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BIOLOGY

ENERGY TRANSFERS IN & BETWEEN ORGANISMS

Level & Board	AQA (A-LEVEL)
TOPIC:	PHOTOSYNTHESIS
PAPER TYPE:	QUESTION PAPER - 2
TOTAL QUESTIONS	6
TOTAL MARKS	38

Photosynthesis - 2

1.

(a) Chlorella cells proliferate quickly. In a fermenter, a culture of two thousand Chlorella cells was established. Every ninety minutes, the cells split.

It is reasonable to believe that no limiting constraints existed and that no cells perished within the 24-hour period.

After a day, count the number of cells in the culture.

Provide a standard response.

Display your work. **(2)**

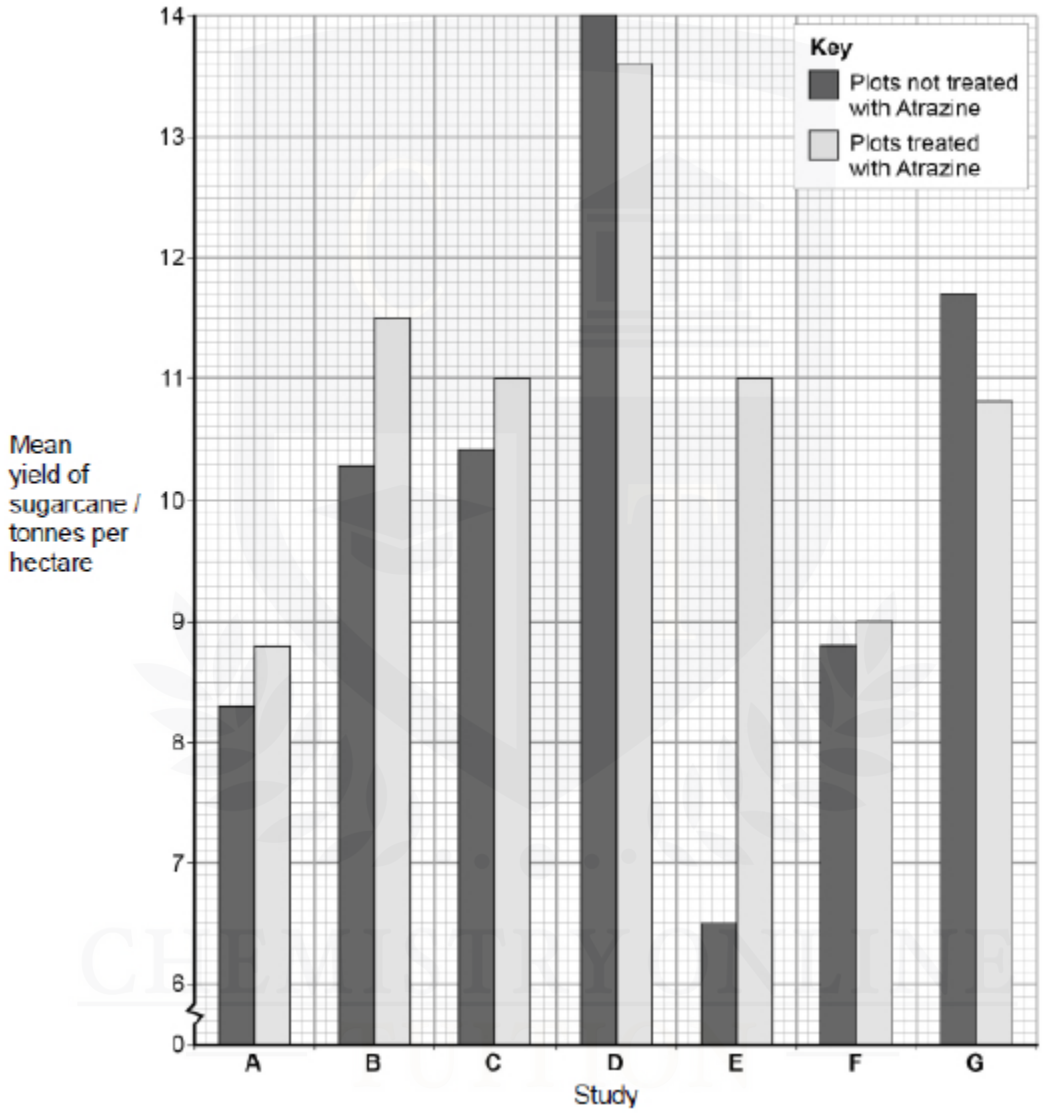
2.

I am Sorry !!!!

Weed growth can be inhibited by the use of herbicides.

Researchers conducted seven trials to find out how the herbicide atrazine influenced sugarcane productivity. In every trial, a portion of the plots received atrazine treatment whereas a portion did not.

The scientists' findings can be seen in the graph below. (1 hectare = 10 000 m_2).



(a) Determine the portion of the yield that was lost as a result of the atrazine use in study G. **(1)**

(b) When examining the mean values in the graph, a teacher who was reviewing these data with her students informed the class that no firm conclusions could be made.

Explain why the teacher said this. **(2)**

(c) Weeds chloroplasts include proteins in the electron transfer chain that are bound by atrazine, which slows down the flow of electrons along the chain.

Describe how this lowers the weeds rate of photosynthesis. **(4)**

3.

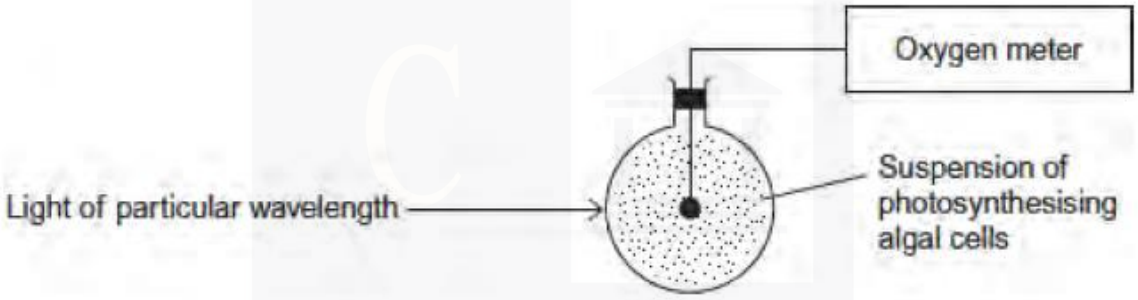
(a) It has been shown that weeds treated with atrazine release trace amounts of heat.

Provide a rationale for this observation. **(1)**

4.

A student looked at how the rate of photosynthesis was affected by various light wavelengths. She made use of the device depicted in Figure 1.

Figure 1



(a) What measurements ought should the student have made in order to ascertain the pace at which photosynthesis occurs? **(1)**

(b) Name two variables that, aside from pH and temperature, should remain constant during this inquiry. **(2)**

(c) The student failed to maintain the pH of the solution by adding a buffer.

Describe the possible outcomes of this experiment for the pH of the solution.

(2)

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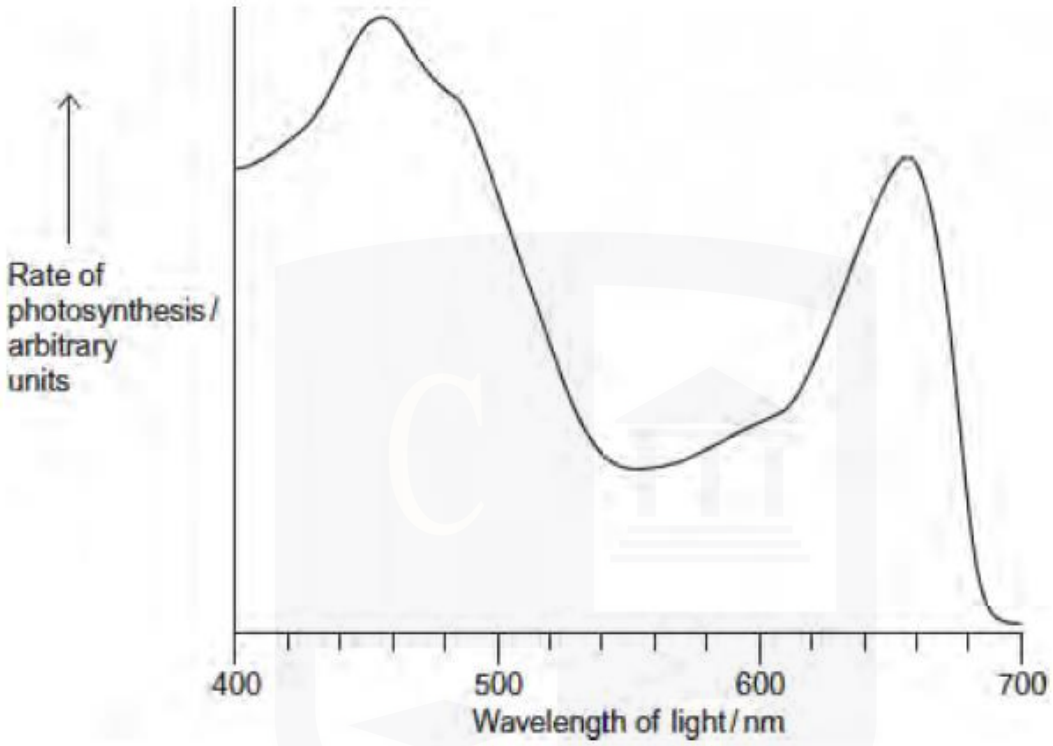
(d) The student's results are shown in Figure 2.

Figure 2



Give a hypothesis and an explanation for the low rate of photosynthesis that occurred between 525 and 575 nm in the visible spectrum. **(2)**

5.

(a) The genus Anolis has around 150 species of lizards that live on Caribbean islands. According to scientists, these species diverged from two that were present in the United States mainland. Why might the species of the Caribbean have evolved? **(6)**

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(b) Some of the smaller Caribbean islands are home to the lizard species Anolis sagrei. Explain how you might calculate the Anolis sagrei population on one of these islands using the mark-release-recapture approach. **(4)**

(c) On certain Caribbean islands, there are still sizable tracts of tropical forest. These woods' air contains varying amounts of carbon dioxide during the course of a day and at various elevations above the ground.

Explain and describe how the amount of carbon dioxide in the air varies at different elevations above ground and over a 24-hour period using your understanding of photosynthesis and respiration. **(5)**

6.

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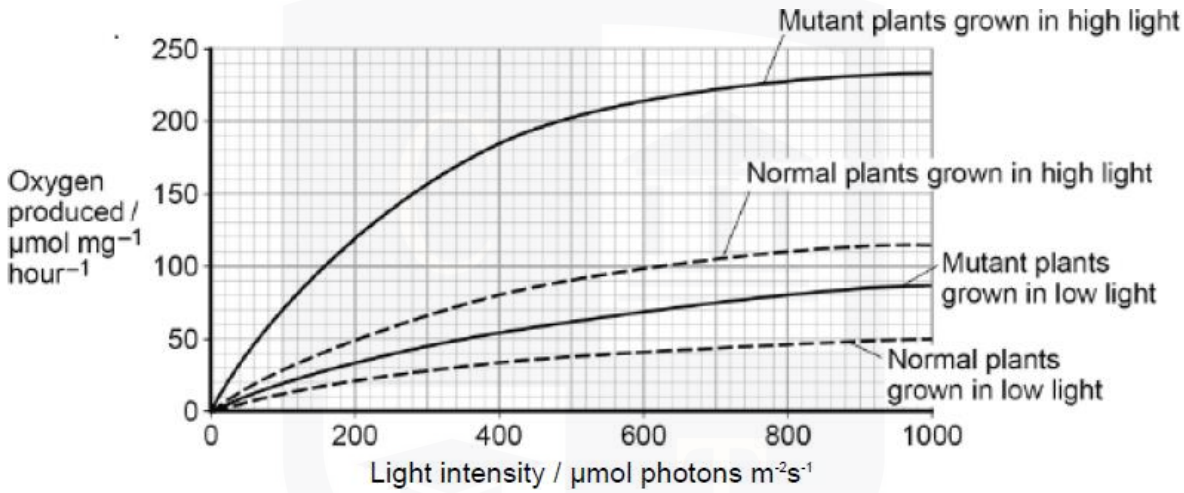
Chlorophyll a and b are found in chloroplasts. Researchers discovered tobacco plants that were mutant enough to produce higher levels of chlorophyll b than regular tobacco plants. They looked into how this mutation affected the rate of photosynthesis.

The following investigation was conducted by the scientists.

• Both regular and mutant tobacco plants flourished there. They extracted samples of chloroplasts from mature plants of both types, cultivated some of each in low light and others in high light, and then assessed the amount of oxygen produced by the chloroplasts they had taken from the plants.

The scientists' findings are depicted in the image below.



(a) Justify the scientists' decision to measure the oxygen production rate in this study. **(2)**

The researchers took 15 minutes to gather oxygen for each attempt.

(b) Determine how much oxygen the chloroplasts of the mutant plants growing in low- and high-light conditions differed in producing at 500 μmol photons m^{-2} s^{-1}.

Display your work. **(2)**

(c) According to the scientists, mutant plants that produce higher amounts of chlorophyll b would develop more quickly than regular plants under all lighting conditions.

Describe how this recommendation is supported by the data. **(2)**

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