

(Photosynthesis (equation, limiting factors, uses of glucose))

Q1.(2019)

This question is about photosynthesis.

Complete the word equation for photosynthesis:

[2 marks]

_____ + _____ → _____ + oxygen

Q2.(2020)

This question is about photosynthesis.

Complete the word equation for photosynthesis.

[2 marks]

_____ + _____ → _____ + oxygen

Q3.(2020)

Describe how energy for the photosynthesis reaction is gained by plants.

[2 marks]

Q4.a)(2020)

Students investigated the effect of temperature on the rate of photosynthesis.

The students shone light from a lamp onto pondweed and measured the volume of oxygen produced per hour.

Table 1 shows the results.

Table 1

Temperature in °C	Rate of photosynthesis in cm ³ /hour			
	Test 1	Test 2	Test 3	Mean
20	18.5	19.3	19.5	X
25	32.6	34.1	32.9	33.2
30	41.9	45.2	44.9	44.0
35	38.6	39.8	44.0	40.8
40	23.1	20.5	22.4	22.0
45	1.9	14.2	2.2	2.1

Calculate mean value **X**.

[2 marks]

X = _____ cm³/hour

Q4.b)(2020)

The students identified one anomalous result in **Table 1**.

Draw a ring around the anomalous result in **Table 1**.

[1 mark]

Q4.c)(2020)

Suggest **one** possible cause of the anomalous result.

[1 mark]

Q4.d)(2020)

How did the students deal with the anomalous result?

[1 mark]

Q4.e)(2020)

Give **one** factor the students should have kept constant in this investigation.

[1 mark]

Q4.f)(2020)

Table 1 is repeated below.

Table 1

Temperature in °C	Rate of photosynthesis in cm ³ /hour			
	Test 1	Test 2	Test 3	Mean
20	18.5	19.3	19.5	X
25	32.6	34.1	32.9	33.2
30	41.9	45.2	44.9	44.0
35	38.6	39.8	44.0	40.8
40	23.1	20.5	22.4	22.0
45	1.9	14.2	2.2	2.1

Why did the rate of photosynthesis decrease from 35 °C to 45 °C?

[1 mark]

Q4.g)(2020)

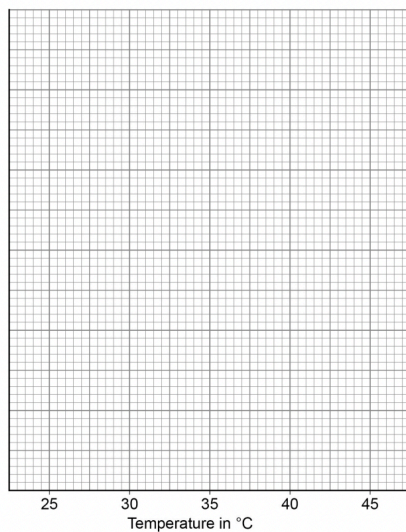
Complete **Figure 1** using data from **Table 1**.

You should:

- label the y-axis
- use a suitable scale for the y-axis
- plot the mean data from **Table 1** for temperatures from 25 °C to 45 °C
- draw a line of best fit.

[5 marks]

Figure 1



Q5.a)(2020)

Bioenergetics

<http://www.pcfgstudy.com>

Students investigated the presence of starch and glucose in the leaves of geranium plants.

This is the method used.

1. Place two identical geranium plants on a bench near a sunny window for two days.
2. After two days:
 - leave one plant near the window for two more days.
 - place one plant in a cupboard with no light for two more days.
3. Remove one leaf from each plant.
4. Crush each leaf to extract the liquid from the cells.
5. Test the liquid from each leaf for glucose and for starch.

Describe how the students would find out if the liquid from the leaf contained glucose.
[3 marks]

Q5.b)(2020)

Describe how the students would find out if the liquid from the leaf contained starch.
[2 marks]

Q5.c)(2020)

Table 2 shows the students' results.

Table 2

Test	Leaf from plant kept in light for four days	Leaf from plant kept in light for two days and then no light for two days
Glucose	Strong positive	Weak positive
Starch	Positive	Negative

Explain why the leaf in the light for four days contained both glucose and starch.
[2 marks]

Q5.d)(2020)

Bioenergetics

<http://www.pcfgstudy.com>

Explain why the leaf left in a cupboard with no light for two days did contain glucose but did **not** contain starch.

[3 marks]

Q5.e)(2020)

Suggest **one** way the students could develop the investigation to find out more about glucose and starch production in plants.

[1 mark]

Q6.(2023)

This question is about photosynthesis.

Complete the symbol equation for photosynthesis.

[1 mark]



Q7.a)(2023)

Bioenergetics

<http://www.pcfgstudy.com>

There are two types of chlorophyll in leaves.

Figure 10 shows the percentage of different wavelengths of light that the two types of chlorophyll absorb.

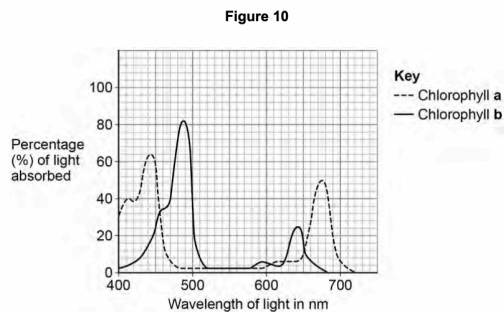


Table 6 shows the colour of different wavelengths of light.

Table 6

Range of wavelength of light in nm	380 – 435	450 – 499	500 – 570	571 – 590	620 – 720
Colour of light	violet	blue	green	yellow	red

Suggest the advantage to a plant of having two types of chlorophyll.

[1 mark]

Q7.b)(2023)

Table 5 is repeated below.

Table 5

Colour of light	Time taken for 10 leaf discs to reach the surface of the solution in seconds
Blue	115
Green	831
Red	397

The leaf discs in the investigation are green.

Explain the results in **Table 5** for blue light and for green light.

Use data from **Figure 10** and **Table 6**.

[4 marks]

Q8.a)(2024)

Bioenergetics

<http://www.pcfgstudy.com>

A student investigated the effect of different factors on photosynthesis.

The student used three leaves growing on the same plant.

Each leaf was treated in a different way.

After 48 hours the student tested each leaf for starch.

Table 3 shows the results.

Table 3

Leaf tested	Treatment	Result after 48 hours
1	Upper and lower surfaces covered with black paper	No starch present
2	Upper and lower surfaces covered and sealed with transparent plastic	No starch present
3	Not covered	Starch present

Explain the results for the three leaves.

[5 marks]

Q8.b)(2024)

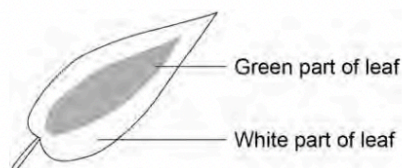
In another investigation the student used a different type of plant.

The plant was left uncovered in the light for 48 hours.

After 48 hours the student tested a leaf from the plant for starch.

Figure 6 shows the leaf before it was tested for starch.

Figure 6



Complete **Table 4** to show the results you would expect for the starch test on the leaf in **Figure 6**.

[1 mark]

Table 4

Part of leaf tested	Result after 48 hours
Green	
White	

Q8.c)(2024)

Explain the results you gave in Question **07.2**.

[2 marks]

Q8.d)(2024)

In some leaves, the green parts become yellow because of an ion deficiency.

Which ion is deficient in a plant with yellow leaves?

[1 mark]

Q8.e)(2024)

Give the scientific term that describes the yellow colour of the leaves.

[1 mark]

Q8.f)(2024)

The rate of photosynthesis is affected by different factors.

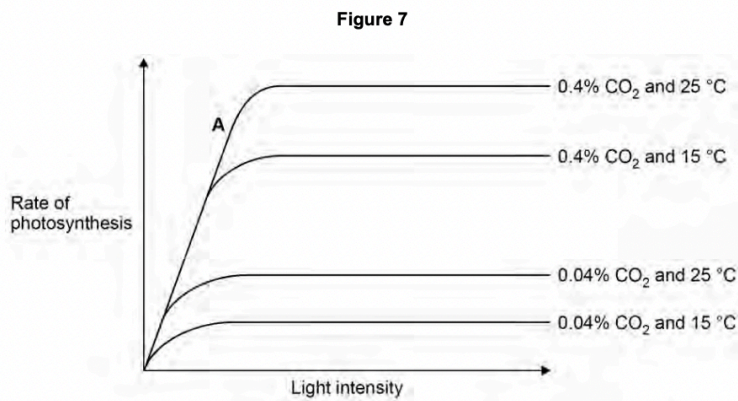
How could the oxygen produced during photosynthesis be used to measure the **rate** of photosynthesis?

[1 mark]

Q9.a)(2024)

Light, carbon dioxide and temperature are limiting factors of photosynthesis.

Figure 7 shows how the rate of photosynthesis is affected by light, carbon dioxide and temperature.



At point **A** on **Figure 7**, light is a limiting factor.

What is meant by a 'limiting factor'?

[1 mark]

Q9.b)(2024)

Explain the effect of increasing temperature and increasing carbon dioxide concentration on the rate of photosynthesis shown in **Figure 7**.

[4 marks]

Q9.c)(2024)

Bioenergetics

<http://www.pcfgstudy.com>

Photosynthesis investigations often use a light source.

The spreading out of light from a source obeys the inverse square law.

The inverse square law links light intensity to distance from the light source.

Which of the following shows the inverse square law?

[1 mark]

Tick (✓) **one** box.

$$\text{light intensity} \propto \frac{1}{\text{distance}^2}$$

☐

$$\text{light intensity} \propto \text{distance}^2$$

☐

$$\frac{1}{(\text{light intensity})^2} \propto \text{distance}^2$$

☐

$$\frac{1}{(\text{light intensity})^2} \propto \frac{1}{\text{distance}^2}$$

☐