Cambridge Assessment International Education

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CANDIDATE NAME									
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BIOLOGY **0610/31**

Paper 3 Theory (Core) **October/November 2024**

1 hour 15 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION
- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

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1 Fig. 1.1 shows a diagram of an animal cell and a bacterial cell.

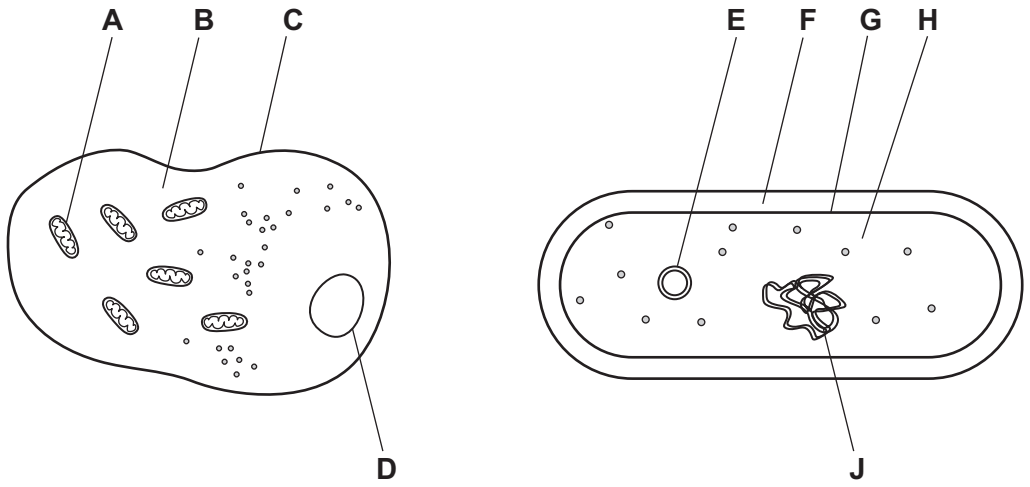

Fig. 1.1

View solution

(a) Complete Table 1.1 by identifying the structures labelled **B** to **J** in Fig. 1.1.

Some structures may **not** be present in both cells.

One row has been completed for you.

Table 1.1

structure	animal cell	bacterial cell
cell membrane		
cell wall		
cytoplasm		
mitochondrion	**A**	
nucleus		
plasmid		

[5]

(b) State the function of mitochondria.

..... [1]

View solution

(c) Egg cells and sperm cells are examples of specialised animal cells.

View solution

Place ticks (✓) in Table 1.2 to show the correct adaptive feature for each type of cell.

Table 1.2

adaptive feature	egg cell	sperm cell
energy store		
enzymes in the acrosome		
flagellum		
jelly coat		

[4]

[Total: 10]

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2 Fig. 2.1 shows part of a food web for a coral reef. Algae and plankton are producers.

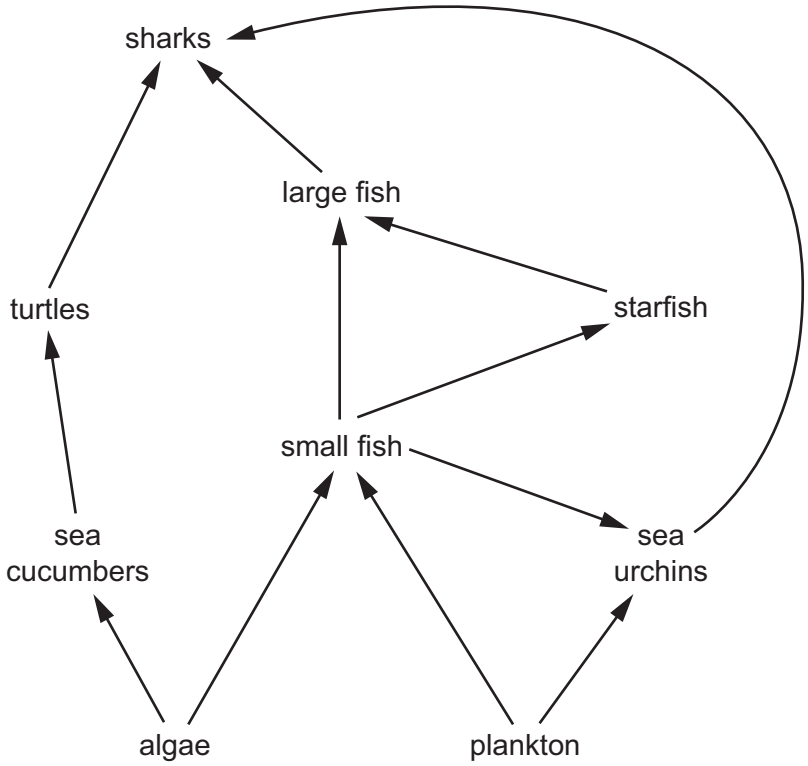

Fig. 2.1

(a) Using the information in Fig. 2.1, identify:

an organism that feeds at the third trophic level .....

a herbivore .....

a carnivore .....

an organism that is a primary consumer **and** a secondary consumer. .....

.....

[4]

(b) **(i)** State what the arrows in Fig. 2.1 represent.

..... [1]

(ii) Using the information in Fig. 2.1, construct a food chain containing **five** organisms.

Do **not** draw the organisms.

[2]

(iii) State the name of the process used by some producers to convert energy from light into chemical energy.

..... [1]

(iv) State the name of the type of organism that gets its energy from dead or waste organic material.

..... [1]

(c) The large fish in the food web is the coral grouper, *Cephalopholis miniata*.

Fig. 2.2 is a photograph of a coral grouper on a coral reef. Coral groupers are a popular food fish for humans.

View solution



Fig. 2.2

Overharvesting of the large fish would cause the turtle population to decrease.

Using the information in Fig. 2.1, explain why the turtle population would decrease.

.....

.....

.....

.....

.....

.....

..... [3]

(d) Coral groupers developed over time from a species of fish with very few spots on their bodies.

Complete the sentences to explain how coral groupers developed.

View solution

The fish species with few spots had genetic variation in their population.

When these fish ....., some of the offspring were born with more spots than others.

Fish with more spots were better adapted to the .....

because predators were less likely to see them.

Fish with more spots had a greater chance of passing on the .....

for more spots to the next generation.

This process is called ..... selection.

[4]

[Total: 16]

3 Fig. 3.1 shows a photograph of some leaves on a tree.



Fig. 3.1

(a) State **two** features of the leaves, **visible** in Fig. 3.1, that are adaptations for photosynthesis.

1 .....

2 .....

[2]

View solution

(b) Fig. 3.2 is a diagram of part of a cross-section of a leaf.

View solution

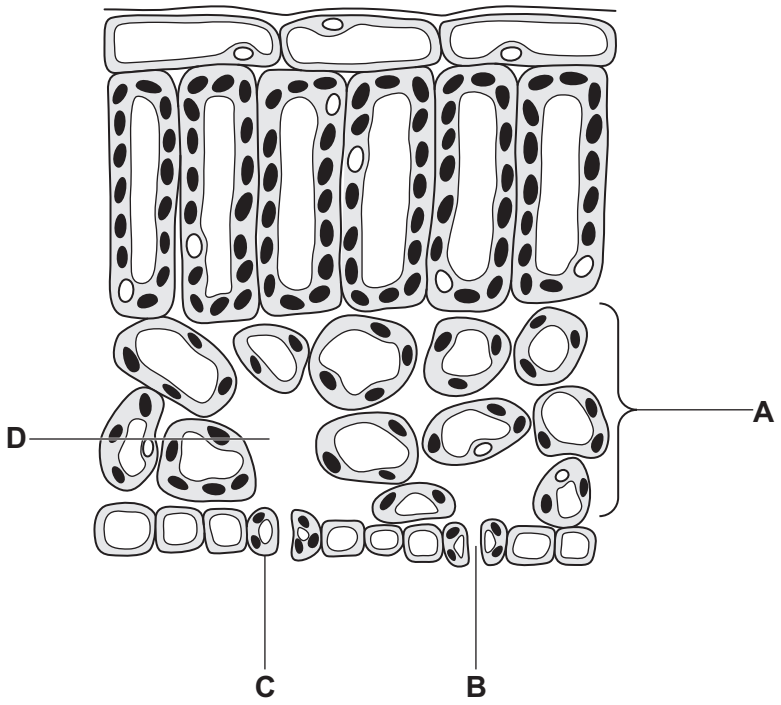

Fig. 3.2

(i) Explain how the parts of the leaf labelled **A**, **B**, **C** and **D** in Fig. 3.2 adapt the leaf for gas exchange during photosynthesis.

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(ii) State the name of the mineral ion that plants need to make chlorophyll.

..... [1]

View solution

(c) Complete the sentences about transport in plants.

View solution

Leaves contain ..... bundles.

The xylem in the bundles provides plants with support and transports water and

..... from the ..... to the leaves.

Phloem in the bundles transports ..... and amino acids.

[4]

[Total: 11]

4 Fig. 4.1 is a diagram of part of the human male reproductive system.

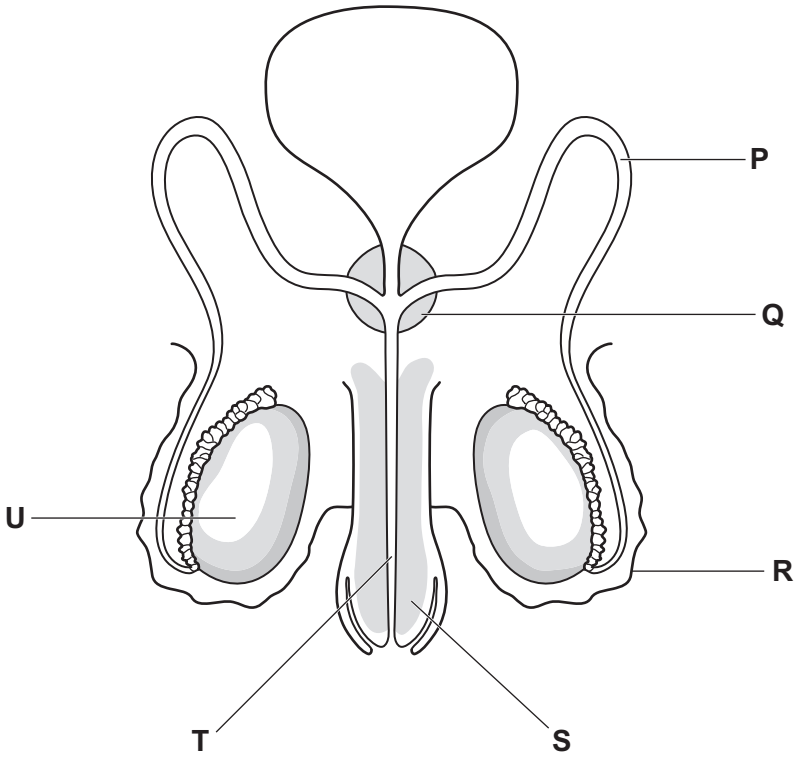

Fig. 4.1

View solution

(a) Identify the letter in Fig. 4.1 for the structure that:

produces sperm .....

places sperm into the vagina .....

carries urine out of the body .....

holds the testes outside the body. .....

[4]

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(b) Scientists investigated the link between testis size and length of sperm in bird species.

View solution

Fig. 4.2 shows the results.

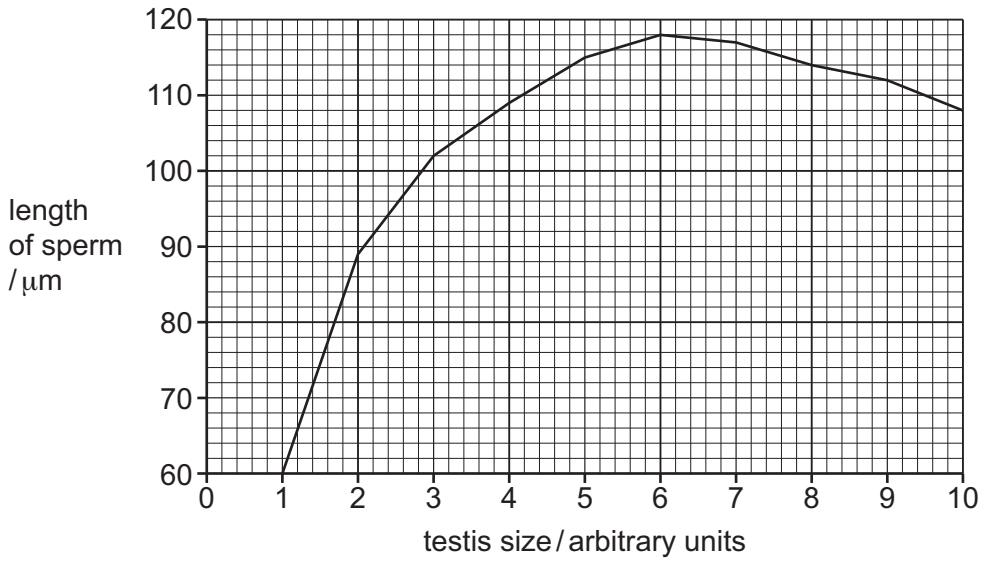

Fig. 4.2

Using the information shown in Fig. 4.2:

(i) Describe how the length of the sperm changes as the testis size increases.

.....

.....

..... [1]

(ii) Calculate the difference in length between the longest sperm and the shortest sperm.

View solution

..... μm [1]

(iii) State the testis size that has the longest sperm.

..... arbitrary units [1]

[Total: 7]

View solution

5 Fig. 5.1 shows part of the human gas exchange system.

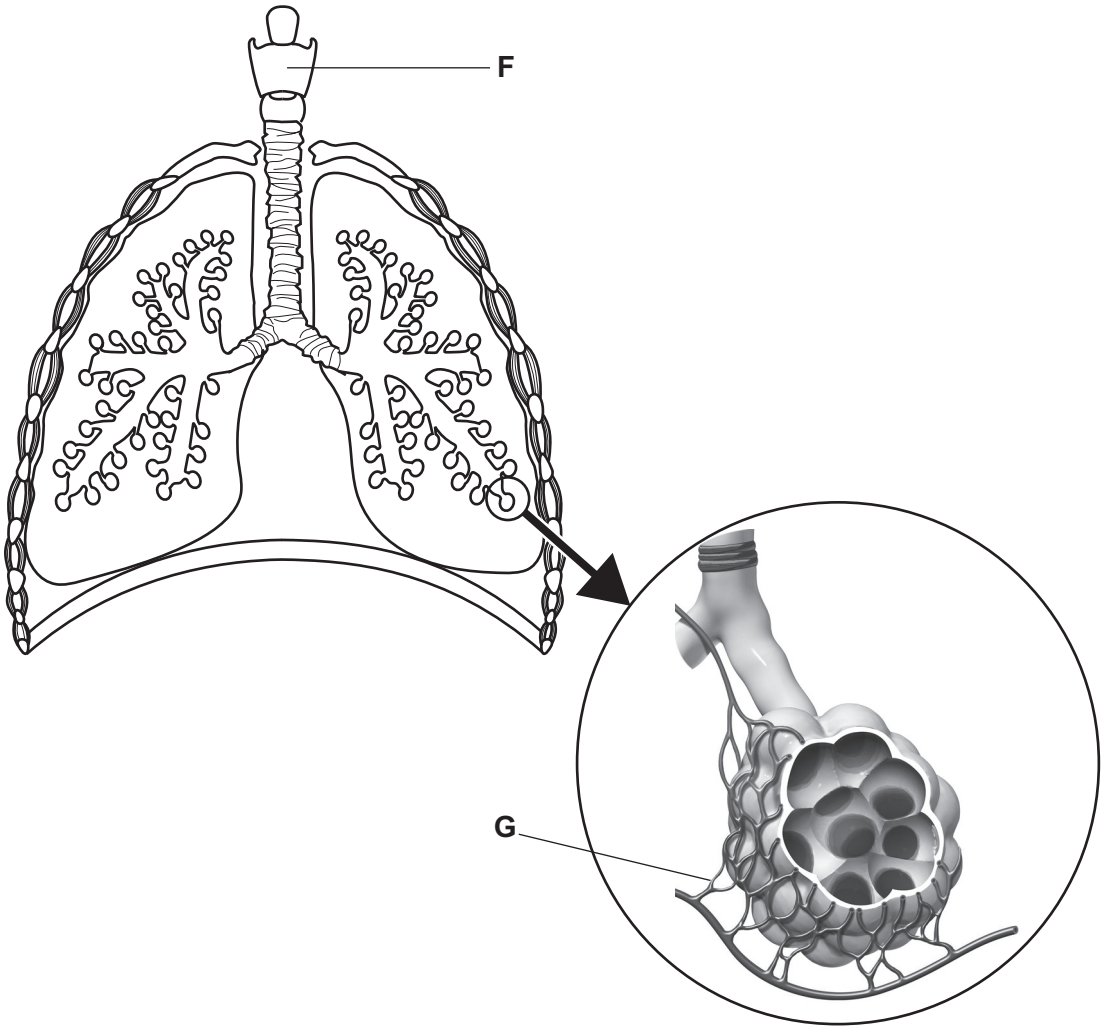

Fig. 5.1

(a) Identify the structures labelled **F** and **G** on Fig. 5.1.

View solution

F .....

G .....

[2]

(b) Write the words in the correct order in the boxes to show the structures inspired gases move through to get from outside the body to the blood.

View solution

alveoli **bronchiole** **bronchus** **trachea**

nose					blood

[2]

(c) The composition of air changes between inspiration and expiration.

View solution

(i) Complete the table about how expired air differs from inspired air.

Choose the word or phrase from the list.

Each word or phrase may be used once, more than once or not at all.

higher **lower** **the same**

gas	concentration in expired air compared to inspired air
carbon dioxide	
oxygen	
water vapour	

[3]

(ii) State the name of the substance used to test for the presence of carbon dioxide gas.

..... [1]

(d) The lungs excrete waste gases.

View solution

(i) State the name of **one other** organ that excretes waste substances.

..... [1]

(ii) Circle **three** other substances that humans excrete.

View solution

amino acids **glycerol** **haemoglobin** **ions**

mucus **starch** **urea** **water**

[3]

[Total: 12]

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6 (a) (i) State the meaning of the term variation.

.....

.....

..... [2]

(ii) Table 6.1 shows some statements about variation.

Place ticks (✓) in the boxes to show which statements describe continuous and discontinuous variation.

Place **one** tick in each row.

View solution

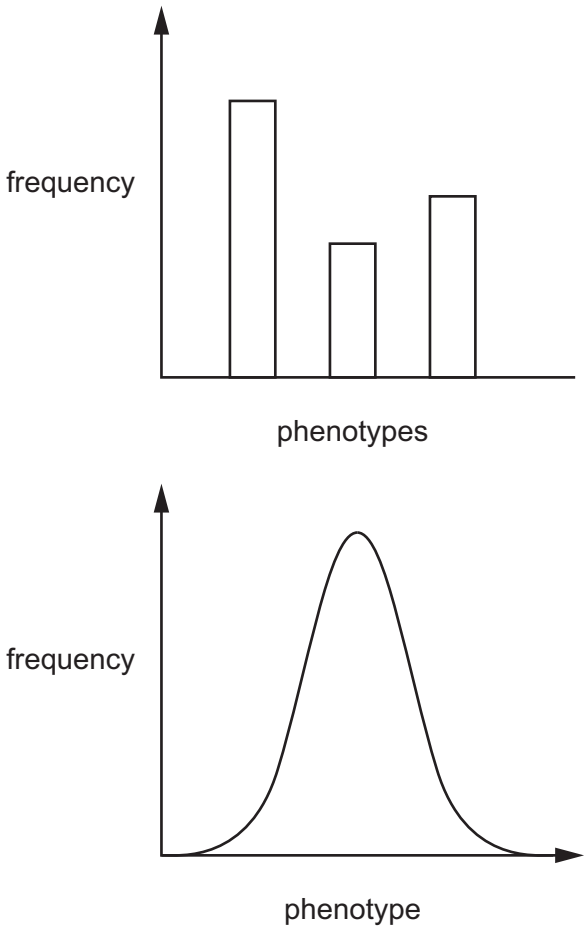
Table 6.1

statement	continuous variation	discontinuous variation
no intermediate phenotypes		
range of phenotypes between two extremes		
usually caused by genes and environment		

[3]

(iii) Fig. 6.1 shows graphs of two types of variation.

On Fig. 6.1, state an example of a phenotype for each type of variation shown.



example .....

example .....

Fig. 6.1

[2]

(b) Complete the statements about mutation.

Mutation is a ..... change in which new

..... are formed.

The rate of mutation is increased by some chemicals and by

..... radiation.

[3]

[Total: 10]

7 Fig. 7.1 shows how some uses of land have changed from the year 1500 to the year 2000 in one country.

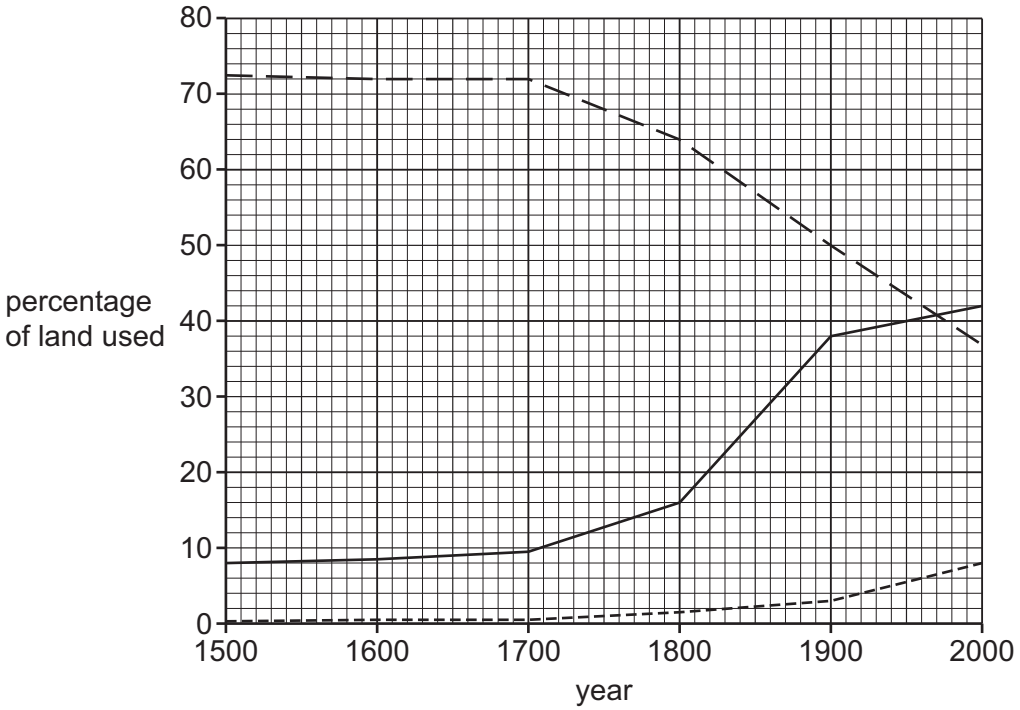


Fig. 7.1

(a) Using the data in Fig. 7.1:

View solution

(i) Identify the years when there was the largest increase in the percentage of land used for farming.

from ..... to ..... [1]

(ii) State the trend for the percentage of land used for housing.

View solution

.....

.....

..... [1]

(iii) State the year when the percentage of land used for forests and wild plants was equal to the percentage of land used for farming.

..... [1]

View solution

(b) Deforestation is one of the consequences of using land for farming.

View solution

Outline the undesirable effects of deforestation.

.....

.....

.....

.....

.....

.....

..... [3]

(c) State **one** way humans can damage **aquatic** environments.

..... [1]

[Total: 7]

View solution

8 **(a)** Yeast can respire anaerobically.

View solution

The box on the left shows the beginning of a sentence.

The boxes on the right show some sentence endings.

Draw **three** straight lines from the box on the left to the boxes on the right to make three correct sentences.

Anaerobic respiration in yeast	breaks down nutrient molecules.
	is a chemical reaction.
	only takes place in ribosomes.
	produces lactic acid.
	releases less energy than aerobic respiration.
	requires oxygen.

[3]

(b) State **two** ways anaerobic respiration in yeast is used in biotechnology.

View solution

1 .....

2 .....

[2]

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(c) A student investigated the effect of different glucose solution concentrations on the volume of gas produced by yeast.

View solution

The results are shown in Table 8.1.

Table 8.1

glucose solution concentration / mol per dm^3	time to produce 1 cm^3 of gas / s
0.1	121
0.2	100
0.3	85
0.4	60
0.5	45

The rate of gas production can be calculated using the formula:

$$\text{rate} = \frac{1}{\text{time}}$$

Calculate the rate of gas production for the glucose solution concentration of 0.4 mol per dm^3.

Give your answer to **two** decimal places.

..... cm^3 per s [2]

[Total: 7]

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