CAMBRIDGE IGCSE BIOLOGY · 0610

BIOLOGY



EXAM QUESTION PACK

TOPIC 12: RESPIRATION

SCORE	PERCENTAGE
/	%

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Respiration – 2023 November IGCSE 0610

1. Nov/2023 /Paper_ 0610/11/No.23

Three statements about anaerobic respiration are listed.

1 In humans, the product is lactic acid.

2 In yeast, the product is lactic acid.

3 It releases more energy per glucose molecule than aerobic respiration.

Which statements are correct?

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

2. Nov/2023 /Paper_ 0610/13/No.23

Which statement about anaerobic respiration is correct?

A Anaerobic respiration requires oxygen and releases less energy per glucose molecule than aerobic respiration.

B Anaerobic respiration requires oxygen and releases more energy per glucose molecule than aerobic respiration.

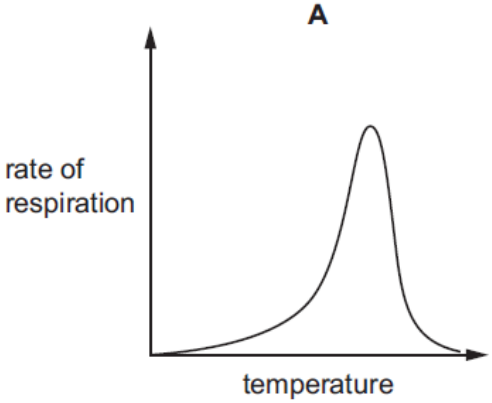
C Anaerobic respiration does **not** require oxygen and releases less energy per glucose molecule than aerobic respiration.

D Anaerobic respiration does **not** require oxygen and releases more energy per glucose molecule than aerobic respiration.

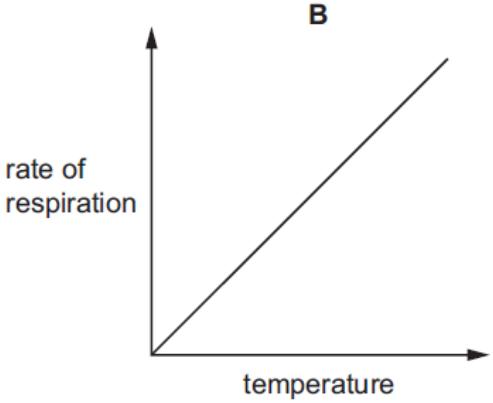
3. Nov/2023 /Paper_ 0610/13/No.31

Which graph shows the effect of temperature on the rate of respiration in yeast?

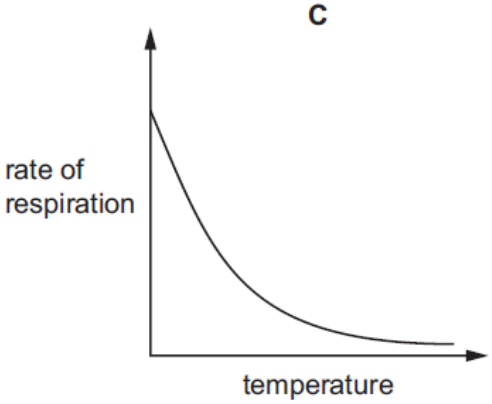
A



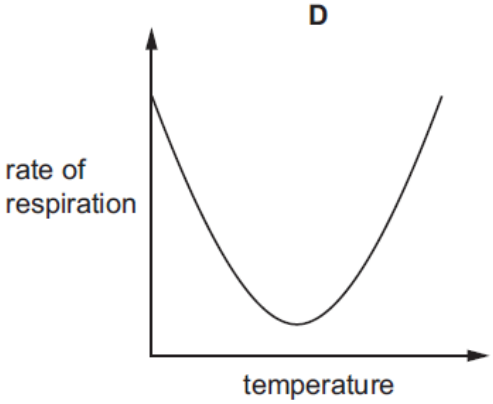
B



C



D



4. Nov/2023 /Paper_ 0610/21/No.23

Three statements about anaerobic respiration are listed.

1 In humans, the product is lactic acid.

2 In yeast, the product is lactic acid.

3 It releases more energy per glucose molecule than aerobic respiration.

Which statements are correct?

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

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5. Nov/2023 /Paper_ 0610/21/No.24

What is the balanced chemical equation for a type of respiration that occurs in yeast?

A $C_6H_{12}O_6 + O_2 \rightarrow CO_2 + 6H_2O$

B $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

C $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$

D $2C_2H_5OH + 2CO_2 \rightarrow C_6H_{12}O_6$

6. Nov/2023 /Paper_ 0610/22/No.10

During exercise, receptors detect a change in the blood and cause the breathing rate to increase.

Which change do the receptors detect and where are they found in the body?

	change detected in the blood	location of receptors
A	carbon dioxide increases	brain
B	carbon dioxide increases	lung
C	carbon dioxide decreases	brain
D	carbon dioxide decreases	lung

7. Nov/2023 /Paper_ 0610/22/No.23

Yeast cells can convert glucose into alcohol and carbon dioxide.

Which statement about this process is correct?

A The alcohol produced can be used to make bread rise.

B The carbon dioxide produced can be burnt as a biofuel.

C The yeast cells are using oxygen for this process.

D The yeast cells are carrying out anaerobic respiration.

8. Nov/2023 /Paper_ 0610/22/No.24

What is the correct balanced equation for one type of respiration?

A $C_2H_5OH \rightarrow 2C_6H_{12}O_6 + 2CO_2$

B $2C_2H_5OH \rightarrow C_6H_{12}O_6 + 2H_2O$

C $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$

D $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2H_2O$

9. Nov/2023 /Paper_ 0610/23/No.23

Which statement about anaerobic respiration is correct?

A Anaerobic respiration requires oxygen and releases less energy per glucose molecule than aerobic respiration.

B Anaerobic respiration requires oxygen and releases more energy per glucose molecule than aerobic respiration.

C Anaerobic respiration does **not** require oxygen and releases less energy per glucose molecule than aerobic respiration.

D Anaerobic respiration does **not** require oxygen and releases more energy per glucose molecule than aerobic respiration.

10. Nov/2023 /Paper_ 0610/23/No.24

During exercise an oxygen debt may occur in muscles.

What is the cause of this oxygen debt?

A Aerobic respiration causes a decrease in lactic acid.

B Aerobic respiration causes an increase in lactic acid.

C Anaerobic respiration causes a decrease in lactic acid.

D Anaerobic respiration causes an increase in lactic acid.

(a) Fig. 6.1 is a diagram showing how glucose is used by different organisms.

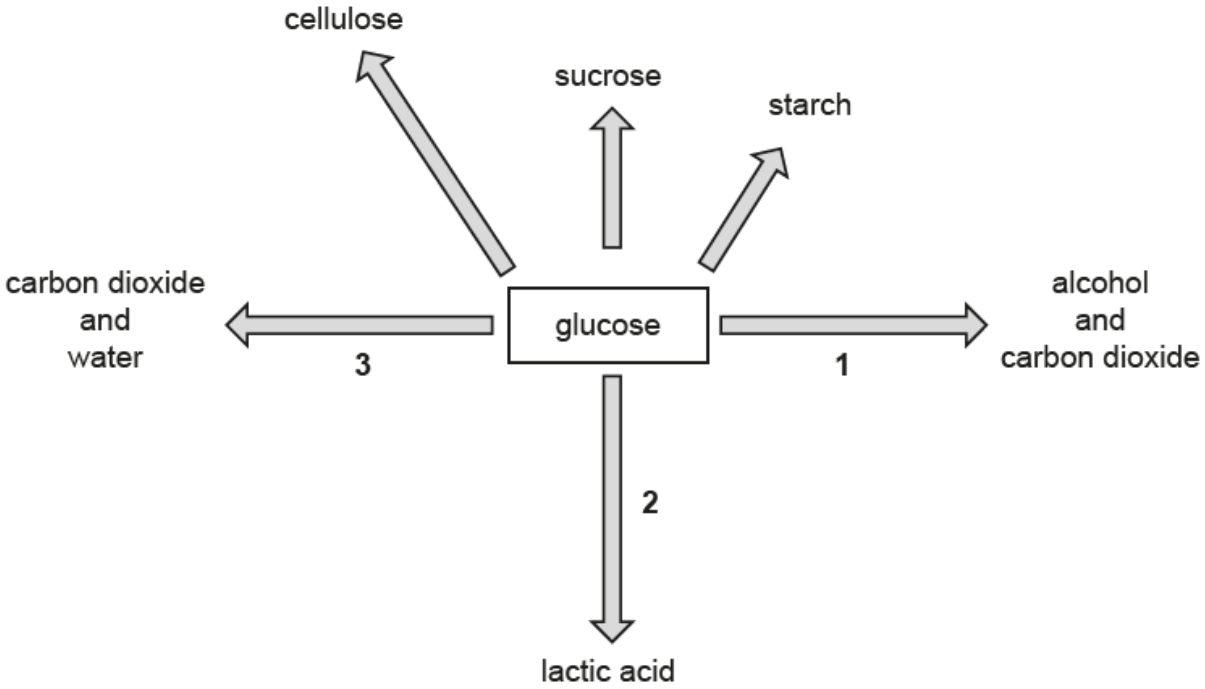


Fig. 6.1

(i) State the number or numbers from Fig. 6.1 that identify the processes that:

- release the most energy per glucose molecule .....
- take place in yeast cells. .....

[2]

(ii) State the balanced chemical equation for anaerobic respiration in a yeast cell.

..... [2]

(iii) State the names of **two** enzymes that are needed to break down starch into glucose in humans.

1 .....

2 .....

[2]

(iv) State the main use of the molecule cellulose in a plant.

..... [1]

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(v) Sucrose and amino acids are transported around a plant.

State the name of:

- the process by which sucrose is transported around a plant
- the tissue that transports sucrose and amino acids around a plant
- the mineral ion that is used to make amino acids.

process .....

tissue .....

mineral ion .....

[3]

(b) In humans, the build-up of lactic acid creates an oxygen debt.

(i) State the body tissue that produces the most lactic acid during vigorous exercise.

..... [1]

(ii) The oxygen debt needs to be removed after exercise.

State how the breathing **and** circulatory systems act to remove the oxygen debt.

.....

.....

.....

.....

..... [2]

(iii) State the name of the organ which breaks down lactic acid.

..... [1]

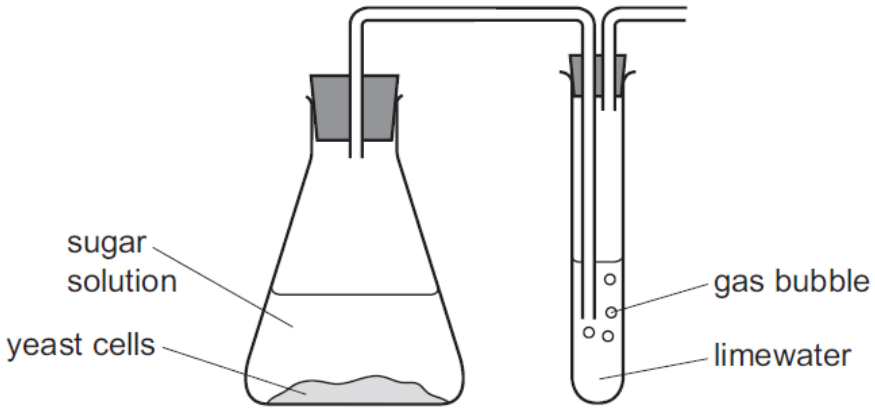
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Respiration – 2023 June IGCSE Biology 0610

1. June/2023/Paper_0610/11/No.23

The diagram shows the activity of some yeast cells in a sugar solution.



Which statement explains what happens to the limewater?

A The limewater changes from colourless to cloudy due to the presence of carbon dioxide.

B The limewater changes from colourless to cloudy due to the presence of oxygen.

C The limewater changes from cloudy to colourless due to the presence of carbon dioxide.

D The limewater changes from cloudy to colourless due to the presence of oxygen.

2. June/2023/Paper_0610/11/No.24

What is the word equation for aerobic respiration?

A carbon dioxide + water → glucose + oxygen

B glucose + oxygen → carbon dioxide + water

C glycogen + oxygen → carbon dioxide + water

D water + oxygen → glucose + carbon dioxide

3. June/2023/Paper_0610/12/No.22

Which chemical can be used to show the presence of carbon dioxide gas?

A Benedict's solution

B biuret solution

C ethanol

D limewater

4. June/2023/Paper_0610/12/No.24

Which molecule is produced by anaerobic respiration in yeast?

A carbon dioxide

B lactic acid

C oxygen

D water

5. June/2023/Paper_0610/13/No.23

Which row about aerobic respiration is correct?

	substrates	products
A	glucose + carbon dioxide	oxygen + water
B	glucose + carbon dioxide	oxygen only
C	glucose + oxygen	carbon dioxide + water
D	glucose only	carbon dioxide + water

6. June/2023/Paper_0610/13/No.24

What is a product of anaerobic respiration in yeast?

A alcohol

B glucose

C oxygen

D water

7. June/2023/Paper_0610/21/No.21

In the chemical equation for anaerobic respiration in yeast, the numbers have been replaced by the letters W, X, Y and Z.

$$C_WH_XO_W \rightarrow YC_YH_ZOH + YCO_Y$$

Which number is Z?

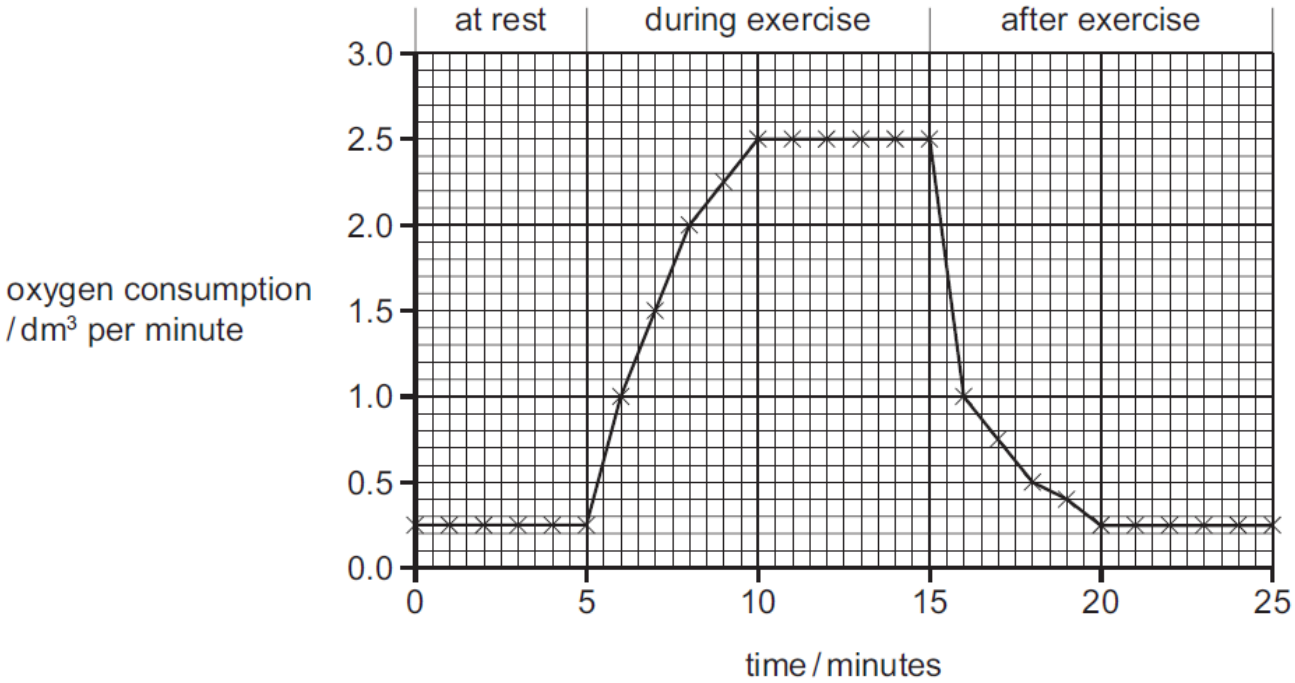
A 2 **B** 5 **C** 6 **D** 12

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8. June/2023/Paper_0610/21/No.22

A student measured their oxygen consumption before, during and after exercise.

The results are shown in the graph.



At which time is the oxygen debt being removed?

A 5–10 minutes

B 5–15 minutes

C 15–20 minutes

D 20–25 minutes

9. June/2023/Paper_0610/22/No.21

Which row shows aerobic respiration?

	substrates	products
A	$6CO_2 + 6H_2O$	$C_6H_{12}O_6 + 6O_2$
B	$C_6H_{12}O_6 + 6CO_2$	$6H_2O + 6O_2$
C	$6CO_2 + 6O_2$	$C_6H_{12}O_6 + 6H_2O$
D	$C_6H_{12}O_6 + 6O_2$	$6CO_2 + 6H_2O$

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10. June/2023/Paper_0610/22/No.22

In which organ is lactic acid respired aerobically to remove an oxygen debt?

A brain

B heart

C liver

D lungs

11. June/2023/Paper_0610/32/No.5

(a) Complete the sentences about anaerobic respiration in **humans**, using words or phrases from the list.

You may use the words or phrases once, more than once or not at all.

alcohol **breaks down** **builds up** **carbon dioxide**

element **lactic acid** **less** **molecule** **more**

muscles **particle** **oxygen** **releases**

Anaerobic respiration is the chemical reaction in cells that ..... nutrient molecules to release energy without using ..... .

Anaerobic respiration releases much ..... energy per glucose ..... than aerobic respiration.

..... is produced by anaerobic respiration during vigorous exercise.

[5]

(b) Complete the word equation for anaerobic respiration in **yeast**.

glucose ⟶ ..... + ...

[2]

[Total: 7]

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12. June/2023/Paper_0610/41/No.6

13. June/2023/Paper_0610/42/No.5

Fig. 5.1 is a photomicrograph of a structure found in animal and plant cells.

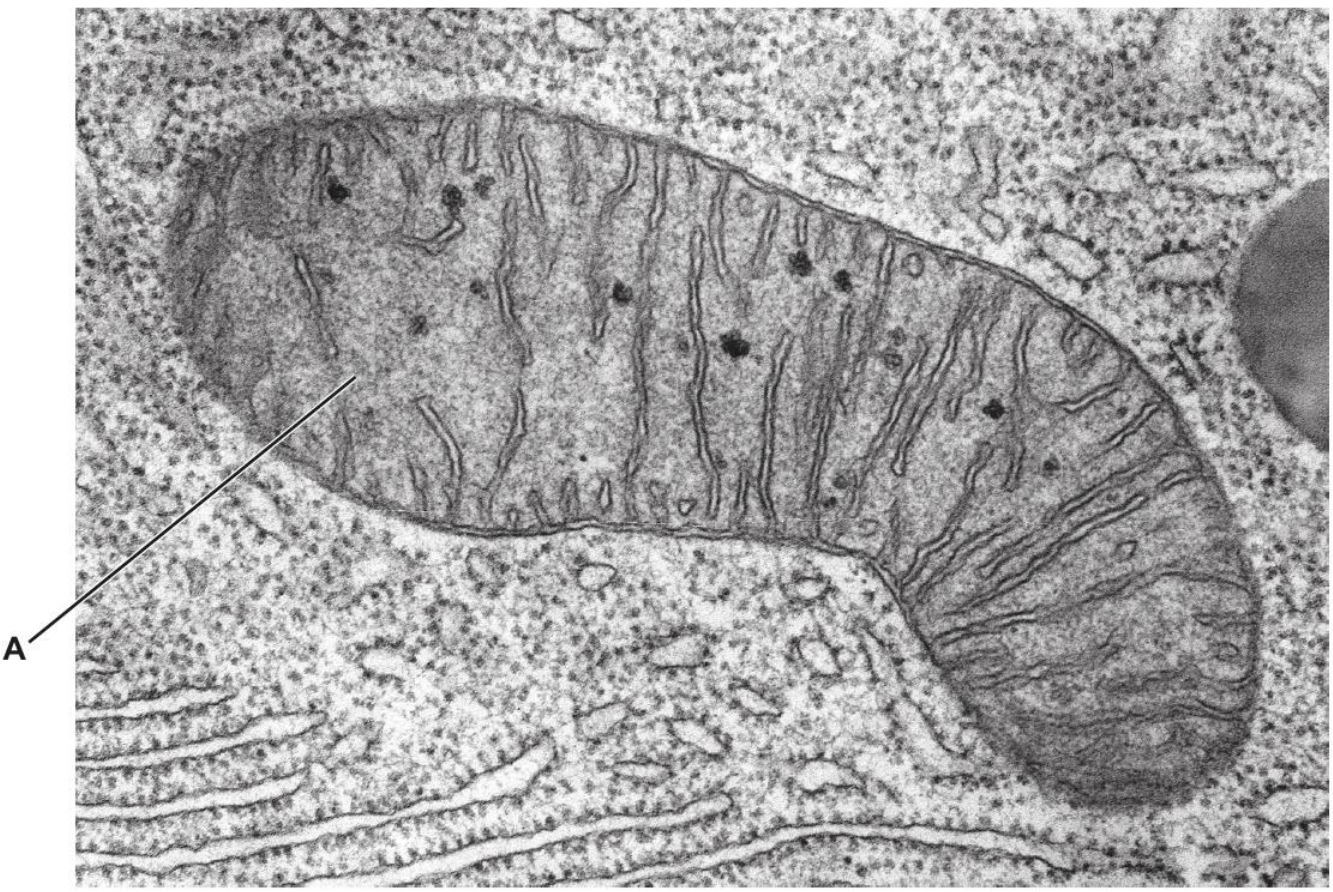


Fig. 5.1

(a) State the name and function of the cell structure labelled **A** in Fig. 5.1.

name .....

function .....

.....

[2]

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(c) The actual length of cell structure **A** is 0.000 75 mm.

Convert this value to micrometres (μm).

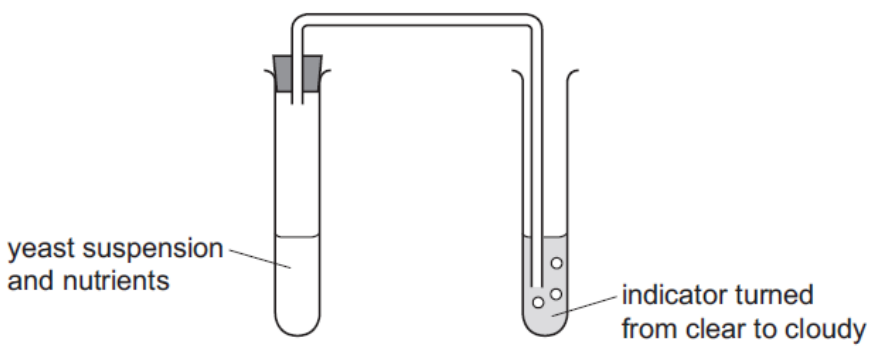
.....μm [1]

[Total: 4]

14. March/2023/Paper_ 0610/12/No.22

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

The diagram shows the apparatus they used.



Which substance turned the indicator from clear to cloudy?

A carbon dioxide

B glucose

C oxygen

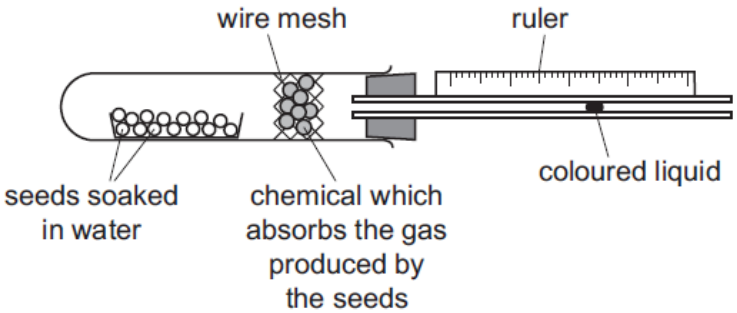
D water

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15. March/2023/Paper_ 0610/12,22/No.23,21

The apparatus shown was used to investigate aerobic respiration in seeds.

The apparatus was placed in a dark room.



All environmental conditions were kept constant.

What will happen in the apparatus?

	gas taken in by the seeds	gas absorbed by the chemical in the wire mesh	direction of movement of the coloured liquid
A	carbon dioxide	oxygen	towards the seeds
B	carbon dioxide	oxygen	away from the seeds
C	oxygen	carbon dioxide	towards the seeds
D	oxygen	carbon dioxide	away from the seeds

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Respiration – 2022 November IGCSE 0610 Biology

1. Nov/2022/Paper_11/No.23

Which row shows processes that all use energy from respiration?

	diffusion	cell division	osmosis	muscle contraction	passage of nerve impulses	active transport
A	✗	✓	✓	✓	✓	✓
B	✓	✗	✓	✗	✗	✗
C	✓	✗	✗	✓	✗	✗
D	✗	✓	✗	✓	✓	✓

key

✓ = uses energy from respiration

✗ = does not use energy from respiration

2. Nov/2022/Paper_11/No.24

What is the word equation for anaerobic respiration in yeast?

A glucose → alcohol + carbon dioxide

B glucose → alcohol

C glucose → lactic acid + carbon dioxide

D glucose → lactic acid

3. Nov/2022/Paper_12/No.24

Which row shows the products of anaerobic respiration in humans and yeast?

	products in humans	products in yeast
A	lactic acid only	alcohol only
B	lactic acid only	alcohol and carbon dioxide
C	lactic acid and carbon dioxide	alcohol only
D	lactic acid and carbon dioxide	alcohol and carbon dioxide

4. Nov/2022/Paper_13/No.23

Which actions use energy released from respiration?

1 muscle contraction

2 protein synthesis

3 cell division

4 transmitting nerve impulses

A 1, 2, 3 and 4

B 1, 2 and 4 only

C 2 and 3 only

D 3 and 4 only

5. Nov/2022/Paper_13/No.24

What is the word equation for anaerobic respiration in muscle cells?

A glucose + oxygen → lactic acid

B glucose → carbon dioxide

C glucose + carbon dioxide → alcohol

D glucose → lactic acid

6. Nov/2022/Paper_21/No.21

Which row shows processes that all use energy from respiration?

	diffusion	cell division	osmosis	muscle contraction	passage of nerve impulses	active transport
A	✗	✓	✓	✓	✓	✓
B	✓	✗	✓	✗	✗	✗
C	✓	✗	✗	✓	✗	✗
D	✗	✓	✗	✓	✓	✓

key

✓ = uses energy from respiration

✗ = does not use energy from respiration

7. Nov/2022/Paper_21/No.22

What is the word equation for anaerobic respiration in yeast?

A glucose → alcohol + carbon dioxide

B glucose → alcohol

C glucose → lactic acid + carbon dioxide

D glucose → lactic acid

8. Nov/2022/Paper_22/No.21

Which process could continue without energy from respiration?

A active transport

B growth

C osmosis

D protein synthesis

9. Nov/2022/Paper_23/No.21

Which actions use energy released from respiration?

1 muscle contraction

2 protein synthesis

3 cell division

4 transmitting nerve impulses

A 1, 2, 3 and 4

B 1, 2 and 4 only

C 2 and 3 only

D 3 and 4 only

10. Nov/2022/Paper_23/No.22

What is the word equation for anaerobic respiration in muscle cells?

A glucose + oxygen → lactic acid

B glucose → carbon dioxide

C glucose + carbon dioxide → alcohol

D glucose → lactic acid

11. Nov/2022/Paper_31/No.5(a)

(a) **(i)** The box on the left shows the beginning of a sentence.

The boxes on the right show some sentence endings.

Draw **three** straight lines to make three correct sentences about aerobic respiration.

	involves enzymes.
	only occurs in animals.
	produces carbon dioxide and water.
Aerobic respiration	
	produces lactic acid.
	requires chlorophyll.
	uses glucose and oxygen.

[3]

(ii) Complete the sentence by circling the correct word or phrase shown **in bold**.

Aerobic respiration releases **less / more / the same amount of** energy compared with anaerobic respiration.

[1]

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(iii) Describe how respiration in yeast is used in industry to produce useful products for humans.

.....

.....

.....

.....

.....

.....

..... [3]

12. Nov/2022/Paper_32/No.6(a, b)

Respiration occurs in all living organisms.

(a) State the name of the product of **anaerobic** respiration in humans.

..... [1]

(b) **(i)** Table 6.1 shows the energy released during the aerobic and anaerobic respiration of one molecule of glucose in humans.

Table 6.1

type of respiration	energy released / kJ
aerobic	2872
anaerobic	118

Calculate the difference in energy released between aerobic and anaerobic respiration.

..... kJ [1]

(ii) State the word equation for **aerobic** respiration.

..... [2]

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Respiration – 2022 June IGCSE 0610

1. June/2022/Paper_ 12/No.23

What is the word equation for anaerobic respiration in yeast?

A glucose → alcohol

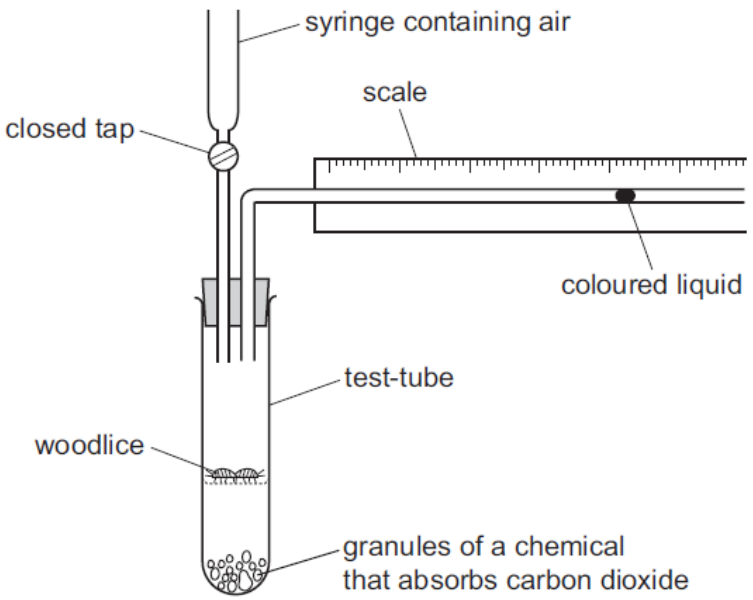
B glucose → alcohol + carbon dioxide

C glucose → lactic acid

D glucose → lactic acid + carbon dioxide

2. June/2022/Paper_ 12/No.24

A student used this apparatus to investigate the rate of aerobic respiration in woodlice.



Which statement describes and explains the movement of the coloured liquid when the woodlice are respiring?

A The coloured liquid moves towards the test-tube because the woodlice are using carbon dioxide.

B The coloured liquid moves towards the test-tube because the woodlice are using oxygen.

C The coloured liquid moves away from the test-tube because the woodlice are using carbon dioxide.

D The coloured liquid moves away from the test-tube because the woodlice are using oxygen.

3. June/2022/Paper_ 13/No.23

Which substances are used in aerobic respiration?

	glucose	oxygen	water
A	✗	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

key

✓ = yes

✗ = no

4. June/2022/Paper_ 21/No.22

What is the balanced chemical equation for anaerobic respiration in yeast?

A $C_6H_{12}O_6 \rightarrow 2CO_2 + 6H_2O$

B $C_6H_{12}O_6 \rightarrow 6CO_2 + 6H_2O$

C $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$

D $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2H_2O$

5. June/2022/Paper_ 23/No.21

Carbon dioxide is produced by aerobic respiration.

How many molecules of carbon dioxide are produced from the aerobic respiration of three molecules of glucose?

A 3 **B** 6 **C** 12 **D** 18

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6. June/2022/Paper_ 31/No.7(a)

(a) A scientist measured the mass of carbon dioxide produced by anaerobic respiration in yeast cells for 1200 minutes.

Fig. 7.1 shows the results.

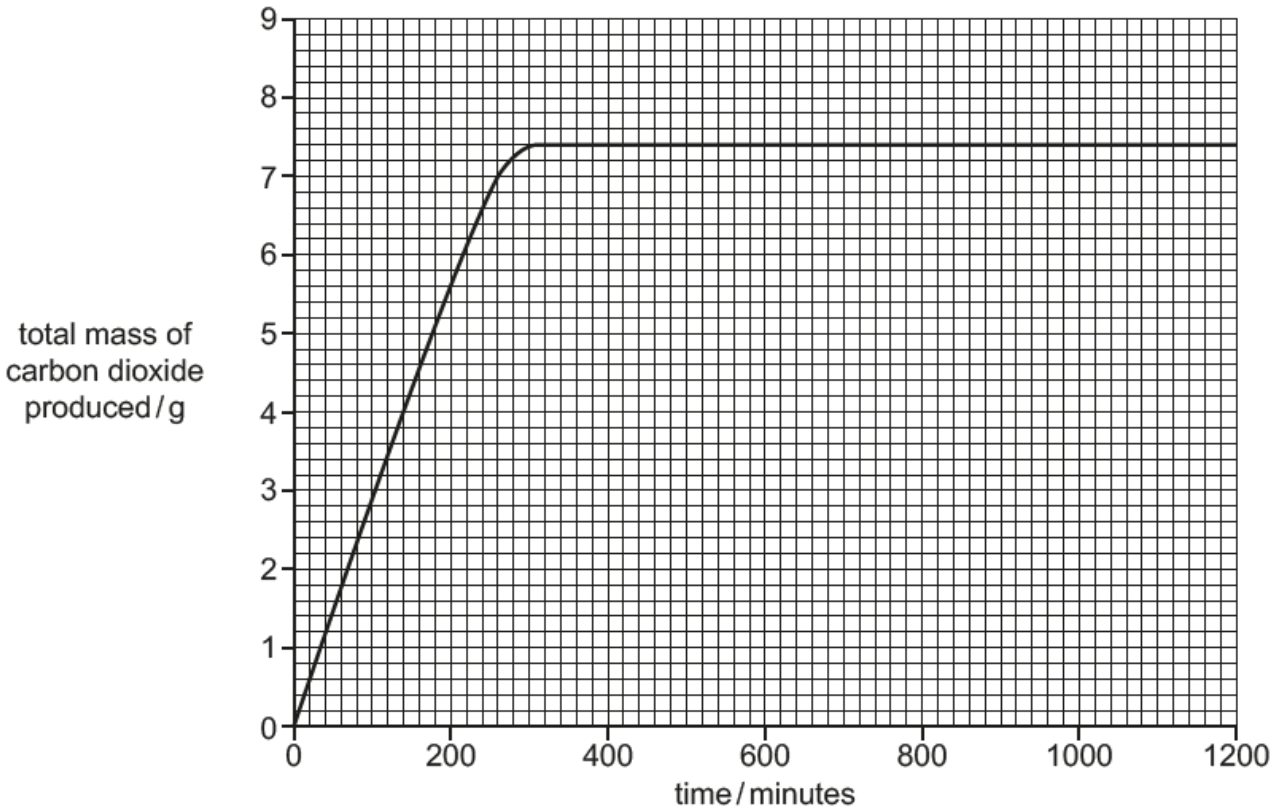


Fig. 7.1

(i) Complete the sentences to describe the results shown in Fig. 7.1.

The yeast cells produced a total of ..... g of carbon dioxide during 1200 minutes.

The yeast cells stopped producing carbon dioxide at ..... minutes.

[2]

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(ii) The investigation was repeated with boiled yeast cells.

Predict the effect on the mass of carbon dioxide produced **and** explain your prediction.

.....

.....

.....

.....

..... [2]

(iii) State the name of **one other** product of anaerobic respiration in yeast cells.

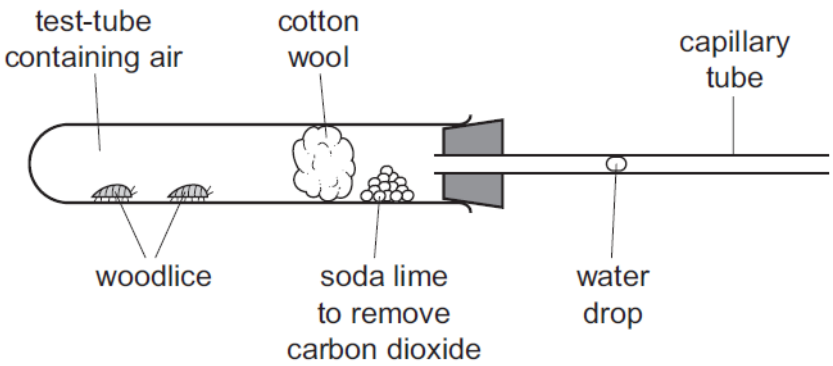
..... [1]

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Respiration – 2021 IGCSE 0610

1. Nov/2021/Paper_11/No.23

The diagram shows the apparatus used by a student to investigate respiration in woodlice (small arthropods).



Which explanation about the direction that the water drop will move is correct?

A The water drop will move away from the woodlice because respiration uses carbon dioxide.

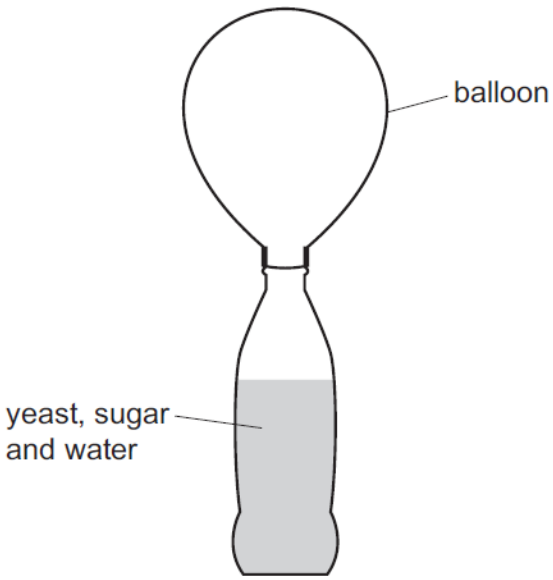
B The water drop will move away from the woodlice because respiration uses oxygen.

C The water drop will move towards the woodlice because respiration uses carbon dioxide.

D The water drop will move towards the woodlice because respiration uses oxygen.

2. Nov/2021/Paper_11/No.24

Some students placed yeast, sugar and water into a bottle. They then placed an empty balloon over the opening of the bottle. The bottle was left in a warm place for one hour. During this time the balloon increased in size.



Why does the balloon increase in size?

A The yeast makes alcohol.

B The yeast makes carbon dioxide.

C The yeast makes oxygen.

D The yeast makes lactic acid.

3. Nov/2021/Paper_12/No.23

Which chemicals are needed to release energy in aerobic respiration?

A carbon dioxide and glucose

B carbon dioxide and water

C oxygen and glucose

D oxygen and water

4. Nov/2021/Paper_12/No.24

Yeast is an organism used in the production of biofuels.

Which statement describes why yeast is used for biofuel production?

A Yeast respires aerobically to produce carbon dioxide.

B Yeast respires aerobically to produce carbon dioxide and ethanol.

C Yeast respires anaerobically to produce carbon dioxide.

D Yeast respires anaerobically to produce carbon dioxide and ethanol.

5. Nov/2021/Paper_13/No.23

The table shows some facts about aerobic respiration.

Which row is correct?

	nutrient molecules	oxygen	energy
A	broken down	released	released
B	broken down	used	released
C	built up	released	required
D	built up	used	required

6. Nov/2021/Paper_13/No.24

Which word equation represents anaerobic respiration in yeast cells?

A glucose → alcohol + carbon dioxide

B glucose + oxygen → carbon dioxide + water

C glucose → lactic acid

D glucose → alcohol

7. Nov/2021/Paper_21/No.22

In a balanced chemical equation for aerobic respiration, what are the products?

A $6O_2$ and $6H_2O$

B $C_6H_{12}O_6$ and $6O_2$

C $6O_2$ and $6CO_2$

D $6CO_2$ and $6H_2O$

8. Nov/2021/Paper_22/No.22

Which statement about lactic acid is correct?

A Lactic acid is a product of anaerobic respiration in yeast.

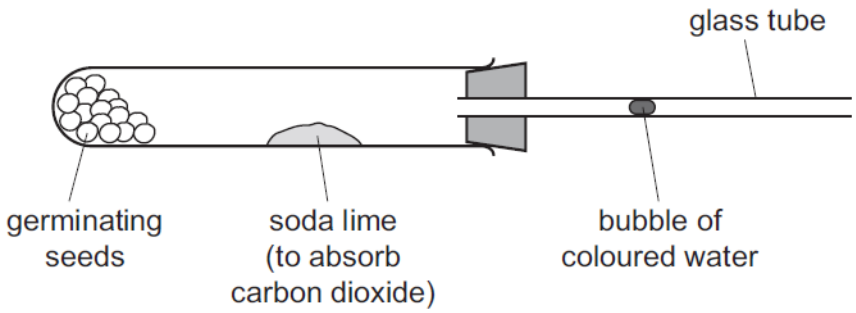
B Lactic acid build-up in tissues can lead to an oxygen debt.

C Lactic acid is produced from sucrose during anaerobic respiration.

D Lactic acid is transported from the liver to the muscles after exercise.

9. Nov/2021/Paper_22/No.23

The diagram shows the apparatus used to measure the rate of respiration in germinating seeds. As the seeds respire, the bubble of coloured water moves along the glass tube.



The temperature is increased from 20 °C to 40 °C.

What happens to the movement of the bubble as the temperature increases?

A The bubble moves more quickly towards the seeds at 40 °C than at 20 °C.

B The bubble moves more quickly away from the seeds at 40 °C than at 20 °C.

C The bubble moves more quickly towards the seeds at 20 °C than at 40 °C.

D The bubble moves more quickly away from the seeds at 20 °C than at 40 °C.

10. Nov/2021/Paper_22/No.38

What is the useful product of anaerobic respiration in the manufacture of bread?

A carbon dioxide

B ethanol

C lactic acid

D oxygen

11. Nov/2021/Paper_23/No.23

What is the equation for anaerobic respiration in yeast?

A $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

B $C_6H_{12}O_6 \rightarrow 2C_3H_6O_3$

C $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$

D $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

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12. Nov/2021/Paper_31/No.4

(a) Place ticks (✓) in the boxes that describe anaerobic respiration.

a chemical reaction in a cell	☐
breaks down nutrient molecules	☐
coordinates and regulates body functions	☐
does **not** use oxygen	☐
affects reaction times and self-control	☐
produces alcohol and carbon dioxide in yeast	☐
uses carbon dioxide	☐
uses oxygen	☐

[4]

(b) State the product of anaerobic respiration in muscles during vigorous exercise.

..... [1]

(c) State **three** uses of the energy released in respiration in the body.

1 .....

2 .....

3 .....

[3]

[Total: 8]

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13. Nov/2021/Paper_33/No.1

Respiration is a process that occurs in all living organisms.

(a) (i) Complete the definition of aerobic respiration.

The ..... reactions in cells that use .....

to break down ..... molecules to release energy.

[3]

(ii) State **two** uses of the energy released by respiration in the human body.

1 .....

2 .....

[2]

(iii) Carbon dioxide is one chemical product of aerobic respiration.

State the name of the other chemical product of aerobic respiration.

..... [1]

(b) A student investigated respiration at two different temperatures in germinating pea seeds.

The apparatus is shown in Fig. 1.1.

Soda lime is a chemical that absorbs carbon dioxide.

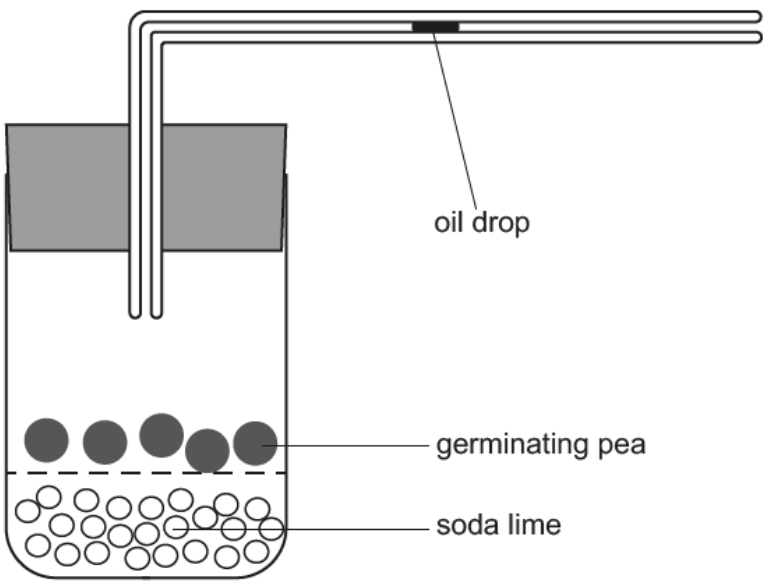


Fig. 1.1

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The results of the investigation are shown in Table 1.1.

Table 1.1

temperature / °C	distance moved by the oil drop / cm
5	2.3
25	5.0

(i) Calculate the percentage increase in the **distance** the oil drop moved, when the temperature changed from 5 °C to 25 °C.

Give your answer to **one** decimal place.

Space for working.

..... %
[3]

(ii) State **two** environmental conditions that the pea seeds shown in Fig. 1.1 would need for germination.

1 .....

2 .....
[2]

[Total: 11]

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Respiration – 2021 IGCSE 0610

1. March/2021/Paper_12/No.23

What are the products of anaerobic respiration in yeast?

A alcohol + carbon dioxide

B alcohol + oxygen

C lactic acid + carbon dioxide

D lactic acid + oxygen

2. March/2021/Paper_22/No.23

After running a fast race a student had pains in their leg muscles.

The pain was caused by the build-up of a product of anaerobic respiration.

Which product caused the pain?

A carbon dioxide

B ethanol

C lactic acid

D water

3. March/2021/Paper_32/No.6

4. June/2021/Paper_11/No.24

What is produced by anaerobic respiration in humans?

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

key

✓ = yes

✗ = no

5. June/2021/Paper_12/No.23

What is the link between muscle contraction, protein synthesis and the maintenance of a constant body temperature?

A They are controlled by hormones.

B They are examples of homeostasis.

C They require energy.

D They require carbon dioxide.

6. June/2021/Paper_13/No.23

Which statement applies to respiration?

A It involves enzymes.

B Energy is absorbed.

C It only takes place in animal cells.

D Oxygen is released.

7. June/2021/Paper_13/No.24

The table shows some products of respiration.

Which row shows the products of anaerobic respiration in muscles?

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

key

✓ = yes

✗ = no

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8. June/2021/Paper_21/No.23

The list shows some processes that take place in a human body.

1 production of new red blood cells

2 transmission of nerve impulses from the eyes to the brain

3 diffusion of gases into and out of the lungs

Which processes use energy released by respiration?

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

9. June/2021/Paper_21/No.24

Which equation is aerobic respiration?

A $6CO_2 + 6H_2O \rightarrow 6C_6H_{12}O_6 + 6O_2$

B $6O_2 + 6CO_2 \rightarrow 6H_2O + C_6H_{12}O_6$

C $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

D $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$

10. June/2021/Paper_22/No.24

After vigorous exercise, an athlete continues to breathe deeply during the recovery period.

During this recovery period the oxygen debt is removed.

Which reaction is used to remove the oxygen debt?

A aerobic respiration of lactic acid in the liver

B aerobic respiration of lactic acid in the muscles

C anaerobic respiration of lactic acid in the liver

D anaerobic respiration of lactic acid in the muscles

11. June/2021/Paper_23/No.23

Which statement applies to respiration?

A It involves enzymes.

B Energy is absorbed.

C It only takes place in animal cells.

D Oxygen is released.

12. June/2021/Paper_23/No.24

Which statement about respiration is correct?

A Deep breathing after exercise reduces an oxygen debt.

B Lactic acid produced by aerobic respiration causes an oxygen debt.

C The energy in ethanol molecules is released by muscle cells.

D The energy in lactic acid is released by anaerobic respiration.

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13. June/2021/Paper_31/No.4

(a) The box on the left contains the words 'Aerobic respiration'.

The boxes on the right show some sentence endings.

Draw lines to make **three** correct sentences about aerobic respiration.

Aerobic respiration	involves the action of enzymes.
	occurs in animals only.
	produces water.
	requires carbon dioxide.
	releases less energy than anaerobic respiration.
	requires oxygen.

[3]

(b) One effect of the release of the hormone adrenaline is to increase blood glucose concentration. This allows more aerobic respiration to occur.

(i) Place ticks (✓) in the correct boxes to show other effects of the release of adrenaline on the body.

change in the genotype	
decreased breathing rate	
development of lung cancer	
increased pulse rate	
widened pupils	

[2]

(ii) State the name of the gland that releases adrenaline.

..... [1]

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(iii) State how adrenaline is transported to its target organs.

.....

..... [1]

(c) State the names of **two** hormones involved in the development of secondary sexual characteristics in humans.

1 .....

2 .....

[2]

(d) State the name of the organ that secretes the hormone insulin.

..... [1]

(e) Organs, tissues and specialised cells are structures in the body that perform a particular function.

Write these parts of the body in order of size from smallest to largest.

cell **DNA molecule** **organ** **organ system** **tissue**

smallest .....

.....

.....

.....

largest .....

[2]

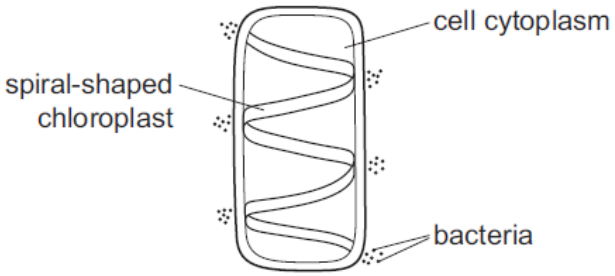
[Total: 12]

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Respiration – 2020 IGCSE 0610

1. Nov/2020/Paper_11/No.12

The diagram shows a cell with groups of bacteria around its edge.



The bacteria move to areas of high oxygen concentration.

Which process in the cell causes the bacteria to form these groups?

A digestion

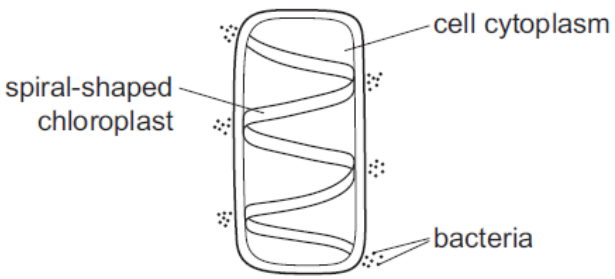
B photosynthesis

C reproduction

D respiration

2. Nov/2020/Paper_12/No.12

The diagram shows a cell with groups of bacteria around its edge.



The bacteria move to areas of high oxygen concentration.

Which process in the cell causes the bacteria to form these groups?

A digestion

B photosynthesis

C reproduction

D respiration

3. Nov/2020/Paper_12/No.23

What is produced during anaerobic respiration in muscles?

A carbon dioxide

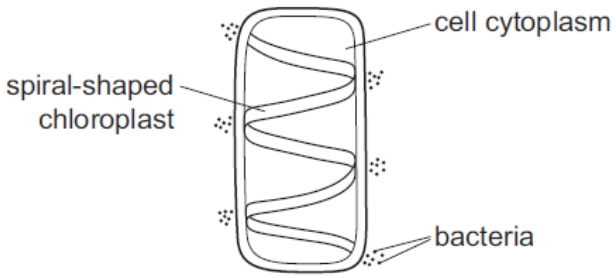
B ethanol

C lactic acid

D water

4. Nov/2020/Paper_13/No.22

The diagram shows a cell with groups of bacteria around its edge.



The bacteria move to areas of high oxygen concentration.

Which process in the cell causes the bacteria to form these groups?

A digestion

B photosynthesis

C reproduction

D respiration

5. Nov/2020/Paper_21/No.21

The list shows some processes that happen in the human body.

1 water enters cells by osmosis

2 muscles contract

3 impulses travel along neurones

4 oxygen diffuses into cells

Which of these require energy released by respiration?

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

6. Nov/2020/Paper_22/No.21

What is produced during anaerobic respiration in muscles?

A carbon dioxide

B ethanol

C lactic acid

D water

7. Nov/2020/Paper_23/No.21

What is produced by anaerobic respiration in yeast?

A alcohol, carbon dioxide and water

B alcohol and carbon dioxide only

C carbon dioxide and lactic acid

D lactic acid only

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8. Nov/2020/Paper_42/No.4

(a) Yeast cells have many structures in common with a plant cell.

Fig. 4.1 is a drawing of a yeast cell.

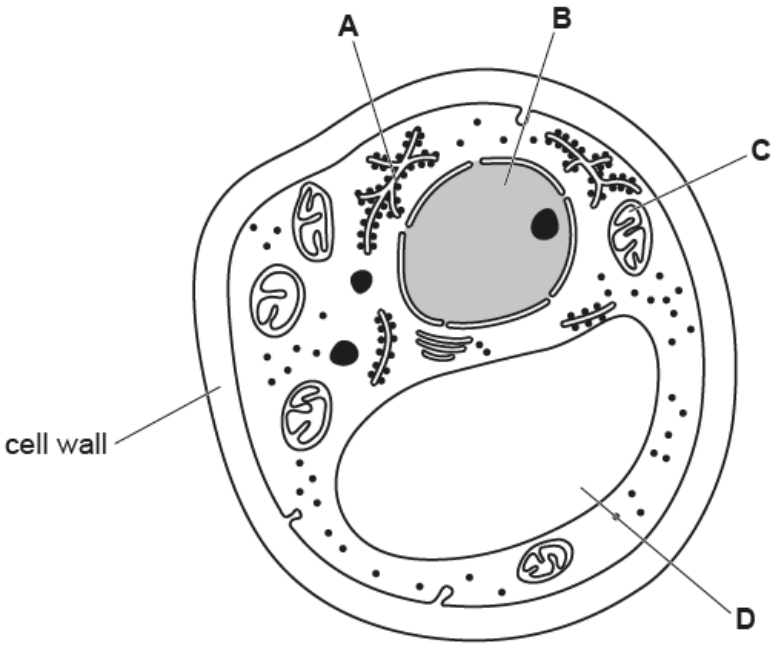


Fig. 4.1

(i) State the names of the cell structures labelled **A** and **D** on Fig. 4.1.

A .....

D .....

[2]

(ii) State the functions of the cell structures labelled **B** and **C** on Fig. 4.1.

B .....

C .....

[2]

(iii) State the name of **one** structure that is found in plant cells but is absent in yeast cells.

..... [1]

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(b) Yeast is used in the production of ethanol to manufacture a type of biofuel.

Fig. 4.2 is a flow chart of the process.

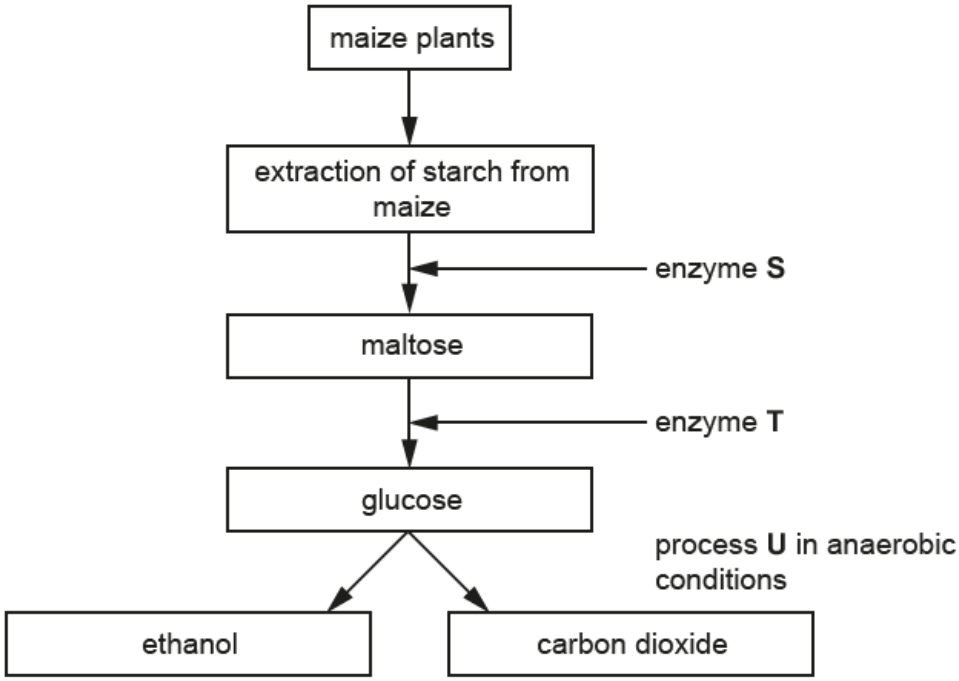


Fig. 4.2

(i) State the names of enzymes **S** and **T**.

S .....

T .....

[2]

(ii) Yeast is used in process **U**. Complete the balanced chemical equation for anaerobic respiration in yeast.

..... ⟶ .....C_2H_5OH + ...

[2]

(iii) Suggest the advantages of using biofuels instead of fossil fuels.

.....

.....

.....

.....

.....

.....

..... [3]

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(iv) Carbon dioxide may be collected from process **U** and sold for use in glasshouses.

Explain why carbon dioxide is used in glasshouses.

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 16]

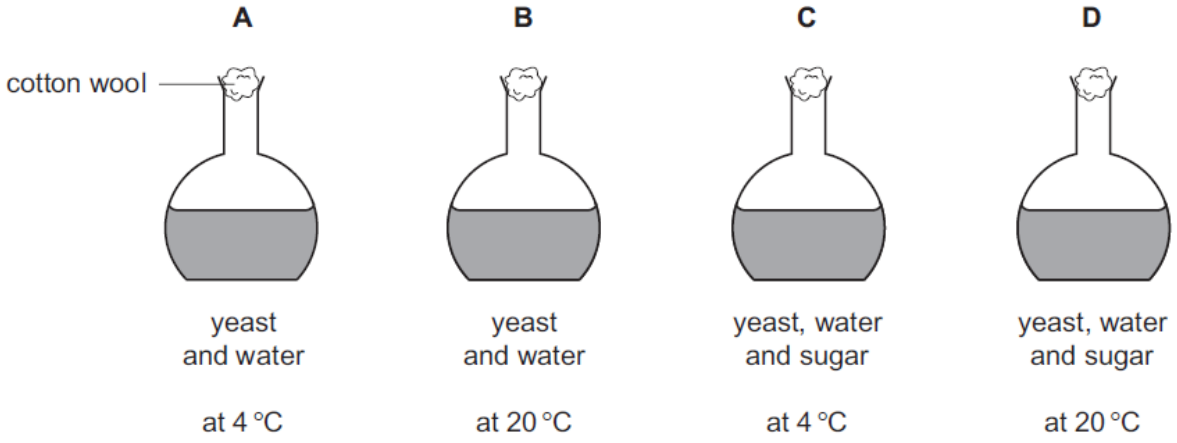
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Respiration – 2020 IGCSE 0610

1. March/2020/Paper_12/No.23

Four flasks are sterilised and are set up as shown.

Which flask will contain the most alcohol after several hours?



2. March/2020/Paper_12/No.30

Which environmental factor is **not** always a requirement for seed germination?

A light

B oxygen

C suitable temperature

D water

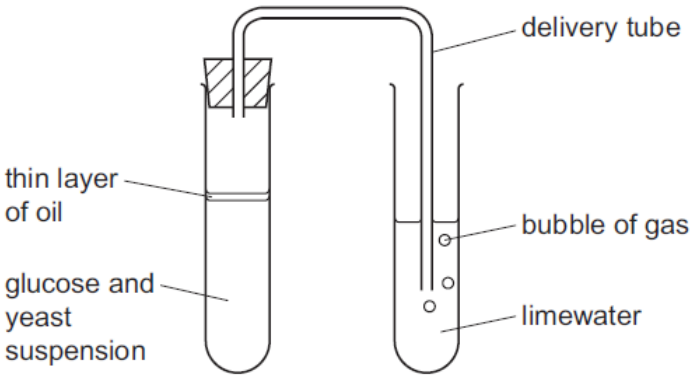
3. March/2020/Paper_22/No.24

How many molecules of ethanol are released from the anaerobic respiration of one molecule of glucose?

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

4. June/2020/Paper_11/No.19

The diagram shows an experiment to investigate the respiration of yeast. Oil prevents oxygen entering the glucose and yeast suspension.



If **no** oxygen is present in the glucose and yeast suspension, what will occur?

A Ethanol will be produced and the limewater will stay clear.

B Ethanol will be produced and the limewater will go cloudy.

C Lactic acid will be produced and the limewater will stay clear.

D Lactic acid will be produced and the limewater will go cloudy.

5. June/2020/Paper_11/No.37

What is the role of anaerobic respiration in bread-making?

A to produce alcohol to flavour the bread

B to produce gas to make the bread rise

C to release enough energy to bake the bread

D to release enough lactic acid to kill the yeast

6. June/2020/Paper_12/No.19

The substances listed are associated with aerobic respiration.

1 carbon dioxide

2 glucose

3 oxygen

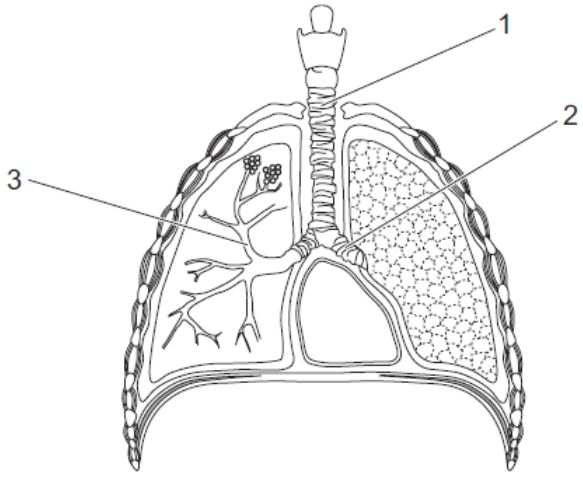
4 water

Which substances are the products of aerobic respiration?

A 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

7. June/2020/Paper_12/No.20

The diagram shows the breathing system.



What are the labelled structures?

	1	2	3
A	bronchus	bronchiole	trachea
B	bronchiole	bronchus	trachea
C	trachea	bronchus	bronchiole
D	trachea	diaphragm	bronchus

8. June/2020/Paper_12/No.27

Which conditions are always required for the germination of seeds?

	condition			
	light	oxygen	suitable temperature	water
A	✓	✓	✗	✓
B	✓	✗	✓	✗
C	✗	✓	✗	✓
D	✗	✓	✓	✓

key

✓ = required

✗ = not required

9. June/2020/Paper_12/No.37

What is the role of anaerobic respiration in bread-making?

A to produce alcohol to flavour the bread

B to produce gas to make the bread rise

C to release enough energy to bake the bread

D to release enough lactic acid to kill the yeast

10. June/2020/Paper_13/No.19

Which examples of respiration produce carbon dioxide?

	aerobic respiration in human muscles	anaerobic respiration in human muscles	anaerobic respiration in yeast
A	✓	✓	✗
B	✓	✗	✓
C	✗	✓	✓
D	✓	✓	✓

key

✓ = yes

✗ = no

11. June/2020/Paper_13/No.37

What is the role of anaerobic respiration in bread-making?

A to produce alcohol to flavour the bread

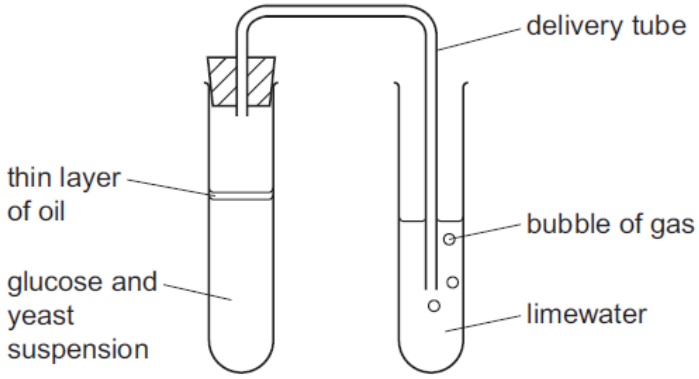
B to produce gas to make the bread rise

C to release enough energy to bake the bread

D to release enough lactic acid to kill the yeast

12. June/2020/Paper_21/No.21

The diagram shows an experiment to investigate the respiration of yeast. Oil prevents oxygen entering the glucose and yeast suspension.



If **no** oxygen is present in the glucose and yeast suspension, what will occur?

A Ethanol will be produced and the limewater will stay clear.

B Ethanol will be produced and the limewater will go cloudy.

C Lactic acid will be produced and the limewater will stay clear.

D Lactic acid will be produced and the limewater will go cloudy.

13. June/2020/Paper_21/No.37

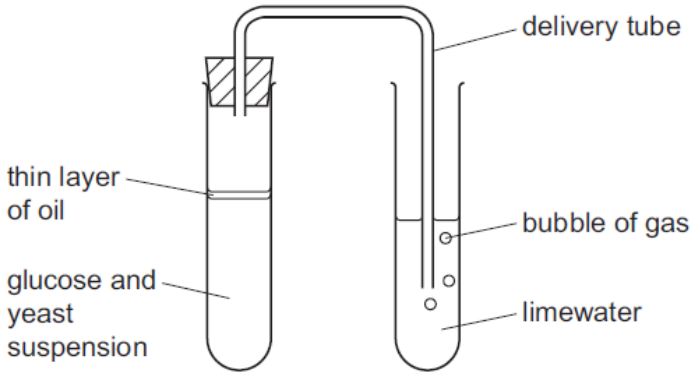
Which row correctly completes the balanced equation for aerobic respiration?

$$X + 6O_2 \rightarrow 6CO_2 + Y$$

	X	Y
A	$6C_6H_{12}O_6$	H_2O
B	$C_6H_{12}O_6$	$6H_2O$
C	$6H_2O$	$C_6H_{12}O_6$
D	$C_6H_{10}O_6$	$6H_2O$

14. June/2020/Paper_21/No.21

The diagram shows an experiment to investigate the respiration of yeast. Oil prevents oxygen entering the glucose and yeast suspension.



If **no** oxygen is present in the glucose and yeast suspension, what will occur?

A Ethanol will be produced and the limewater will stay clear.

B Ethanol will be produced and the limewater will go cloudy.

C Lactic acid will be produced and the limewater will stay clear.

D Lactic acid will be produced and the limewater will go cloudy.

15. June/2020/Paper_21/No.22

Which row correctly completes the balanced equation for aerobic respiration?

$$X + 6O_2 \rightarrow 6CO_2 + Y$$

	X	Y
A	$6C_6H_{12}O_6$	H_2O
B	$C_6H_{12}O_6$	$6H_2O$
C	$6H_2O$	$C_6H_{12}O_6$
D	$C_6H_{10}O_6$	$6H_2O$

16. June/2020/Paper_22/No.22

The formula C_2H_5OH represents a chemical produced during anaerobic respiration.

What is this chemical?

A alcohol

B glucose

C glycogen

D lactic acid

17. June/2020/Paper_23/No.21

The symbol equation for aerobic respiration is shown.

$$C_6H_xO_y + 6O_2 \rightarrow 6CO_z + 6H_2O$$

Which numbers represent the letters shown in the equation as x, y and z?

	x	y	z
A	2	12	6
B	6	2	12
C	6	12	2
D	12	6	2

18. June/2020/Paper_32/No.3

(a) A student investigated respiration in yeast. An equal mass of yeast was added to different types of sugar solution.

The student measured the volume of carbon dioxide released by the yeast using four different sugar solutions with the same concentrations.

The four different sugar solutions used were:

- dextrose
- lactose
- maltose
- sucrose.

Fig. 3.1 is a graph of the results.

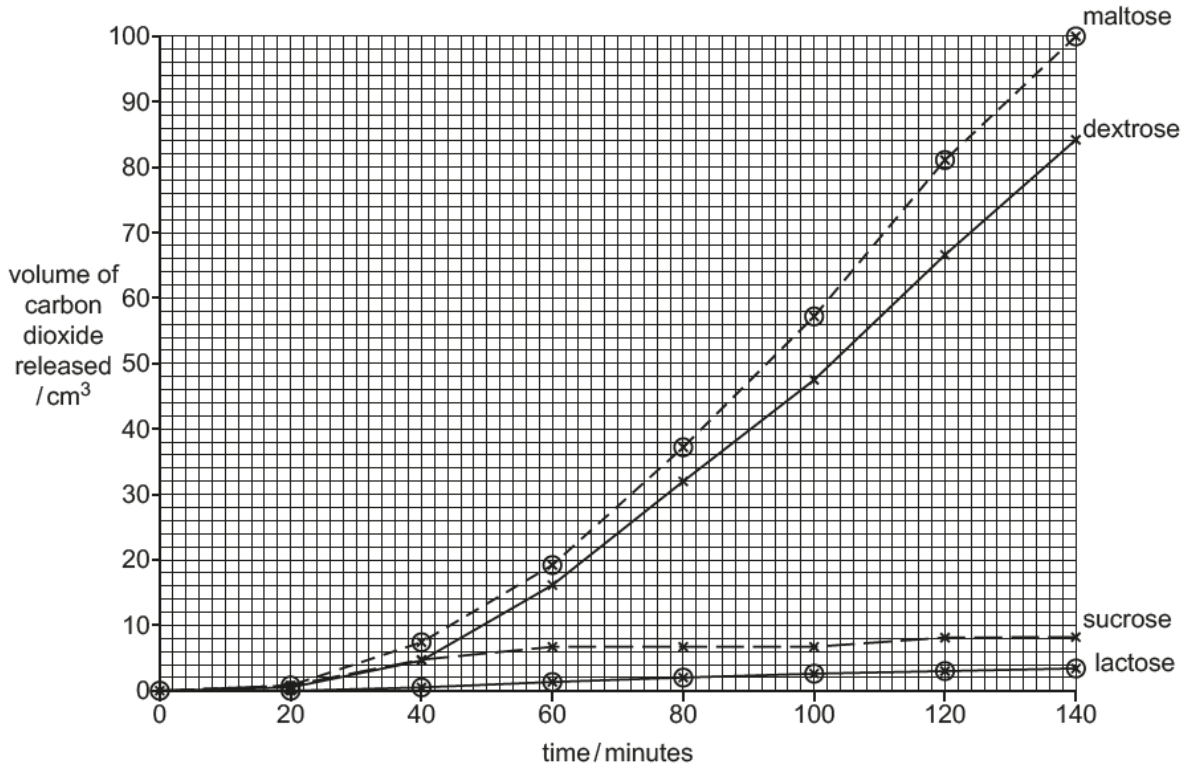


Fig. 3.1

(i) State the name of the sugar solution that produced the most carbon dioxide.

..... [1]

(ii) State the volume of carbon dioxide produced by yeast with the dextrose solution at 80 minutes.

..... cm^3 [1]

(b) The temperature during the investigation was maintained at 20 °C.

Predict the effect on the volume of carbon dioxide produced if the investigation was repeated at 30 °C.

.....

.....

..... [1]

(c) State **two** ways humans use anaerobic respiration in yeast to make useful products.

1 .....

2 .....

[2]

(d) Describe the similarities **and** differences between **anaerobic** respiration in yeast and **aerobic** respiration in humans.

similarities .....

.....

.....

.....

.....

differences .....

.....

.....

.....

.....

[4]

(e) State the word equation for **anaerobic** respiration in humans.

..... [2]

[Total: 11]

8. Respiration

Content

8.1 Aerobic respiration
8.2 Anaerobic respiration
8.3 Human gas exchange

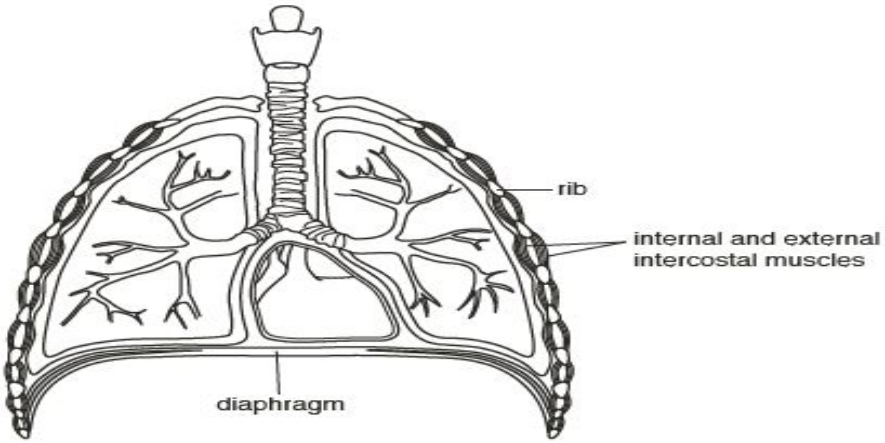
Learning outcomes

Candidates should be able to:

(a) define *respiration* as the release of energy from food substances in all living cells
(b) define *aerobic respiration* as the release of a relatively large amount of energy by the breakdown of food
substances in the presence of oxygen
(c) state the equation (in words or symbols) for aerobic respiration
(d) state the uses of energy in the human body: muscle contraction, protein synthesis, cell division, active
transport, growth, the passage of nerve impulses and the maintenance of a constant body temperature
(e) define *anaerobic respiration* as the release of a relatively small amount of energy by the breakdown of
food substances in the absence of oxygen
(f) state the equation (in words or symbols) for anaerobic respiration in humans and in yeast
(g) describe the effect of lactic acid production in muscles during exercise
(h) know the percentages of the gases in atmospheric air and investigate and state the differences between
inspired and expired air
(i) investigate and state the effect of physical activity on rate and depth of breathing
(j) identify on diagrams and name the larynx, trachea, bronchi, bronchioles, alveoli and associated capillaries
(k) state the characteristics of, and describe the role of, the exchange surface of the alveoli in gas exchange
(l) describe the role of cilia, diaphragm, ribs and intercostal muscles (external and internal) in breathing.

O/N18/21/Q4

The diagram shows the human thorax.



(a) **(i)** Describe how each of the structures named in the diagram is involved when a person takes a single breath **in**.

.....

.....

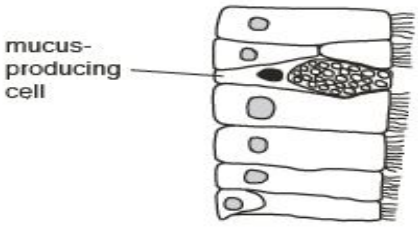
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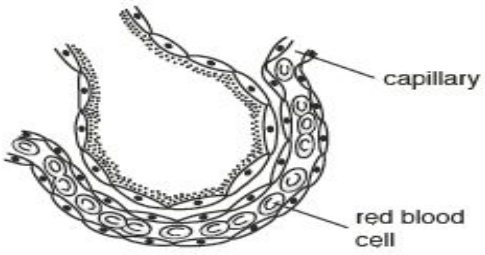
.....

..... [3]

(ii) The diagrams below show two magnified structures, **D** and **E**, from the thorax.



structure D



structure E

Draw lines labelled **D** and **E** on the diagram of the thorax on page 8 to indicate the positions of **structure D** and **structure E**. [2]

(b) Describe how structure is related to function for each of the following:

a capillary, ...

.....

.....

a red blood cell. .....

.....

..... [5]

[Total: 10]

O/N17/22/Q9

(a) Describe and explain the features of a gas exchange surface.

.....

.....

.....

.....

.....

.....[4]

(b) Explain the effect of exercise on the breathing rate of a person.

.....

.....

.....

.....

.....

.....[4]

(c) Living at high altitude increases the number of red blood cells in a person's blood.

Suggest why athletes sometimes train at high altitude.

.....

.....

.....

.....[2]

[Total: 10]

M/J17/21/Q6

(a) Describe the role of the cilia in the trachea.

.....

.....

.....

.....

.....[3]

(b) Fig. 6.1 shows components of the human gas exchange surface and an associated blood vessel.

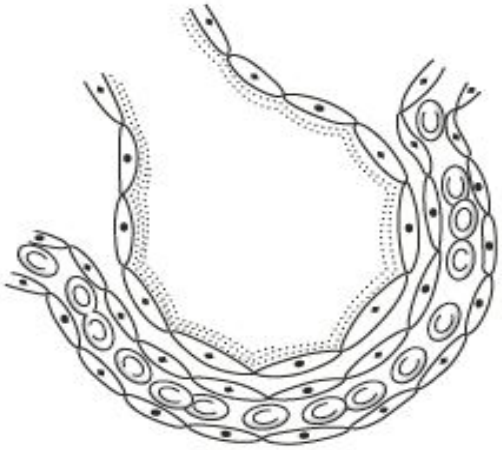


Fig. 6.1

State the characteristics, and describe the roles, of each of the components shown in Fig. 6.1. You should make reference to **named** structures in your answer.

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.....[7]

[Total: 10]

M/J17/21/Q9

Compare each of the following processes:

(a) aerobic respiration and anaerobic respiration

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.....[3]

(b) anaerobic respiration in muscles and anaerobic respiration in yeast

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.....[3]

(c) diffusion and active transport

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.....[4]

[Total: 10]

M/J17/22/Q1

(a) Fig. 1.1 shows the front view of a person's chest and abdomen.

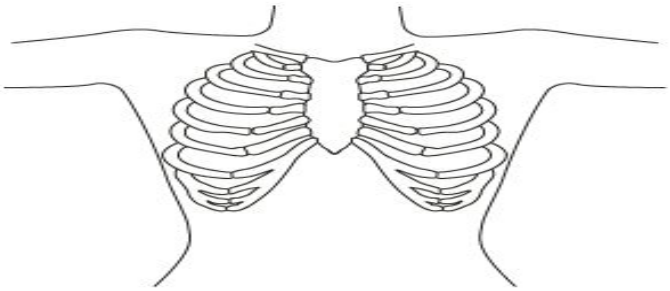


Fig. 1.1

On Fig. 1.1 draw:

- the diaphragm as it would appear immediately after breathing in,
- a circle (O) to show the position of the heart,
- a cross (X) to show the position of the liver. [3]

(b) Fig. 1.2 shows a person about to lift the handle of a bucket from position **A** to position **B**.

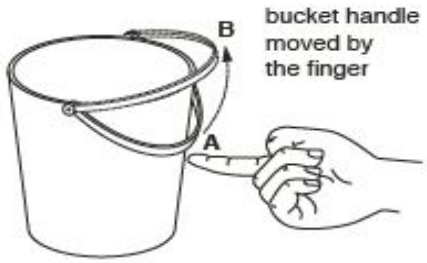


Fig. 1.2

The movement of the bucket handle, as shown, illustrates some features of the movement of a person's chest while breathing in.

(i) State **two similarities** between the movement of a person's chest while breathing in and the movement of the handle.

1 .....

2 .....

[2]

(ii) Explain the **differences** between the movement of a person's chest and the movement of the handle.

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.....[5]

[Total: 10]

M/J17/22/Q6

(a) Describe the journey made by a molecule of carbon dioxide after its production by respiration in a body cell, to the moment it enters the air in the lungs.

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.....[7]

(b) Explain how blood is kept flowing from the foot to the heart.

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.....[3]

[Total: 10]

O/N16/21/Q1

Fig. 1.1 shows a model that a student made to represent the human breathing system.

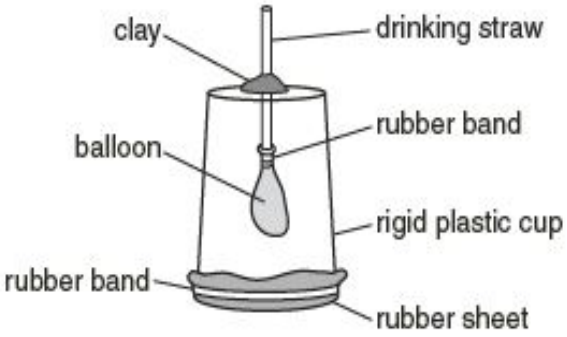


Fig. 1.1

(a) State the part of the model shown in Fig. 1.1 that represents each of the following structures.

the trachea .....

the diaphragm ..... [2]

(b) Describe how this model does **not** accurately represent the human breathing system.

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..... [4]

(c) (i) The model can be used to demonstrate the action of breathing.

Describe what the student must do to the model to demonstrate the action of breathing in.

.....

.....

.....

..... [2]

(ii) State what the student would observe as the model is used to demonstrate the action of breathing in.

.....

..... [1]

(iii) The model becomes damaged by a hole being made in the side of the rigid plastic cup.

Describe and explain how this damage will change what the student would observe as the model is used to demonstrate the action of breathing in.

.....

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.....

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.....

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..... [3]

[Total: 12]

O/N16/22/Q7

7 (a) Describe and explain the benefits to a person of the changes that occur in the body during a physical activity such as a 400 m running race.

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.....[8]

(b) Explain why, after this type of physical activity, a person remains out of breath for several minutes.

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.....[2]

[Total: 10]

M/J16/22/Q5

Table 5.1 shows a number of processes that occur in the lungs and thorax (chest cavity).

Table 5.1

process involved	✔
diffusion into red blood cells	
diffusion into the alveoli	
the diaphragm contracts	
the diaphragm relaxes	
the external intercostal muscles contract	
the internal intercostal muscles relax	
the ribs rise	
the ribs fall	
pressure in the thorax increases	
pressure in the thorax decreases	

(a) Carbon dioxide arrives at the lungs in capillaries. Place a tick (✔) in each box against a process involved in removing carbon dioxide from the blood and expelling it to the atmosphere. [4]

(b) Table 5.2 shows the percentage of oxygen in inspired and expired air of three people, J, K and L.

Table 5.2

person	% of oxygen in inspired air	% of oxygen in expired air
J	20.5	15.0
K	20.5	16.5
L	20.5	18.5

Describe the differences shown in Table 5.2 and suggest reasons for them.

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.....[4]

[Total: 8]

M/J15/21/Q2

Table 2.1 shows the volume of blood supplied to parts of the body at rest and during strenuous exercise.

Table 2.1

part of body	volume of blood supplied in cm^3/min	
	at rest	during strenuous exercise
brain	750	750
heart	250	750
skeletal muscle	1200	12500
skin	500	1900
kidneys	1100	.....
digestive organs	1400	600
other	600	400
Total	5800	17500

(a) (I) Calculate the volume of blood that is supplied to the brain **at rest** as a percentage of the total supplied to the whole body.

Show your working in the space below.

..... % [2]

(II) Name the blood vessels that supply each kidney with blood.

..... [1]

(III) Using the information in Table 2.1, calculate the volume of blood supplied to the kidneys during strenuous exercise.

Write your answer in the space provided in Table 2.1. [1]

(b) Use the information in Table 2.1 to name **two** parts of the body that have an increased supply of blood during strenuous exercise.

Explain the advantage to the body of increasing the supply of blood to each of the parts you name.

name of part .....

advantage .....

.....

.....

.....

name of part .....

advantage .....

.....

.....

..... [4]

(c) Using the information in Table 2.1, suggest why eating immediately before exercise is not recommended.

.....

.....

.....

..... [2]

[Total: 10]

M/J15/22/Q5

Table 5.1 shows the mean daily water intake and loss by a person.

Table 5.1

water intake / dm^3		water loss / dm^3	
drinks food	1.50 0.75	faeces sweat urine exhaled air	0.10 0.52 1.50 .....
Total	2.25	**Total**	2.50

(a) (I) Using the information in Table 5.1, calculate the daily loss of water in exhaled air.

..... [1]

(II) Explain why exhaled air contains water.

.....

.....

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..... [2]

(b) Explain why, even though 2.25 dm^3 of water are taken in through the mouth, the faeces contain only 0.10 dm^3 of water.

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..... [3]

(c) Explain the importance of water in urine.

.....

.....

..... [2]

(d) The difference between water intake and water loss by a person is accounted for by water produced by a metabolic process in the body. Name this metabolic process.

..... [1]

[Total: 9]

O/N14/21/Q4

Fig. 4.1 shows the effect of exercise on the concentration of oxygen in the blood and the concentration of lactic acid in the muscles of a healthy person over a 5-minute period.

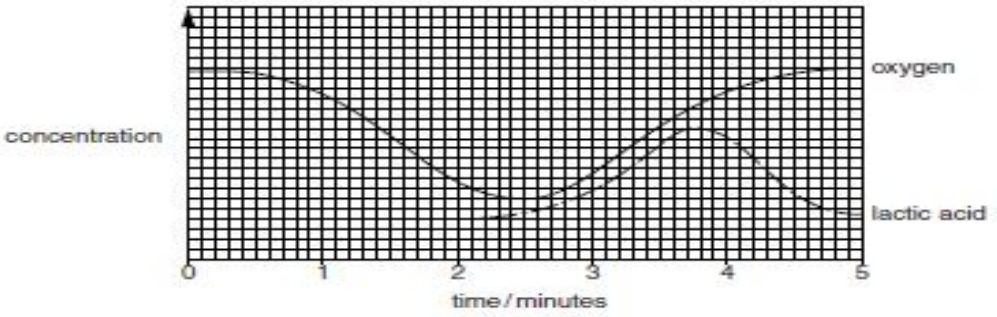


Fig. 4.1

(a) Use Fig. 4.1 to find the time at which the person started to exercise.

..... [1]

(b) Name the process that causes the change in oxygen concentration during the first 2 minutes on Fig. 4.1.

..... [1]

(c) Suggest and explain how each of the two curves on Fig. 4.1 might be different if the person suffered from emphysema.

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..... [5]

[Total: 7]

(d) Suggest why anaerobic respiration does not release as much energy as aerobic respiration for each molecule of the same substrate.

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..... [2]

[Total: 11]

M/J14/22/Q6

(a) Explain the fact that humans breathe while plants do not.

.....

.....

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.....[3]

(b) Explain why the respiration rate of humans is relatively high and constant, while that of plants may vary widely.

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.....[7]

[Total: 10]

O/N12/21/Q3

Atmospheric air contains oxygen and carbon dioxide.

(a) Complete table 3.1 to show the percentage of oxygen and carbon dioxide in inhaled and exhaled air.

Table 3.1

gas	% gas in air	
	inhaled air	exhaled air
oxygen		
carbon dioxide		

[2]

(b) (i) Explain how oxygen is used by a muscle cell.

.....

.....

..... [3]

(ii) Explain what happens in a muscle cell when oxygen is in short supply.

.....

..... [2]

(c) At high altitudes, oxygen is less available than it is at low altitudes.
Suggest modifications of the circulatory and respiratory systems that might help people that live for many years at high altitude.

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.....

..... [3]

[Total: 10]

O/N11/22/Q8

(a) Describe how anaerobic respiration in muscles differs from anaerobic respiration in yeast.

.....

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.....

.....[3]

(b) Describe the part played by the cells lining the trachea.

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.....[3]

(c) Explain what may happen to the cells lining the trachea in a smoker, and how this may affect the person's health.

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.....[4]

[Total: 10]

M/J11/22/Q5

5 Fig. 5.1(a) and Fig. 5.1(b) show graphs of the pulse and breathing rates of two students, **E** and **F**, during and after one minute's vigorous exercise.

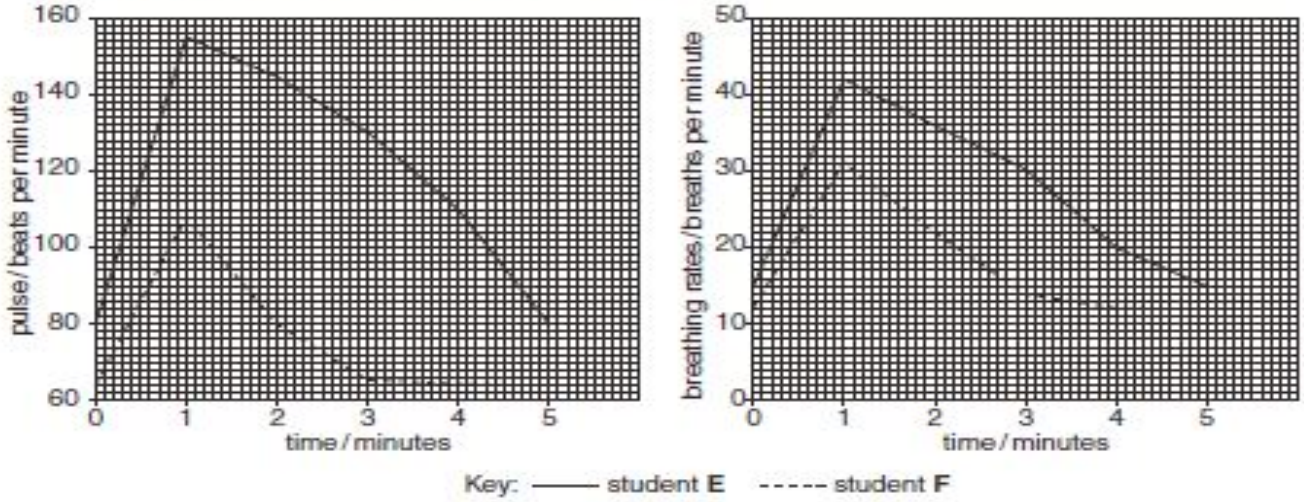


Fig. 5.1(a) **Fig. 5.1(b)**

(a) State how long it took for student **F**'s pulse and breathing rates to return to their original levels after the student had finished exercising.

pulse rate .....

breathing rate ..... [2]

(b) Explain why the pulse and breathing rates of both students increased during exercise.

.....

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.....[4]

(c) Suggest and describe possible reasons for the differences in the effect of vigorous exercise on these two students.

.....

.....

.....

.....

.....[4]

[Total: 10]

MARK SCHEMES WILL USE THESE ABBREVIATIONS:
; SEPARATES MARKING POINTS
/ ALTERNATIVES
() CONTENTS OF BRACKETS ARE NOT REQUIRED BUT SHOULD BE IMPLIED
R REJECT
A ACCEPT (FOR ANSWERS CORRECTLY CUED BY THE QUESTION, OR GUIDANCE FOR EXAMINERS)
IG IGNORE (FOR INCORRECT BUT IRRELEVANT RESPONSES)
AW ALTERNATIVE WORDING (WHERE RESPONSES VARY MORE THAN USUAL)
AVP ALTERNATIVE VALID POINT (WHERE A GREATER THAN USUAL VARIETY OF RESPONSES IS EXPECTED)
ORA OR REVERSE ARGUMENT
UNDERLINE ACTUAL WORD UNDERLINED MUST BE USED BY CANDIDATE
+ STATEMENTS ON BOTH SIDES OF THE + ARE NEEDED FOR THAT MARK

Mark Scheme

O/N18/22/Q4

4(a)(i) diaphragm **+** contracts **;**
diaphragm **+** moves down **;**
external intercostal muscles **+** contract **;**
internal intercostal muscles **+** relax **;**
ribs move **+** up / out **;**
3 Ig references to volume / pressure
4(a)(ii) **structure D** correctly identified on trachea / bronchus **;**
structure E identified at end of a bronchiole **;**
2 A any method of correct identification
4(b) *(capillary) max 3 marks from*
wall **+** one cell thick **;**
diffusion **;**
example of **named** substance **+** in / out / through wall **;**
branching / network / contacts many cells / large surface area **;**
(red blood cell) max 3 marks from
biconcave **AW ;**
no nucleus **;**
haemoglobin **;**
large surface area **;**
oxygen in / out / carriage **;**
able to squeeze through capillaries / flexible **;**

O/N17/22/Q9

9(a) **1** thin / one cell thick / short distance **;**
2 moist **;**
3 large surface area **;**
4 permeable **;**
5 maximum / more / quick / efficient **+** diffusion / absorption / exchange **;**
6 reference to dissolving / in solution **;**
4
9(b) **1** faster / deeper **+** breathing **;**
2 more **+** oxygen **;**
3 (oxygen) in lungs / inhaled / in blood **;**
4 muscle **;**
5 faster / increased **+** respiration / oxidation of glucose **;**
6 aerobic **;**
7 more energy **+** required / released **;**
8 more **+** carbon dioxide removed **AW ;**
9 delays / prevents **AW +** anaerobic respiration **;**
4
9(c) **1** less oxygen in atmosphere (at high altitude) **;**
2 more **+** haemoglobin **;**
3 oxyhaemoglobin **OR** more **+** oxygen carried / supplied **;**
4 competitive advantage **AW ;**

M/J17/21/Q6

6(a) move mucus **;**
(containing) bacteria / pathogens / dust **;**
(moves) up / away from lungs **AW ;**
prevent infection **;**
6(b) reference to diffusion **;**
(for) O_2 / CO_2 **+** exchange **AW ;**
alveolus / air sac **;**
large surface area **;**
one cell thick **+** wall **;**
moist **AW** / mucus **;**
(gases) to dissolve **;**
capillary **;**
one cell thick **+** wall **;**
connect **AW** arteries **+** veins **;**
blood **+** moving **;**
red blood cells / erythrocytes **;**
no nucleus **;**
biconcave **;**
contain haemoglobin **;**
live for 90 / 120 days **OR** 3 / 4 months **;**
carry oxygen **;**
plasma **;**
carriage of carbon dioxide **;**
7

M/J17/21/Q9

9(a) glucose **+** required for both **;**
complete or incomplete breakdown (of glucose) **;**
ref. oxygen requirement **;**
amount of energy released **;**

3 A each point **only** if linked to **either** 'aerobic' **or** 'anaerobic' respiration
9(b) glucose **+** required for both **;**
reference to oxygen debt **AW ;**
lactic acid **;**
carbon dioxide **;**
alcohol / ethanol **;**
3 A each point **only** if linked to **either** 'muscles **or** 'yeast'
9(c) movement of particles / molecules / named molecule **;**
concentration gradient **;**
membrane requirement **;**
living cell requirement **;**
energy requirement **;**
(energy from) respiration **;**
correct example **;**
4 A each point **only** if linked to **either** 'diffusion' **or** 'active transport'
Total: 10

M/J17/22/Q1
1(a) **1** line starts and ends at body wall **+** crosses abdomen below ribs **;**
2 circle with all or part of it touching / on the sternum **;**
3 middle of cross below diaphragm **;**
3
1(b)(i) **1** any reference to up / rises / raised **;**
2 out / forwards **;**
3 reference to muscle **;**
4 (muscle) contract(ion) **;**
5 reference to (requires) energy **;**
2
1(b)(ii) (movement of person's chest)
1 involuntary **AW ;**
2 intercostal (muscles) **;**
3 (muscles) between the ribs / in the chest (wall) **;**
4 (move) bone / ribs / ribcage **;**
5 attached / hinged **+** to vertebrae / backbone / at back **;**
6 ***leads to increase in volume / decrease in pressure **;
(movement of bucket handle)
7 voluntary **AW ;**
8 muscle in arm / finger **OR** reference to bicep(s) **;**
9 external to / not part of **+** the bucket / handle **;**
10 (move) metal / plastic **OR** reference to a single handle **;**
11 attached / hinged **+** to bucket / at side **;**
12 ***does not lead to change in volume / pressure **;
5
*** A** once only for either chest or handle
*** A** once only for either chest or handle

M/J17/22/Q6

6(a) **1** correct reference to (CO_2) diffusion **;**
2 cytoplasm **;**

3 (across) cell membrane **;**
4 tissue fluid **;**
5 * capillary **;**
6 plasma / (red) blood (cell) **;**
7 vein / vena cava **;**
8 heart **+** right (side of heart) **;**
9 reference to atrium / auricle **+** followed by ventricle **;**
10 pulmonary artery / arch **;**
11 * capillary **;**
12 alveolus / alveoli **;**
7
*** A** once only either here or below
Ig inferior / superior vena cava
*** A** once only either here or above
Ig reference to air sac
6(b) **1** (blood is under) pressure **;**
2 (moved) by (contraction of skeletal) muscles **;**
3 reference to veins / correct named vein **;**
4 reference to valves (in veins) **;**
5 (valves) prevent backflow of blood **AW ;**

O/N16/21/Q1

1(a) (drinking) straw **;**
(rubber) sheet **;**
2
1(b) only one lung / balloon **;**
reference to ribs **;**
reference to intercostal muscles **;**
rigid plastic cup doesn't move **;**
no bronchi / bronchioles **;**
no alveoli / blood vessels / capillaries **;**
no cilia / mucus **;**
lung / balloon not attached to cup / thorax wall **;**
rubber sheet doesn’t move independently / not muscular / pulled down below diaphragm position / flat at rest, not domed **;**
4 A ORA for all marking points in an answer referring to the human breathing system rather than to the model
1(c)(i) (move) rubber sheet **;**
down **;**
2 R blowing down straw
1(c)(ii) balloon + inflates / expands / gets bigger **AW ; 1**

O/N16/22/Q7

7(a) 1 adrenaline **;**
2 glycogen to glucose **;**
3 liver / muscles (in context of adrenaline effect) **;**
4 boosts blood glucose / sugar levels **;**
5 fast(er) heart beat **;**
6 better / faster circulation **;**

7 more oxygen **+** to muscles **;**
7(a) 1 adrenaline **;**

2 glycogen to glucose **;**
3 liver / muscles (in context of adrenaline effect) **;**
4 boosts blood glucose / sugar levels **;**
5 fast(er) heart beat **;**
6 better / faster circulation **;**
7 more oxygen **+** to muscles **;**

M/J16/22/Q5

5 (a) _ diffusion into the alveoli (box 2) ;
_ the diaphragm relaxes (box 4) ;
_ the ribs fall (box 8) ;
_ pressure in the thorax increases
(box 9) ;
[4]
(b) 1. any stated difference between
inspired and expired % O_2 ;
2. O_2 used in respiration ;
3. Person J – the most / more (than
normal) O_2 absorbed / used ;
4. Person J - active / taking
exercise / athlete / pregnant / high
respiratory rate / high blood cell or
red blood cell count AW ;
5. Person K – moderate
activity / normal ;
6. Person L – low O_2
absorption / use ;
7. Person L – (named) lung
disease / anaemia /
smoker / inactive / sleeping / elderly
/ dying / low respiratory
rate / reference to low red blood
cell count / carboxyhaemoglobin ;
A any disease that would restrict O_2
uptake
[4]
[Total 8]

M/J15/21/Q2

(a) (i) (750/5800) *100 ;
12.9 / 13 (%) ;
[2]
(ii) renal artery ; [1]
(iii) 600 ;

(b)
heart ;
skeletal muscle ;

for above named parts
ref. supply of more oxygen / glucose ;
ref. increased (aerobic) respiration /
prevent anaerobic respiration ;
remove lactic acid (for skeletal muscle
only) ;
ref. contract harder / faster ;
skin ;
increased heat loss ;
[max 4]
[1]
[1]
[max 2]
(c) less blood to digestive organs ;
less digestion ;
less / slower absorption of products of
digestion ;
A ref. active transport in digestive
System

M/J15/22/Q5

5 (a) (i) 0.38 + dm^3 ; [1]
(ii) evaporation / water vapour ;
from (moist lining of) alveoli / lungs ;
Ig other named parts of breathing
system
[2]
(b) 1. water is absorbed + blood ;
2. (from) ileum / small intestine /
colon / large intestine ;
3. ref need to prevent water loss /
importance of water in body (e.g.
solvent / transport) ;
4. water lost by other methods / ref. to
any named other method of water
loss ;
[max 3]
(c) water is a solvent / dissolves ;
any one named solute ;
A salts
[2]
(d) respiration ; if qualified must be aerobic [1]

O/N14/21/Q4

4 (a) 0.3–0.4 minutes ; [1] A 18–24 s
(b) aerobic respiration ; [1]
(c) O_2 curve not as high at start / finish ;
O_2 curve drops more quickly / ORA ;
damage to alveoli ;
less surface area for O_2 absorption ;

less O_2 to blood / muscles ;
lactic acid curve rises sooner / higher / takes longer to return to normal ;
shorter period of aerobic / longer period anaerobic respiration ;
more lactic acid build-up ;
[max. 5]
A uptake / diffusion
[Total: 7]

O/N14/22/Q4

4 (a) glucose / $C_6H_{12}O_6$ (substrate) ;
(yeast) alcohol / ethanol / C_2H_5OH ;
(yeast) carbon dioxide / CO_2 ;
(muscles) lactic acid / lactate / $C_3H_6O_3$;
[4]
(b) (i) food / glucose deficiency / AW ;
(killed) by alcohol ;
poisoned by competing organisms (e.g. bacteria) ;
[max. 2]
(ii) (killed) by heat / baking / high temperature ; [1]
(c) lactic acid removed / broken down / converted ;
by circulation / blood / AW ;
lactic acid not toxic (at concentrations experienced) ;
[max. 2]
(d) substrate / glucose not completely broken down ;
chemical energy ;
still contained within product / lactic acid / alcohol ;
[max. 2]
[Total: 11]

M/J14/22/Q6

6 (a) muscles in humans / no muscles in plants ;
ref. intercostals / diaphragm ;
humans need to keep (constant) supply of O_2 (to blood)
/ remove CO_2 (from blood) / ref. higher metabolic rate / rate of
respiration in humans ;
ref. production of (some of their own) oxygen by
photosynthesis ;
lungs / no lungs ;
ref. stomata/spongy mesophyll in plants / not in humans / ref.
alveoli in humans / no alveoli in plants ;
[3]
(N.B. intercostal ; muscles ; will score 2 marks)

(b) (High respiration rate)
humans active / move / muscle N action (or described) / ORA ;
requires large quantities of / more N energy / ORA ;
high body temperature in humans / ORA ;
activity of enzymes / high metabolic rate / ORA ;
humans complex / named organs, e.g. brain, kidneys, heart ;
(Constant respiration rate)
homeostasis ;
temperature constant in humans / thermoregulation ;
rate dependent on external temperature in plants ;
rate dependent on stage of life cycle, e.g. germination /
growing season ;
[7]
R humans are larger
Total [10]

O/N12/21/Q3

3 (a) oxygen 19 – 21% + 14 – 16%;
carbon dioxide 0.03 – 0.045% + 3 – 4.5%; [2]
(b) (i) (aerobic) respiration;
release energy;
from glucose;
for contraction;
lactic acid +ref. oxygen debt AW;
R produce AW energy
A give AW; [max 3]

3 (a) oxygen 19 – 21% + 14 – 16%;
carbon dioxide 0.03 – 0.045% + 3 – 4.5%; [2]
(b) (i) (aerobic) respiration;
release energy;
from glucose;
for contraction;
lactic acid +ref. oxygen debt AW;
R produce AW energy
A give AW; [max 3]

M/J12/21/Q9

9 (a) diaphragm + relaxes;
and moves up / assumes domed shape;
intercostal (if named must be external) muscles relax / internal intercostal muscles contract;
ribs move down / inwards;
volume of thorax / lungs / chest cavity decreases;
pressure in thorax increases; [5]
(b) nitrogen unchanged (A percentage if given 78 – 80%);
(A. 79% in air breathed in + reduced percentage in air breathed out)
not used / produced (in the body / cells / metabolism);
oxygen reduces (A %s from 19 /20 / 21% to 16% +/–);
carbon dioxide increases (A %s - from 0.03 / 0.04% to 4%);
correct ref. aerobic respiration / O_2 / CO_2 diffuse into / out of blood;
ref. water vapour comparison + explanation;

(R waste product of respiration)
ref. temperature comparison + explanation;
ref. comparison of cleanliness of air; [5]
[Total: 10]

O/N11/22/Q8

8 (a) (Accept reverse argument or mix and match answers. A points on equations – identified –
either words or symbols – correctly balanced)
lactic acid / $CH_3CHOHCOOH$ produced;
no alcohol / ethanol / C_2H_5OH produced;
no carbon dioxide / CO_2 produced; [max 3]
(b) produce mucus;
to trap dust;
and bacteria / pathogens (R germs);
cilia;
to move mucus + up AW;
moisten air / warm air; [max 3]
(c) cilia paralysed / destroyed / killed AW;
airways blocked with mucus / mucus builds up / excess mucus produced (A mucus not removed);
narrower airways / breathing difficulty / breathlessness;
(smoker's) cough;
pathogens not removed / enter lungs / bacteria proliferate;
tendency to infection / disease or named caused by pathogen;
lung / tracheal cancer / emphysema;
ref. to the effect of decreased oxygen uptake; [max 4]
[Total: 10]

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5 (a) 2.5 – 4 + minutes for pulse (A any within range);
3 – 4 + minutes for breathing (A anything within range); [2]
(b) muscles;
For the remaining marks in this part, there must be the use somewhere of a word that indicates enhancement of at least one of the factors (i.e. more / greater, faster etc.). Thus, for example, 'more oxygen' scores, and so, then, would any ref. to CO_2 removal or energy, even if 'more' is not repeated.
more / faster blood;
more oxygen / glucose;
ref. more CO_2 removed / lactic acid;
more energy (R produced, made, manufactured, etc.); [max. 4]
(c) (If they do not indicate which student they are talking about, mark up to 2 max.)
*student F is fitter / exercises regularly AW;
*more efficient muscles / better breakdown of lactic acid;
*more efficient circulation / no or limited cholesterol in blood vessels;
*more efficient lungs / respiratory system;

*exercised less vigorously;
*more haemoglobin / more RBCs;
(*A reverse arguments for Student E)
student E was a smoker, F was not;
student E was obese / overweight AW (R large mass);
emphysema;
suffered from asthma / bronchitis / heart problems / lung infection AW; [max. 4]
[Total: 10]