

GCSE Biology (9 – 1)

Respiration

Name:

Group:

Instructions

- Read each question carefully before you begin to answer it.
- Use black ink or black ball-point pen for your answers.
- Fill in the boxes at the top of this page with your name and group.
- Attempt to answer every question in the booklet.
- Answer the questions in the spaces provided – there may be more space than you need in some answer spaces.
- Calculators may be used for this booklet.
- For any calculations, you **must** show all your working.
- Any and all drawings or graphs should be completed in pencil.



For markers use	
Question	Mark
1	/5
2	/16
3	/10
4	/9
5	/17
6	/6
7	/8
8	/4
Total	/75
%	
Grade	

Information

- The maximum mark for this paper is 75 marks.
- The marks for each question are shown in brackets.
- Please be aware that good English and clear presentation are required in your answers.



1. Respiration is the process that releases energy from glucose, making it available for the diverse functions of living cells. Circle the letter of the correct answer for each.

a) Yeast is placed inside a container full of a glucose solution with **no** air.

Which word equation summarises the process that takes place inside the container?

- A** glucose → ethanol + carbon dioxide
- B** glucose → lactic acid
- C** glucose + oxygen → carbon dioxide + water
- D** glucose + oxygen → ethanol

(1 mark)

b) Which row describes anaerobic respiration?

	Oxygen required	Energy released	Waste products
A	Yes	Some	carbon dioxide and water
B	No	A lot	lactic acid
C	Yes	A lot	carbon dioxide and water
D	No	Some	lactic acid

(1 mark)

c) What role does anaerobic respiration perform in bread-making?

- A** To produce alcohol to flavour the bread.
- B** To produce oxygen to cause the bread to rise.
- C** To produce enough lactic acid to kill bacteria in the bread.
- D** To produce carbon dioxide to cause the bread to rise.

(1 mark)

d) Which organelle is the site of aerobic respiration within cells?

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|-------------|----------|---------------|----------|
| A | B | C | D |
| Chloroplast | Ribosome | Mitochondrion | Vacuole |

(1 mark)

e) Which of the following is a product of **aerobic** respiration in animal cells?

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|----------|----------|----------------|-------------|
| A | B | C | D |
| Glucose | Oxygen | Carbon dioxide | Lactic acid |

(1 mark)

(Total for Question 1 is 5 marks)

2. A student investigated how different amounts of glucose influence anaerobic respiration in yeast. They prepared five glucose solutions with concentrations ranging from 5% to 25%. For each solution, yeast was added, along with washing-up liquid, in a measuring cylinder. After mixing, the amount of foam produced after three minutes was measured.

This process was carried out for each of the five glucose concentrations.

- a) This method was repeated for each concentration of glucose. Describe how to set up a control for this investigation.

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(2 marks)

- b) Give the word and balanced symbol equation for **aerobic** respiration.

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(4 marks)

- c) State how the scientist could improve this investigation to increase the rate of the reaction.

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(2 marks)

The results of the student's investigation are shown below.

Glucose concentration (%)	Height of foam after three minutes (mm)
5	2
10	6
15	3
20	12
25	15
30	20

d) The student thought one of the results was anomalous. Explain which of these results is anomalous.

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(2 marks)

e) The student repeated the experiment at the 20% glucose concentration five times.
Their recorded foam heights in mm were: 12, 13, 11, 4, 12.
Calculate the mean height of foam for this concentration, excluding any anomalous results

Mean = ...

(3 marks)

f) Provide an explanation for why the foam reached its maximum height when the glucose concentration was 30 %.

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(3 marks)

(Total for Question 2 is 16 marks)

3. Dead plants and animals contain complex organic molecules.
Decomposers, such as bacteria and fungi, play a vital role in ecosystems by breaking down these molecules.

a) Name the process carried out by decomposers that releases energy from these complex organic molecules.

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(2 marks)

b) Describe **two** ways in which the respiration of decomposers is important for the recycling of nutrients within an ecosystem.

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(4 marks)

c) Explain why decomposers respire both aerobically and anaerobically, depending on the conditions in their environment.

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(3 marks)

d) Give **one** example of an environmental condition that would favour anaerobic respiration in decomposers.

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(1 mark)

(Total for Question 3 is 10 marks)

4. During intense exercise in animals and in the absence of oxygen in yeast, anaerobic respiration occurs.
- a) State **one** similarity and **one** difference in the overall process of anaerobic respiration in animal muscle cells and yeast cells.

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(2 marks)

- b) Write the **balanced** chemical equation for anaerobic respiration in yeast cells.

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(3 marks)

A student set up an experiment to investigate anaerobic respiration in yeast.
They measured the volume of carbon dioxide gas produced over 10 minutes.

Time (minutes)	Volume of CO ₂ produced (cm ³)
0	0
2	6
4	12
6	20
8	25
10	30

- c) Calculate the percentage change in the rate of carbon dioxide production between the first 4 minutes and the last 4 minutes of the experiment. Show all working.

Percentage change = ...

(2 marks)

- d) Explain why the products of anaerobic respiration in animal muscle cells can lead to muscle fatigue.

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(2 marks)

(Total for Question 4 is 9 marks)

5. All living organisms respire.

a) What is the balanced chemical equation for aerobic respiration?

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(3 marks)

b) Name the sub-cellular structures where aerobic respiration takes place.

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(1 mark)

Energy is released during aerobic respiration from the oxidation of glucose.

c) Give **two** uses of the energy released in respiration.

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(2 marks)

d) Describe **two** differences between aerobic and anaerobic respiration in humans.

Your answer should not refer to oxygen.

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(2 marks)

e) What are the **two** products of anaerobic respiration in plant cells?

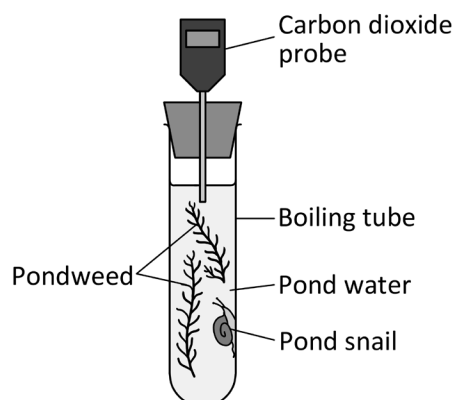
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(2 marks)

An ecologist investigated respiration and photosynthesis that occurs in a pond. The ecologist used a small section of pond weed and a pond snail in their investigation.

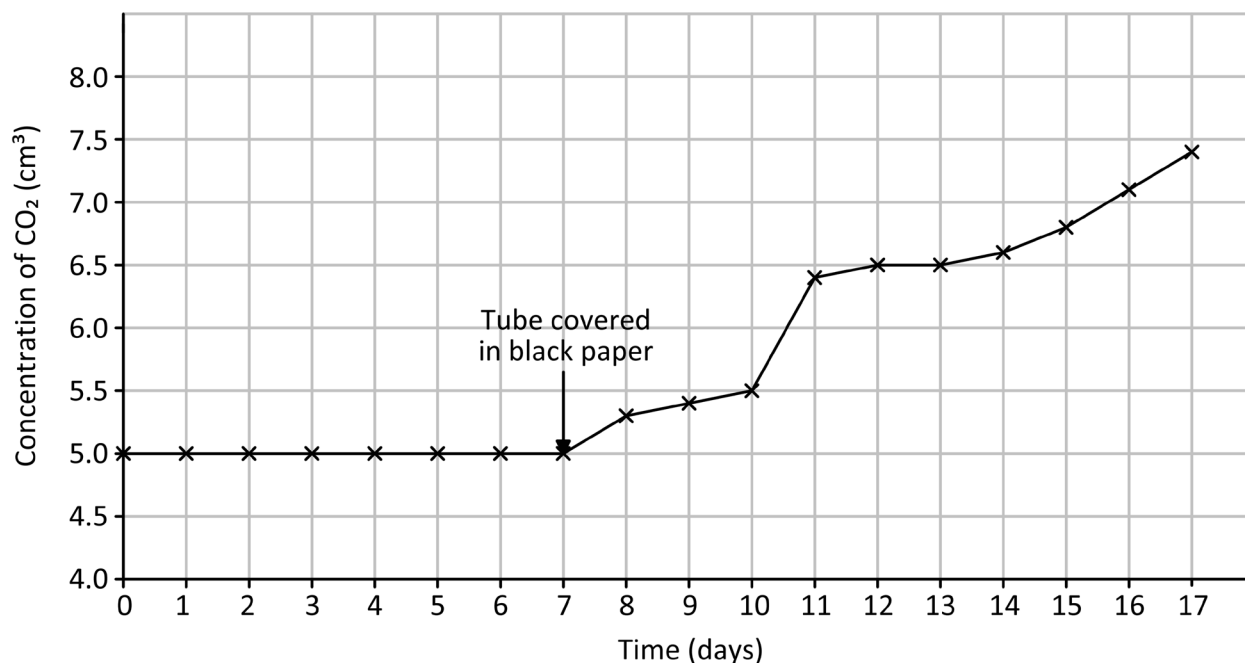
The figure below shows the apparatus used by ecologist.



The experimental apparatus was maintained in a well-lit environment for a period of seven days. During this interval, carbon dioxide concentration was continuously recorded using a data logger.

After this initial seven day period, the boiling tube was entirely encased in black paper, and the data logger continued to monitor carbon dioxide levels.

The graph below shows the concentration of carbon dioxide inside the boiling tube over 15 days.



- f) Explain why the concentration of carbon dioxide in the tube did not change between day 0 and day 7.

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(2 marks)

- g) Explain the increase in the concentration of carbon dioxide concentration between day 7 and day 10.

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(2 marks)

- h) On day 11 of the investigation the pond snail being used died. The pond snail was left in the tube. Explain the increase in the concentration of carbon dioxide in the tube after day 11.

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(3 marks)

(Total for Question 5 is 17 marks)

- [illegible]

(Total for Question 6 is 6 marks)

7. Anaerobic respiration is a process that releases energy from glucose without the involvement of oxygen. This process occurs in both animal and fungal cells, but with different end products.

a) State the location within both an animal muscle cell and a yeast cell where anaerobic respiration takes place.

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(1 mark)

b) Complete the word equations for anaerobic respiration in:

Animal cell: Glucose →

Plant cell: Glucose → + ...
(2 marks)

c) Explain why animal muscle cells respire anaerobically during vigorous exercise.

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(2 marks)

d) Describe **one** consequence of anaerobic respiration in animal muscle cells that can affect their function.

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(2 marks)

e) Give **one** way in which the anaerobic respiration of yeast is commercially important.

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(1 mark)

(Total for Question 7 is 8 marks)

8. This question is about anaerobic respiration.

During vigorous exercise, anaerobic respiration occurs in a person's body.

Identify and explain **two** effects that anaerobic respiration has on a person's physiology during strenuous exercise.

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(4 marks)

(Total for Question 8 is 4 marks)