

Name:

Date:

B4 - Test 2
BIOENERGETICS
Beginner

GCSE

BIOLOGY

AQA - Triple Science

Mark

Grade

Materials

For this paper you must have:

- Ruler
- Pencil and Rubber
- Scientific calculator, which you are expected to use when appropriate

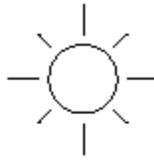
Instructions

- Answer all questions
- Answer questions in the space provided
- All working must be shown

Information

- The marks for the questions are shown in brackets

1. Energy for living organisms comes from the Sun.



Complete the sentences by using the correct words from the box.

animals carbohydrates carbon dioxide oxygen plants water

Light energy is captured by green _____ .

They use this energy to make _____ .

To do this, they also use _____ .

(Total 3 marks)

2. Anaerobic respiration happens in muscle cells and yeast cells.

The equation describes anaerobic respiration in muscle cells.



(a) How can you tell from the equation that this process is anaerobic?

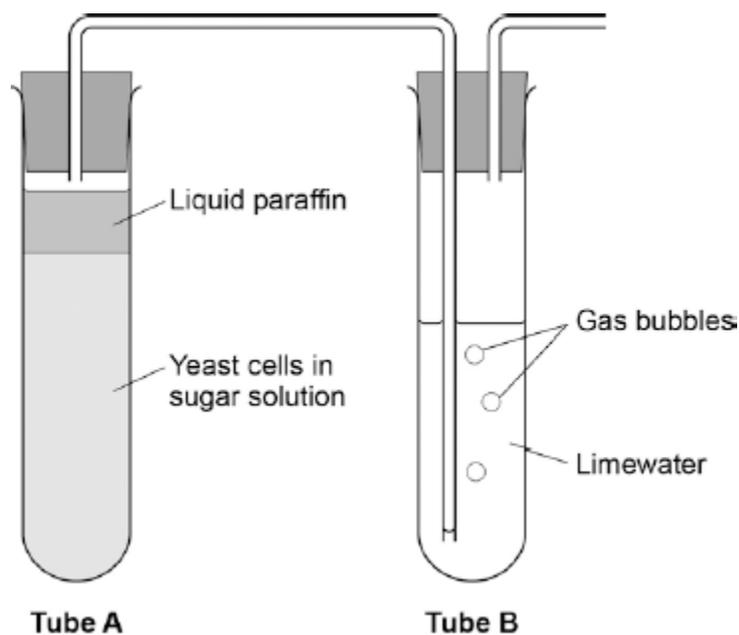
(1)

(b) Exercise **cannot** be sustained when anaerobic respiration takes place in muscle cells.

Explain why.

(2)

(c) The diagram below shows an experiment to investigate **anaerobic** respiration in yeast cells.



What gas will bubble into Tube **B**?

Tick **one** box.

Carbon dioxide

Nitrogen

Oxygen

Water vapour

(1)

(d) Describe how you could use tube **B** to measure the rate of the reaction in tube **A**.

(2)

(e) Anaerobic respiration in yeast is also called fermentation.

Fermentation produces ethanol.

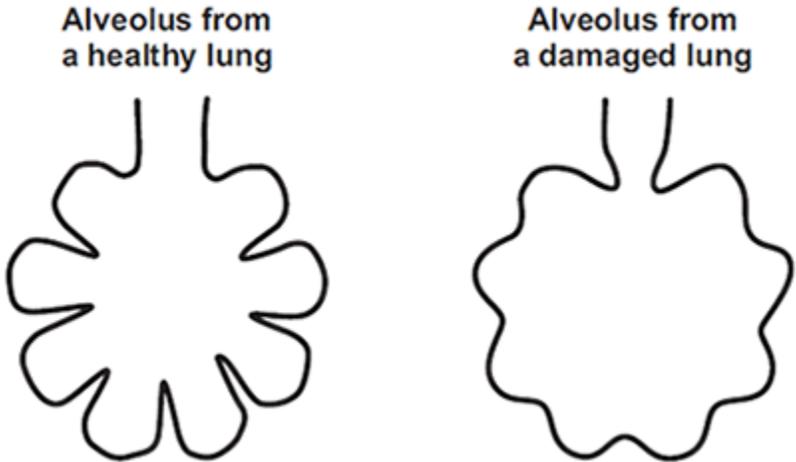
Give **one** use of fermentation in the food industry.

(1)

(Total 7 marks)

3.

The diagram below shows an alveolus from a healthy lung and an alveolus from a damaged lung.



(a) Which **one** of the following is a difference between the alveolus from the damaged lung and the alveolus from the healthy lung?

Tick (✓) **one** box.

The damaged alveolus has a smaller surface area.

The damaged alveolus has a shorter diffusion pathway.

The damaged alveolus has a better blood supply.

(1)

(b) A person with damaged alveoli finds exercising difficult.

Which **one** of the following is the reason why the damaged alveoli will make exercising difficult?

Tick (✓) **one** box.

Less carbon dioxide is taken in.

Less energy is needed for exercise.

Less oxygen is taken in.

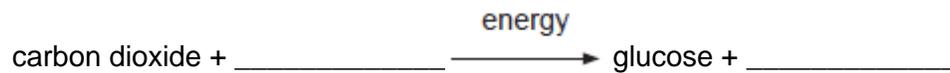
(1)

(Total 2 marks)

4.

Photosynthesis uses carbon dioxide to make glucose.

(a) (i) Complete the equation for photosynthesis.



(2)

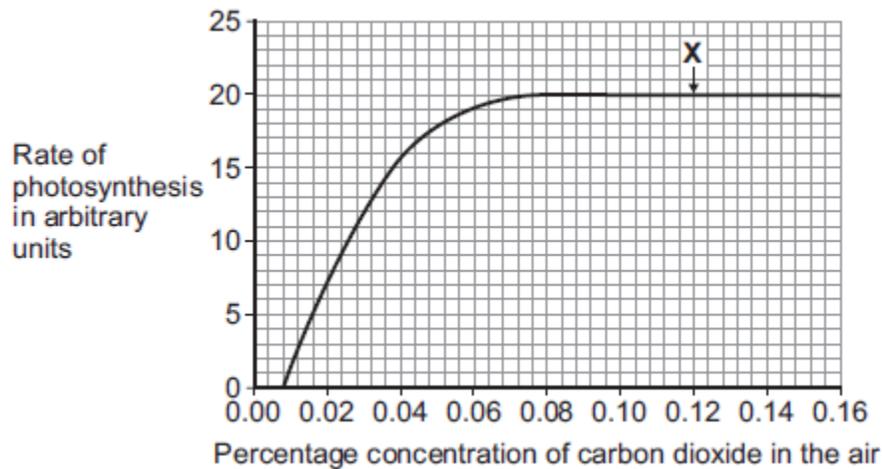
(ii) What type of energy does a plant use in photosynthesis?

(1)

(iii) Which part of a plant cell absorbs the energy needed for photosynthesis?

(1)

- (b) The graph shows the effect of the concentration of carbon dioxide on the rate of photosynthesis in tomato plants at 20 °C.



- (i) What is the maximum rate of photosynthesis of the tomato plants shown in the graph?

_____ arbitrary units

(1)

- (ii) At point **X**, carbon dioxide is **not** a limiting factor of photosynthesis.

Suggest **one** factor that is limiting the rate of photosynthesis at point **X**.

(1)

- (c) A farmer plans to grow tomatoes in a large greenhouse.

The concentration of carbon dioxide in the atmosphere is 0.04%.

The farmer adds carbon dioxide to the greenhouse so that its concentration is 0.08%.

- (i) Why does the farmer use 0.08% carbon dioxide?

Tick (✓) **one** box.

To increase the rate of growth of the tomato plants

To increase the rate of respiration of the tomato plants

To increase water uptake by the tomato plants

(1)

(ii) Why does the farmer **not** use a concentration of carbon dioxide higher than 0.08%?

Tick (✓) **two** boxes.

Because it would cost more money than using 0.08%

Because it would decrease the temperature of the greenhouse

Because it would not increase the rate of photosynthesis of the tomato plants any further

Because it would increase water loss from the tomato plants

(2)

(Total 9 marks)

5.

Scientists investigated how exercise affects blood flow to different organs in the body.

The scientists made measurements of blood flow to different organs of:

- a person resting in a room at 20°C
- the same person, in the same room, doing vigorous exercise at constant speed on an exercise cycle.

The table shows the scientists' results.

Organ	Blood flow in cm ³ per minute whilst ...	
	resting	doing vigorous exercise
Brain	750	750
Heart	250	1000
Muscles	1200	22 000
Skin	500	600
Other	3100	650

(a) In this investigation, it was better to do the exercise indoors on an exercise cycle than to go cycling outdoors on the road.

Suggest **two** reasons why.

Do **not** include safety reasons.

1. _____

2. _____

(2)

(b) Blood flow to **one** organ did **not** change between resting and vigorous exercise.

Which organ? _____

(1)

- (c) (i) How much more blood flowed to the muscles during vigorous exercise than when resting?

Answer = _____ cm³ per minute

(2)

- (ii) Name **two** substances needed in larger amounts by the muscles during vigorous exercise than when resting.

1. _____

2. _____

(2)

- (iii) Tick (✓) **one** box to complete the sentence.

The substances you named in part (c)(ii) helped the muscles to

make more lactic acid.

respire aerobically.

make more glycogen.

(1)

- (iv) The higher rate of blood flow to the muscles during exercise removed larger amounts of waste products made by the muscles.

Which **two** substances need to be removed from the muscles in larger amounts during vigorous exercise?

Tick (✓) **two** boxes.

Amino acids	<input type="checkbox"/>
Carbon dioxide	<input type="checkbox"/>
Glycogen	<input type="checkbox"/>
Lactic acid	<input type="checkbox"/>

(2)

- (d) The total blood flow was much higher during exercise than when resting.

One way to increase the total blood flow is for the heart to pump out a larger volume of blood each beat.

Give **one** other way to increase the blood flow.

(1)

(Total 11 marks)

6.

- (a) A student carried out the following investigation using a plant with variegated leaves. A variegated leaf has green and white stripes.

The student:

- left the plant in the dark for 3 days to remove the starch
- fixed two pieces of card to a leaf on the plant
- left the plant in the light for 2 days
- removed the leaf from the plant
- tested the leaf for starch.

Figure 1 shows how the two pieces of card were attached to the leaf.

Figure 1

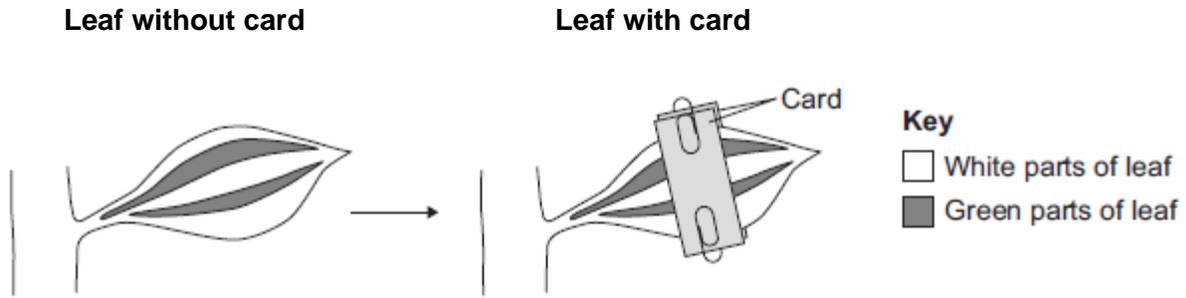
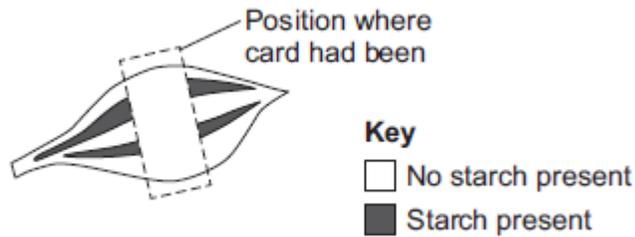


Figure 2 shows the same leaf after 2 days in the light. The leaf has been tested for starch.

Figure 2



Give **two** conclusions from this investigation.

Tick (✓) **two** boxes.

Carbon dioxide is needed for photosynthesis.

Chlorophyll is needed for photosynthesis.

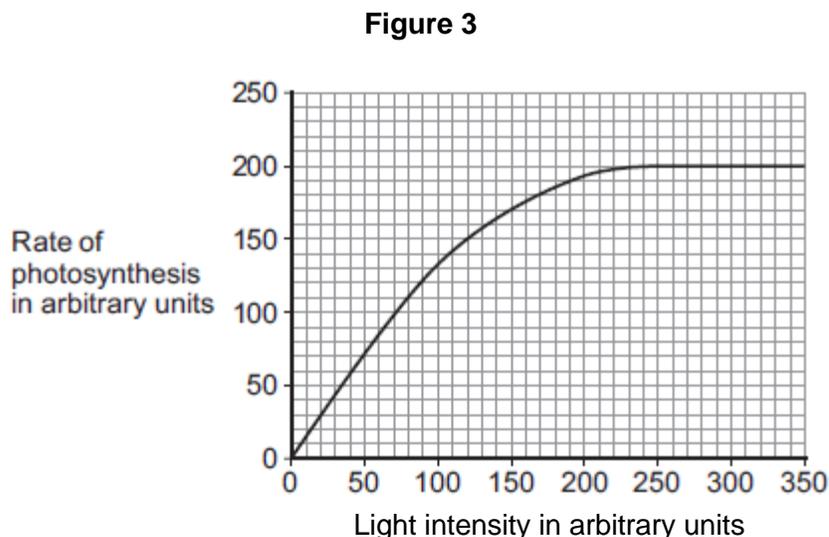
Light is needed for photosynthesis.

Water is needed for photosynthesis.

(2)

(b) Scientists investigated the effect of light intensity on the rate of photosynthesis.

Figure 3 shows the scientists' results.



Describe the effect of increasing light intensity on the rate of photosynthesis. You should include numbers from **Figure 3** in your description.

(3)

(c) At a light intensity of 250 arbitrary units, light is **not** a limiting factor of photosynthesis.

(i) What is the evidence for this in **Figure 3**?

(1)

(ii) Give **two** factors that could be limiting the rate of photosynthesis at a light intensity of 250 arbitrary units.

1. _____

2. _____

(2)

(Total 8 marks)

7.

The table shows the percentage of some gases in the air a boy breathed in and out.

Gases	Air breathed in	Air breathed out
carbon dioxide	0.04%	4.0%
oxigen	20.0%	16.0%
water vapour	1.0%	6.0%

(a) What happens in the lungs to change the levels of oxygen and carbon dioxide in this way?

Oxygen _____

Carbon dioxide _____

(4)

(b) Compare the percentage of water vapour in the air breathed out with the percentage in air breathed in.

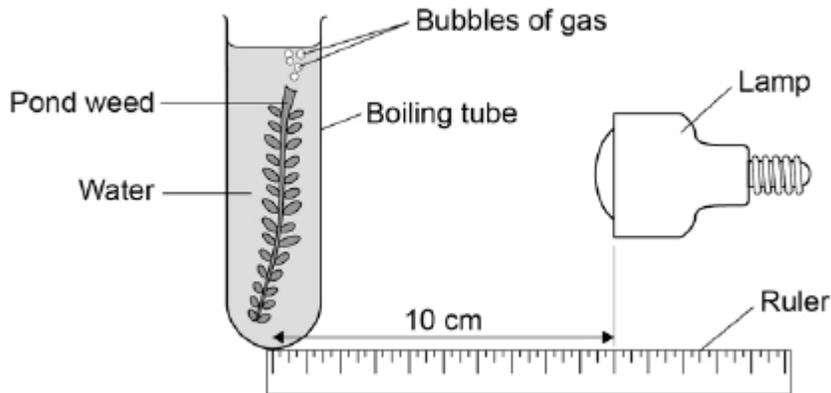
(2)

(Total 6 marks)

8.

A student investigated the effect of light intensity on the rate of photosynthesis.

The diagram shows the apparatus the student used.



This is the method used.

1. Set up the apparatus as shown in the diagram above.
2. Place the lamp 10 cm from the pondweed.
3. Turn the lamp on and count the number of bubbles produced in one minute.
4. Repeat with the lamp at different distances from the pondweed.

(a) Complete the hypothesis for the student's investigation.

'As light intensity increases, _____
_____.'

(1)

(b) What was the independent variable in this investigation?

Tick **one** box.

Light intensity

Number of bubbles produced

Temperature

Time

(1)

- (c) The teacher suggests putting the boiling tube into a beaker of water during the investigation.

Suggest why this would make the results more valid.

(1)

Table 1 shows the student's results.

Table 1

Distance of lamp from pondweed in cm	Number of bubbles produced per minute			
	Trial 1	Trial 2	Trial 3	Mean
10	67	66	69	67
20	61	64	62	62.3
30	53	51	52	X
40	30	32	31	31
50	13	15	15	14

- (d) Calculate value X in Table 1.

X = _____ bubbles per minute

(1)

- (e) State **one** error the student has made when completing the results at 20 cm.

(1)

(f) What evidence in **Table 1** shows that the data is repeatable?

Tick **one** box.

The number of bubbles decreases as distance decreases.

The numbers of bubbles at each distance are similar.

The student calculated a mean for each distance.

The student did the experiment three times.

(1)

Another student investigated the effect of the colour of light on the rate of photosynthesis.

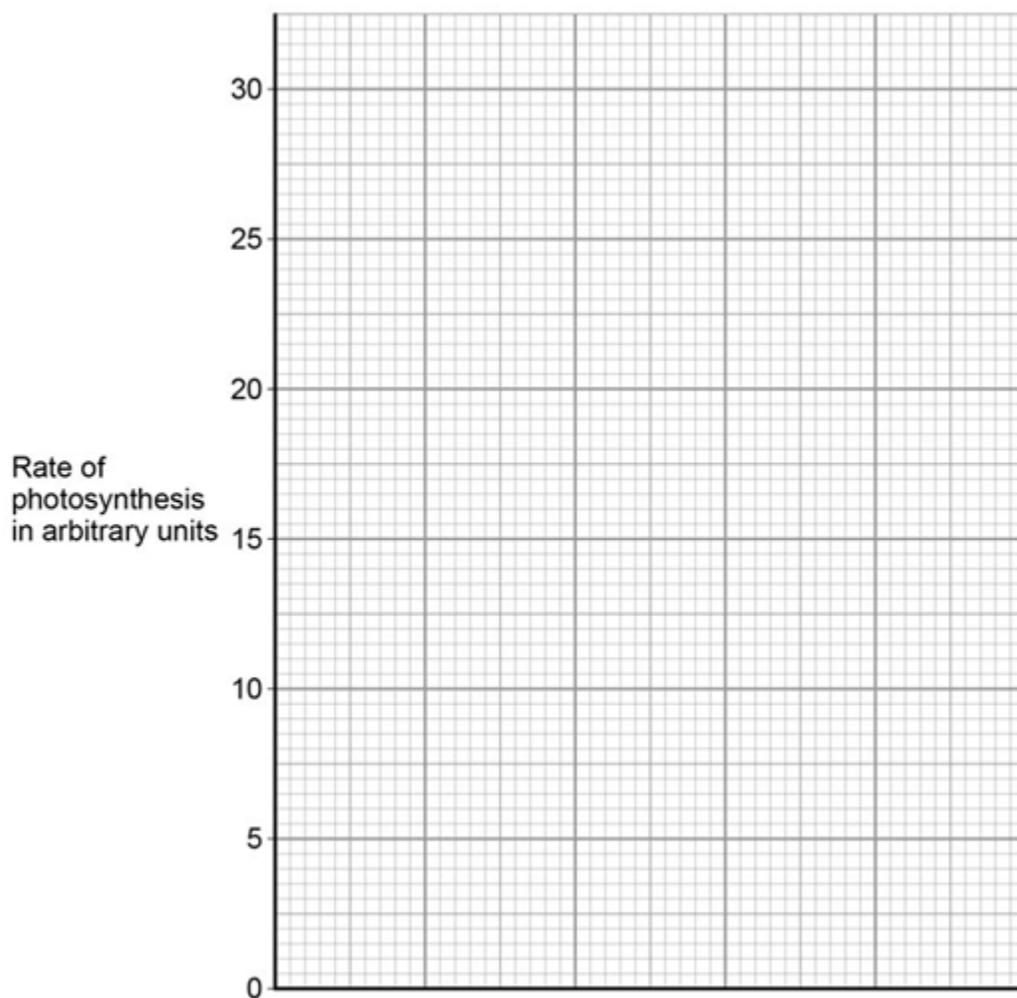
The results are shown in **Table 2**.

Table 2

Colour of light	Rate of photosynthesis in arbitrary units
Blue	24
Green	4
Red	17
Yellow	8

(g) Plot the data from **Table 2** on the graph.

You should label the x-axis.



(3)

(h) Give **two** conclusions from the graph above.

1. _____

2. _____

(2)

- (i) The glucose produced in photosynthesis can be converted into amino acids to make new proteins for the plant.

Complete the sentences.

The glucose produced in photosynthesis can also be used in other ways.

Glucose can be used in respiration to release _____ .

Glucose can be converted to cellulose to strengthen the _____ .

Glucose can be stored as _____ .

(3)

(Total 14 marks)

9.

- (a) The air you breathe in and the air you breathe out are different.

Use the names of gases from this box to complete the **three** spaces.

argon carbon dioxide nitrogen oxygen water vapour

Compared to the air you breathe in, the air you breathe out contains:

- **more** _____
- **more** _____
- **less** _____

(3)

- (b) The process of aerobic respiration takes place in your cells.

- (i) Complete the space in the word equation for this process.

_____ + oxygen → carbon dioxide + water

(1)

- (ii) Complete the space to give the main energy transfer which takes place in this process.

chemical energy → _____ energy

(1)

- (iii) What is the name of the organ where oxygen from the air passes to your blood?

(1)

(c) The athlete is taking part in vigorous exercise.



Complete the **two** spaces in the passage.

The cells in our muscles respire anaerobically during vigorous exercise. This results in _____ debt and the production of _____ acid.

(2)

(Total 8 marks)