

Name: _____ ()

Class: _____

PRELIMINARY EXAMINATION
GENERAL CERTIFICATE OF EDUCATION ORDINARY LEVEL

BIOLOGY**6093/02****Wednesday 27 August 2025****1 hour 45 minutes****READ THESE INSTRUCTIONS FIRST**

Write your name, register number, and class on all the work you hand in.

Write in dark blue or black pen.

You may use a soft pencil for any diagrams or graphs.

Do not use paper clips, glue or correction fluid.

Answer **all** questions.

Write all answers in the answer space provided.

The use of a scientific calculator is expected, where appropriate.

You are reminded of the need for clear presentation in your answers.

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

For Examiner's Use	
Section A (70)	
Section B (10)	
10 Either	
10 Or	
Total (80)	

This document consists of **23** printed pages.



圣尼各拉女校
CHI J ST. NICHOLAS GIRLS' SCHOOL

Girls of Grace • Women of Strength • Leaders with Heart

[Turn over]

Section A

Answer **all** questions in this section.

Write your answers in the spaces provided.

- 1 a) Fig. 1.1 is a diagram representing the concentration of oxygen inside and outside an animal cell.

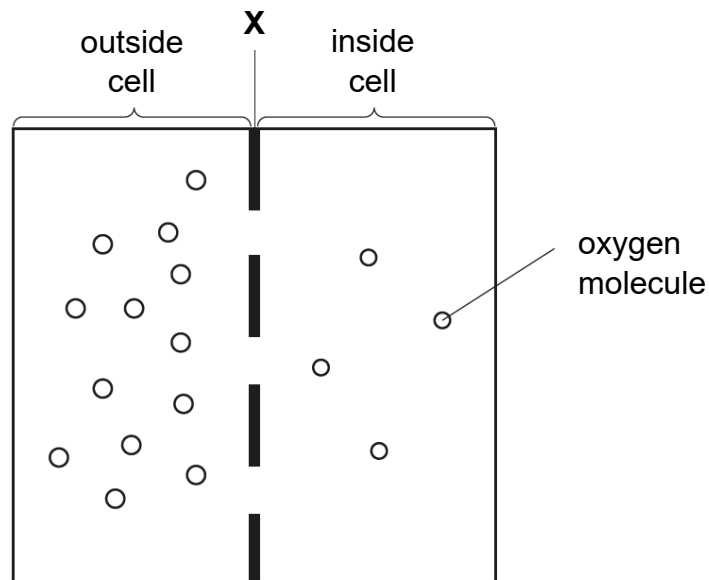


Fig. 1.1

- (i) Identify the part of the cell that **X** represents.

.....

[1]

- (ii) Draw an arrow on Fig. 1.1 to show the net direction of movement of the oxygen molecules in the absence of energy.

[1]

- b) Fig. 1.2 shows a dialysis machine for treating people who have kidney failure. The dialysate is a solution of glucose and salts.

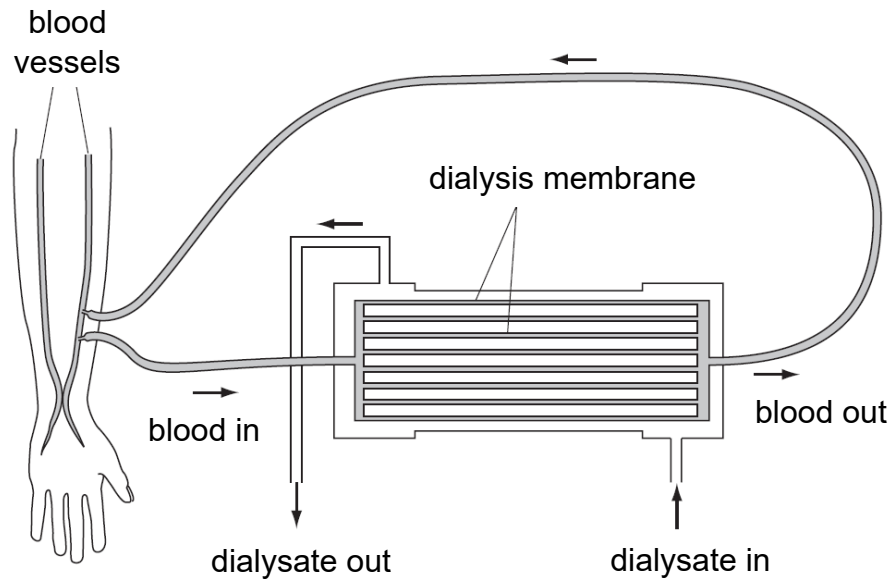


Fig. 1.2

When the patient is undergoing dialysis, explain

- (i) why red blood cells and blood proteins are not lost from blood,

.....
 [1]

- (ii) how the normal glucose concentration of blood is maintained.

.....

 [2]

A person with kidney failure received regular dialysis treatment for 17 days. Fig. 1.3 shows how the concentration of urea in the blood changed over the 17 days.

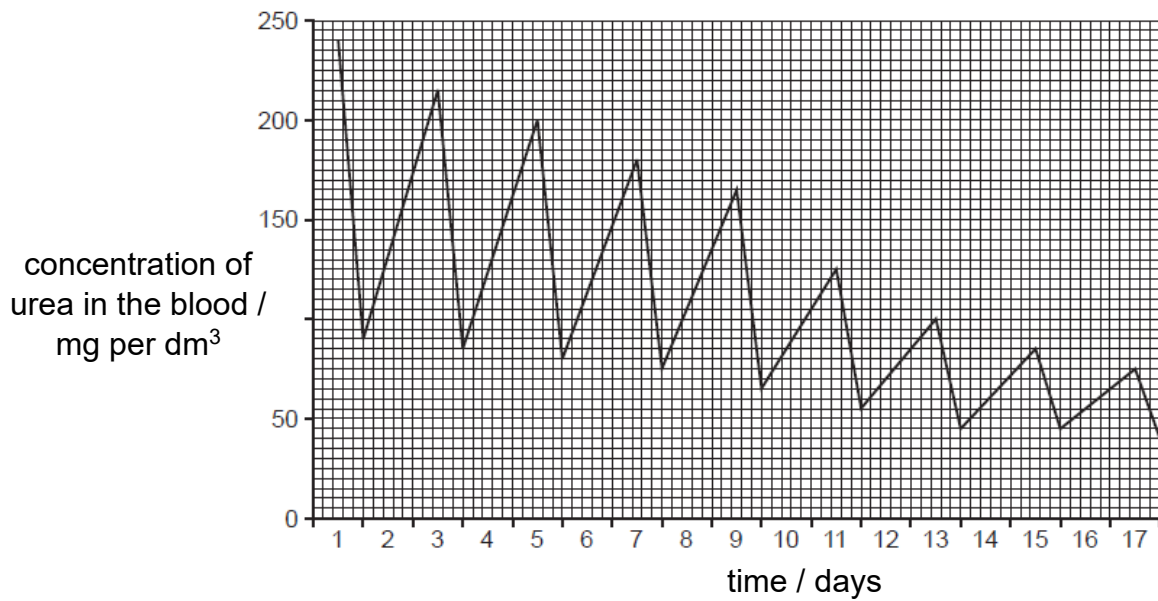


Fig. 1.3

(iii) State how many times the person received dialysis treatment.

..... [1]

(iv) The patient was given a restricted diet during his treatment. Suggest a possible restriction and explain how it leads to the overall decrease in urea concentration in the blood as shown in Fig. 1.3.

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.....

.....

..... [2]

[Total: 8 marks]

2 Fig. 2.1 shows two structures found in the human digestive system.

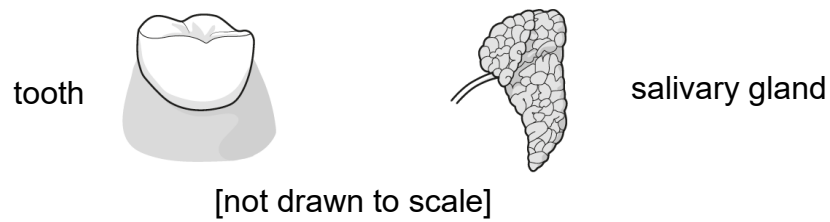


Fig. 2.1

a) Describe and explain how the tooth and the salivary gland contribute to digestion.

Tooth:

.....

.....

.....

Salivary gland:

.....

.....

.....

[2]

b) A hormone called gastrin stimulates cells in the stomach wall to release the substances involved in digestion. Some of the gastrin is produced in the duodenum.

Describe how this gastrin reaches the stomach.

.....

.....

[1]

c) Explain why bile is not considered a digestive enzyme.

.....

.....

.....

[2]

- d) Fig. 2.2 shows the stages involved in protein synthesis. The segment **A** codes for a polypeptide.

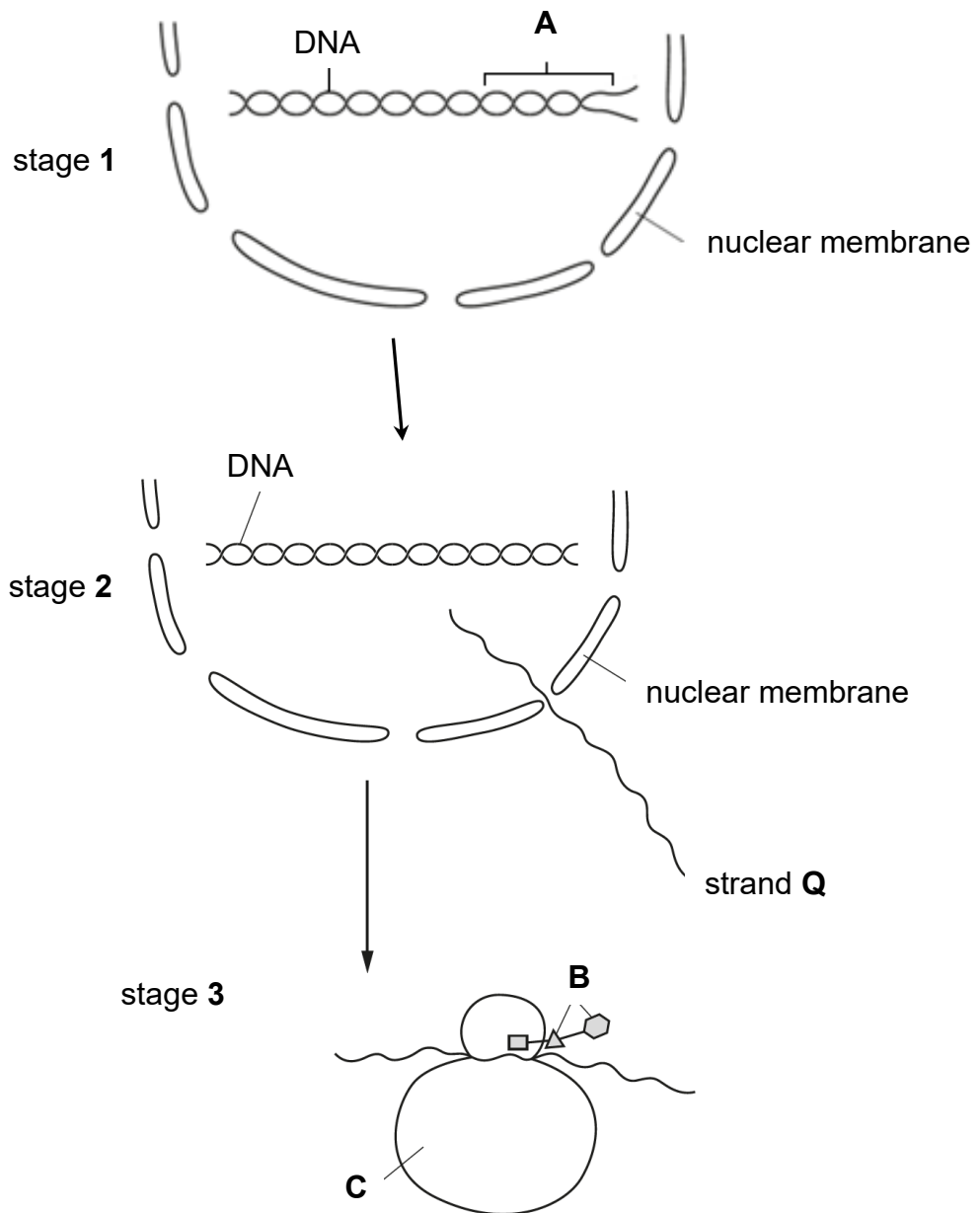


Fig. 2.2

- (i) State the name of the parts represented by the letters **A**, **C**, and **Q** in Fig. 2.2.

A:

C:

Q:

[3]

- (ii) State what determines the order in which the parts labelled **B** are assembled.

.....

[1]

(iii) State a difference between DNA and strand Q.

.....
 [1]

[Total: 10 marks]

3 A researcher investigated the effect of temperature on two different biological washing powders, **A** and **B**.

Two identical pieces of clothing of the same size were stained with the same type and amount of food.

The researcher timed how long each washing powder took to remove the stains, at different temperatures.

Fig. 3.1 is a graph of the results.

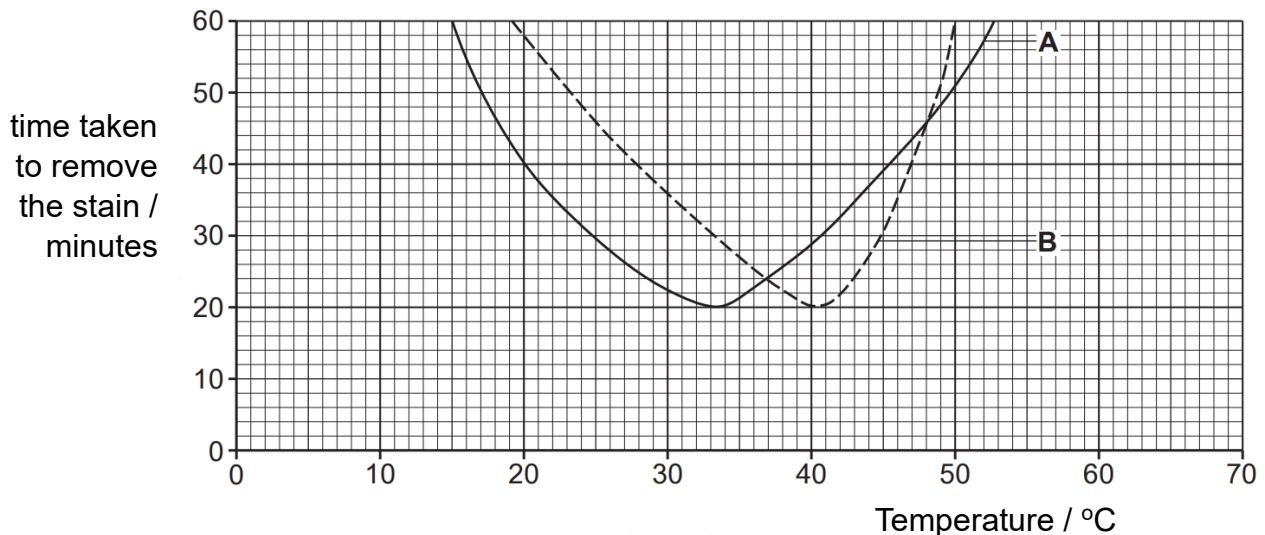


Fig. 3.1

a) With reference to Fig. 3.1, determine the time taken for washing powder **A** to remove the stain at 20 °C. Show on the graph how you arrived at your answer.

..... minutes [2]

b) With reference to Fig. 3.1, compare the effect of **A** and **B** on stain removal.

1.

2.

[2]

- c) State one factor, other than temperature, that affects enzyme activity.

..... [1]

[Total: 5 marks]

- 4 Fig. 4.1 is a diagram of a section through a human heart.

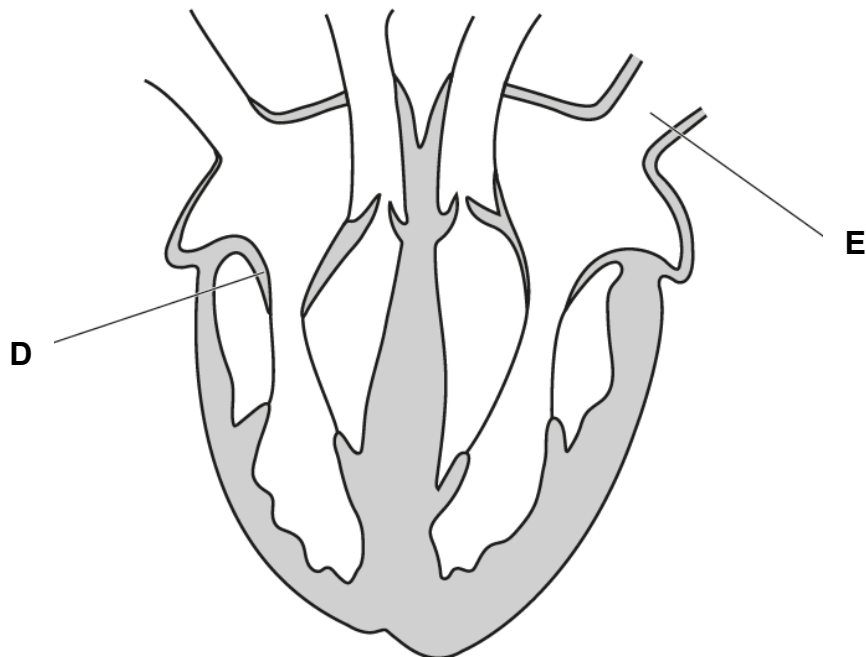


Fig. 4.1

- a) Name vessel **E** and state its function.

.....
 [2]

- b) Label the **left** ventricular wall "**F**" on Fig. 4.1 and explain why it is the thickest compared to other chamber walls.

.....

 [2]

- c) State and explain the consequence if the part labelled **D** in Fig. 4.1 cannot fully close.

.....

 [2]

[Total: 6 marks]

- 5 Ecologists study plants and animals in their natural environment. Some ecologists inserted probes into two positions of the same water-conducting tissue in trees, as shown in Fig. 5.1. The ecologists measured the time taken for water to move.

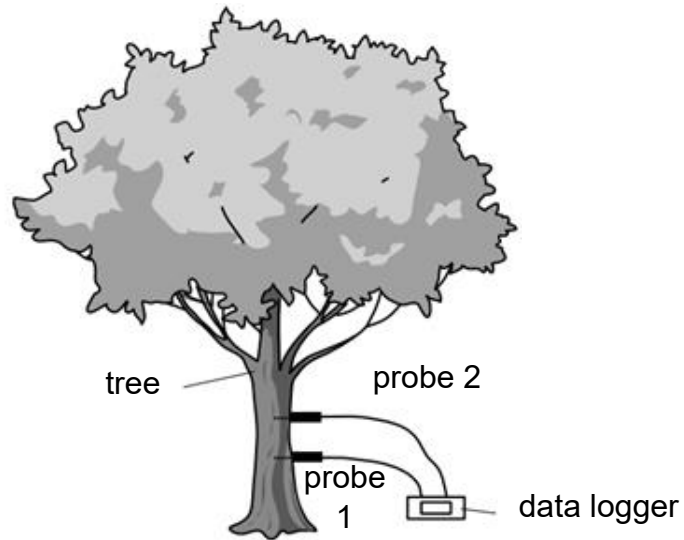


Fig. 5.1

- a) Name an adaptation these water-conducting tissues have.

.....

..... [1]

- b) Name the primary force that draws water up the water-conducting tissue.

.....

..... [1]

- c) Fig. 5.2 shows the rate of water conduction up three different trees in the same forest over 24 hours.

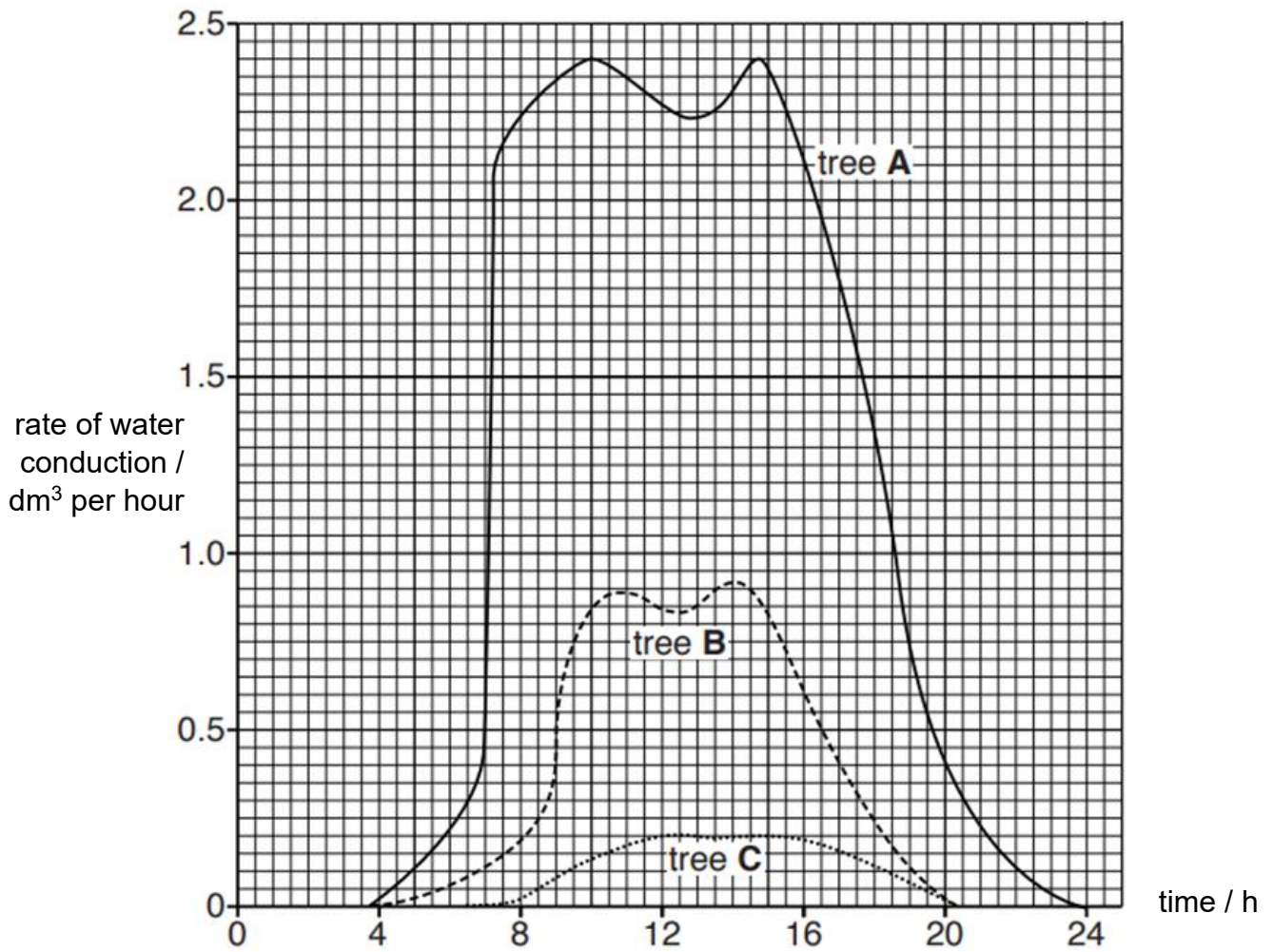


Fig. 5.2

- (i) Compare, in two ways, the rate of water conduction in tree **A** with tree **C** during this 24-hour period.

.....

.....

.....

.....

.....

[2]

- (ii) Suggest a reason for the different rates of water conduction in the three trees.

.....

.....

[1]

d) Describe two ways in which trees are important in our ecosystem.

.....

.....

.....

..... [2]

[Total: 7 marks]

6 A student investigated aerobic respiration in an insect.

Fig. 6.1 shows the apparatus the student used. The movement of the drop of coloured liquid towards the test tube is measured.

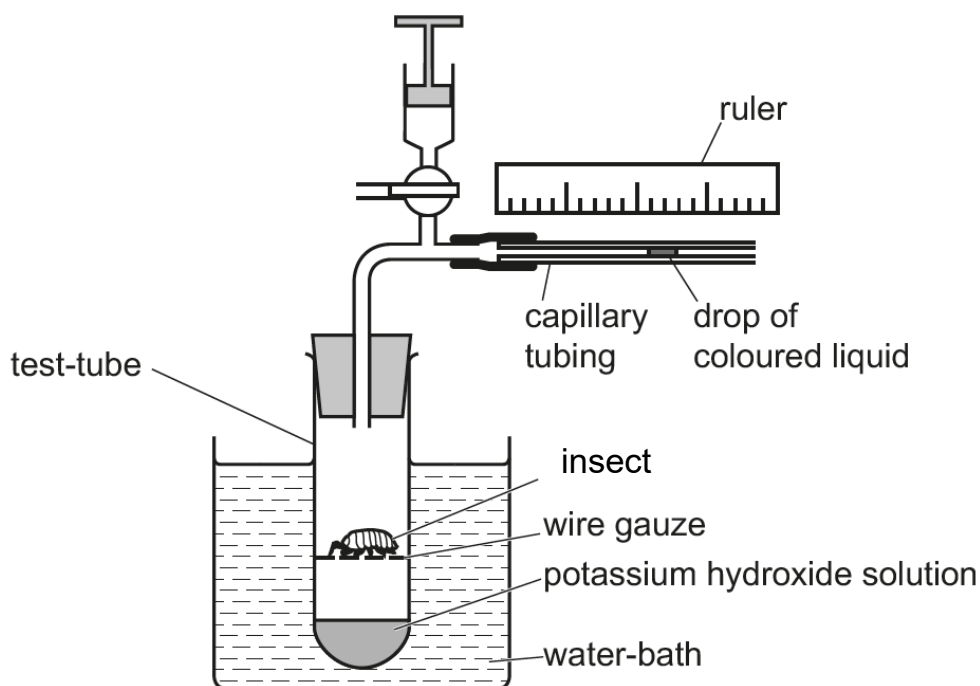


Fig. 6.1

- a)** With reference to Fig. 6.1, suggest the function of the potassium hydroxide solution.

.....
 [1]

- b)** Explain why the drop of coloured liquid would move towards the test tube.

.....

 [3]

- c) The coloured liquid moved 9 mm in 40 seconds. Calculate the distance moved by the coloured liquid in one minute. Leave your answer to 1 d.p.

..... mm [2]

[Total: 6 marks]

- 7 The United States Public Health Service released a poster providing guidance on how to prevent the spread of tuberculosis in 1950s.

Tuberculosis (TB) is caused by a pathogen which lives in the lungs and causes destruction of tissue. Tuberculosis, when exposed to the air, can form resistant spores. Once infected, patients experience fever, chest pain, and cough with bloody phlegm. Overcrowded living conditions encourage the spread of tuberculosis.

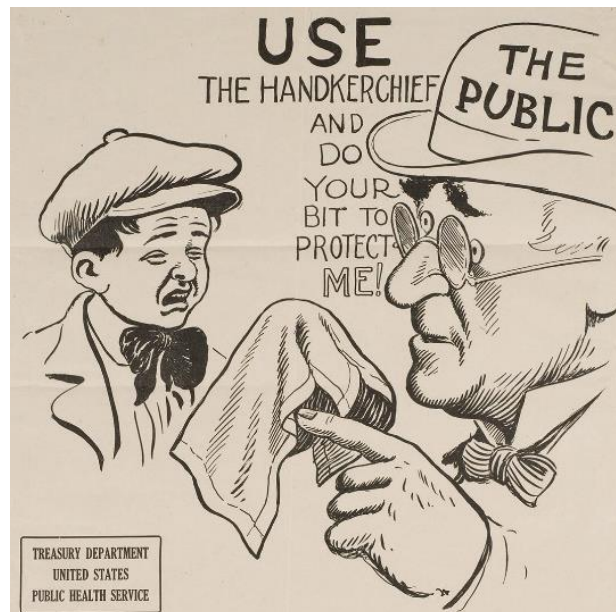


Fig. 7.1

- a) With reference to Fig. 7.1, suggest how tuberculosis may spread.

.....

[2]

- b) Suggest why treatment for tuberculosis involves antibiotics.

.....

[1]

- c) Describe how vaccination against TB helps prevent this disease from spreading.

.....

.....

.....

[2]

- d) Patients often experience emphysema upon recovering from the infection.

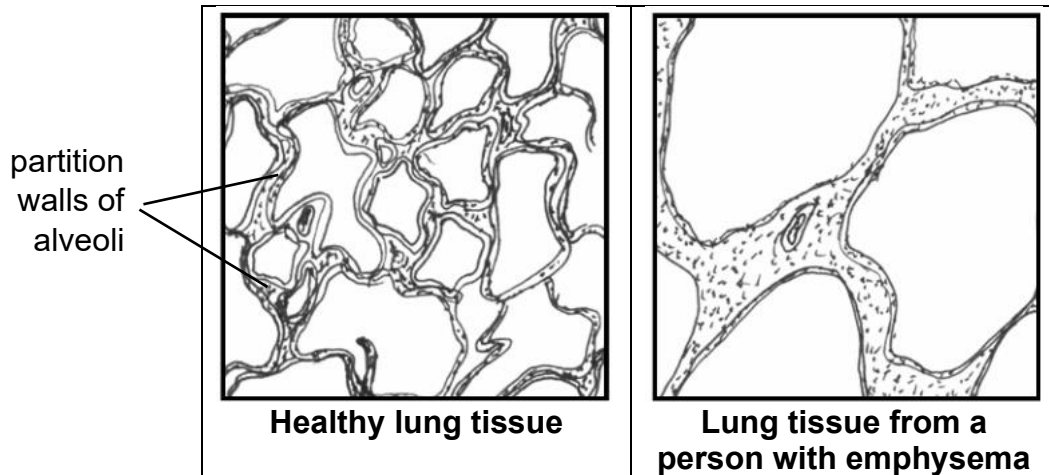


Fig. 7.2

With reference to Fig. 7.2, explain why these patients will pant easily while walking.

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.....

.....

.....

.....

[3]

[Total: 8 marks]

- 8 A sneeze can be triggered by dust irritating receptor cells in the lining of the nose or throat. During a sneeze, air is exhaled from the lungs with some force and the eyelids close.

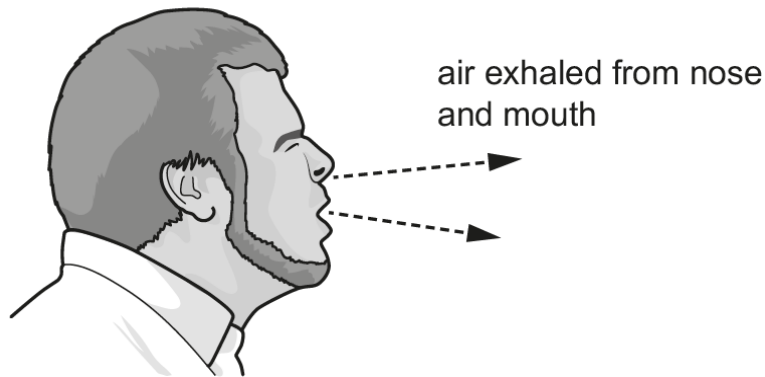


Fig. 8.1

- a) The man in Fig. 8.1 sneezed after inhaling some pollen from fragrant lilies. Describe the nervous pathway that leads to the closure of the eyelids during this reflex action.

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.....

[4]

- b) A sudden increase in light intensity can trigger sneezing in some people. This is called photic sneezing or having “sun sneeze”. It is estimated that 18 to 35% of the human population can be triggered to sneeze by an increase in light intensity.

Photic sneezing is caused by a dominant allele.

- (i) Describe what happens in the eyes when triggered by an increase in light intensity.

.....

.....

..... [2]

- (ii) Draw a Punnett square in the space below to show how two heterozygotes can have a child who does not sneeze in the sun. State the probability of having this child.

Let the dominant allele be represented by “*T*” and the recessive allele be presented by “*t*”.

.....% [3]

- (iii) State the type of variation this “sun-sneezing” is classified under.

..... [1]

[Total: 10 marks]

- 9 a) Fig. 9.1 shows a section through the anther of a lily flower. The cells in the centre are dividing by meiosis.

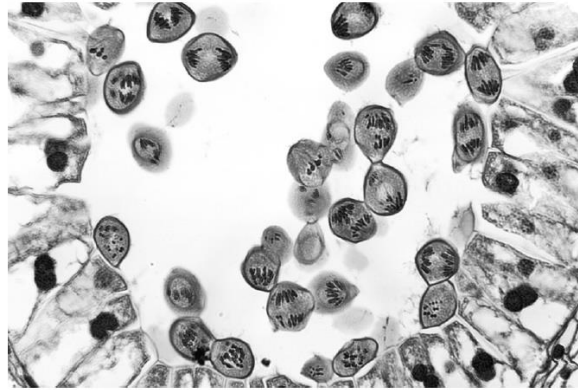


Fig. 9.1

Explain the importance of meiosis in sexual reproduction.

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.....

.....

[2]

- b) Fig. 9.2 shows a flower of *Lilium polyphyllum*, a lily that grows in the Himalayan mountains. This species is cross-pollinated by insects.



Fig. 9.2

- (i) Describe what is meant by *cross-pollination*.

.....

.....

.....

[2]

(ii) Name one feature visible in Fig. 9.2 that helps to attract insects.

.....
..... [1]

- c) Scientists think that plants of *L. polyphyllum* growing at high altitudes may evolve into a new species due to increased global temperatures.

Explain how natural selection could lead to the evolution of a new species of lily.

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..... [5]

[Total: 10 marks]

Section B

Question 10 is in the form of an **Either/Or** question.

Answer only **ONE** question.

EITHER

- 10** Fig. 10.1 shows the total mass of wild fish caught worldwide between 1950 and 2012 and the mass of farmed fish produced worldwide over the same period.

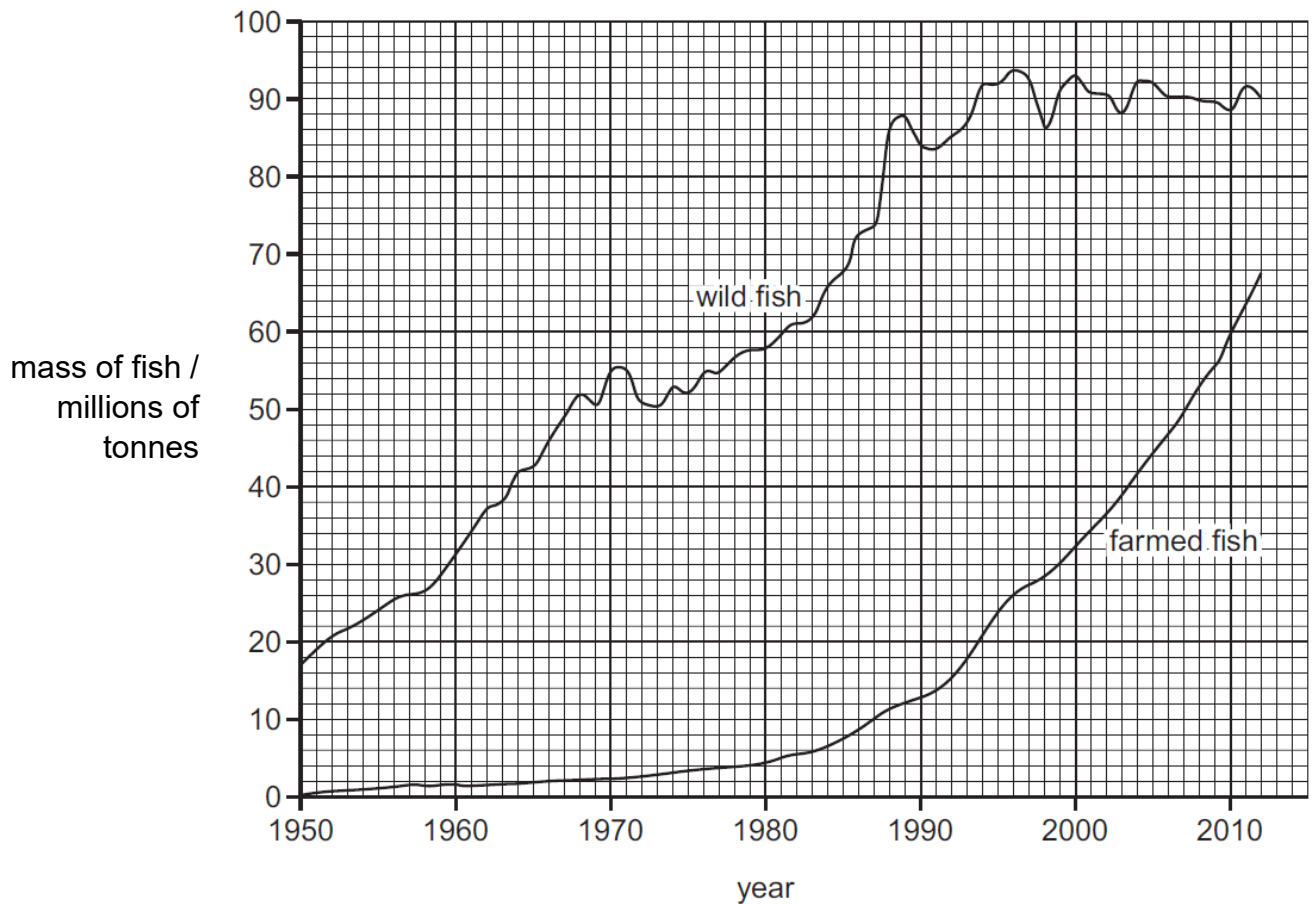


Fig. 10.1

- a)** With reference to Fig. 10.1, describe the changes in the mass of **wild fish** caught between 1950 and 1990.

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- b)** Fish farming involves stocking a farmer's lakes with a small number of wild fish and monitoring their growth. Results show that the population of fish in these farms tend to increase very quickly.

Suggest two reasons for the increase in fish population in fish farms.

.....

 [2]

- c)** Suggest one method governments can use to prevent overfishing.

.....
 [1]

- d)** The fish farms are located next to two large fruit farms so these farmers work closely together to monitor soil minerals, nitrogen, and phosphorus levels to prevent eutrophication from happening.

Explain how levels of minerals in soil of fruit farm can lead to eutrophication in the lakes and affect the fish population.

.....

 [4]

[Total: 10 marks]

OR

10 Fig. 10.2 shows the carbon cycle. **P**, **Q**, **R**, **S** and **T** each represent a part of the carbon cycle.

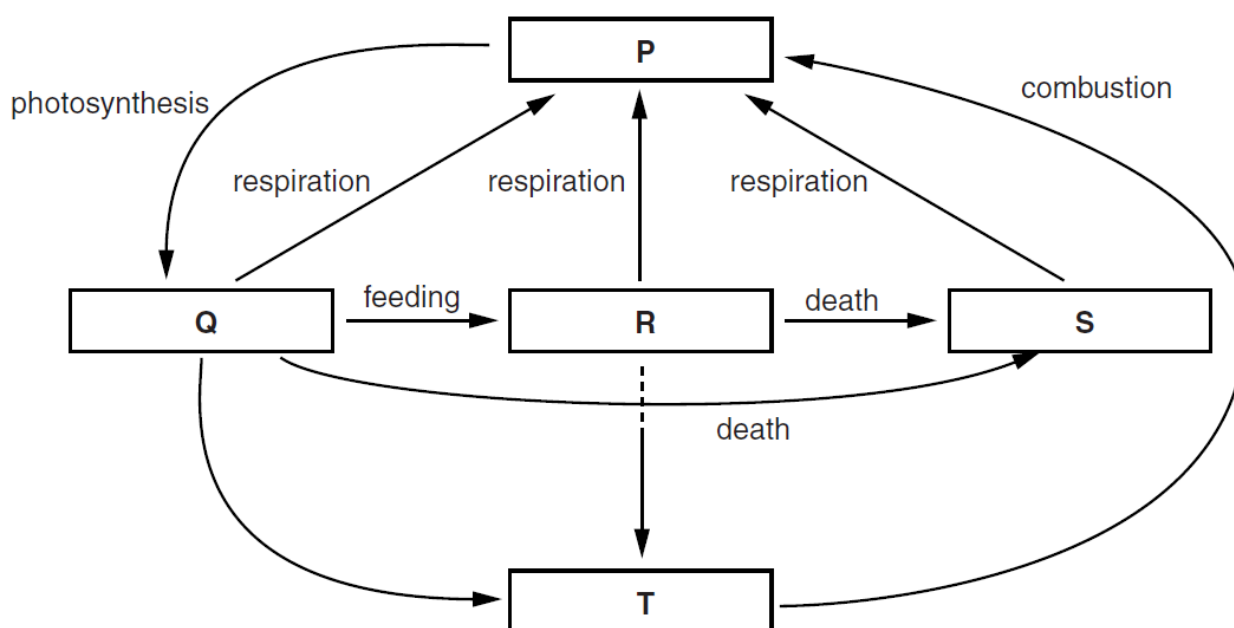


Fig. 10.2

- a) Complete Table 10.2 by identifying **P** and **Q** and the name of **one** example of a carbon compound found in each. **T** has been completed for you.

Table 10.2

letter	part of cycle	carbon compound found
P		
Q		
T	fossil fuels, e.g. natural gas	methane

[2]

- b) The relationship between **R** and **S** was studied to observe how healthy the ecosystem had become, via an energy flow analysis. Explain why only a small proportion of energy in **R** was transferred to **S**.

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.....

.....

[3]

- c) Improper methods of industrial combustion releases sulfur dioxide (SO_2), a pollutant that causes acid rain, so its atmospheric concentration has been monitored over years.

(i) Suggest a problem to aquatic living organisms caused by acid rain.

.....
 [1]

- (ii) Sulfur dioxide gas can be absorbed through the stomata, converted into sulfates, and transported to other parts of the plant, where it is assimilated into various amino acids like cysteine and methionine.

Scientists in China measured the concentration of sulfur dioxide (SO_2) in the atmosphere and sulfur in plant tissues from 1990 until 2005. They did not record any measurements between 1990 and 1996.

Their results are shown in Fig. 10.3.

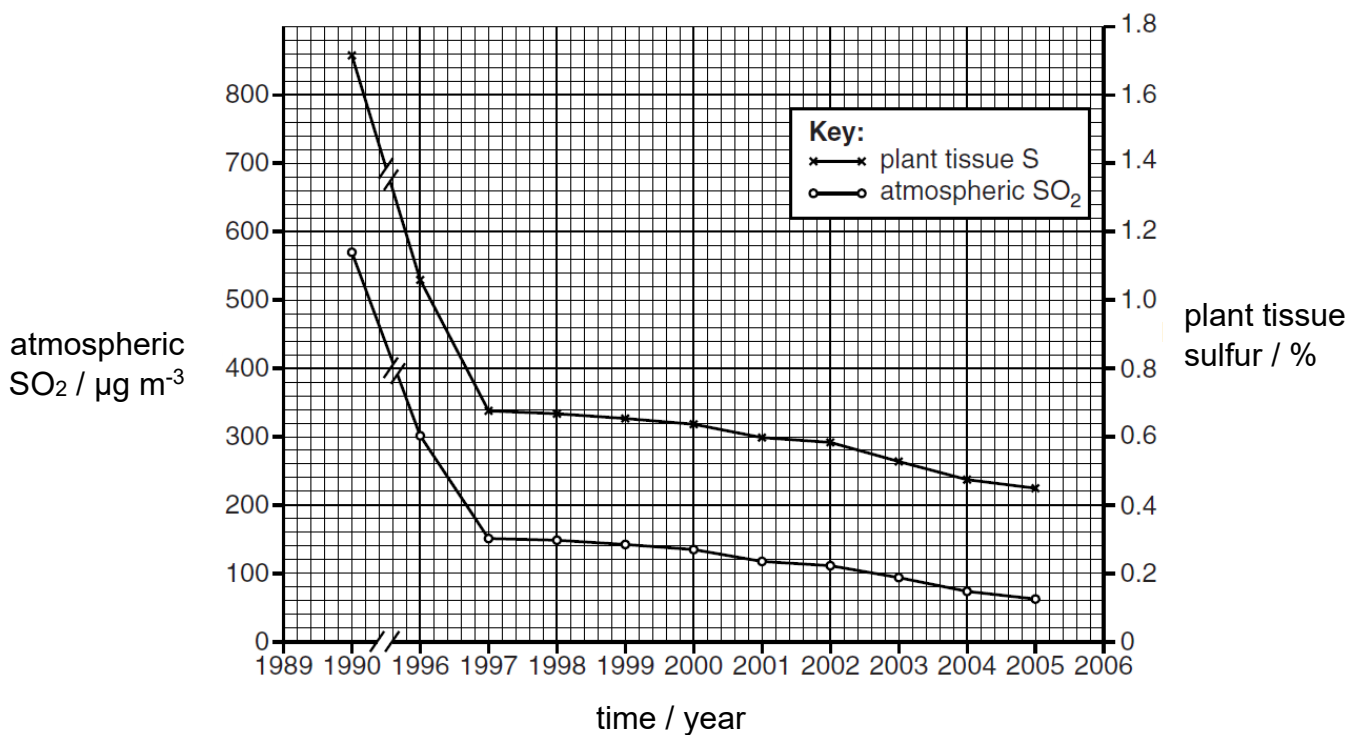


Fig. 10.3

Describe the trends in the concentrations of sulfur found in plant tissues as shown in Fig. 10.3.

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.....

..... [3]

- (iii) Suggest why the concentration of sulfur in the plant tissues was calculated as a **percentage** of the **dry mass** of the plant tissue.

.....

.....

..... [1]

[Total: 10 marks]