

# 13.2 Investigation of Limiting Factors

## Question Paper

Course	CIE A Level Biology
Section	13. Photosynthesis
Topic	13.2 Investigation of Limiting Factors
Difficulty	Easy

**Time allowed:** 30  
**Score:** /24  
**Percentage:** /100

**Question 1a**

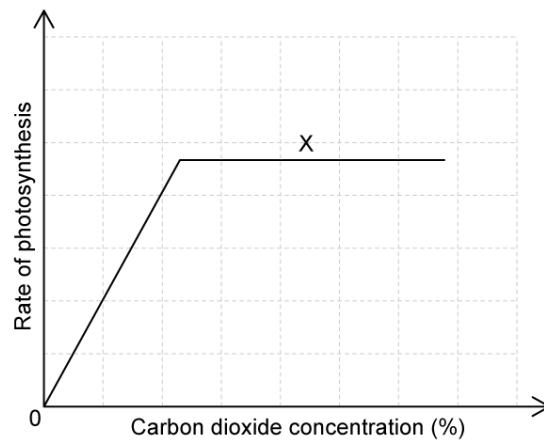
Carbon dioxide concentration is a limiting factor in photosynthesis.

Explain why this is the case.

[2 marks]

**Question 1b**

Fig. 1 shows the relationship between carbon dioxide concentration and the rate of photosynthesis.



**Fig. 1**

Describe the relationship between carbon dioxide concentration and rate of photosynthesis shown in Fig. 1.

[2 marks]

**Question 1c**

Identify a possible limiting factor at the point labelled X in Fig. 1.

[1 mark]

### Question 1d

(i)  
Sketch a graph of the rate of photosynthesis against temperature

[1]

(ii)  
Explain the shape of the graph that you have drawn in part (i).

[2]

[3 marks]

### Question 2a

A student wanted to investigate the effect of light intensity on the rate of photosynthesis.

They set up an investigation as shown in Fig. 1 and altered the light intensity by changing the distance between the lamp and the pondweed.

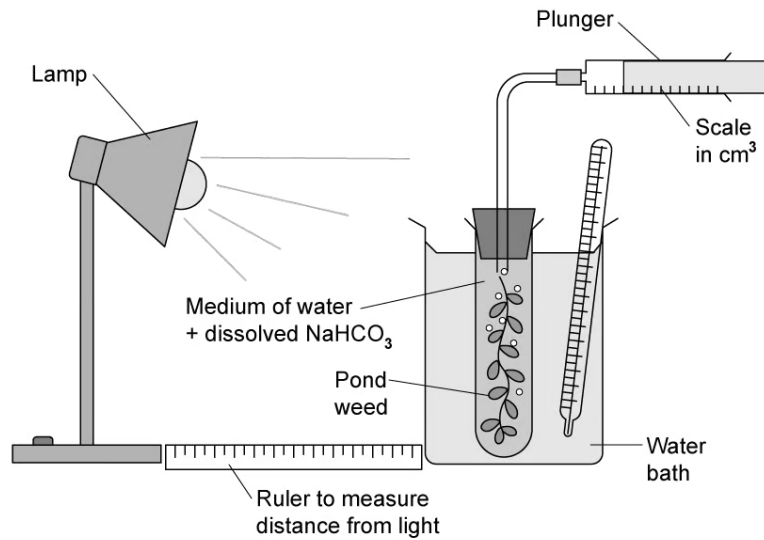


Fig. 1

Name the variable measured here to give the rate of photosynthesis.

[1 mark]

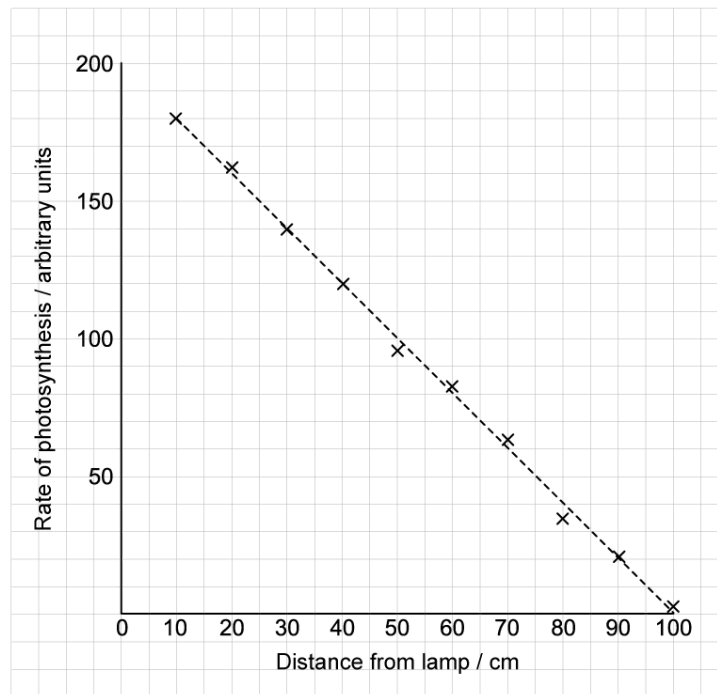
**Question 2b**

State **two** variables that need to be controlled in the investigation shown in Fig. 1.

[2 marks]

**Question 2c**

Fig. 2 shows the student's results.



**Fig. 2**

Using Fig. 2, calculate the percentage decrease in the rate of photosynthesis that takes place when the distance from the lamp is 10 cm compared to when it is 90 cm.

[2 marks]

### Question 2d

Explain why lower light intensity leads to a reduced rate of photosynthesis, as shown in Fig. 2

[2 marks]

### Question 3a

Redox indicators are sometimes used to show that certain reactions are occurring during photosynthesis.

(i)

Name **one** redox indicator that can be used to measure the rate of photosynthesis.

[1]

(ii)

Describe the colour change that the indicator named in part (i) displays when the indicator goes from an oxidised to a reduced state.

[1]

[2 marks]

### Question 3b

It can be difficult to observe the full colour change described in part (a) (ii) when measuring the rate of photosynthesis in a suspension of chloroplasts.

Explain why a colour change may not be fully observed even though the indicator has been fully reduced.

[2 marks]

**Question 3c**

A study is carried out to examine the effect of light intensity on the rate of photosynthesis in a chloroplast suspension.

State one other light-related variable that must be controlled / kept constant in this experiment.

**[2 marks]**

**Question 3d**

A chloroplast suspension can be produced by crushing green leaves with an isolation medium in a pestle and mortar.

State **three** features of an isolation medium that are required when preparing a chloroplast suspension.

**[3 marks]**