

# GCSE Biology

## Worksheet: Aerobic and anaerobic respiration

|                       |                          |                              |                                   |
|-----------------------|--------------------------|------------------------------|-----------------------------------|
| TIME<br><b>35 min</b> | TOTAL<br><b>32 marks</b> | CALCULATOR<br><b>Allowed</b> | DIFFICULTY<br><b>Easy, Medium</b> |
|-----------------------|--------------------------|------------------------------|-----------------------------------|

**Topics:** Aerobic and anaerobic respiration

**NAME** \_\_\_\_\_ **CLASS** \_\_\_\_\_ **DATE** \_\_\_\_\_

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

Respiration takes place continuously in all living cells.

0 1 . 1

Complete the word equation for aerobic respiration.

glucose + oxygen → ..... + .....

.....

.....

.....

.....

**[2 marks]**

0 1 . 2

In which part of a cell does most aerobic respiration take place?

Tick (✓) **one** box.

Chloroplast

☐

Mitochondrion

☐

Nucleus

☐

Ribosome

☐

**[1 mark]**

0 1 . 3

Respiration is an exothermic reaction.  
What does exothermic mean?

.....

.....

[1 mark]

0 1 . 4

What name is given to respiration that takes place without oxygen?

.....

.....

.....

.....

[1 mark]

---

0 2

Aerobic respiration happens in all living cells. Some cells can also respire anaerobically.

0 2 . 1

Give the word equation for anaerobic respiration in human muscle cells.

.....

.....

[1 mark]

0 2 . 2

Give the word equation for anaerobic respiration in yeast cells.

.....

.....

[1 mark]

0 2 . 3

Which statement correctly compares anaerobic respiration in muscles with anaerobic respiration in yeast?

Tick (✓) **one** box.

Both anaerobic processes produce carbon dioxide.

☐

Both anaerobic processes produce ethanol.

☐

Both anaerobic processes need a small amount of oxygen.

☐

Both anaerobic processes transfer less energy than aerobic respiration.

☐

[1 mark]

0 3

Organisms need the energy transferred by respiration.

0 3 . 1

Give **three** uses of the energy transferred by respiration in animals.

.....

.....

.....

.....

.....

.....

[3 marks]

0 3 . 2

Complete the word equation for anaerobic respiration in muscles.  
glucose → .....

.....

.....

.....

[1 mark]

0 3 . 3

Which statement about anaerobic respiration in muscles is correct?

Tick (✓) **one** box.

It needs oxygen.

☐

It produces carbon dioxide.

☐

It transfers less energy than aerobic respiration.

☐

It takes place in chloroplasts.

☐

[1 mark]

0 4

A student investigated the effect of temperature on the rate of respiration of yeast. The student added a layer of oil on top of a mixture of yeast and glucose solution, then measured the volume of carbon dioxide produced in 10 minutes at different temperatures.

Table 1 shows the results.

Table 1

| Temperature in °C | Volume of CO <sub>2</sub> in cm <sup>3</sup> : trial 1 | Trial 2 | Trial 3 | Mean volume in cm <sup>3</sup> |
|-------------------|--------------------------------------------------------|---------|---------|--------------------------------|
| 15                | 4.2                                                    | 3.8     | 4.0     | 4.0                            |
| 25                | 9.1                                                    | 8.7     | 9.2     | 9.0                            |
| 35                | 15.8                                                   | 16.4    | 16.1    | X                              |
| 45                | 11.9                                                   | 12.5    | 12.2    | 12.2                           |
| 55                | 1.1                                                    | 0.8     | 0.9     | 0.9                            |

0 4 . 1

Calculate value X.

.....

.....

.....

X = ..... cm<sup>3</sup>

[1 mark]

0 4 . 2

Calculate the mean rate of carbon dioxide production at 35 °C.  
Give your answer in cm<sup>3</sup> per minute.

.....

.....

.....

Rate = ..... cm<sup>3</sup> per minute  
[1 mark]

0 4 . 3

Explain the change in the rate of respiration between 35 °C and 55 °C.

.....

.....

.....

.....

.....

.....

[3 marks]

0 4 . 4

Suggest how the student could find the optimum temperature more precisely.

.....

.....

[1 mark]

0 4 . 5

Suggest why the student added a layer of oil on top of the yeast mixture.

.....

.....

.....

.....

[2 marks]

.....

0 5

A person with a mass of 75 kg used 25.2 dm<sup>3</sup> of oxygen in 12 minutes of steady exercise.

0 5 . 1

Calculate the person's rate of oxygen use, in dm<sup>3</sup> per minute.

.....

.....

.....

.....

Rate = ..... dm<sup>3</sup> per minute

[2 marks]

0 5 . 2

Calculate the person's rate of oxygen use per kg of body mass, in cm<sup>3</sup> per kg per minute.

Give your answer to 3 significant figures. (1 dm<sup>3</sup> = 1000 cm<sup>3</sup>)

.....

.....

.....

.....

Rate = ..... cm<sup>3</sup> per kg per minute

[2 marks]

0 6

Yeast is a single-celled fungus that can respire anaerobically.

0 6 . 1

Complete the word equation for anaerobic respiration in yeast.

glucose → ..... + .....

.....

.....

.....

.....

[2 marks]

0 6 . 2

What name is given to anaerobic respiration in yeast?

.....

.....

.....

.....

**[1 mark]**

0 6 . 3

Explain why yeast is used in bread-making.

.....

.....

.....

.....

**[2 marks]**

0 6 . 4

Explain why yeast is used to make alcoholic drinks.

.....

.....

**[1 mark]**

0 6 . 5

Anaerobic respiration also takes place in plant cells.  
Suggest when the cells in plant roots might respire anaerobically.

.....

.....

**[1 mark]**

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**END OF QUESTIONS**

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

# Mark scheme

## GCSE Biology · Worksheet: Aerobic and anaerobic respiration · 32 marks

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### Question 1 (5 marks)

#### 01.1 [2 marks]

**Answer:** glucose + oxygen → carbon dioxide + water

- carbon dioxide (1)
  - water (1)
- 

#### 01.2 [1 mark]

**Correct:** Mitochondrion

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#### 01.3 [1 mark]

- energy is transferred to the surroundings (1)
- 

#### 01.4 [1 mark]

**Answer:** Anaerobic respiration

- anaerobic (respiration) (1)
- 

### Question 2 (3 marks)

#### 02.1 [1 mark]

- glucose → lactic acid (1)
- 

#### 02.2 [1 mark]

- glucose → ethanol + carbon dioxide (1)
- 

#### 02.3 [1 mark]

**Correct:** Both anaerobic processes transfer less energy than aerobic respiration.

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### Question 3 (5 marks)

#### 03.1 [3 marks]

- chemical reactions to build larger molecules (1)
- movement / muscle contraction (1)
- keeping warm (1)
- active transport (1)

Any 3 of the points above.

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#### 03.2 [1 mark]

**Answer:** lactic acid

- lactic acid (1)

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#### 03.3 [1 mark]

**Correct:** It transfers less energy than aerobic respiration.

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### Question 4 (8 marks)

#### 04.1 [1 mark]

**Answer:** 16.1 cm<sup>3</sup>

- 16.1 (cm<sup>3</sup>) (1)

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#### 04.2 [1 mark]

**Answer:** 1.61 cm<sup>3</sup> per minute

- 1.61 (cm<sup>3</sup> per minute) (1)

**Notes:** Allow ECF from the previous part.

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#### 04.3 [3 marks]

- the rate decreases above (about) 35 °C / the optimum temperature (1)
- the enzymes that control respiration are denatured (1)
- the shape of the active site changes, so the substrate no longer fits (1)

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#### 04.4 [1 mark]

- repeat using smaller temperature intervals between 25 °C and 45 °C, e.g. every 2 °C (1)

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#### 04.5 [2 marks]

- to stop oxygen (from the air) dissolving in the mixture (1)
  - (so) the yeast respire anaerobically / ferments (1)
-

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## Question 5 (4 marks)

### 05.1 [2 marks]

**Answer:** 2.1 dm<sup>3</sup> per minute

- $25.2 \div 12$  (1)
  - 2.1 (dm<sup>3</sup> per minute) (1)
- 

### 05.2 [2 marks]

**Answer:** 28.0 cm<sup>3</sup> per kg per minute

- $2.1 \times 1000 \div 75$  (1)
- 28.0 (cm<sup>3</sup> per kg per minute) (1)

**Notes:** Allow ECF from an incorrect rate of oxygen use.

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## Question 6 (7 marks)

### 06.1 [2 marks]

**Answer:** glucose  $\rightarrow$  ethanol + carbon dioxide

- ethanol (1)
  - carbon dioxide (1)
- 

### 06.2 [1 mark]

**Answer:** Fermentation

- fermentation (1)
- 

### 06.3 [2 marks]

- yeast produces carbon dioxide (gas) (1)
  - (the gas) makes the dough rise (1)
- 

### 06.4 [1 mark]

- it produces ethanol / alcohol (1)
- 

### 06.5 [1 mark]

- when the soil is waterlogged / flooded (so there is little oxygen) (1)
-