



Anglo-Chinese School (Independent)

COMMON TEST

YEAR FOUR EXPRESS

CANDIDATE
NAME

CLASS

PARENT'S
SIGNATURE

BIOLOGY

6093

21 April 2023, Friday

1 hour 45 minutes

READ THESE INSTRUCTIONS FIRST

Electronic calculators may be used.

Section A

There are thirty questions in this section. Answer **all** questions.

For each question, there are four possible answers, **A, B, C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Section B

Answer **all** the questions. The number of marks is given in brackets [] at the end of each question or part question.

Write your answers in the spaces provided on the Question Paper.

Write in dark blue or black pen.

You may use a pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

You are advised to spend no longer than 30 minutes on Section A and no longer than 1 hour 15 minutes on Section B.

For Examiner's Use	
Section A	
Section B	
1	
2	
3	
4	
5	
TOTAL	/ 80

This document consists of **19** printed pages, including this cover page.

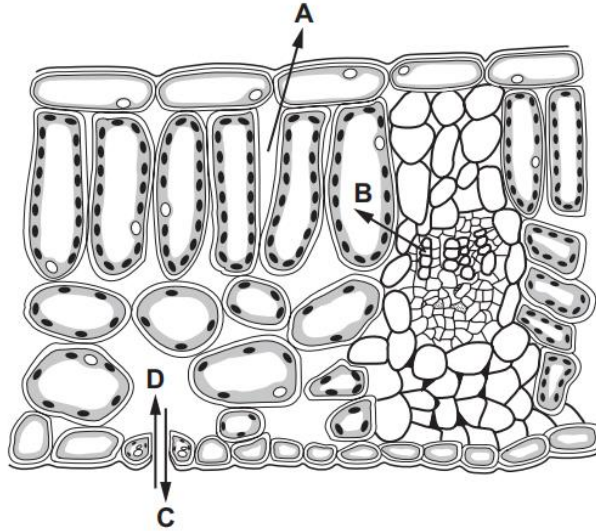
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Section A

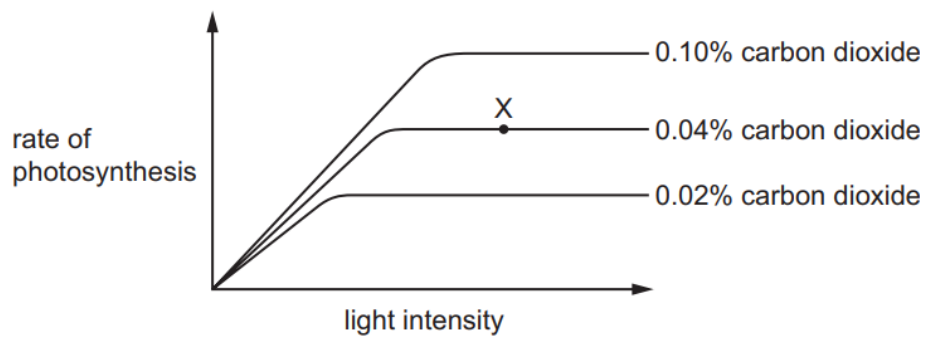
Answer **all** questions.

Record your choice in **soft pencil** on the separate Answer Sheet

- 1 The diagram shows a section through a leaf.
Which arrow shows the direction of diffusion of carbon dioxide on a sunny day?



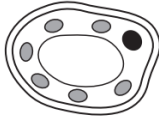
- 2 The graph shows how the rate of photosynthesis of a plant changes with light intensity, at three different carbon dioxide concentrations. In each case the temperature is 15°C.



What is the limiting factor for the rate of photosynthesis at point X on the graph?

- A carbon dioxide concentration
- B light intensity
- C surface area of the plant
- D temperature

- 3 The table shows diagrams of three types of cell found in a leaf. Which row correctly identifies each cell type?

			
A	spongy mesophyll	epidermis	xylem
B	spongy mesophyll	xylem	epidermis
C	xylem	epidermis	spongy mesophyll
D	xylem	spongy mesophyll	epidermis

- 4 Which description of the movement of water through a leaf is **not** correct?
- A Water evaporates into an air space from the higher water potential in the cell wall of a mesophyll cell.
- B Water moves from the higher water potential of the cytoplasm of a mesophyll cell to the lower water potential in its cell wall.
- C Water moves from the lower water potential of a xylem vessel to the higher water potential of a mesophyll cell.
- D Water vapour diffuses from an air space, through an open stoma, to the lower humidity of the surrounding air.
- 5 In an investigation, a leafy shoot was attached to a potometer and exposed to a variety of conditions. The time taken for the meniscus to move 50 mm along the capillary tubing was recorded for each set of conditions.

temperature / °C	humidity	air movement	time taken to move 50 mm /s
20	dry	not moving	125
20	dry	moving	71
30	dry	not moving	40
20	humid	not moving	166
20	humid	moving	83
30	humid	not moving	55

Which row shows the slowest and fastest rates of water uptake for this investigation?

	slowest rate / mm s ⁻¹	fastest rate / mm s ⁻¹
A	0.3	1.3
B	0.3	3.3
C	3.3	0.3
D	1.3	0.8

- 6 A region of a plant containing the vascular tissue is treated with a metabolic poison. How will this treatment affect the transport between roots and leaves via xylem and phloem?

	xylem	phloem
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key
 ✓ = transport continues
 ✗ = transport stops

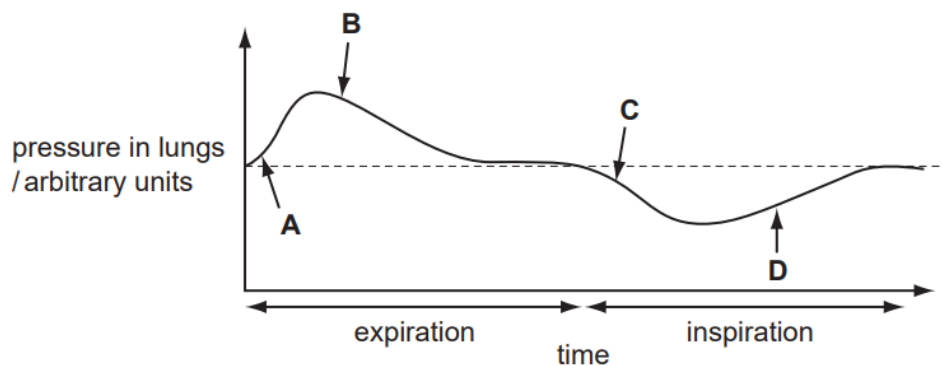
- 7 The diagrams show four components of blood. Which component produces antibodies?



- 8 At one point in the cardiac cycle, the pressure in the right ventricle is lower than that in the right atrium and lower than that in the pulmonary artery. Which row is correct?

	atrioventricular valve	semilunar valve
A	closed	closed
B	closed	open
C	open	closed
D	open	open

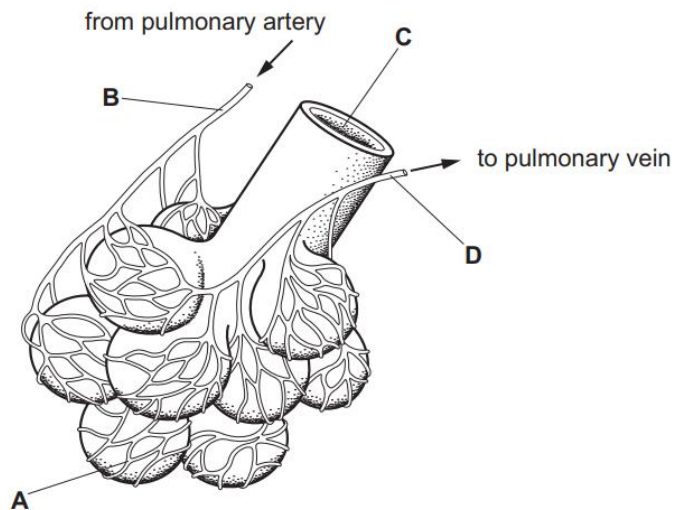
- 9 The diagram illustrates changes in air pressure taking place inside the lungs during a complete cycle of breathing. Which position on the graph corresponds to the point at which the ribs are beginning to be lowered?



10 What is the equation for aerobic respiration?

- A $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$
- B $\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2\text{C}_3\text{H}_6\text{O}_3$
- C $\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2\text{C}_2\text{H}_5\text{OH} + 2\text{CO}_2$
- D $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$

11 The diagram shows some of the structures in a human lung. Where is the carbon dioxide concentration highest?



12 Which feature of the human gas exchange system helps to maintain a steep diffusion gradient for gas exchange?

- A A large number of alveoli are present in each lung.
- B Alveoli walls contain elastic fibres allowing expansion.
- C The air brought into the alveoli by ventilation is high in oxygen.
- D The endothelium of the capillary wall is made of flattened cells.

13 Lactic acid builds up in the muscles during vigorous exercise. During recovery, how is this lactic acid removed?

- A aerobic respiration of lactic acid in the liver
- B anaerobic respiration of lactic acid in the muscles
- C excretion of lactic acid by the kidneys
- D removal of lactic acid by the alimentary canal

14 What are short-term effects of nicotine on the cardiovascular system?

- 1 constriction of small arteries
- 2 increase in heart rate
- 3 increase in blood pressure

A 1, 2 and 3

B 1 and 2

C 1 and 3

D 2 and 3

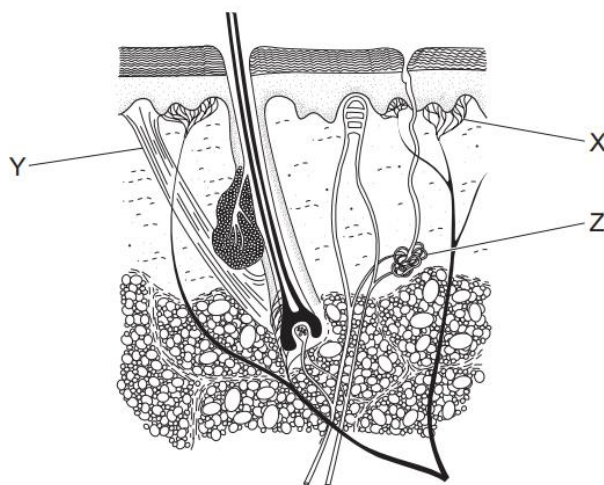
15 In a kidney machine, protein molecules are not lost from the blood. How is loss of protein prevented?

- A** Membranes prevent protein molecules diffusing out of the blood.
- B** Proteins are actively transported back into the blood.
- C** Proteins do not enter the kidney machine.
- D** The dialysis fluid contains protein, so there is no diffusion gradient.

16 Which organs remove excretory products from the blood?

- A** bladder and liver
- B** bladder and lungs
- C** kidneys and bladder
- D** lungs and kidneys

17 The diagram shows a section through human skin.



What are the structures labelled X, Y and Z?

	X	Y	Z
A	receptor	sweat gland	hair erector muscle
B	receptor	hair erector muscle	sweat gland
C	sweat gland	receptor	hair erector muscle
D	sweat gland	hair erector muscle	receptor

- 18 What would be the effects of vasodilation and sweating on the body temperature and on the amount of moisture on the surface of the skin?

	body temperature	moisture on skin surface
A	decreased	decreased
B	decreased	increased
C	increased	decreased
D	increased	increased

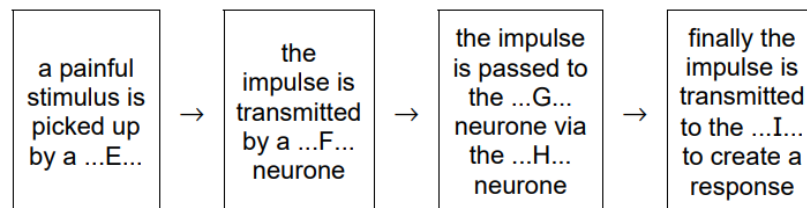
- 19 What is **not** an example of a simple reflex action?

- A** blinking when sand blows in your eyes
- B** jumping when hearing a loud noise
- C** removing your hand from a hot object
- D** steering a car to avoid hitting something

- 20 Hormones and the nervous system both control our bodies.
Which statement about the control provided by our hormones is correct?

- A** fast response and long lasting
- B** fast response and short lived
- C** slow response and long lasting
- D** slow response and short lived

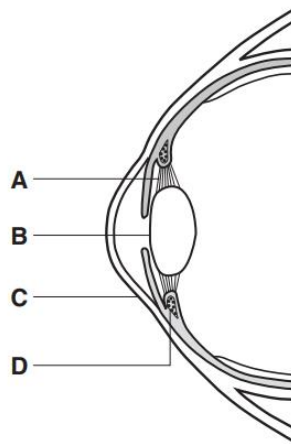
- 21 The flow chart describes a reflex action.



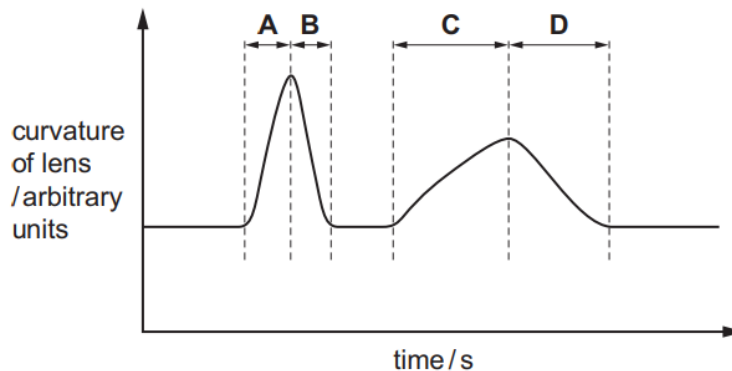
Which row correctly fills the flow chart?

	E	F	G	H	I
A	effector	relay	motor	sensory	brain
B	effector	sensory	relay	motor	receptor
C	receptor	sensory	motor	relay	effector
D	receptor	motor	sensory	relay	brain

- 22 The diagram shows a section through part of the human eye. Which part contains muscles?



- 23 The diagram shows the curvature of the lens in a person's eye. The shape of the lens changes as the person watches two motorbikes go past at different speeds. During which period was a motorbike moving away from the person at the higher speed?

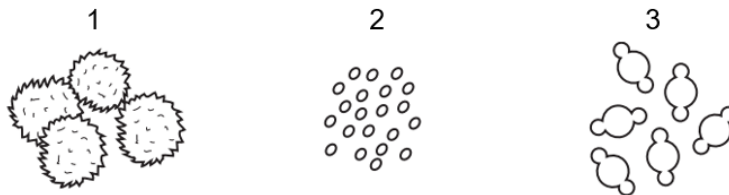


- 24 What are advantages of using sexual reproduction to produce crop plants?

- 1 It produces genetic variation to help breed new varieties of crop plant.
- 2 It ensures that crops have the identical characteristics.
- 3 It quickly produces many identical copies of a plant.

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

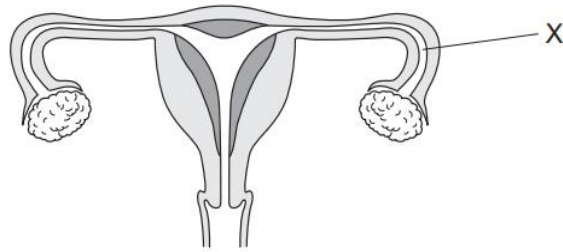
- 25 The diagrams show pollen grains from three different species of plant as they appear under the microscope. The diagrams are all to the same scale.



Which pollen grains are involved in wind-pollination?

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

- 26 The diagram shows the human female reproductive system.

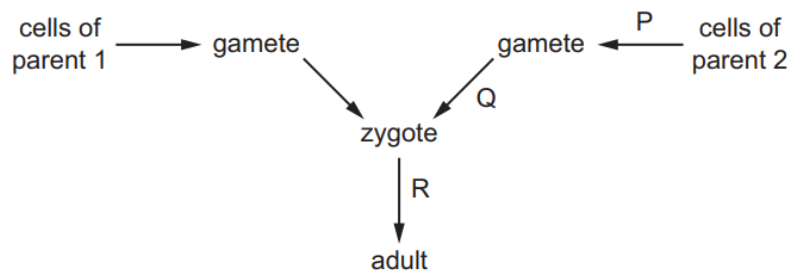


Sometimes a woman may be unable to have a baby because the tube at X becomes blocked. Which processes are prevented?

	fertilisation	implantation	ovulation
A	✓	✓	✓
B	✓	✓	x
C	x	✓	✓
D	✓	x	✓

key
 ✓ = prevented
 x = not prevented

- 27 The diagram represents stages in the life cycle of an organism.



Which arrow represents a process that results in haploid cells, and which represents mitosis?

	produces haploid cells	mitosis
A	P	Q
B	Q	R
C	R	Q
D	P	R

- 28 The spread of HIV has been reduced in many countries. Which action has assisted this reduction?
- A development of an effective vaccine
 - B health education
 - C treating patients with new antibiotics
 - D using drugs that slow the appearance of symptoms of HIV

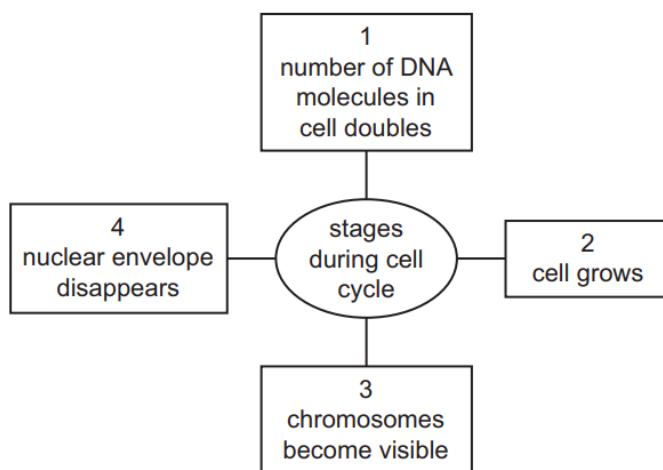
- 29 The diagram shows the chromosomes of four daughter cells produced by meiosis.



Which parent cell produced these cells?



- 30 The diagram shows some of the stages that take place during the cell cycle.



Which two stages take place during mitosis?

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

Section B

Answer **all** questions. Write your answers in the spaces provided.

- 1** Fig. 1.1 shows a drawing of an external view of human heart.

Two cross-sections were made of the heart:

- section 1 was made across the line **A–B**.
- section 2 was made across the line **C–D**.

Drawings of the two sections were viewed from above as shown by the arrow on Fig. 1.1. Fig. 1.2 is a drawing of section **A–B**. Fig. 1.3 is a drawing of section **C–D**.

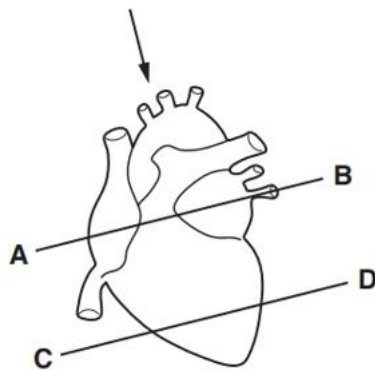


Fig. 1.1

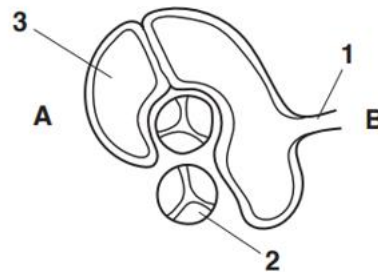


Fig. 1.2



Fig. 1.3

- (a)(i)** Name structures **1**, **2** and **3**, as shown in Fig. 1.2.

1

2

3

[3]

- (ii) Explain why the wall of chamber Y is thicker than the wall of chamber X, as shown in Fig. 1.3.

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.....

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.....[3]

Fig. 1.4 shows an angiogram of a heart before and after treatment for coronary heart disease. An angiogram is an image of the blood flow through the blood vessels of the heart.

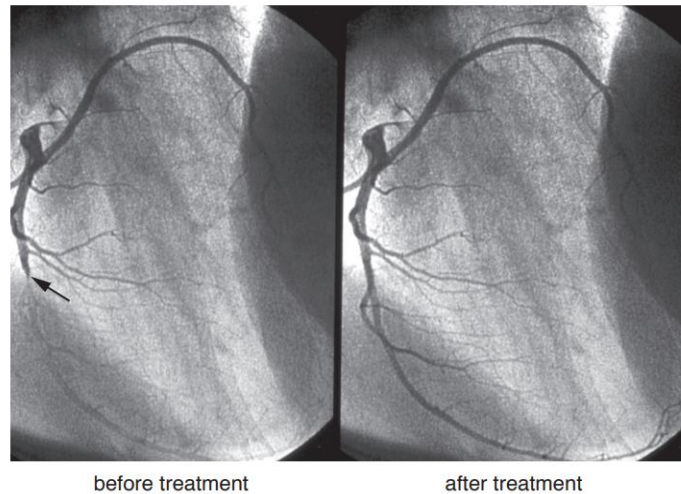


Fig. 1.4

- (b) The arrow on Fig. 1.4 shows the position of a blockage in a blood vessel before treatment.
 (i) State the name of the blocked blood vessel.

.....[1]

- (ii) The blockage is caused by a blood clot. Describe how a blood clot is formed.

.....

.....

.....

.....

.....

.....[3]

[Total: 10]

- 2 Insulin and glucagon are hormones secreted by the pancreas to control the concentration of glucose in blood.

(a)(i) Define the term, *hormone*.

.....

.....

.....

.....

.....[3]

- (ii) Complete Table 2.1 to show how the uptake of glucose by cells and the concentration of glucose in the blood respond when the two hormones are secreted.

Use the words *increases*, *decreases* and *stays the same* to complete the table.

Table 2.1

hormone	uptake of glucose by cells	concentration of glucose in the blood
insulin		
glucagon		

[2]

- (iii) Name another hormone that influences the concentration of glucose in the blood.

.....[1]

- (b) Explain why the control of the concentration of glucose in the blood is an example of negative feedback.

.....

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.....[4]

[Total: 10]

- 3 Fig. 3.1 shows a pollen grain with a pollen tube growing from it.

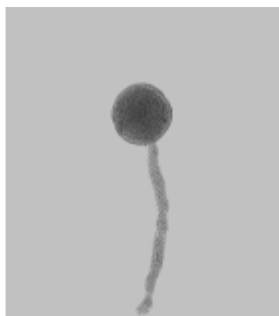


Fig. 3.1

Pollen grains from the same type of plant were placed in sucrose solutions of different concentrations for a fixed amount of time. After this time, the pollen grains and tubes were examined using a microscope.

The following observations were made for each concentration of sucrose:

- the number of pollen grains that had germinated to produce a pollen tube
- the length of each pollen tube.

Table 3.1 shows the results of the investigation.

Table 3.1

percentage sucrose concentration / %	percentage of pollen grains germinated / %	mean pollen tube length / mm
1	6	0.005
2	13	0.008
4	25	0.015
8	56	0.040
10	31	0.030
20	25	0.018
40	13	0.006

- (a)(i) Using information in Table 3.1, suggest the optimum concentration of sucrose solution for pollen tube germination and growth.

.....[1]

- (ii) Explain how the information in Table 3.1 enabled you to reach this conclusion.

.....

.....

.....[2]

(b) Fig. 3.2 shows a flower.

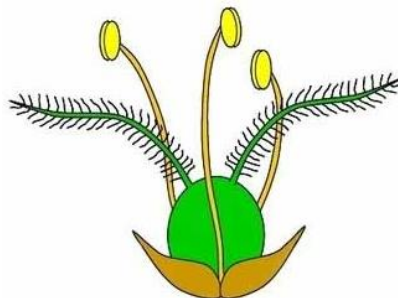


Fig. 3.2

(i) Suggest the mode of pollination in this flower and give a reason for your answer.

.....

.....

.....[2]

(ii) Describe the events that lead to the fertilisation of the gametes after the pollen grain has landed on the stigma.

.....

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.....

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.....[5]

[Total: 10]

- 4 Fig. 4.1 shows the changes in the thickness of the endometrium and the level of the two hormones produced.

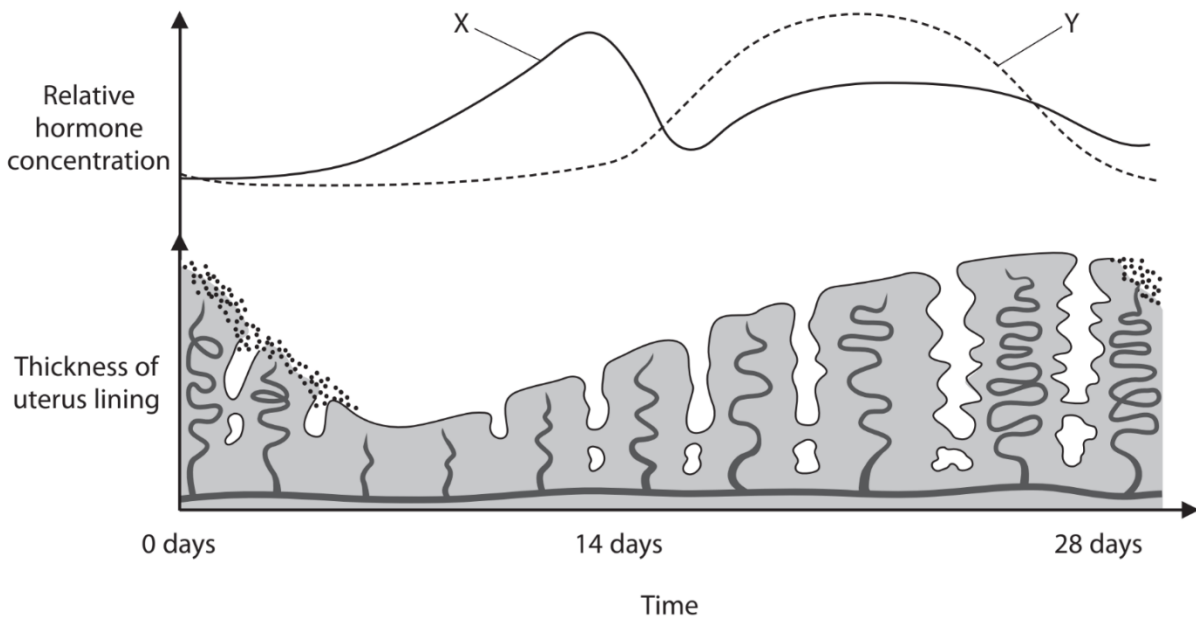


Fig. 4.1

- (a)(i) Name hormones X and Y.

X Y [2]

- (ii) State the roles of hormones X and Y during the menstrual cycle.

X

 Y
 [2]

Fig. 4.2 shows a human fetus in development.

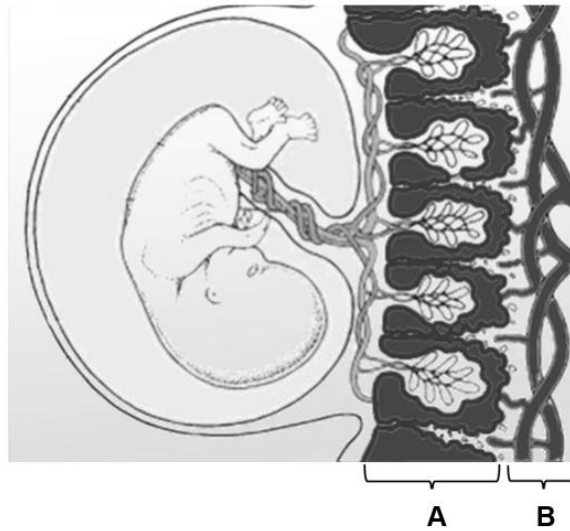


Fig. 4.2

- (b)(i)** Identify regions **A** and **B**.

A

B

[2]

- (ii)** Describe the functions of the amniotic sac and amniotic fluid until the end of pregnancy.

[4]

[4]

[Total: 10]

- 5 A student investigated the effect of light intensity on the rate of photosynthesis in *Elodea* sp.

The student changed the light intensity by placing a light source at different distances from the plant. For each set-up, he counted the number of bubbles of oxygen produced in three minutes.

The results of the investigation are shown in Table 5.1.

Table 5.1

distance of light source from the plant /cm	number of bubbles produced in three minutes	rate of bubble production /bubbles per minute
80	312	104
100	312	104
120	309	
140	264	88
160	162	54
180	96	32
200	57	19

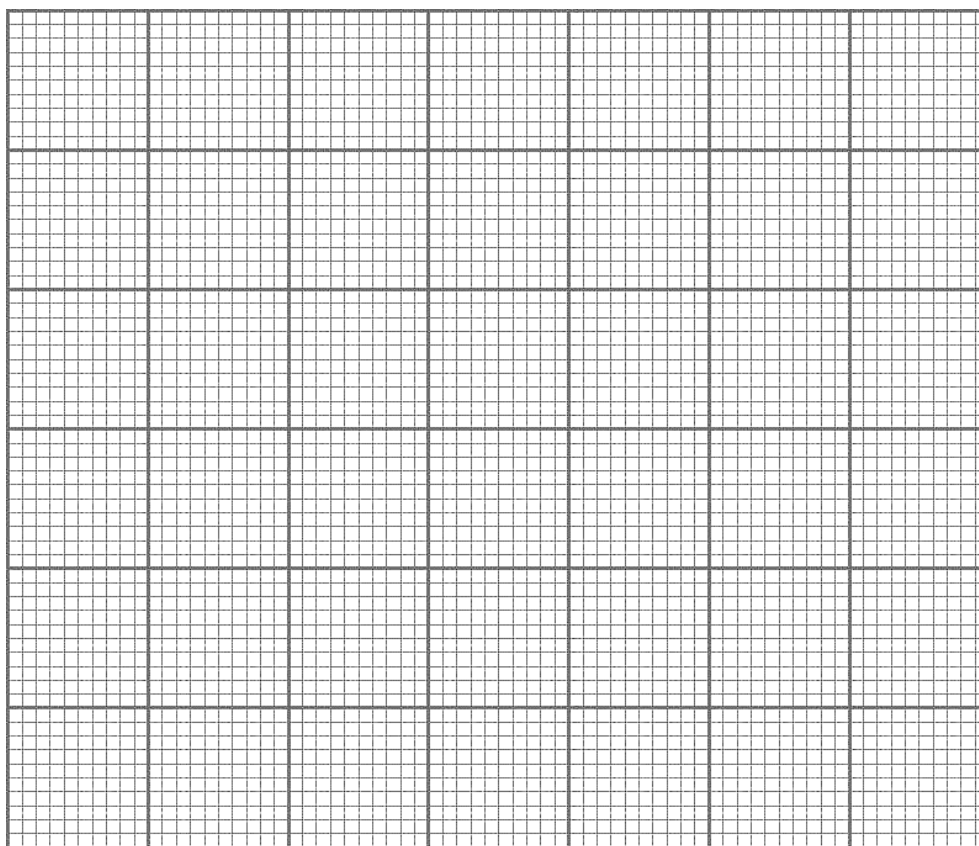
- (a)(i) Calculate the rate of bubble production when the light source was 120 cm from the plant.

.....bubbles per minute [1]

- (ii) State one variable that should be kept constant in this investigation.

.....[1]

- (b)(i) Plot the data in Table 5.1 to show the relationship between the distance of the light source from the plant and the rate of bubble production.



[4]

- (ii) Estimate, using your graph, the rate of bubble production per minute if the distance from the light source was 170 cm.

.....bubbles per minute [1]

- (iii) With reference to the graph, describe the pattern shown by the data.

.....

[2]

- (iv) The student repeated the experiment at a higher temperature. The student left the plant for ten minutes at the new temperature before starting to measure the rate of bubble production.

Suggest why the student waited for ten minutes before taking measurements.

.....
[1]

[Total: 10]

End of Paper