

APOLLO

Photosynthesis

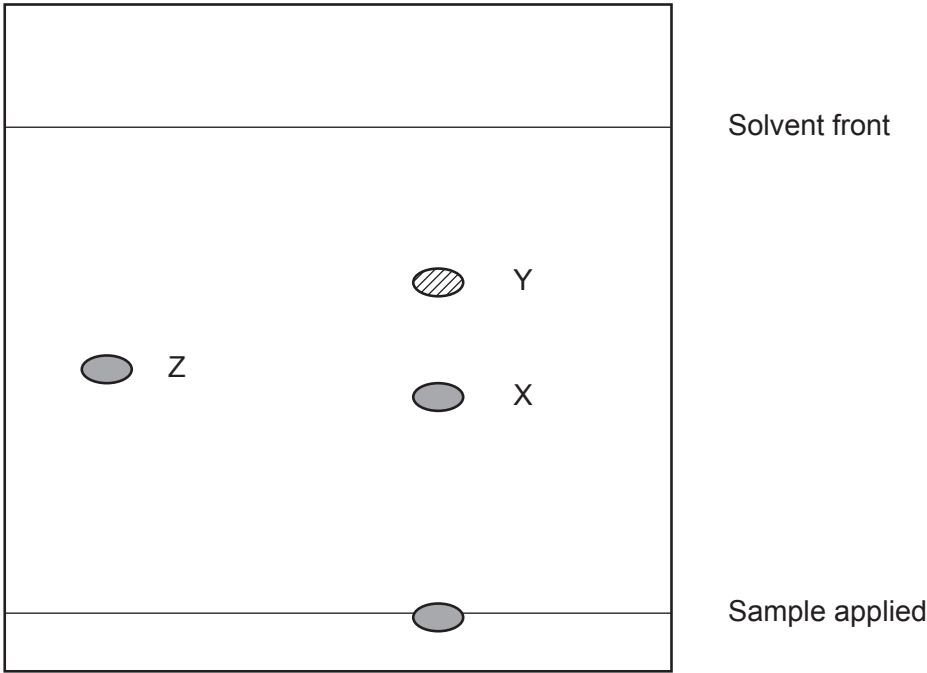
HL

Biology

First assessment 2025

10 questions | questions

8. The diagram shows a chromatogram of the pigments in a leaf. Substance Z is known to have an R_f of 0.5.

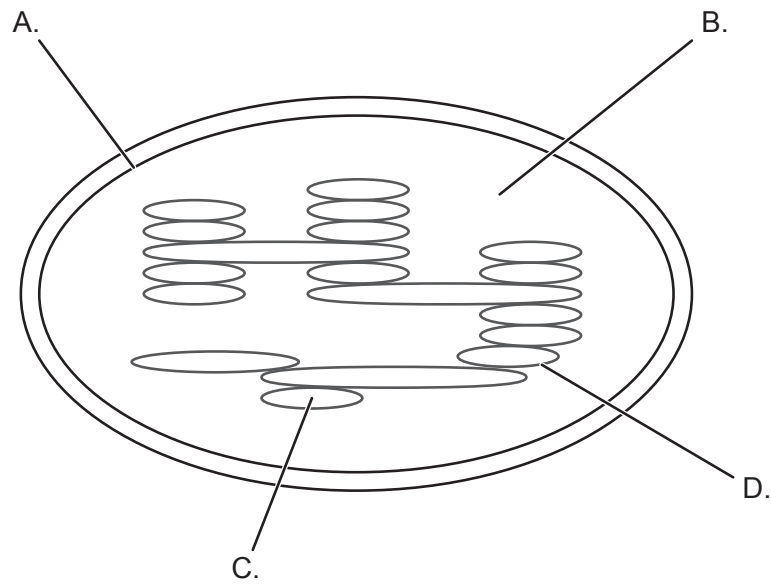


Pigment	Colour	R_f
Carotene	Yellow	0.95
Phaeophytin	Yellow-grey	0.83
Chlorophyll <i>a</i>	Blue-green	0.65
Chlorophyll <i>b</i>	Green	0.45

What are pigments X and Y?

	X	Y
A.	Chlorophyll <i>a</i>	Phaeophytin
B.	Chlorophyll <i>a</i>	Carotene
C.	Chlorophyll <i>b</i>	Carotene
D.	Chlorophyll <i>b</i>	Chlorophyll <i>a</i>

14. The diagram shows the structure of a chloroplast. Where does the Calvin cycle occur?



6. Bromothymol blue is an indicator that is initially blue and turns yellow when CO_2 is present. Tests were carried out varying the presence of a plant (*Elodea canadensis*) and a snail (*Marisa cornuarietis*) in an aquatic environment. What condition would produce a blue colour after sampling the water?
- A. Plant kept in the dark without snail
 - B. Plant and snail kept in the dark
 - C. Plant kept in the light without snail
 - D. Snail with no plant

7. What occurs during photosynthesis?
- A. Water is oxidized by releasing two electrons to NADPH.
 - B. Glycerate-3-phosphate (GP) is oxidized by releasing two electrons to photosystem II.
 - C. NAD is reduced by accepting two electrons from ATP.
 - D. NADP is reduced by accepting two electrons from photosystem I.

8. The Calvin cycle continues throughout the life of a plant. In this cycle, triose phosphate is produced, which is used to form glucose. In total, how many RuBP molecules are regenerated in the process of creating one glucose molecule?
- A. 2
 - B. 6
 - C. 10
 - D. 14

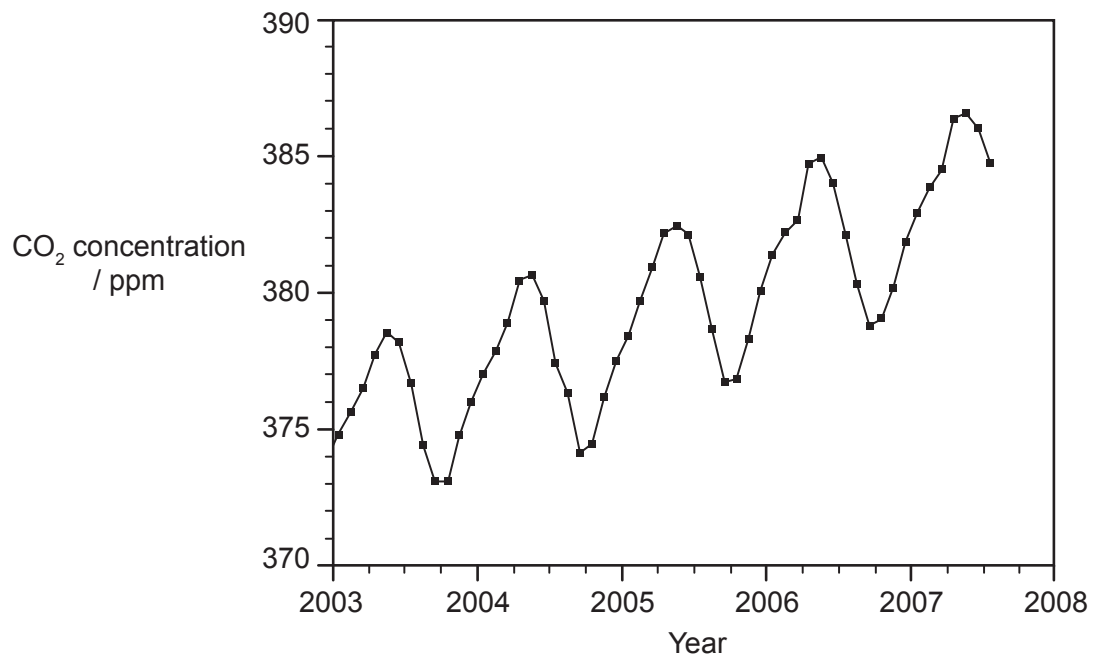
Turn over

7. Which group(s) produce(s) oxygen as a by-product of photosynthesis?

- I. Algae
- II. Cyanobacteria
- III. Fungi

- A. I only
- B. I and II only
- C. II and III only
- D. I, II and III

36. The graph shows data collected at Mauna Loa, USA, for monthly mean carbon dioxide concentration.



What causes the decreases in monthly mean carbon dioxide concentration each year?

- A. Combustion increases.
- B. Respiration increases.
- C. Decomposition increases.
- D. Photosynthesis increases.

Section B

Answer **two** questions. Up to one additional mark is available for the construction of your answers for each question. Answers must be written within the answer boxes provided.

- 10.** All cells require a supply of energy and can transform the energy that they obtain in different ways.
- (a) Explain the properties of ATP that make it useful for distributing energy within cells. [3]
 - (b) Describe how cells in plants use light energy to produce ATP. [7]
 - (c) Compare and contrast how different types of heterotrophs obtain the energy that they need to produce ATP. [5]



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References:

1. Image: diegograndi, 2023. *Beautiful Fluffy White Angora Rabbit*. [image online] Available at: <https://www.gettyimages.co.uk/detail/photo/beautiful-fluffy-white-angora-rabbit-royalty-free-image/1804804966> [Accessed 30 April 2024]. Source adapted.
4. David Nascari and Alan Sved. https://commons.wikimedia.org/wiki/File:Impact_of_arterial_blood_gases_on_alveolar_ventilation.png. Licensed under CC BY-SA 4.0 <https://creativecommons.org/licenses/by-sa/4.0>. Image adapted.
5. Gorvett, P., 2022. *Japanese Knot weed highly invasive plant*. [image online] Available at: <https://www.gettyimages.co.uk/detail/photo/very-fast-growing-japanese-knot-weed-highly-royalty-free-image/1396706880> [Accessed 13 May 2024]. Reference redacted. Source adapted.
6. Berkshire Community College Bioscience Image Library. [https://commons.wikimedia.org/wiki/File:Mesophyte_leaf_Syringia_\(34850169936\).jpg](https://commons.wikimedia.org/wiki/File:Mesophyte_leaf_Syringia_(34850169936).jpg). Public domain.

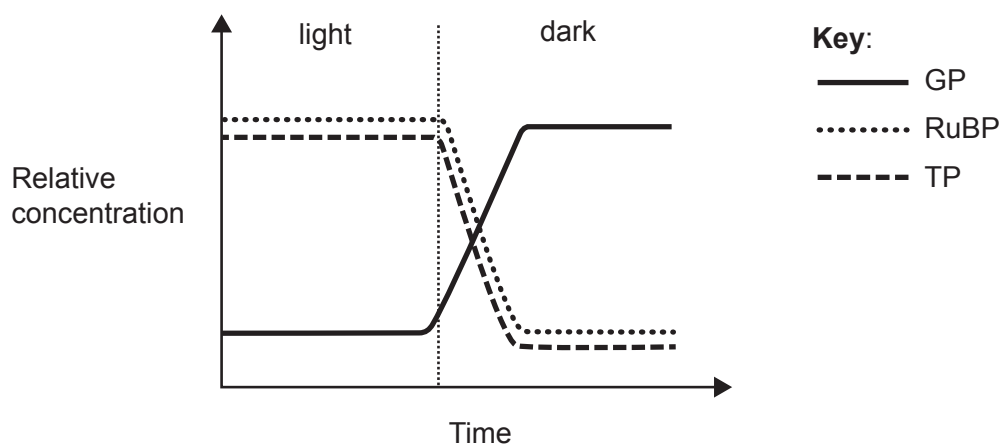
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8. What occurs in photosynthesis?
- A. Photolysis occurs in photosystem I.
 - B. Electron transport chain synthesises ATP in the outer membrane of the chloroplast.
 - C. Oxidation of NADP occurs in photosystem I.
 - D. Photosystems I and II emit excited electrons.

Turn over

7. A photosynthesis experiment was set up in both light and dark conditions to determine the variations in relative concentrations of glycerate-3-phosphate (GP), triose phosphate (TP) and ribulose biphosphate (RuBP).



What explains the results obtained in the dark conditions?

- A. TP and RuBP from the light-dependent reaction are used to synthesize GP.
- B. Less ATP and reduced NADP (NADPH) are available to convert GP to TP.
- C. There is a low carbon dioxide supply for carbon fixation.
- D. The enzyme Rubisco is only active in the presence of light.

Turn over