.....

.....

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October 2025 · Unit 4: Energy, Environment, Microbiology and Immunity (WBI14/01)

Question 2 · Chloroplast membranes & the action spectrum

● hard ● medium ● easy

● 2 (a)

Identify (multiple choice) · [1 mark]

Which statements about chloroplasts are correct?

.....

.....

● 2 (b)(i)

Complete (diagram) · [3 marks]

Complete the diagram to show and label the other membrane structures inside a chloroplast.

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● 2 (b)(ii)

Identify (multiple choice) · [1 mark]

Which are found in chloroplast membranes?

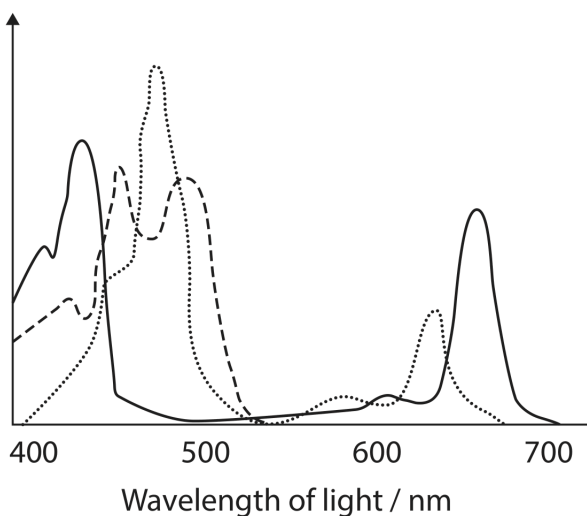
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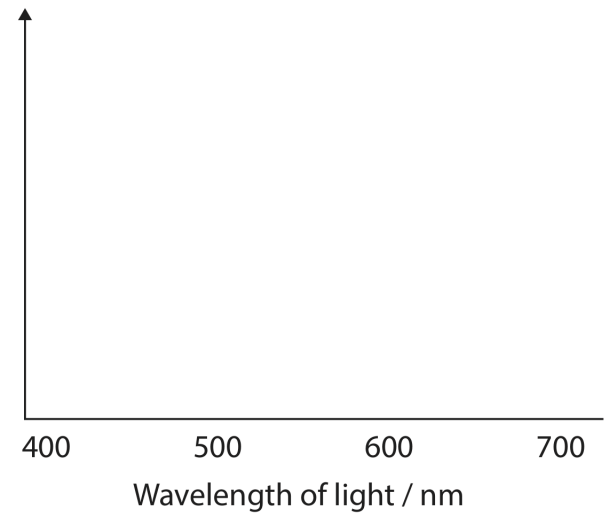
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● 2 (c)

Complete (graph) · [2 marks]

Complete the graph to show the action spectrum of this chloroplast.





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Chromatography of pigments

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January 2023 · Unit 4: Energy, Environment, Microbiology and Immunity (WBI14/01)

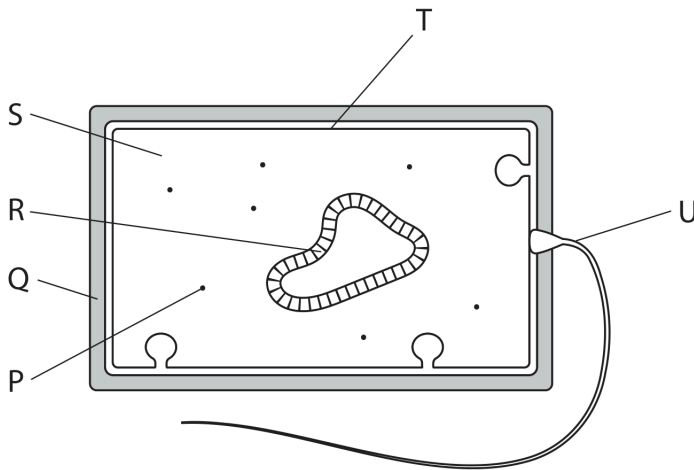
Question 2 · Photosynthetic bacteria, spectra & chromatography

● hard ● medium ● easy

● 2 (a)(i)

Identify (multiple choice) · [1 mark]

Which structure contains the genes coding for the photosynthesis enzymes?



● 2 (a)(ii)

Identify (multiple choice) · [1 mark]

Where do the light-dependent reactions take place?

● 2 (a)(iii)

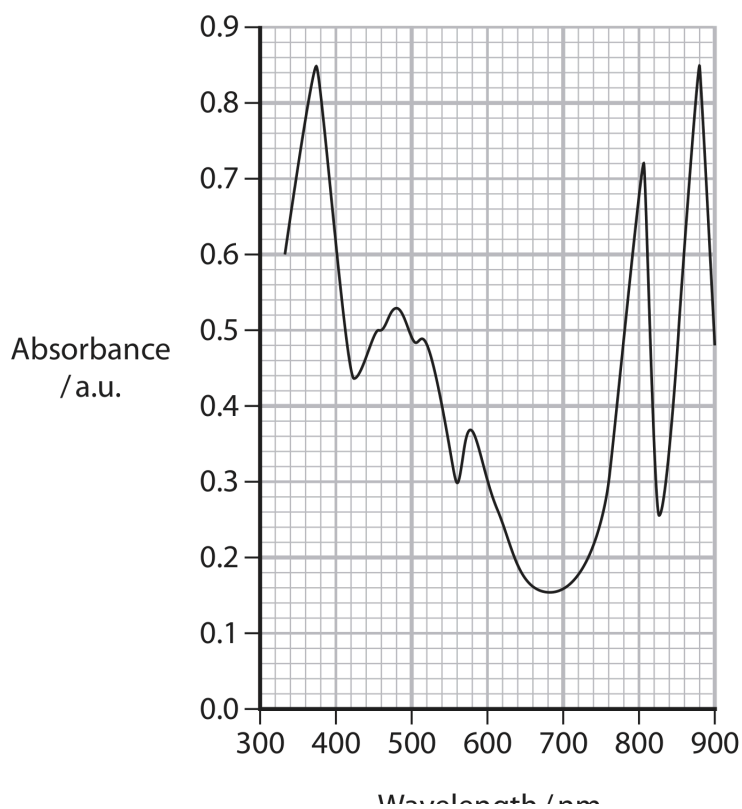
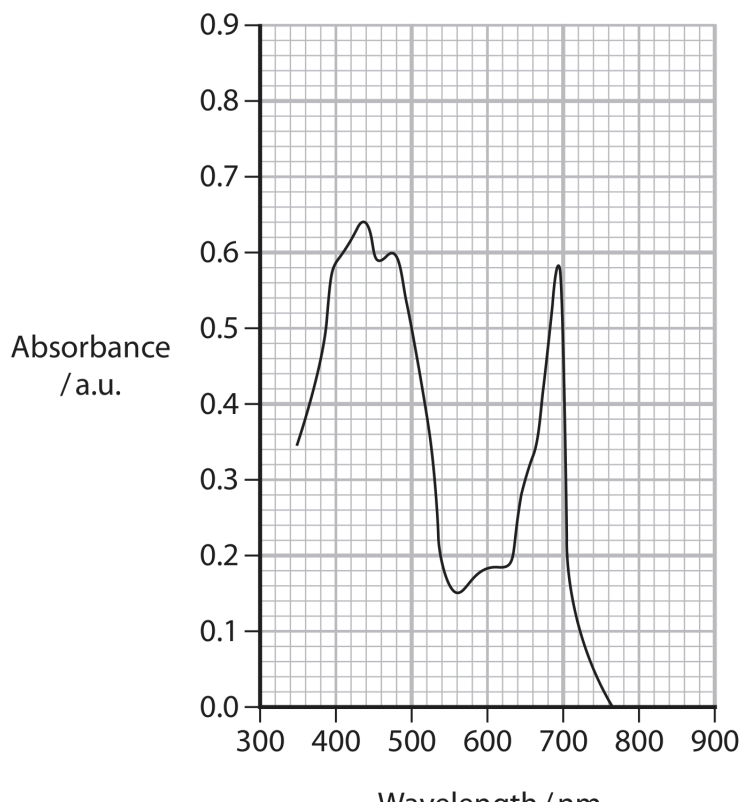
Identify (multiple choice) · [1 mark]

Where do the light-independent reactions take place?

● 2 (b)

Describe · [2 marks]

Describe two conclusions about the differences in the two absorption spectra.



Describe the measurements taken and how the R_f value is calculated.

Edexcel IAL Biology - Solved Past Paper

May 2024 · Unit 4: Energy, Environment, Microbiology and Immunity (WBI14/01) · Question 1
Seaweed pigments, chromatography & light

● hard ● medium ● easy

● 1 (a) Identify (multiple choice) · [1 mark]

Which process separates pigments according to their solubility?

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● 1 (b)(i) Compare and contrast · [3 marks]

Compare and contrast the pigments in the seaweeds with those in spinach.

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● 1 (b)(ii) Describe · [3 marks]

Describe how the student could identify pigment P using this method.

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● 1 (c)(i) Identify (multiple choice) · [1 mark]

Which row shows the light that green seaweed can absorb?

Green light	Red light
can absorb	can absorb
can absorb	cannot absorb
cannot absorb	can absorb
cannot absorb	cannot absorb

.....

.....

● **1 (c)(ii)**

Explain · [2 marks]

Explain the positions of the brown and red seaweeds on the rock.

The light-dependent reactions & photophosphorylation

Edexcel IAL Biology - Solved Past Paper

January 2021 · Unit 4: Energy, Environment, Microbiology and Immunity (WBI14/01)

Question 5 · The light-dependent reactions & ATP

● hard ● medium ● easy

● 5 (a)(i)

Explain · [2 marks]

Explain why light energy is converted into energy stored in ATP.

● 5 (a)(ii)

Complete · [2 marks]

Complete the ATP equation with the substrates and the type of reaction.

● 5 (a)(iii)

Explain · [3 marks]

Explain the role of light energy in the light-dependent reactions.

● 5 (b)(i)

Identify (multiple choice) · [1 mark]

Which row shows the products of the light-dependent reactions used in the light-independent reactions?

ATP produced by	NADP
cyclic photophosphorylation	oxidised
cyclic photophosphorylation	reduced
non-cyclic photophosphorylation	oxidised

New biological molecule	Nitrates	Phosphates	Both nitrates and phosphates	Neither nitrates nor phosphates
protein	☒	☒	☒	☒
RNA	☒	☒	☒	☒
triglyceride	☒	☒	☒	☒

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● 5 (b)(ii)

Name · [2 marks]

Name the inorganic molecule from which each element (C, H, O) in a simple sugar originated.

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● 5 (b)(iii)

Identify (table) · [3 marks]

Which inorganic ions are needed to synthesise each new biological molecule?

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Edexcel IAL Biology - Solved Past Paper

June 2020 · Unit 4: Energy, Environment, Microbiology and Immunity (WBI14/01) · Question 3
Bond energies, photophosphorylation & amino acids

● hard ● medium ● easy

● 3 (a)(i)

Calculate · [1 mark]

In photolysis one bond in each water molecule is broken. Using the equation, calculate the energy released by photolysis to make one glucose molecule.

Type of bond	Bond energy / kJ per bond
C=O	785
O—H	462
O=O	487

● 3 (a)(ii)

Explain · [4 marks]

Explain how light energy is converted into chemical energy in the form of ATP.

● 3 (b)(i)

State · [1 mark]

State what other information is needed in the table of bond energies for the glucose figure to be calculated.

● 3 (b)(ii)

Identify (multiple choice) · [1 mark]

Where in the chloroplasts are these bonds formed?

● 3 (c)(i)

Identify (multiple choice) · [1 mark]

Which row describes how two amino acids join together?

Bond formed between	Type of reaction
carbon and nitrogen	condensation
carbon and nitrogen	hydrolysis
oxygen and nitrogen	condensation
oxygen and nitrogen	hydrolysis

● 3 (c)(ii)

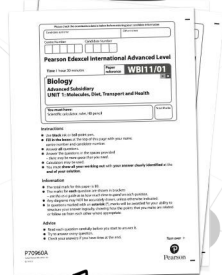
Explain · [2 marks]

Explain why amino acids cannot be produced from glucose alone.

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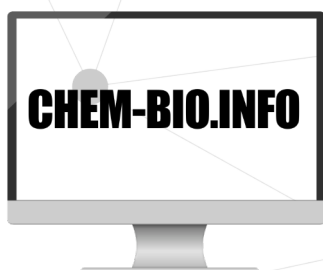
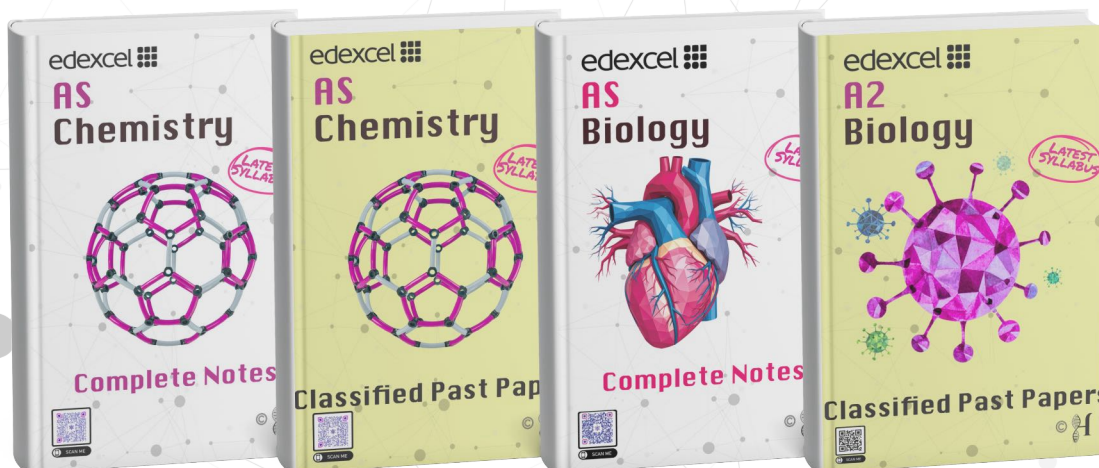


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