

Week 16

IGCSE Biology

Homework bundle for this week

本周作业合集

exercises.lol

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IGCSE Biology

Name: _____ Score: _____

1. Respiration is the process of:

- ☐ releasing energy from food in cells
- ☐ breathing air in and out
- ☐ making food from light
- ☐ removing waste

2. The products of aerobic respiration are:

- ☐ carbon dioxide and water
- ☐ glucose and oxygen
- ☐ lactic acid
- ☐ alcohol and carbon dioxide

3. Anaerobic respiration in human muscles produces:

- ☐ lactic acid
- ☐ alcohol
- ☐ carbon dioxide and water
- ☐ glucose

4. What does a cell use the energy from respiration for? (Select all that apply.)

- ☐ movement
- ☐ growth
- ☐ active transport
- ☐ making sunlight

Tick every correct option.

5. In aerobic respiration, oxygen is:

- ☐ used up
- ☐ produced
- ☐ not involved
- ☐ turned into glucose

6. Anaerobic respiration in yeast produces:

- ☐ alcohol and carbon dioxide

☐ lactic acid

☐ water and oxygen

☐ protein

7. Respiration and breathing are the same process.

☐ True ☐ False

8. The aerobic respiration equation is the reverse of photosynthesis.

☐ True ☐ False

9. After hard exercise, oxygen is needed to break down the lactic acid built up (the oxygen debt).

☐ True ☐ False

10. Aerobic respiration takes place mainly in the _____ of the cell.

IGCSE Biology

1. **releasing energy from food in cells**

Respiration releases energy from glucose in cells.

2. **carbon dioxide and water**

Glucose + oxygen → carbon dioxide + water.

3. **lactic acid**

Glucose → lactic acid in muscles.

4. **movement; growth; active transport**

Energy powers movement, growth and active transport; cells cannot make sunlight.

5. **used up**

Oxygen is a reactant, used up in the reaction.

6. **alcohol and carbon dioxide**

Yeast fermentation gives alcohol + CO₂.

7. **False**

Respiration is a chemical reaction in cells; breathing moves air.

8. **True**

Glucose + oxygen → CO₂ + water reverses CO₂ + water → glucose + oxygen.

9. **True**

This is why you keep breathing hard after stopping.

10. **mitochondria**

Mitochondria are the site of aerobic respiration.

12.1 Respiration

Name: _____ Class: _____ Date: _____

Total: 8 marks

KEY WORDS respiration 呼吸作用 • yeast 酵母 • carbon dioxide 二氧化碳 • energy 能量 • division 分裂

Objective

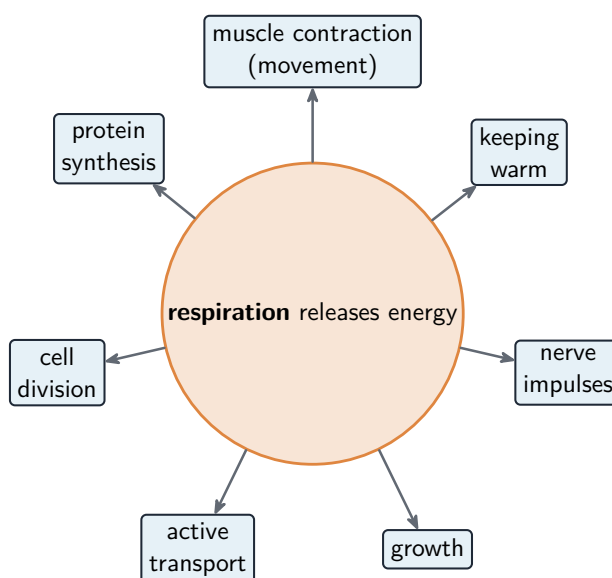
Build the skills to answer exam questions on **respiration** 呼吸作用 — what it is, why it is needed, and how it differs from breathing.

You must be able to:

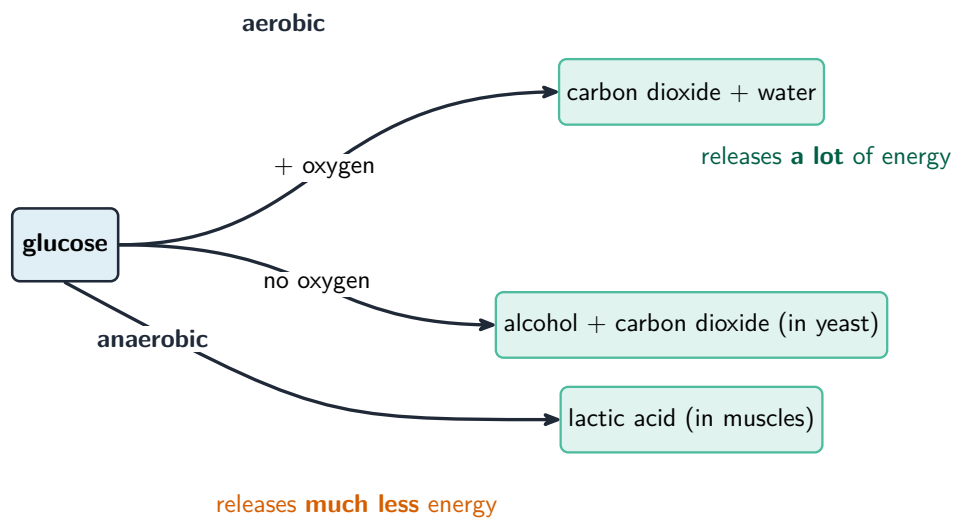
- define respiration as the release of energy from food in cells
- list the uses of the energy released
- distinguish respiration from breathing

1 Worked examples

■ Uses of energy



Respiration releases energy in all living cells, all the time (not the same as breathing)



Respiration can be aerobic or anaerobic

- **uses:** muscle contraction, protein synthesis, cell division, active transport, growth, nerve impulses, keeping warm.

2 Practice

2.1 Define respiration.

[1]

2.2 State two uses cells make of the energy from respiration.

[2]

3 Exam-style questions

3.1 Respiration takes place in: [1]

- **A** the lungs only
 - **B** all living cells
 - **C** the blood only
 - **D** the air spaces
-

3.2 Respiration is often confused with breathing.

(a) State the difference between respiration and breathing. [2]

(b) In a yeast experiment, explain why warmer yeast gives off carbon dioxide faster (up to a point). [2]

Solutions

2.1 the release of energy from food (nutrient molecules) in cells.

2.2 any two of: muscle contraction; protein synthesis; cell division; active transport; growth; nerve impulses; keeping warm.

3.1 B. Respiration happens in all living cells.

3.2 (a) respiration is the release of energy from food in cells; breathing is the movement of air in and out of the lungs.

(b) warmer yeast respire faster as the enzymes work faster, so more carbon dioxide is given off.

1 A student investigated the rate of respiration in yeast using different concentrations of glucose.

They used a 5% glucose solution to make a 1% glucose solution and a 4% glucose solution.

The student used this method:

Step 1 Label two small test-tubes **1%** and **4%**.

Step 2 Use a syringe to put 1 cm³ of 5% glucose solution into the small test-tube labelled **1%**.

Put 4 cm³ of 5% glucose solution into the small test-tube labelled **4%**.

Step 3 Use a clean syringe to put 4 cm³ of distilled water into the small test-tube labelled **1%**.

Put 1 cm³ of distilled water into the small test-tube labelled **4%**.

Step 4 Pour yeast suspension into the small test-tube labelled **1%** until it is completely full.

Step 5 Keep the small test-tube upright and carefully place a large test-tube over the top of the small test-tube labelled **1%**. Push the small test-tube up to the top of the large test-tube, as shown in Fig. 1.1A. Quickly invert the test-tubes, as shown in Fig. 1.1B.

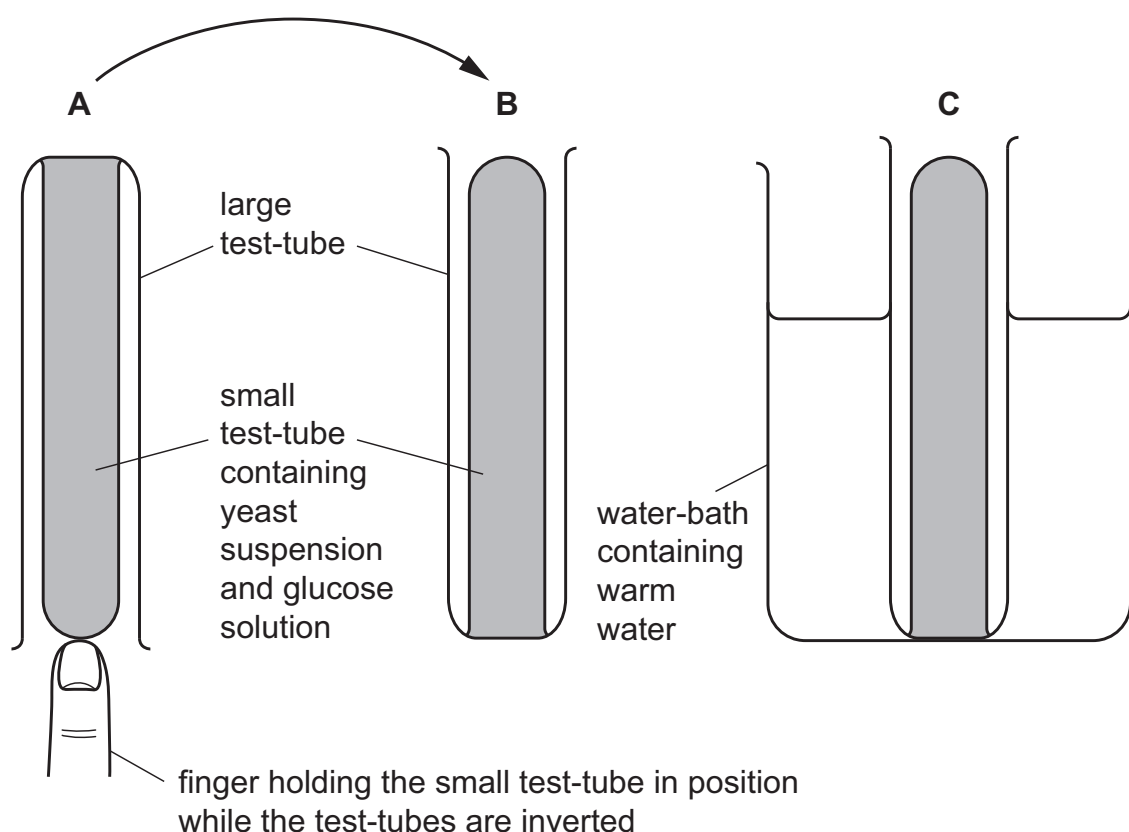


Fig. 1.1

Step 6 Put the large test-tube and the small test-tube labelled **1%** into a warm water-bath, as shown in Fig. 1.1C.

Step 7 Start the stop-clock and wait for five minutes.

Step 8 After five minutes, stop the stop-clock and use a ruler to measure the height of the yeast suspension in the **large** test-tube, as shown in Fig. 1.2.

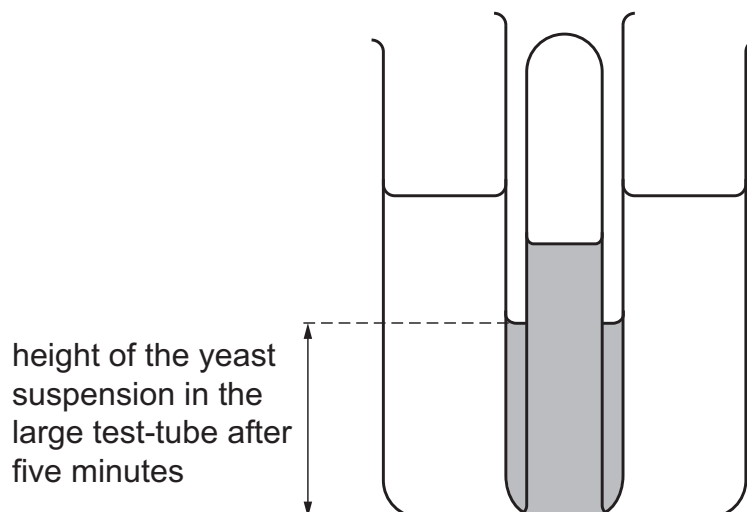


Fig. 1.2

Step 9 Remove the test-tubes from the warm water-bath and discard them.

Step 10 Pour yeast suspension into the small test-tube labelled **4%** until it is completely full.

Step 11 Repeat steps 5 to 8 with the small test-tube labelled **4%**.

(a) Fig. 1.3 is a diagram of the water-baths in steps 8 and 11.

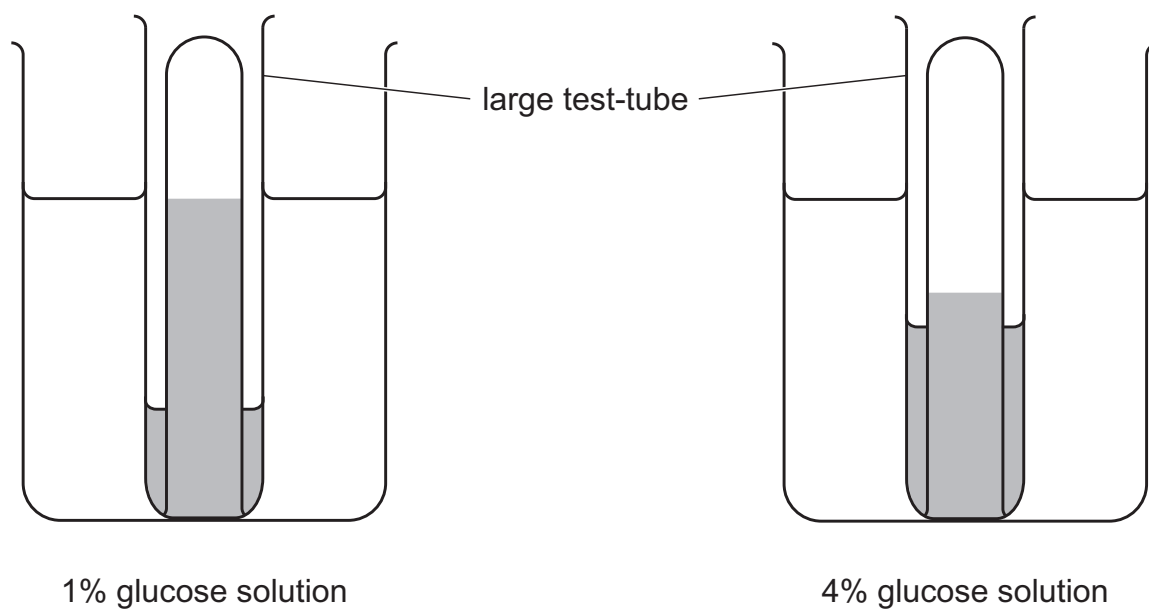


Fig. 1.3

- (i) Measure the height of the yeast suspension in each of the **large** test-tubes shown in Fig. 1.3.

Prepare a table for the results and record your measurements from Fig. 1.3.

(ii) State a conclusion for the results of this investigation.

[1]

(iii) State the independent and dependent variables in this investigation.

independent variable

dependent variable

[2]

(iv) Describe how the temperature of the water-bath could be maintained.

[1]

(v) Explain why a clean syringe was used in step 3.

[1]

(b) A student extended the investigation by using more concentrations of glucose solution.

Calculate the volumes of 5% glucose solution and distilled water that are needed to make 5 cm³ of a 3% glucose solution.

volume of 5% glucose solution cm³

volume of distilled water cm³

[1]

(c) Sports drinks often contain glucose, which is a reducing sugar.

State how you could test a sample of a sports drink for reducing sugar.

.....

.....

.....

.....

..... [2]

(d) (i) The ethanol emulsion test can be used to show that a sample of food contains fat.

State the result of a positive test.

..... [1]

(ii) Suggest **one** safety precaution that should be followed when using ethanol.

.....

.....

..... [1]

[Total: 14]

2 A student investigated the effect of temperature on the rate of respiration in yeast cells.

They used the apparatus shown in Fig. 2.1.

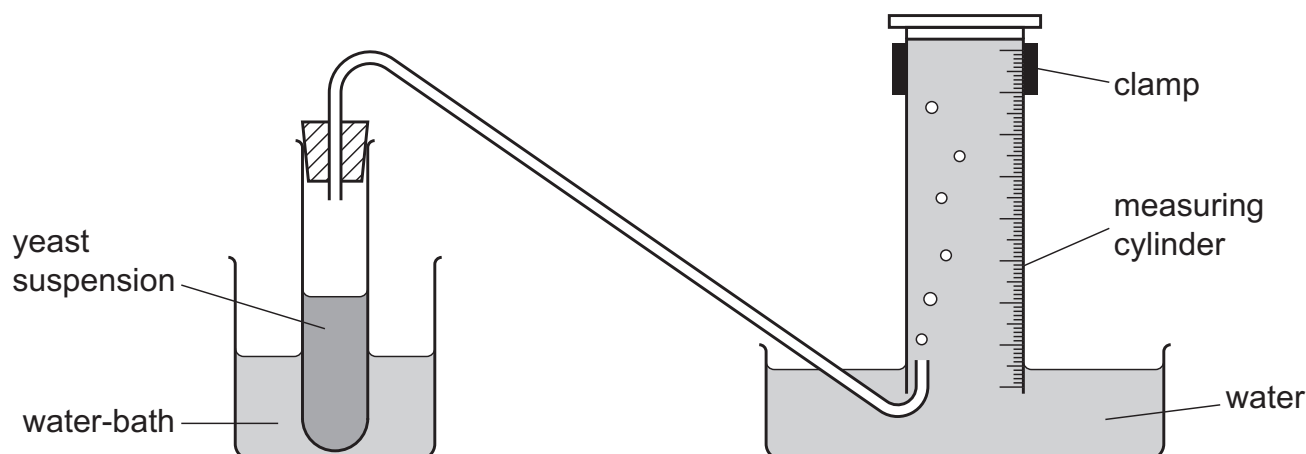


Fig. 2.1

The student used this method:

- Put 25 cm³ of yeast suspension into a test-tube.
- Put the test-tube into a water-bath and add water at 10 °C to the water-bath.
- Leave the apparatus for five minutes before moving on to the next step.
- Start a stop-clock and count the number of bubbles produced by the respiring yeast cells in three minutes.
- Repeat the procedure using a water-bath maintained at different temperatures.

(a) (i) State **two** variables that the student kept constant in this investigation.

- 1
-
- 2
-

[2]

(ii) State **one** possible source of error when measuring the dependent variable **and** suggest an improvement to this method of measuring.

- error
-
- improvement
-
-

[2]

(b) Table 2.1 shows the results of the investigation.

Table 2.1

water-bath temperature / °C	number of bubbles produced in 3 minutes	rate of bubble production / bubbles per minute
10	33	11
20	45	15
30	79	
40	112	37
50	124	41
60	37	12

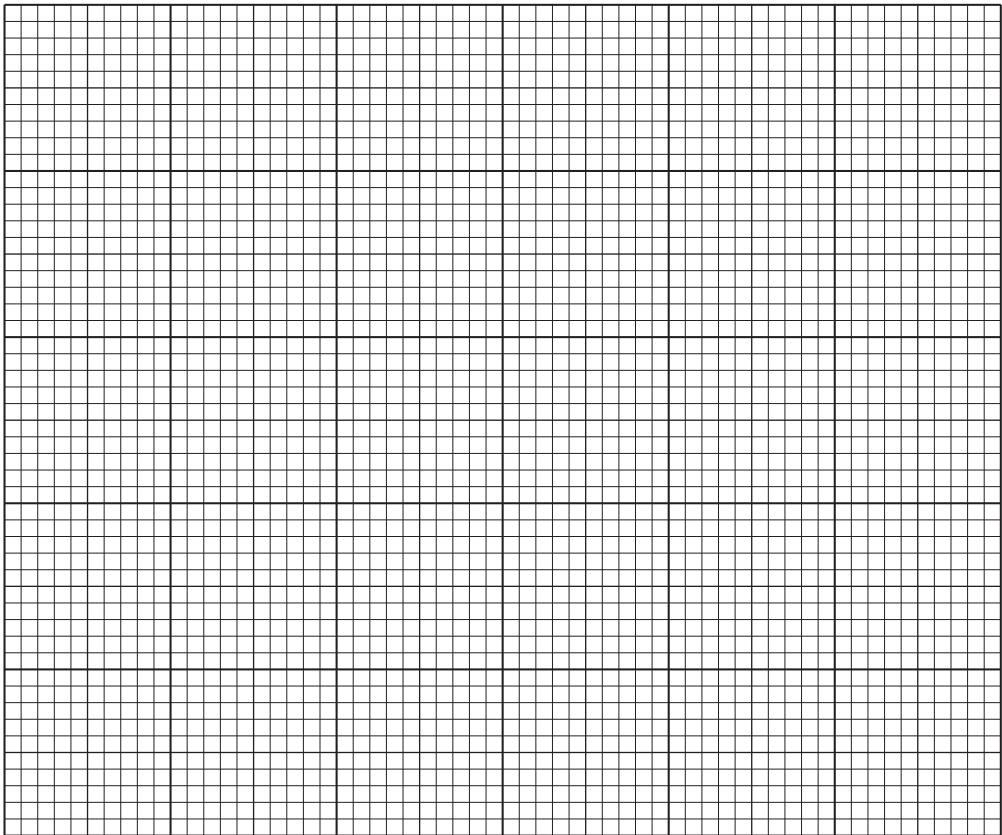
(i) Calculate the rate of bubble production at 30 °C.

Give your answer to an appropriate number of significant figures.

Space for working.

..... bubbles per minute [2]

(ii) Plot the data in Table 2.1 on the grid to show the effect of temperature on the **rate** of bubble production.



[4]

(iii) Describe the results of this investigation.

[2]

(c) Describe how the student could confirm that the gas produced is carbon dioxide.

[2]

[Total: 14]

19 The processes listed occur in living organisms.

- 1 cell division
- 2 diffusion
- 3 muscle contraction
- 4 osmosis

Which processes require energy from respiration?

- A** 1, 2, 3 and 4 **B** 1 and 3 only **C** 2 and 3 only **D** 3 and 4 only

12.2 Aerobic respiration

Name: _____ Class: _____ Date: _____

Total: 7 marks

KEY WORDS aerobic respiration 有氧呼吸 • oxygen 氧气 • glucose 葡萄糖 • respiration 呼吸作用
• energy 能量

Objective

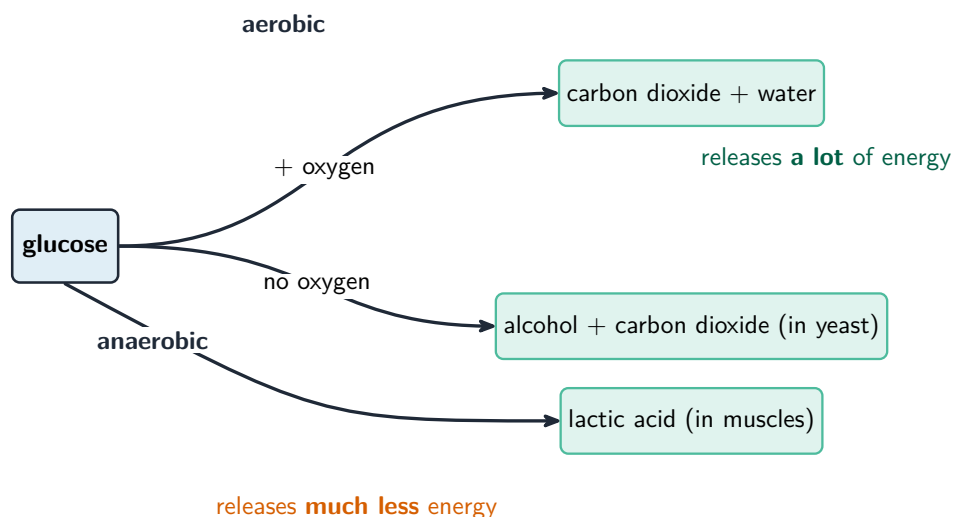
Build the skills to answer exam questions on **aerobic respiration** 有氧呼吸 — the equation and the energy released.

You must be able to:

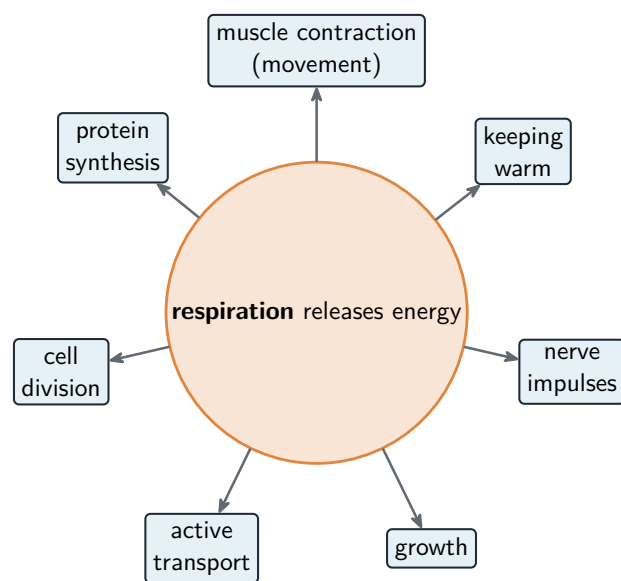
- write the word (and balanced) equation for aerobic respiration
- state that it needs oxygen and releases a lot of energy
- name the products

1 Worked examples

■ Aerobic respiration



Aerobic respiration needs oxygen and releases a lot of energy



Aerobic respiration releases energy for the cell

glucose + oxygen → carbon dioxide + water

Balanced: $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$.

2 Practice

2.1 Write the word equation for aerobic respiration.

[2]

2.2 State the gas needed for aerobic respiration.

[1]

3 Exam-style questions

3.1 The products of aerobic respiration are: [1]

- **A** alcohol and carbon dioxide
 - **B** lactic acid only
 - **C** carbon dioxide and water
 - **D** glucose and oxygen
-

3.2 Aerobic respiration releases energy from glucose.

(a) Write the balanced chemical equation. [2]

(b) State how the energy released compares with anaerobic respiration. [1]

Solutions

2.1 glucose + oxygen $\rightarrow$ carbon dioxide + water.

2.2 oxygen.

3.1 C. Aerobic respiration produces carbon dioxide and water.

3.2 (a) $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$.

(b) aerobic respiration releases much more energy.

12.3 Anaerobic respiration

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS anaerobic respiration 无氧呼吸 • lactic acid 乳酸 • heart rate 心率 • oxygen debt 氧债
• liver 肝脏

Objective

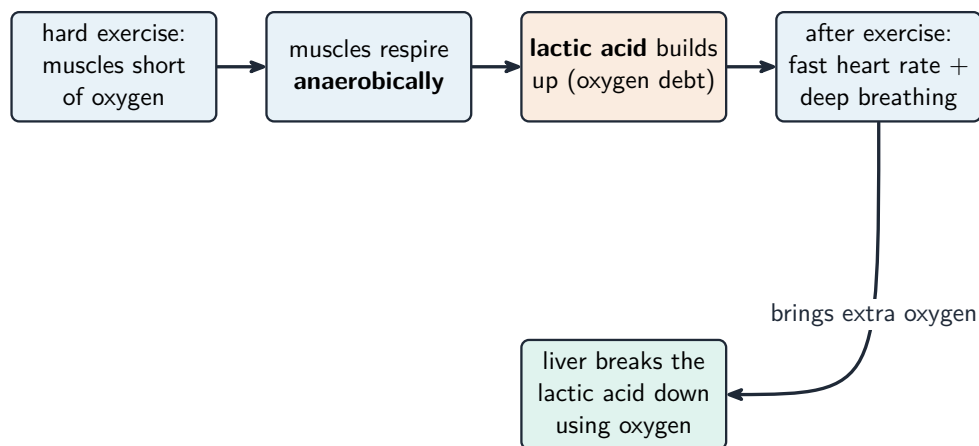
Build the skills to answer exam questions on **anaerobic respiration** 无氧呼吸 — the equations in yeast and muscle, and the **oxygen debt** 氧债.

You must be able to:

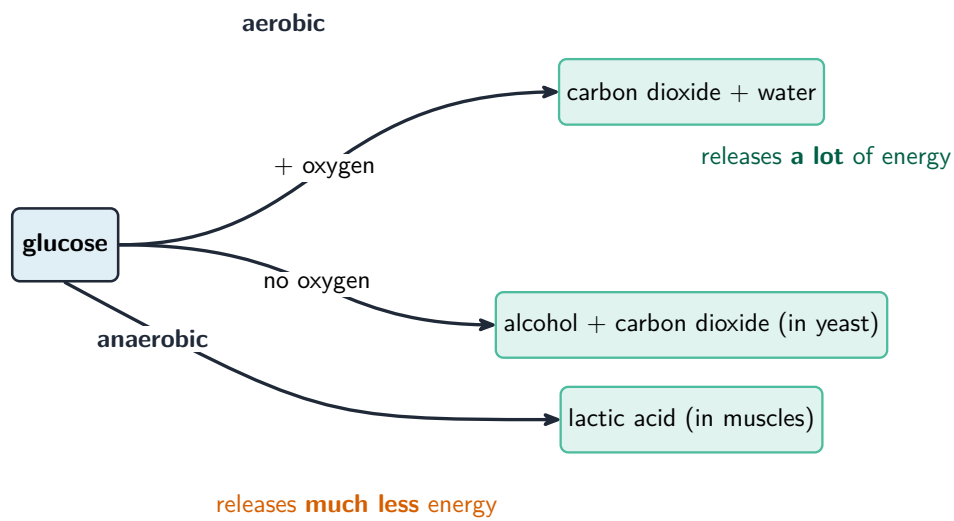
- write the anaerobic equations for yeast and for muscle
- compare the energy released with aerobic respiration
- explain the oxygen debt and how it is repaid

1 Worked examples

■ Anaerobic respiration & oxygen debt



Anaerobic respiration: no oxygen, much less energy



Anaerobic respiration compared with aerobic

- **yeast:** glucose → alcohol + carbon dioxide.
- **muscle:** glucose → lactic acid → an **oxygen debt** (extra O₂ needed later).

2 Practice

2.1 Write the word equation for anaerobic respiration in yeast. [2]

2.2 Name the substance that builds up in muscles during hard exercise. [1]

3 Exam-style questions

3.1 Compared with aerobic respiration, anaerobic respiration releases: [1]

- **A** more energy
 - **B** much less energy
 - **C** the same energy
 - **D** no energy
-

3.2 During a sprint the muscles respire anaerobically.

(a) Write the equation for anaerobic respiration in muscle. [1]

(b) Explain what is meant by an oxygen debt. [2]

3.3 Describe how the oxygen debt is repaid after exercise. [2]

Solutions

2.1 glucose $\rightarrow$ alcohol + carbon dioxide.

2.2 lactic acid.

3.1 B. Anaerobic respiration releases much less energy.

3.2 (a) glucose $\rightarrow$ lactic acid.

(b) it is the extra oxygen needed after exercise to break down the lactic acid that built up.

3.3 the heart rate stays high and breathing stays deep, bringing extra oxygen; the liver uses it to break down the lactic acid.

19 What is produced by anaerobic respiration in human muscles?

	carbon dioxide	lactic acid	water
A	✓	✓	✗
B	✓	✗	✓
C	✗	✓	✗
D	✗	✗	✓

key

✓ = substance is produced

✗ = substance is **not** produced

17 A person exercised vigorously for one minute and then rested for one hour.

Which statements about lactic acid are correct?

- 1 During exercise, lactic acid is produced in the muscles and diffuses into the blood.
- 2 The blood transports lactic acid to the liver.
- 3 Lactic acid is broken down by anaerobic respiration.

A 1, 2 and 3 **B** 1 and 2 only **C** 2 and 3 only **D** 2 only

- 6 (a) An athlete monitored their heart rate and breathing rate before, during and after vigorous exercise.

Fig. 6.1 shows the results.

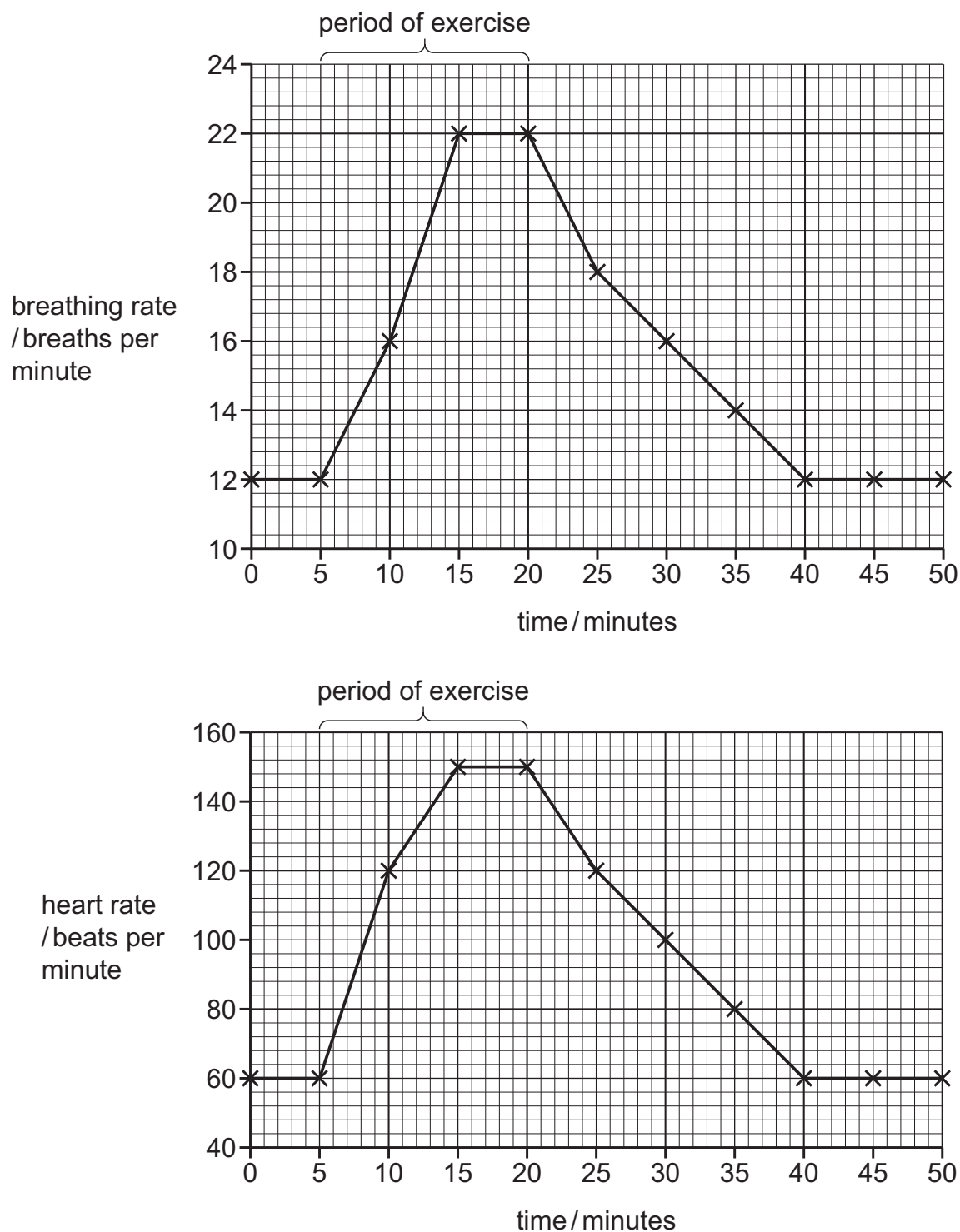


Fig. 6.1

Complete the sentences to describe **and** explain the results shown in Fig. 6.1.

After exercise, it takes minutes for the athlete's breathing rate to return to its resting rate.

The heart rate decreases by beats per minute between 20 and 40 minutes.

The heart rate and breathing rate do not immediately return to their resting rates because anaerobic respiration has occurred.

Lactic acid has built up in causing an oxygen

The heart rate remains high to transport lactic acid to the

The breathing rate remains high to supply for the respiration of lactic acid.

[7]

(b) The carbon dioxide produced during exercise is excreted. Urea is another substance that is excreted.

(i) State the name of the organ that produces urea.

..... [1]

(ii) State the name of the organ that excretes urea.

..... [1]

(c) State the balanced chemical equation for anaerobic respiration in yeast.

..... [2]

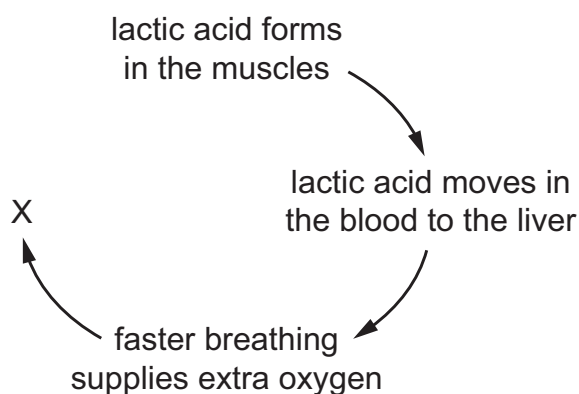
(d) State **one** food product that is made using anaerobic respiration in yeast.

..... [1]

[Total: 12]

22 After a race, athletes experience oxygen debt.

The diagram shows how the oxygen debt is removed.



What happens at X?

- A** aerobic respiration of glucose
- B** aerobic respiration of lactic acid
- C** anaerobic respiration of glucose
- D** anaerobic respiration of lactic acid

20 Which sequence of statements explains the build-up and removal of an oxygen debt?

- 1 Anaerobic respiration occurs in muscles during vigorous exercise.
- 2 Faster and deeper breathing continues after exercise.
- 3 Glucose is converted to lactic acid.
- 4 Lactic acid builds up in muscles causing an oxygen debt.
- 5 Oxygen enables the continued aerobic respiration of lactic acid.

- A** 1 → 3 → 4 → 2 → 5
- B** 1 → 3 → 2 → 4 → 5
- C** 3 → 4 → 5 → 1 → 2
- D** 3 → 4 → 1 → 5 → 2

19 Yeast can respire aerobically and anaerobically.

For each molecule of glucose used in yeast, how many more molecules of carbon dioxide gas are produced by aerobic respiration compared with anaerobic respiration?

- A** 1 more
- B** 2 more
- C** 4 more
- D** 6 more