

A Level Biology A
H420/01 Biological Processes

Question Set 22

22 (a)

Plants are capable of synthesising a variety of molecules from the products of the light-independent stage of photosynthesis.

Fig 22.1 summarises these processes.

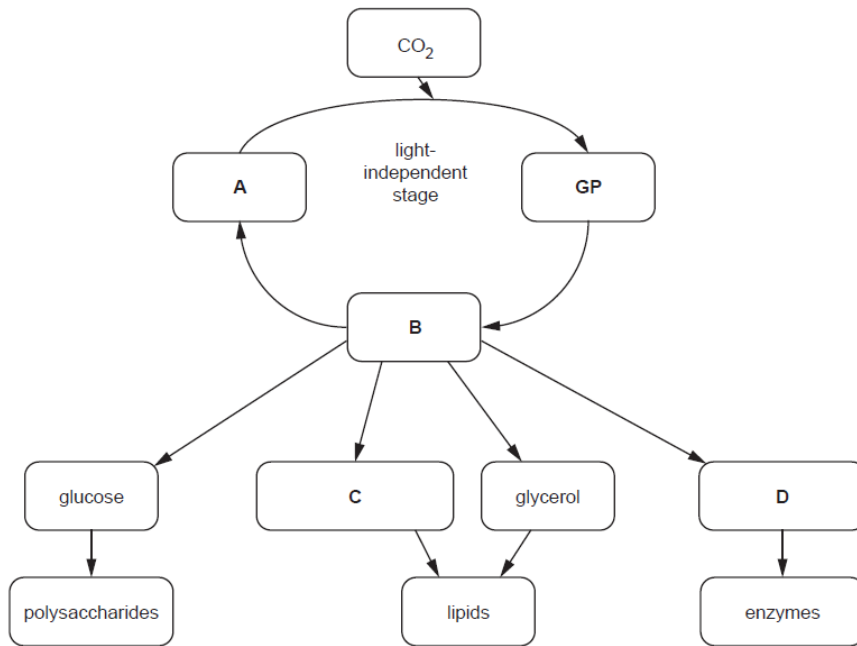


Fig. 22.1

Identify the molecules represented by the letters **A**, **B**, **C** and **D** in Fig. 22.1

A Ribulose biphosphate (RuBP)

B Triose phosphate (TP)

C Fatty acids

D Amino acids

[4]

22 (b) (i) A scientist investigated the rate of photosynthesis in lesser pondweed, *Potamogeton pusillus*.

The method used is outlined below:

- Add 200 cm³ of distilled water to a 300 cm³ glass beaker.
- Dissolve 5 g of NaHCO₃ in the water to provide an excess of CO₂.
- Place the beaker in a water bath at 10 °C and leave for 10 min to equilibrate.
- Insert an oxygen sensor into the water in the beaker and measure the baseline O₂ concentration.
- Place 100 g of *P. pusillus* into the beaker.
- Remove all other light sources from the room and place an LED light source 20 cm above the top of the beaker.
- Use a light intensity meter to ensure the light intensity above the beaker is 5000 lux.
- Measure the concentration of oxygen dissolved in the water using a data logger every 10 min for 200 min.
- Carry out four more repeats at 10 °C.
- Repeat all the above steps in water baths at 15 °C, 20 °C, 25 °C and 30 °C.

Identify the following variables from the scientist's method: independent variable

Temperature.....

dependent variable

Oxygen concentration in the water.....

one control variable

Light intensity.....

[3]

22 (b) (ii) Identify **one** variable that was **not** controlled in the scientist's method.

[2]

pH of the solution

- 2 (c) A scientist investigated the rate of photosynthesis in lesser pondweed, *Potamogeton pusillus*.

Fig. 22.2 is a graph of the scientist's results.

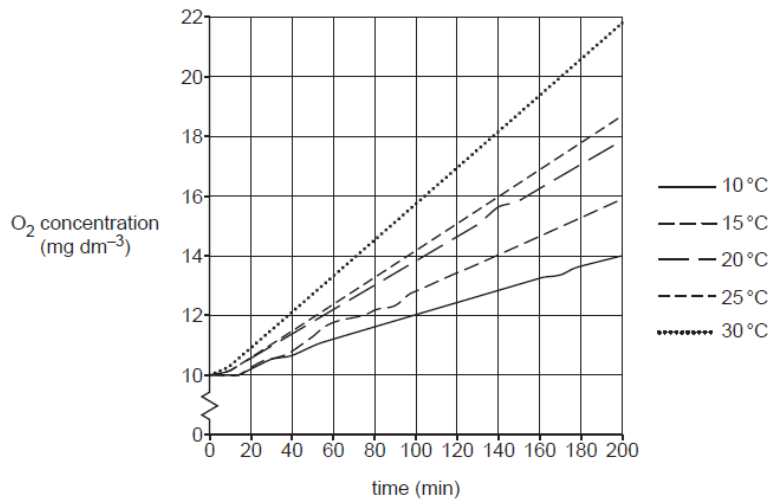


Fig. 22.2

Describe and explain what these results show about photosynthesis in *P. pusillus*. [3]

As temperature increases, the rate of O₂ production, and thus the rate of photosynthesis in *P. pusillus* increases. At any given time, O₂ concentration for *P. pusillus* at 30°C exceeds that of *P. pusillus* exposed to lower temperatures. This is because as temperature rises, the rate of enzyme activity increases. Enzymes such as RuBisCO possess more kE so the random movement of molecules increases and there is a greater chance of successful collisions. This increases the rate of photosynthetic enzyme-controlled reactions such as carbon fixation in the light-independent stage.

- 22 (d) (i) The light-independent stage of photosynthesis used to be referred to as the 'dark reaction'.

Explain why this is both an accurate and an inaccurate way to describe the light-independent stage.

The light-independent stage does not directly require light, so it may be accurate to describe it as the 'dark reaction'. However, 'dark reaction' implies that this stage is completely independent of light and occurs in the dark which is misleading. The light-independent stage does not take place in the dark because it is driven by ATP and NADPH produced in the light-dependent stage, which requires light. Thus, the phrase is inaccurate. [2]

- 22 (d) (ii) Name the enzyme responsible for fixing CO₂ in the light-independent stage of photosynthesis. RuBisCO [1]

- 22 (e) (i) The scientist then investigated the effect of auxin on *P. pusillus* stems.

The growing tips of stems were removed and the stems were placed in solutions containing different concentrations of auxin.

The scientist analysed the results and determined the following relationship:

The higher the concentration of auxin in the solution, the fewer side shoots grew on the *P. pusillus* stems.

Explain why this relationship occurs in *P. pusillus* stems. [1]

High auxin concentrations inhibit lateral shoot growth, apical dominance.

22 (e) (ii) Give **two** examples of the commercial uses of auxin.

Production of seedless fruit

Used in hormone rooting powders

[2]

Total Marks for Question Set 22: 17

OCR

Oxford Cambridge and RSA

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact The OCR Copyright Team, The Triangle Building, Shaftesbury Road, Cambridge CB2 8EA.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge