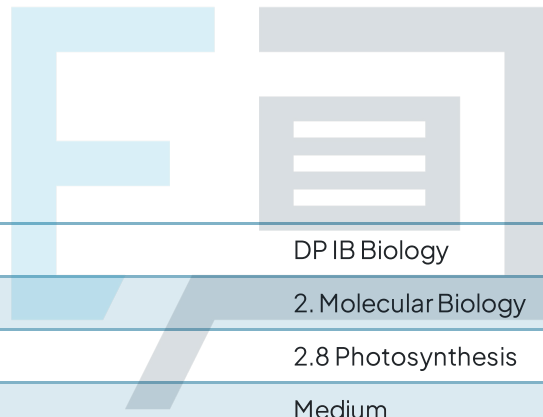




2.8 Photosynthesis

Mark Schemes



Course	DP IB Biology
Section	2. Molecular Biology
Topic	2.8 Photosynthesis
Difficulty	Medium

Exam Papers Practice

To be used by all students preparing for DP IB Biology SL
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1

The correct answer is **C** as it is the only incorrect statement. In plants and algae photosynthesis does occur in chloroplasts but photosynthetic bacteria do not possess chloroplasts. The photosynthetic pigments are present in folds of the cell membrane.

A, B and D are all correct statements about photosynthesis.

2

The correct answer is **D**, chlorophyll a and chlorophyll b are less soluble in the solvent and would move the least distance. These pigments would also appear green in colour.

As chlorophyll a and chlorophyll b are both similar in structure and polarity they would be expected to be grouped close together on the chromatogram. Therefore, other answer combinations are incorrect. Carotene moves the farthest because it is the most soluble of the pigments.

3

The correct answer is **A**. Chlorophyll absorbs red and blue light most effectively, the poor absorption of green light is the reason why so many plants appear green.

B is incorrect as it is essentially the opposite of what happens.

C is incorrect as chlorophyll primarily absorbs light in the blue and red wavelengths. Although some green light is absorbed by plants this is mainly through accessory pigments such as carotene and not chlorophyll.

D is incorrect as wavelengths of red light are also absorbed.



4

The correct answer is **A** as statements I and II are correct. The process of photosynthesis is catalysed by enzymes and at low or high temperatures the enzymes do not work as efficiently. As temperature continues to increase the enzymes start to denature, the active site loses its shape and the enzyme stops working. Therefore the rate of photosynthesis decreases until it stops.

Statement III is incorrect, although there can be slight fluctuations in atmospheric carbon dioxide levels over time this would not account for the sharp decrease in rate of photosynthesis.

Statement IV is also incorrect, like photosynthesis, respiration is also an enzyme catalysed reaction so the rate would decrease at high temperatures.

5

The correct answer is **D** because when carbon dioxide is reduced below 100 ppm the rate of photosynthesis decreases and almost stops. Stored sugars will be utilised through respiration and eventually the plant will lower its metabolism to save energy.

A and **B** are incorrect as statement I is incorrect, the rate of photosynthesis does not increase when carbon dioxide is limited.

C is incorrect as although statements II and III are scientifically correct, statement IV is excluded.



6

The correct answer is **A**, although only chlorophyll a is shown on the absorption spectrum, photosynthetic organisms use a range of pigments that absorb light of different wavelengths.

B is a valid statement but incorrect as it does not explain the differences in the graphs.

C is incorrect as photosynthesis can occur in the full spectrum of visible light.

D is incorrect as there is no inhibition of light absorption by chlorophyll.

7

The correct answer is **C**. As water was used in the experiment, variations in the availability of carbon dioxide could be accounting for the variable results. Sodium hydrogen carbonate increases carbon dioxide availability and ensures that carbon dioxide is not a limiting factor for photosynthesis.

A is a valid indirect method of measuring the rate of photosynthesis. However, many other factors could influence biomass production and this method would not be suitable over a short duration.

B is incorrect: Boiling the water would remove any dissolved oxygen but this would not increase the availability of carbon dioxide.

D is incorrect, although red light could improve the rate of photosynthesis the colour of light would not explain the inconsistent results between replicates.



8

The correct answer is **C**. Plant growth as determined by height, shoot length and biomass is greatest when grown in red light.

A is incorrect, white light was not tested in the investigation so there is no data to support this statement.

B is incorrect. Although there appears to be a linear relationship between biomass and wavelength, the height of the seedlings is reduced in orange light (600 nm) and so there is not a linear relationship between shoot length and wavelength.

D is incorrect as there does appear to be a relationship between these two factors, graphing the data would confirm this.

9

The correct answer is **D** because oxygen is a waste product of photolysis.

A is incorrect as no water is generated during photosynthesis.

B is incorrect as the oxygen incorporated into glucose is derived from carbon dioxide.

C is incorrect, although oxygen is used during cellular respiration, it is not obtained from photolysis during the initial stages of photosynthesis.



10

The correct answer is **B**: around 2.5 million years ago, cyanobacteria living in the oceans released oxygen through the process of photosynthesis. The oxygen combined with dissolved iron to form insoluble iron oxides which precipitated onto the seafloor.

A is a valid statement but is not linked to the formation of iron deposits, it is thought that this led to the first glaciation event.

C is incorrect: although iron oxidising microorganisms can oxidise soluble iron to form iron precipitates, this process is not linked to photosynthesis or 'banded iron formations' in rock.

D is incorrect: photosynthesis by plants and algae did result in increased atmospheric oxygen levels but this was not responsible for 'banded iron formations' in rock.

Exam Papers Practice