Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

BIOLOGY **0610/31**

Paper 3 Theory (Core) **October/November 2021**

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 **(a)** Fig. 1.1 is a diagram of part of the human circulatory system.

View solution

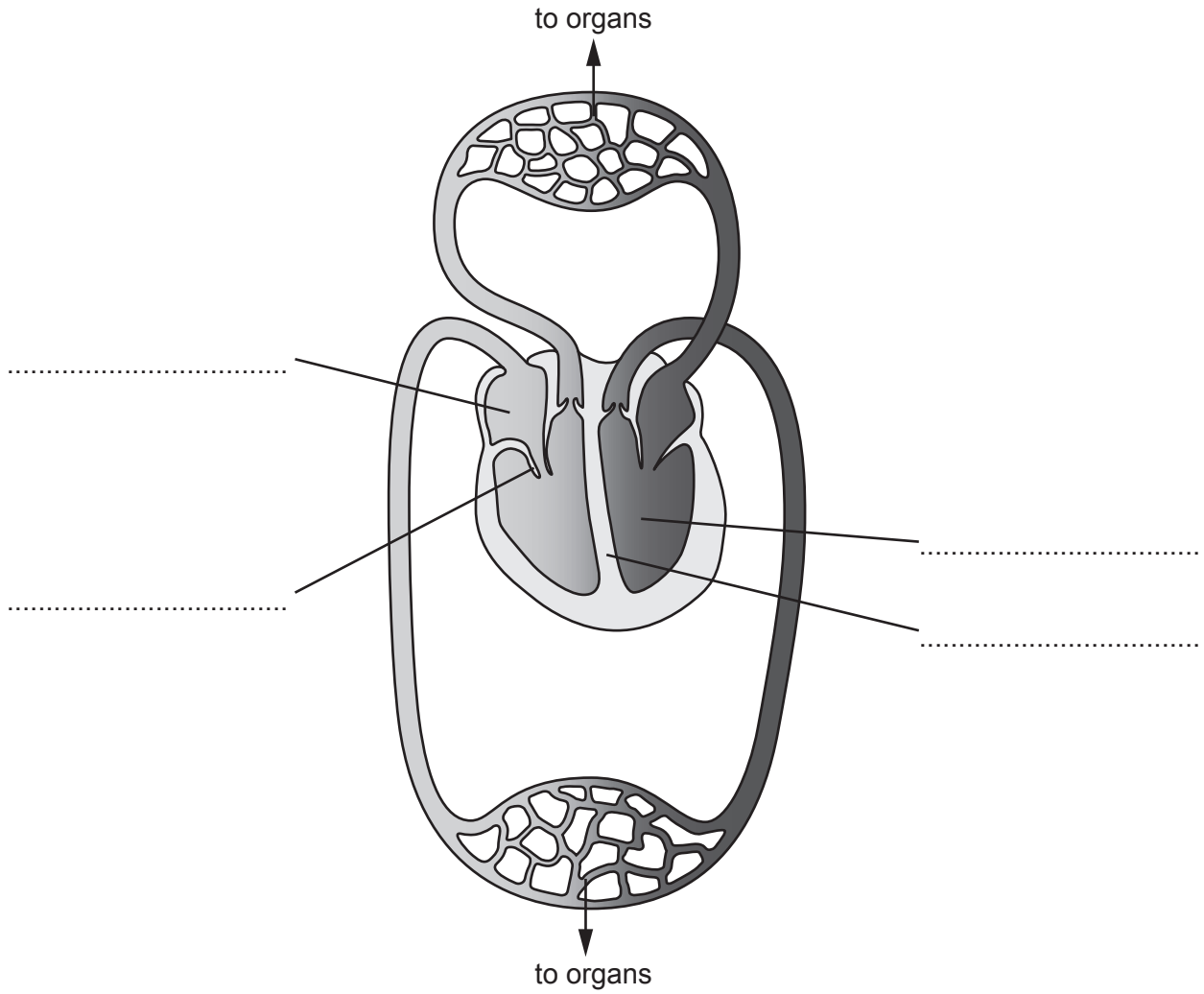


Fig. 1.1

(i) Identify and label on Fig. 1.1 in the spaces provided:

- the left ventricle
- the right atrium
- the septum
- a valve

[4]

(ii) Complete the flow chart of the circulatory system by writing the correct blood vessels from the list, in the spaces provided.

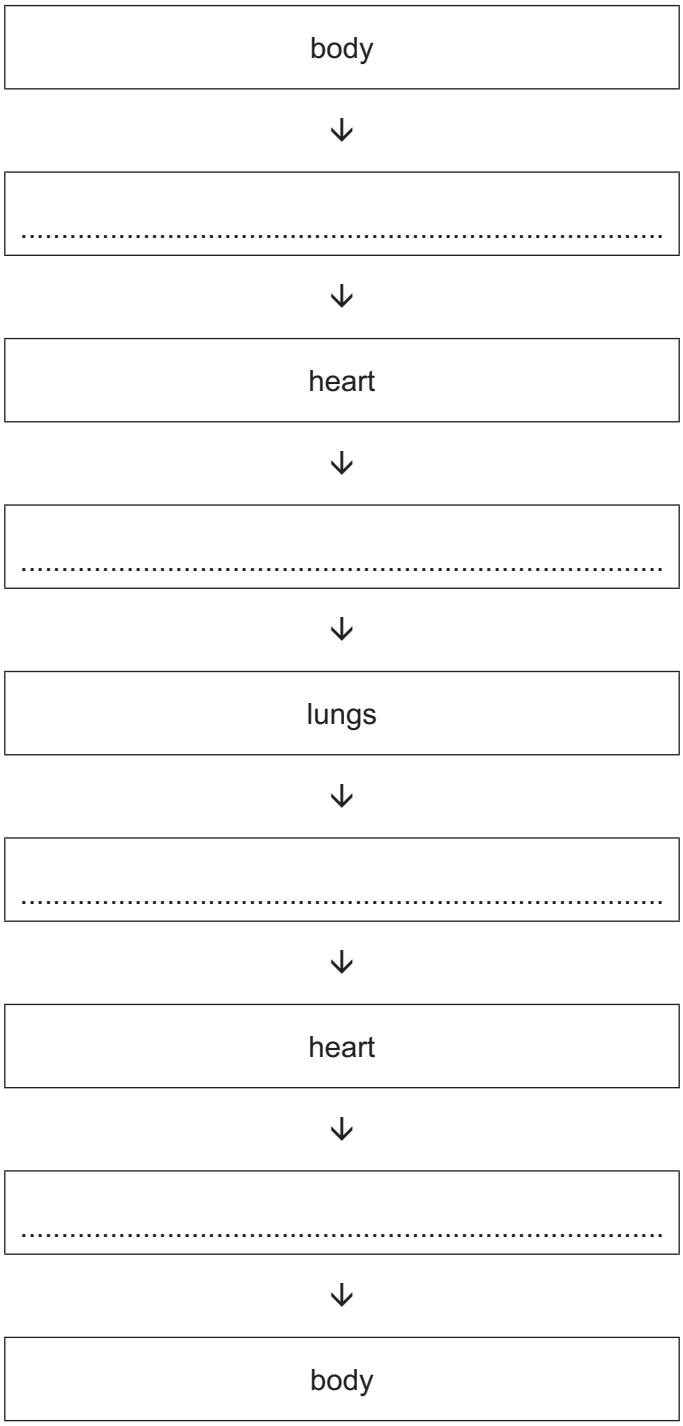
View solution

The arrows show the direction of blood flow.

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

aorta **pulmonary artery** **pulmonary vein**

renal artery **renal vein** **vena cava**



[4]

(b) A healthy diet is recommended to reduce the risk of coronary heart disease (CHD).

View solution

State **three** other risk factors for CHD.

1 .....

2 .....

3 .....

[3]

[Total: 11]

2 **(a)** Fig. 2.1 shows some of the processes involved in the water cycle.

View solution

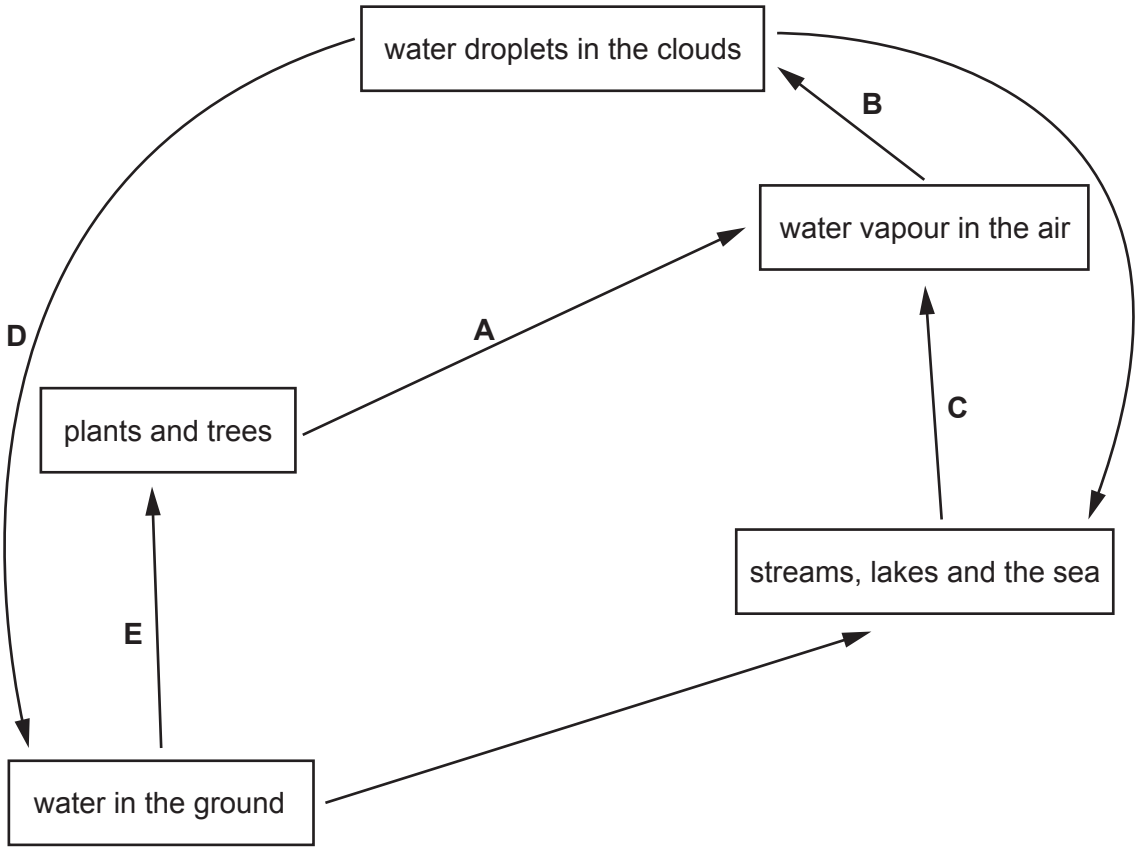


Fig. 2.1

(i) Identify the processes labelled **A** to **D** in Fig. 2.1.

A .....

B .....

C .....

D .....

[4]

(ii) Describe the process that occurs at **E** in Fig. 2.1.

View solution

.....

.....

.....

.....

.....

.....

..... [3]

(b) Some animals can only live in clean water that has a high concentration of dissolved oxygen.

Some animals can live in polluted water.

View solution

A student investigated which animal species lived in different locations in a river.

Fig. 2.2 is a diagram of the river. The numbers are the locations of where the student counted how many of each animal species were present.

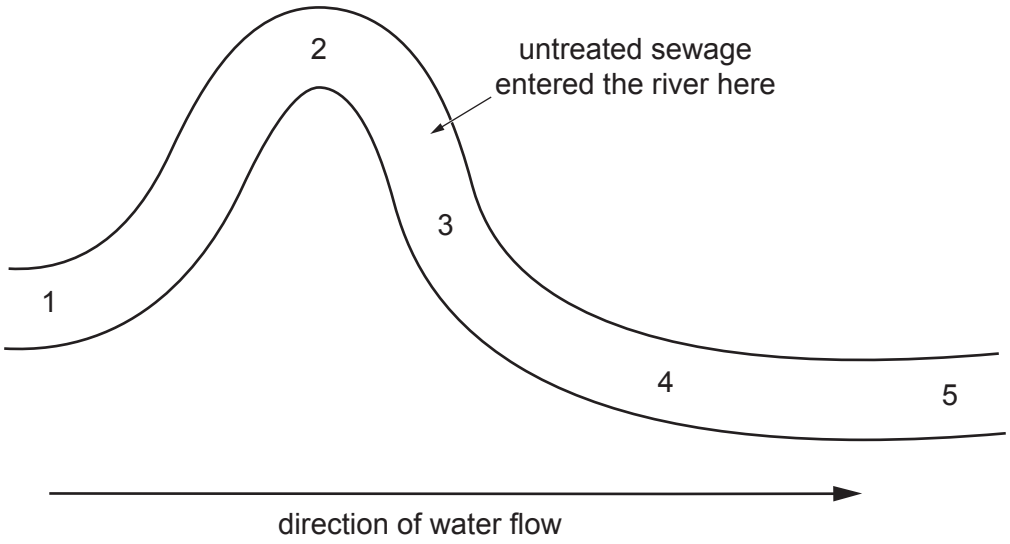


Fig. 2.2

The number of each animal species present is shown in Table 2.1.

Table 2.1

animal species	total number of each animal species found				
	location 1	location 2	location 3	location 4	location 5
mayfly nymph	76	78	0	0	0
freshwater shrimp	70	73	9	17	35
bloodworm	2	1	65	45	16
sludge worm	0	0	111	77	34

(i) State which location has the most animals present.

..... [1]

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(ii) Using the information in Fig. 2.2 and Table 2.1, suggest which animal species is unable to survive in polluted water. Give reasons for your choice.

species .....

reasons .....

.....

.....

.....

.....

.....

[3]

(iii) Suggest which animal species in Table 2.1 indicates that the water is polluted when it is present.

..... [1]

(iv) Calculate the percentage change in the freshwater shrimp numbers between location **2** and location **3**.

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

Space for working.

..... %

[3]

[Total: 15]

3 Enzymes help to digest food in humans and are produced by different parts of the alimentary canal.

(a) The box on the left contains a sentence beginning.

The boxes on the right contain some sentence endings.

Draw **two** lines to make two correct sentences about enzymes.

	are carbohydrates.
	are catalysts that slow down reactions and remain unchanged.
	are catalysts that speed up reactions and are changed.
Enzymes	are catalysts that speed up reactions and remain unchanged.
	are lipids.
	are proteins.

[2]

(b) Fig. 3.1 is a diagram showing an enzyme and several different substrate molecules.

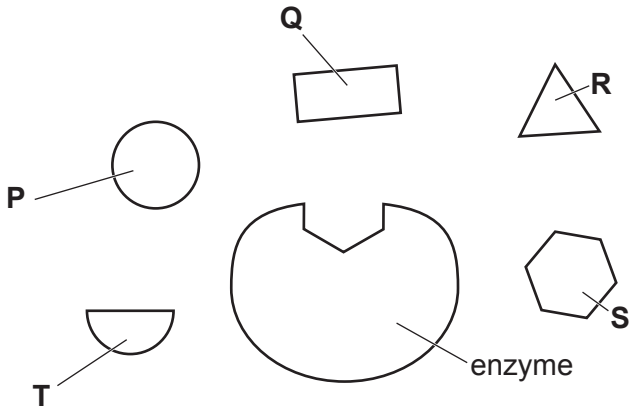


Fig. 3.1

State the letter of the molecule that is most likely to be the substrate for this enzyme.

.....

[1]

(c) Enzymes are involved in chemical digestion in humans.

View solution

Define the term chemical digestion.

.....

.....

.....

.....

..... [2]

(d) Fig. 3.2 is a graph showing the effect of changes in pH on the activity of four different enzymes, **U** to **X**.

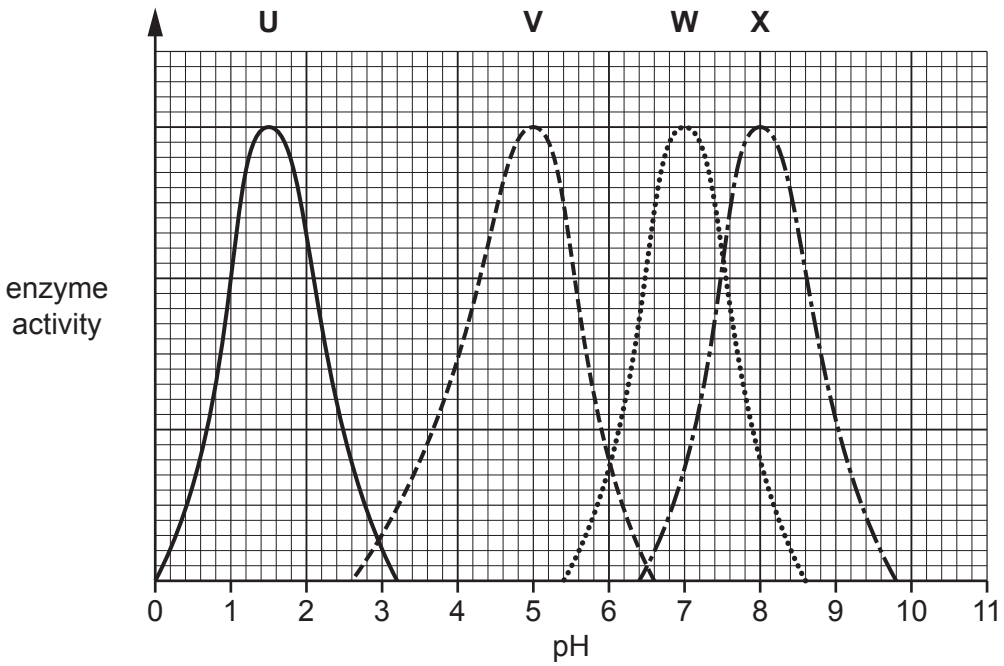


Fig. 3.2

The pH values in different parts of the alimentary canal were measured.

Table 3.1 shows the pH values found in the different parts of the alimentary canal.

(i) Use the information in Fig. 3.2 to state the letter of the enzyme that would be **most** active in each part of the alimentary canal.

Table 3.1

part of the alimentary canal	pH values	enzyme letter
duodenum	5.5	
ileum	8.0	
mouth	6.7	
stomach	1.5	

[2]

(ii) The duodenum and ileum are part of the small intestine.

State the name of **one** part of the large intestine.

..... [1]

(e) The acid in gastric juice provides an acid pH for enzymes.

View solution

(i) State **one** other function of the acid in gastric juice.

.....

..... [1]

(ii) State the name of the acid that is found in gastric juice.

View solution

..... [1]

(f) Table 3.2 shows the names of some enzymes, the substrate they act on and the products of the reaction they are involved in. It also shows the organ that secretes the enzyme.

View solution

Complete Table 3.2.

Table 3.2

enzyme	substrate	products	organ that secretes the enzyme
amylase	starch	.....	.....
.....	.....	fatty acids and glycerol	pancreas
protease	.....	amino acids	.....

[6]

[Total: 16]

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

View solution

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.

View solution

..... [1]

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

View solution

1 .....

2 .....

3 .....

[3]

[Total: 8]

5 **(a)** Complete the sentences using the words or phrases from the list.

View solution

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

different from **divide** **embryo** **gamete** **fuse**

fetus **identical to** **meiosis** **mitosis** **zygote**

In sexual reproduction, each parent organism produces a sex cell called a

..... . These cells are produced by a type of cell division called

..... .

The nuclei of two sex cells ..... to form a

..... in a process called fertilisation.

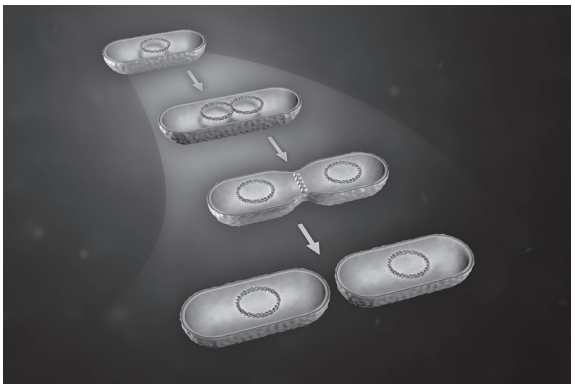
The offspring are genetically ..... each other and their parents.

[5]

(b) Fig. 5.1 shows four examples of reproduction in living organisms.

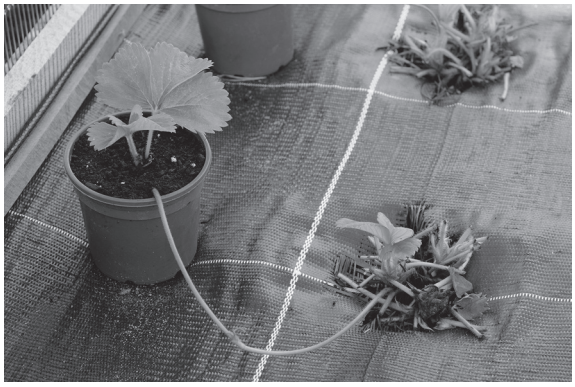


Q a sperm cell reaching an egg cell



R a single bacterial cell dividing

View solution



S a strawberry plant with offspring connected by a runner



T an insect pollinating a flower

Fig. 5.1

State the **two** letters in Fig. 5.1 that identify examples of asexual reproduction.

..... and .....

[2]

(c) Fig. 5.2 is a diagram showing all of the chromosome pairs in a cell from a human male. The twenty-third pair of chromosomes are the sex chromosomes.

View solution

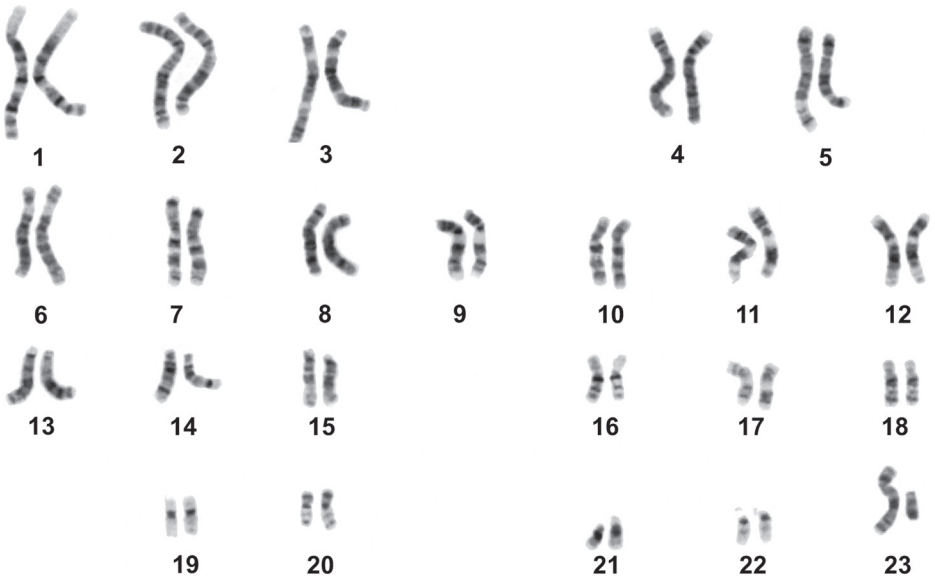


Fig. 5.2

Describe how the chromosomes in a human female differ from those shown in Fig. 5.2.

.....

.....

..... [1]

(d) Describe how insect-pollinated flowers are adapted for pollination.

View solution

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 12]

6 **(a)** **(i)** State the word equation for photosynthesis.

..... [2]

(ii) State the source of energy for photosynthesis.

View solution

..... [1]

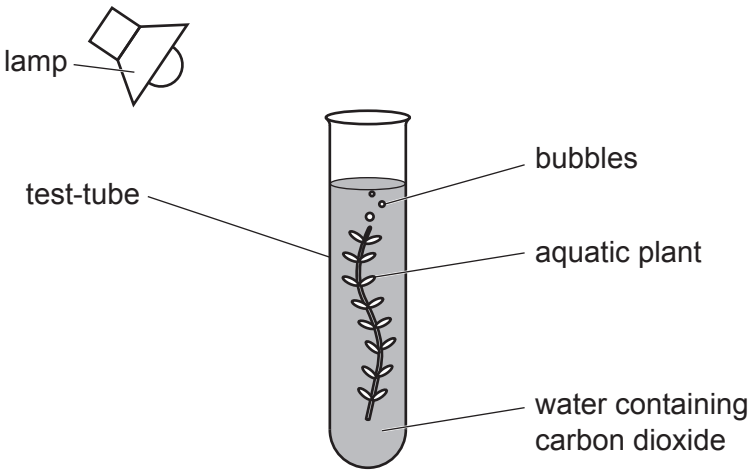
(iii) State the name of the structure in a cell where photosynthesis takes place.

..... [1]

(b) The effect of carbon dioxide concentration on the rate of photosynthesis in an aquatic plant was investigated.

- 10 test-tubes were prepared. Each contained water, an aquatic plant and a different concentration of carbon dioxide.
- Each test-tube was placed next to a lamp and the temperature in the test-tubes was maintained at 20 °C.
- The number of bubbles produced by each aquatic plant in one minute was counted.

Fig. 6.1 shows the apparatus that was used.



not to scale

Fig. 6.1

The results of the investigation are shown in Fig. 6.2.

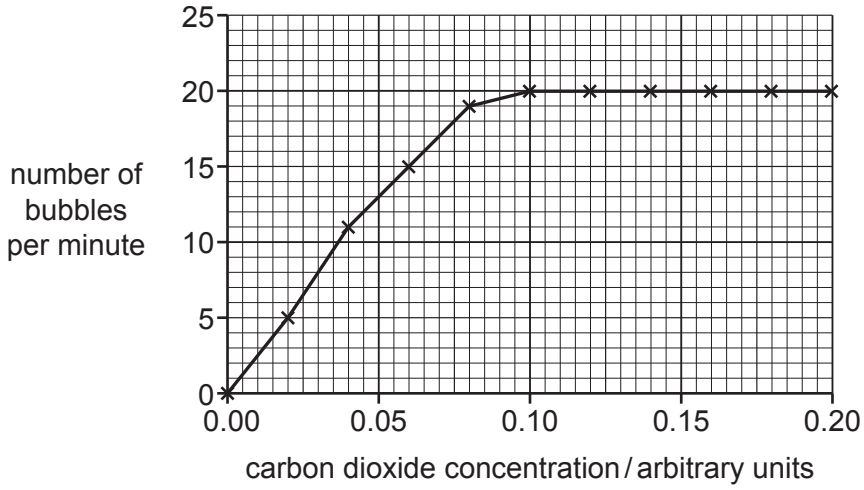


Fig. 6.2

(i) State the maximum number of bubbles produced in one minute.

..... [1]

(ii) The investigator concluded that 0.10 arbitrary units was the optimum (best) concentration of carbon dioxide for photosynthesis in this investigation.

Describe the evidence shown in Fig. 6.2 that supports the investigator's conclusion.

View solution

.....

.....

.....

.....

..... [2]

(iii) The investigation described in **6(b)** was repeated but the temperature was reduced from 20 °C to 10 °C.

Predict the effect of reducing the temperature on the number of bubbles produced and explain your answer.

prediction .....

.....

explanation .....

.....

.....

[2]

(c) Carbon dioxide is a greenhouse gas.

State the name of **one** other greenhouse gas.

View solution

..... [1]

[Total: 10]

7 **(a)** State the term used to describe the maintenance of a constant internal environment.

..... [1]

(b) Mammals can maintain a constant body temperature.

Complete the sentences by **circling** the correct word in each group of three words that are shown in bold.

Circle **five** words.

View solution

When a mammal becomes too cold the **effectors / hormones / receptors** detect a low body temperature and send information to the brain.

The brain coordinates the response. The **effectors / hormones / receptors** respond by raising body hairs to trap a layer of **air / oil / sweat** around the body to insulate it.

During shivering, the **blood / muscle / skin** cells contract and respire more, releasing heat.

Sweat production decreases so that heat transfer to the environment **decreases / increases / stays the same**.

[5]

(c) Drugs can alter the chemical reactions in the body.

View solution

State the names of **two** drugs that can act as depressants.

1 .....

2 .....

[2]

[Total: 8]

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