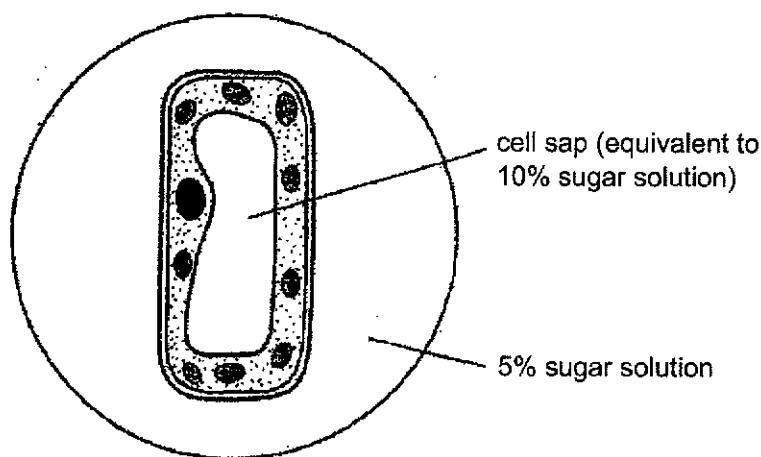


2019 Sec 4 Science Biology - Yuhua Sec

21 How does the cell wall help to maintain the turgor of a plant cell?

- A It maintains the concentration gradient.
- B It prevents mineral ions from leaving the cell.
- C It prevents water from leaving the cell.
- D It supports the cell membrane.

22 A plant cell containing sap with a concentration equivalent to 10% sugar solution is placed in a 5% sugar solution.



Which statement describes the movement of water?

- A into the cell through the cell membrane by osmosis
- B into the cell through the cell wall by osmosis
- C out of the cell through the cell membrane by osmosis
- D out of the cell through the cell wall by osmosis

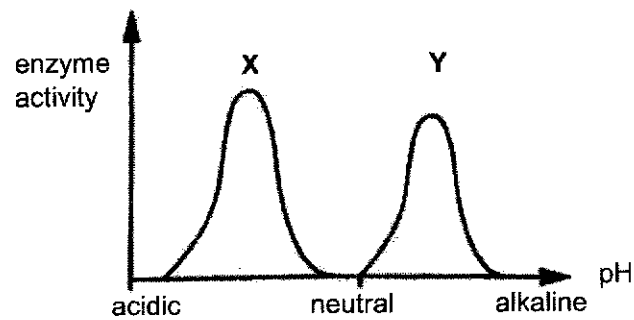
23 Which chemical element forms part of all protein molecules?

- A calcium
- B iron
- C magnesium
- D nitrogen

- 24 A food sample produces a cloudy white emulsion when mixed with ethanol. A violet colour develops when the biuret test is carried out.

Using these results only, what does the food sample contain?

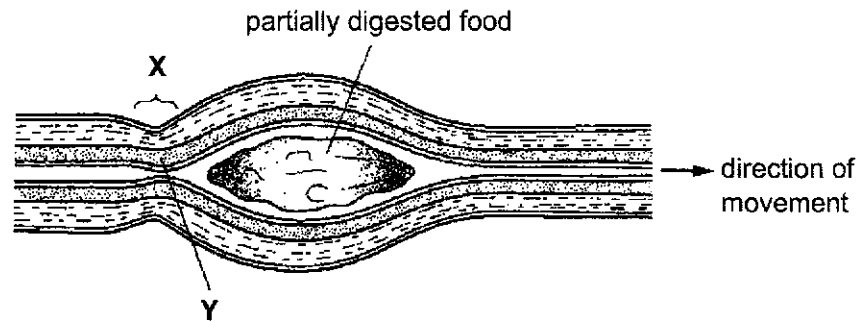
- A fat and protein
 B fat and starch
 C reducing sugar and protein
 D reducing sugar and starch
- 25 The diagram shows the effect of pH on the activity of two enzymes, X and Y, in the alimentary canal.



In which regions of the alimentary canal would these enzymes be most active?

| | X | Y |
|---|----------|----------|
| A | duodenum | stomach |
| B | duodenum | mouth |
| C | mouth | duodenum |
| D | stomach | duodenum |

- 26 The diagram shows some partially digested food moving along the small intestine.



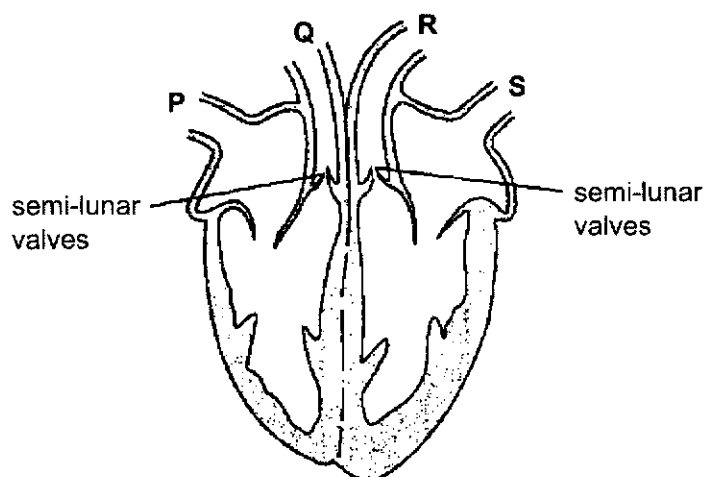
Which row is correct for muscle Y at region X?

| | muscle Y | |
|----------|--------------|---------------|
| | muscle type | muscle action |
| A | circular | contracting |
| B | circular | relaxing |
| C | longitudinal | contracting |
| D | longitudinal | relaxing |

- 27 Under what conditions of carbon dioxide concentration and temperature listed will there be the greatest rate of photosynthesis?

| | carbon dioxide concentration / % | temperature / °C |
|----------|----------------------------------|------------------|
| A | 0.03 | 15 |
| B | 0.03 | 30 |
| C | 0.1 | 15 |
| D | 0.1 | 30 |

- 28 The diagram shows a section through the human heart.

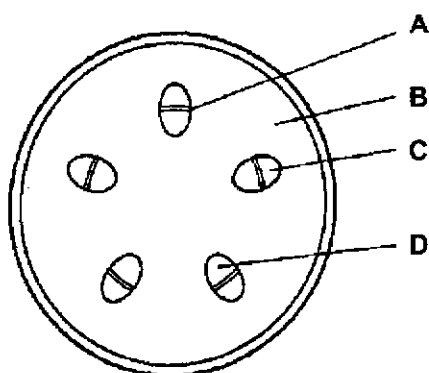


What happens as blood is pumped to the lungs?

| | semi-lunar valves | vessel through which blood passes to the lungs |
|----------|-------------------|--|
| A | open | P |
| B | open | Q |
| C | close | R |
| D | close | S |

- 29 The diagram shows a section through a stem of a plant.

Where does translocation take place?

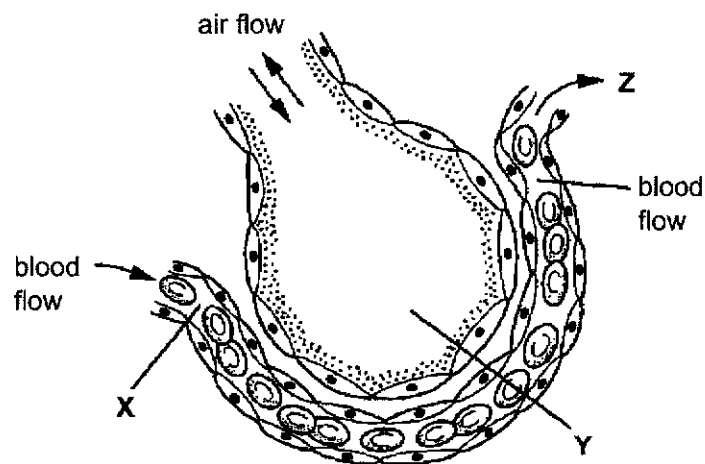


- 30 Four similar plants are growing under different conditions of temperature and humidity.

Which plant is likely to wilt first?

| | temperature | humidity |
|----------|-------------|----------|
| A | high | high |
| B | high | low |
| C | low | high |
| D | low | low |

- 31 The diagram shows a section through an alveolus and a blood capillary.



What describes the oxygen concentrations at X, Y and Z?

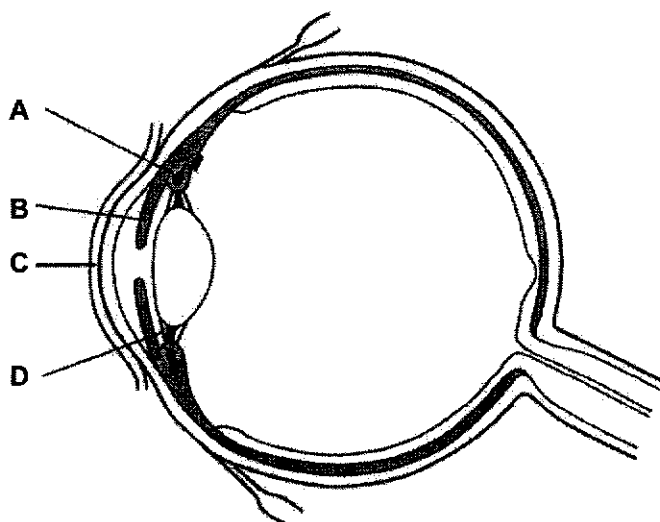
| | X | Y | Z |
|----------|------|------|------|
| A | high | low | high |
| B | high | low | low |
| C | low | high | high |
| D | low | high | low |

- 32 A finger that touches a hot object is quickly taken away from the source of heat.

What is the role of relay neurones in this response?

- A** to carry nerve impulses within the spinal cord
B to generate impulses in the receptors of the finger
C to link the sense organs to the sensory neurones
D to pass impulses from the motor neurones to muscles
- 33 The diagram shows a section through the eye.

Which structure is responsible for refracting light rays on the photoreceptors?

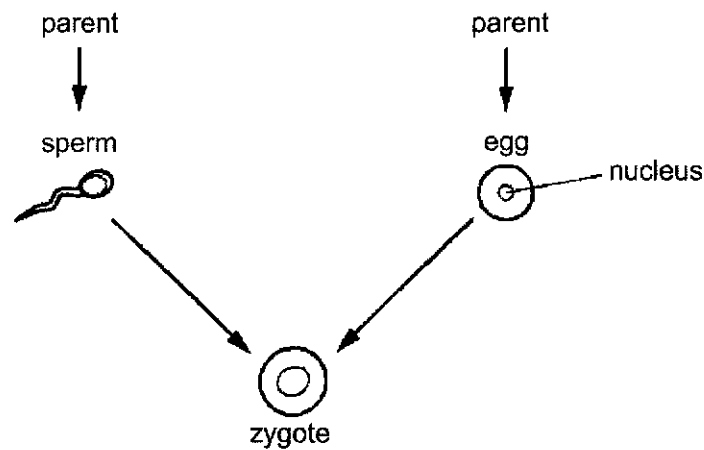


- 34 The table gives information about some hormones in the body.

Which information is correct?

| | hormone | target organ | effect |
|----------|--------------|--------------|---------------------------------------|
| A | glucagon | pancreas | decrease blood glucose concentration |
| B | insulin | liver | increases blood glucose concentration |
| C | oestrogen | uterus | repair of uterine lining |
| D | progesterone | ovaries | causes ovulation |

- 35 The diagram below shows a human zygote being formed.



What describes the zygote?

| | identical to parents | number of chromosomes |
|----------|----------------------|-----------------------|
| A | no | 23 |
| B | no | 46 |
| C | yes | 23 |
| D | yes | 46 |

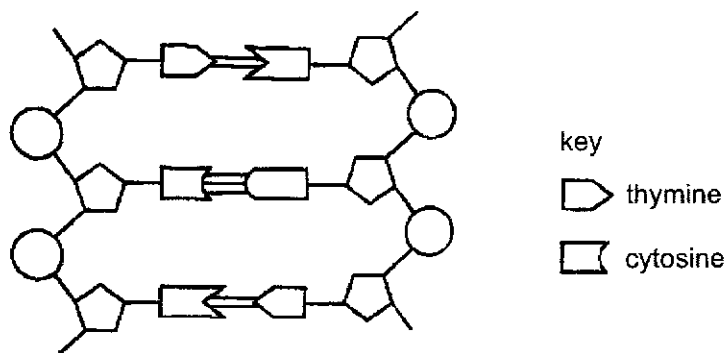
- 36 What is an advantage of the testes being held in the scrotum, outside the body cavity?

- A** More sperm can be stored in an external scrotum.
- B** Sperm development is more efficient at temperatures below 37°C.
- C** Testes are better protected in the scrotum than in the body cavity.
- D** There is more time for prostate secretions to be added to sperm.





- 37 Which one of these structures is part of the other three?

- A** chromosome
- B** gamete
- C** gene
- D** nucleus

- 38 The diagram shows a short section of a molecule of DNA.



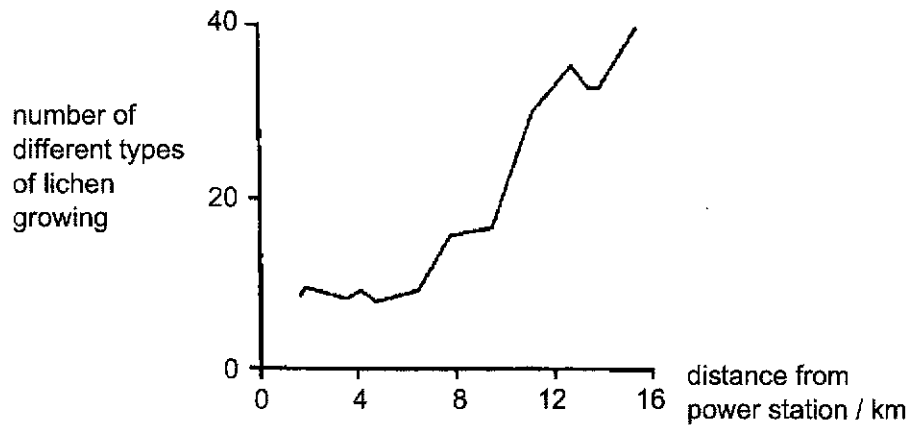
Which row identifies the other shapes used in this diagram?

| | shape | | | |
|----------|---|---|--|---|
| |  |  |  |  |
| A | phosphate | sugar | adenine | guanine |
| B | phosphate | sugar | guanine | adenine |
| C | sugar | phosphate | adenine | guanine |
| D | sugar | phosphate | guanine | adenine |

- 39 Which of these effects of man on the ecosystem is directly reduced by proper treatment of sewage?
- A** acid rain
- B** climate change
- C** eutrophication
- D** soil erosion

- 40 Lichens are organisms which are very sensitive to air pollution.

The graph shows how the distance from a coal-fired power station affects the number of different types of lichen growing.



Which conclusion can be drawn from this information?

- A Lichens grow faster near the power station.
- B Lichens grow more slowly near the power station.
- C There are fewer different types of lichen growing near the power station.
- D There are more different types of lichen growing near the power station.

END OF PAPER

**YUHUA SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2019
SECONDARY 4 EXPRESS / 5 NORMAL ACADEMIC**

| | | | | |
|--------------|----------------|--|--------------|--|
| 4E/5N | CANDIDATE NAME | | | |
| | CLASS | | INDEX NUMBER | |

SCIENCE (BIOLOGY)**5078/04**

Paper 4

30 Aug 2019
1 hour 15 minutes

Candidates answer on the Question Paper.
No Additional Materials are required.

Setter: Ms Bo Yiting

READ THESE INSTRUCTIONS FIRST

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

Write in dark blue and black pen.

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

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

The use of an approved scientific calculator is expected, where appropriate.

You may lose marks if you do not show your working or if you do not use appropriate units.

Section A

Answer **all** questions

Write your answers in the spaces provided on the question paper.

Section B

Answer any **two** questions.

Write your answers in the spaces provided on the question paper.

At the end of the examination, fasten all your work securely together.

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

| For Examiner's Use | |
|--------------------|--|
| Section A | |
| Section B | |
| | |
| | |
| Total | |

This document consists of **18** printed pages, inclusive of this page.

[Turn over

2

Section A

Answer **all** questions in the spaces provided.

- 1 A student investigates the enzyme salivary amylase.

She adds salivary amylase to starch solution and keeps the mixture in a tube at 37 °C for ten minutes.

She then adds iodine solution and records her observations. She repeats the experiment at different temperatures.

Her results are shown in **Table 1**.

Table 1

| temperature / °C | colour when iodine added |
|------------------|--------------------------|
| 5 | blue-black |
| 20 | blue-black |
| 37 | brown |
| 60 | blue-black |

- (a) Complete the table below to describe the action of salivary amylase.

| enzyme | substrate | product |
|------------------|-----------|---------|
| salivary amylase | | |

[2]

- (b) (i) Explain why the results at 37 °C is different from the results at 5 °C and 20 °C.

.....

.....

.....

..... [2]

(ii) Explain the result of the test-tube that was kept at 60 °C.

.....
.....
.....
..... [2]

(c) The student repeats the experiment at 37 °C, but adds some dilute hydrochloric acid to the mixture before leaving it for ten minutes.

(i) Predict the results for this experiment when iodine solution is added after ten minutes.

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

(ii) Use ideas about the 'lock and key' hypothesis to explain your prediction.

.....
.....
.....
.....
.....
..... [3]

2 Fig. 2 shows an experiment that is carried out using water snails and water plants.

At the start of the experiment, water with the same carbon dioxide concentration is placed in each tube.

Tubes X and Y are placed in sunlight for 30 minutes.

Tube Z is placed in darkness for 30 minutes.

The solution in each tube is then analysed to find the concentration of dissolved carbon dioxide.

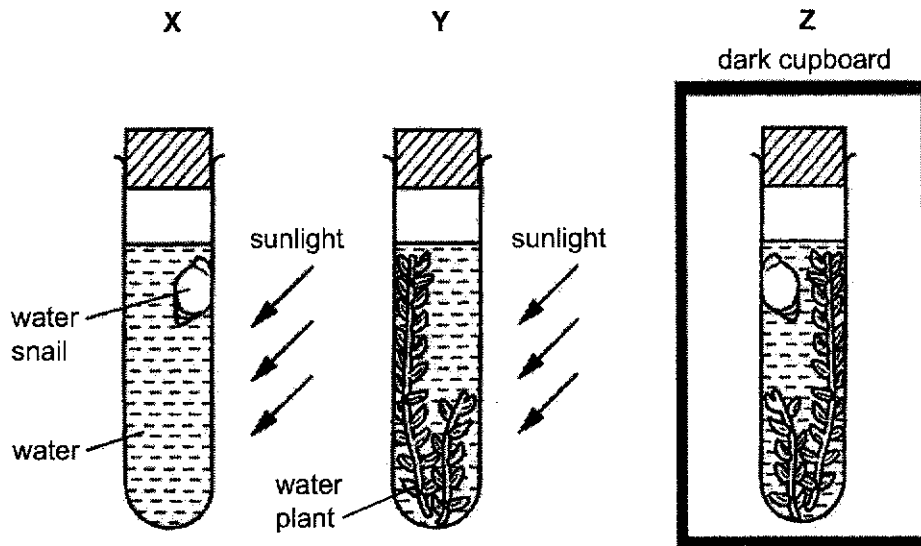


Fig. 2

(a) The concentration of carbon dioxide in tube X increases.

The water snail releases carbon dioxide.

(i) Name the process that releases this carbon dioxide.

..... [1]

(ii) Write a word equation for this process.

..... [1]

(b) The concentration of carbon dioxide in tube Y decreases.

The water plant uses carbon dioxide.

(i) Name the process that uses this carbon dioxide.

..... [1]

(ii) Write a word equation for this process.

..... [1]

(c) (i) Suggest what happens to the carbon dioxide concentration in tube Z.

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

(ii) Explain your answer.

.....
.....
.....
.....
.....
.....
..... [3]

3 Fig. 3 shows the pressure changes in the heart during one heartbeat.

Part of the next heartbeat is also shown.

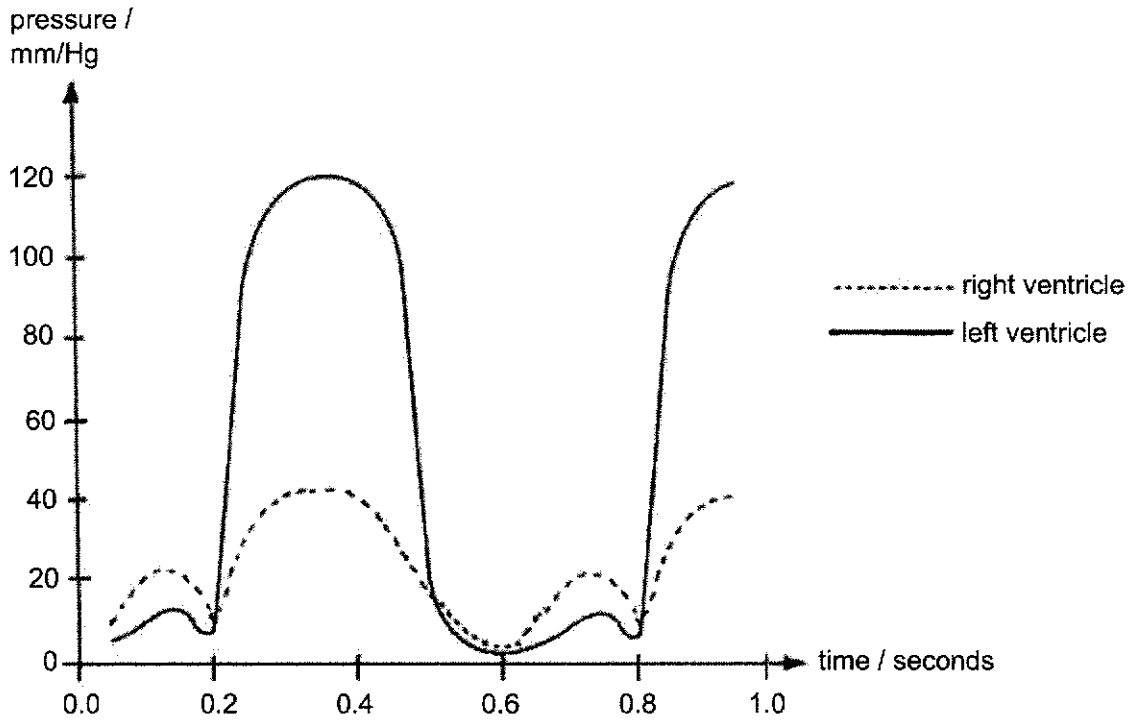


Fig. 3

(a) (i) State the time interval between two heartbeats.

..... seconds [1]

(ii) Calculate the heart rate of the person.

..... beats per minute [1]

(b) (i) State the maximum pressure exerted by the right ventricle.

..... mm/Hg [1]

(ii) State the maximum pressure exerted by the left ventricle.

..... mm/Hg [1]

(iii) Explain the difference in pressure that is exerted by the two ventricles.

.....
.....
.....
..... [2]

(c) List one difference between the composition of blood in the right ventricle and the blood in the left ventricle.

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

4 Fig. 4 shows the change in blood glucose concentration over a period of time.

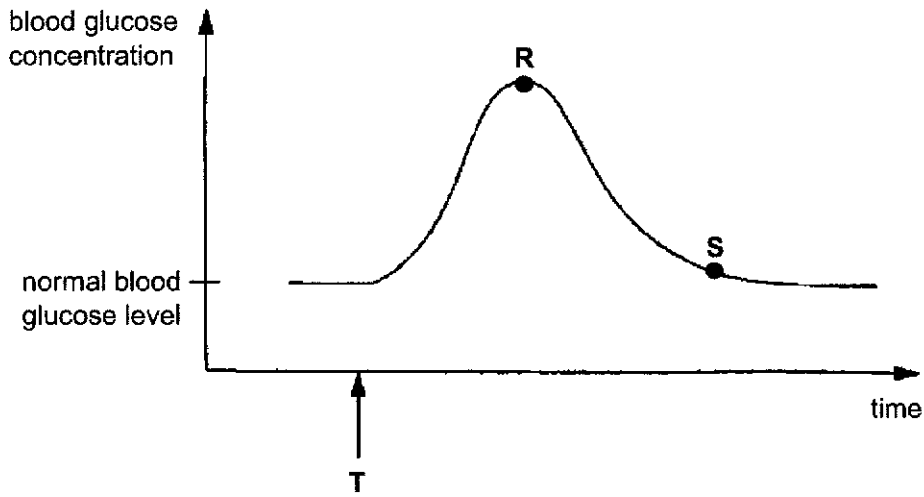


Fig. 4

(a) Describe the processes that take place to result in the change in blood glucose concentration from R to S.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(b) Suggest what the person was doing at T.

..... [1]

(c) Suggest how the graph will appear different in a person with diabetes mellitus.

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

- 5 Cystic fibrosis is a hereditary condition that may arise due to a mutation.
 A person with cystic fibrosis produces thick mucus that can obstruct the respiratory system.
Fig. 5 shows part of the family tree of a person suffering from cystic fibrosis.

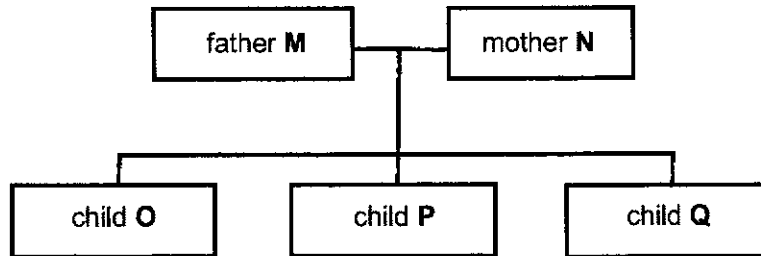


Fig. 5

- (a) Define mutation.

.....
 [1]

- (b) Parents **M** and **N** do not suffer from cystic fibrosis, but their child **O** does.

Draw a genetic diagram to show how this is possible.

Use letter **F** to represent the dominant allele and letter **f** to represent the recessive allele.

[4]

11

- (c) Calculate the probability that **P** and **Q** are both healthy.
Show your working clearly.

probability that **P** and **Q** are both healthy = [2]

- 6 A student counted the numbers of small animals found in four samples of leaf litter from a forest floor. Her results are shown in **Table 6**.

Table 6

| animal | sample 1 | sample 2 | sample 3 | average |
|--------------|----------|----------|----------|---------|
| centipede | 5 | 6 | 7 | 6 |
| frog | 0 | 2 | 1 | 1 |
| small insect | 32 | 26 | 41 | 33 |

- (a) Use the information in **Table 6** to construct a food chain for the leaf litter in this forest.

[3]

- (b) Identify the primary consumer in this food chain.

..... [1]

- (c) The average number of frogs is less than that of centipedes, and the average number of centipedes is less than that of small insects.

Using ideas of energy flow, explain why this is so.

.....

.....

.....

.....

.....

.....

..... [3]

Section B

Answer any **two** questions in this section.
Write your answers in the spaces provided.

7 (a) Fig. 7.1 shows an animal cell while Fig. 7.2 shows a plant cell.

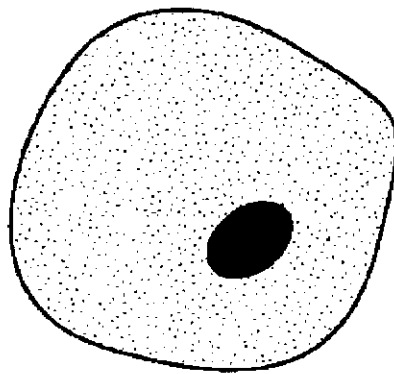


Fig. 7.1

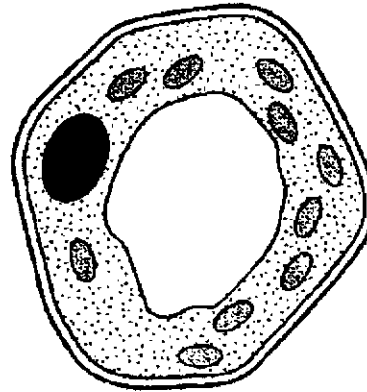


Fig. 7.2

(i) Using information from Fig. 7.1 and 7.2 only, describe two structural differences between an animal cell and a plant cell.

.....
.....
.....
..... [2]

(ii) Explain the advantages of these differences to a plant.

.....
.....
.....
..... [2]

8 (a) Fig. 8 shows the change that occurs in a person's eye over a period of time.

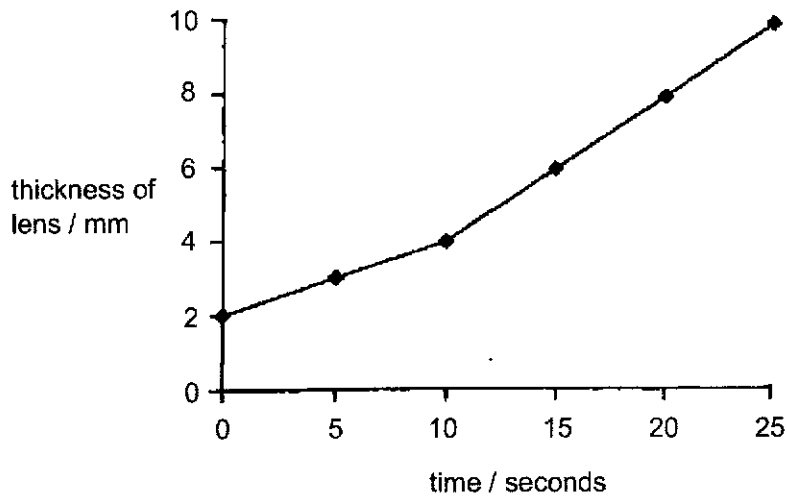


Fig. 8

(i) Using information from Fig. 8, describe and explain how the change in the eye is brought about.

.....
.....
.....
.....
.....
.....
..... [3]

(ii) Suggest a scenario that caused the change.

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

9 (a) Fig. 9 shows a section through a flower.

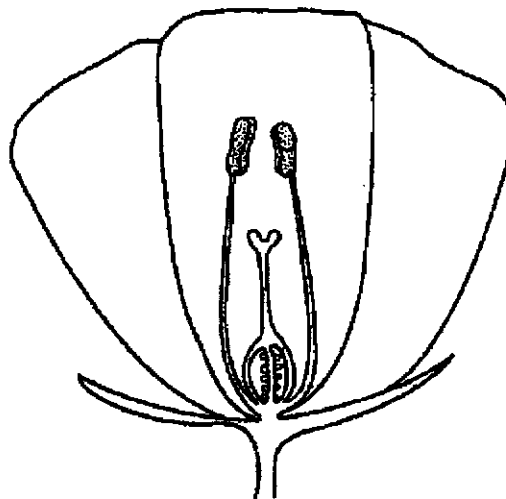


Fig. 9

(i) With reference to Fig. 9, state whether the flower is insect-pollinated or wind-pollinated.

..... [1]

(ii) Explain your answer.

.....
.....
.....
.....
.....
..... [3]

4E/5N PRELIMINARY EXAMINATION

Science Biology 5078

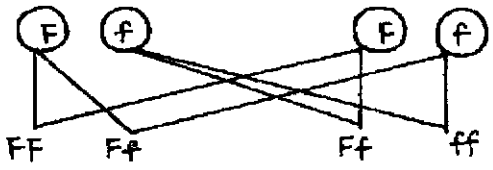
MARK SCHEME

Paper 1

| | | | | | | | | | |
|----|---|----|---|----|---|----|---|----|---|
| 21 | D | 22 | A | 23 | D | 24 | A | 25 | D |
| 26 | A | 27 | D | 28 | B | 29 | C | 30 | B |
| 31 | C | 32 | A | 33 | C | 34 | C | 35 | B |
| 36 | B | 37 | C | 38 | A | 39 | C | 40 | C |

Paper 4

| | | |
|-----------|--|---|
| 1(a) | substrate – starch; product – maltose; | 2 |
| 1(b)(i) | at 37°C, salivary amylase is working at <u>optimum temperature</u> ; at 5°C and 20°C, salivary amylase is <u>inactive</u> ; | 2 |
| 1(b)(ii) | amylase is <u>denatured</u> at 60°C; starch cannot be broken down; | 2 |
| 1(c)(i) | starch is <u>present</u> or iodine solution turns <u>blue-black</u> ; | 1 |
| 1(c)(ii) | salivary amylase is the lock, starch is the key; dilute hydrochloric acid causes change in <u>active site</u> of salivary amylase; salivary amylase is <u>denatured</u> , starch <u>cannot fit</u> into active site; | 3 |
| 2(a)(i) | (aerobic) respiration; | 1 |
| 2(a)(ii) | glucose + oxygen → carbon dioxide + water + <u>large amount</u> of energy; | 1 |
| 2(b)(i) | photosynthesis; | 1 |
| 2(b)(ii) | $\begin{array}{ccc} & \text{sunlight} & \\ & \longrightarrow & \\ \text{carbon dioxide + water} & & \text{glucose + oxygen + water;} \\ & \text{chlorophyll} & \end{array}$ | 1 |
| 2(c)(i) | carbon dioxide concentration <u>increases</u> ; | 1 |
| 2(c)(ii) | snails respire to give off carbon dioxide; plants are unable to photosynthesise in the dark; respires to give off carbon dioxide, further increasing carbon dioxide concentration; | 3 |
| 3(a)(i) | 0.6; | 1 |
| 3(a)(ii) | 100; | 1 |
| 3(b)(i) | 40; | 1 |
| 3(b)(ii) | 120; | 1 |
| 3(b)(iii) | left ventricle <u>contracts</u> to force blood to the <u>rest of the body</u> at a <u>higher pressure</u> ; right ventricle <u>contracts</u> to force blood to the <u>lungs</u> at a <u>lower pressure</u> ; | 2 |

| | | |
|---------|--|---|
| 3(c) | right ventricle contains <u>deoxygenated blood</u> while left ventricle contains <u>oxygenated blood</u> ; | 1 |
| 4(a) | <ul style="list-style-type: none"> at R, blood glucose is <u>above</u> normal blood glucose concentration; islets of Langerhans in the <u>pancreas</u> secrete <u>insulin</u>; promoting conversion of excess glucose into glycogen or increasing permeability of cells to glucose; decreases blood glucose concentration back to normal; | 4 |
| 4(b) | eating; | 1 |
| 4(c) | blood glucose concentration is higher than normal or it takes a longer time for blood glucose to decrease back to normal; <i>accept answers that suggest difficulty with blood glucose regulation</i> | 1 |
| 5(a) | <u>sudden, random change</u> in the structure of a gene or in the chromosome number; | 1 |
| 5(b) | <p>parent phenotype normal x normal</p> <p>parent genotype Ff Ff</p> <p>Gametes</p>  <p>offspring genotype FF Ff Ff ff</p> <p>offspring phenotype normal normal normal cystic fibrosis</p> <p>offspring phenotypic ratio 3 normal : 1 cystic fibrosis</p> <p>correct parent phenotype; correct parent genotype; correct gametes and crosses to form correct offspring genotype; correct offspring phenotype and phenotypic ratio;</p> | 4 |
| 5(c) | $\frac{3}{4} \times \frac{3}{4}$ or 0.75×0.75 ; $= \frac{9}{16}$ or 0.56 or 56% ; | 2 |
| 6(a) | leaf \rightarrow small insect \rightarrow centipede \rightarrow frog; <i>1m for each transfer of energy between trophic levels</i> | 3 |
| 6(b) | small insect; | 1 |
| 6(c) | <u>90%</u> of energy is lost as it passes through each trophic level number of organisms one trophic level must be larger than the trophic level above; in order to provide sufficient energy for the final consumer; | 3 |
| 7(a)(i) | plant cells have cell walls but animal cells do not have cell walls; plant cells have chloroplasts but animal cells do not have chloroplasts; plant cells have large central vacuoles but animal cells do not have large central vacuoles; <i>any 2</i> | 2 |

| | | |
|----------|---|---|
| 7(a)(ii) | cell wall protects the cell from injury or gives the cell a fixed shape; chloroplasts are essential for photosynthesis; vacuoles contain cell sap, which stores dissolved substances; <i>two points must match answers in (a)(i)</i> | 2 |
| 7(b) | <ul style="list-style-type: none"> • red blood cell has <u>haemoglobin that binds to oxygen</u>, allowing it to be carried around the body; • red blood cell has a <u>circular, biconcave</u> shape that <u>increases surface area to volume ratio</u>, allowing oxygen exchange at a faster rate; • red blood cell <u>does not have a nucleus</u> to allow it to carry <u>more haemoglobin</u>, which in turn allows it to carry <u>more oxygen</u>; • root hair cell has a <u>long and narrow extension</u> which <u>increases surface area to volume ratio</u>, allowing water and mineral salts to enter at a faster rate; • xylem vessel is <u>hollow/with no cross-walls</u> to <u>reduce resistance</u> to the flow of water and mineral salts; • xylem vessel has deposits of <u>lignin</u>, allowing the xylem to provide <u>mechanical support</u> for the plant; | 6 |
| 8(a)(i) | ciliary muscles contract, relaxing their pull on the suspensory ligaments; suspensory ligaments slacken, relaxing their pull on the lens; lens <u>increases</u> in thickness, from <u>2mm to 10 mm</u> ; | 3 |
| 8(a)(ii) | looking at a near object after looking at a far object; | 1 |
| 8(b) | photoreceptors in the <u>retina</u> detect increased light intensity; sensory neurone in the optic nerve transmits nerve impulses to the <u>brain</u> ; relay neurone transmits nerve impulses from the sensory neurone to the motor neurone; motor neurone transmits nerve impulses to the <u>iris</u> muscles; circular muscles contract, radial muscles relax, pupil constricts; | 6 |
| 9(a)(i) | insect-pollinated; | 1 |
| 9(a)(ii) | large petals to attract insects; small and compact stigma; stamen contained <u>within</u> the flower (not protruding); | 3 |
| 9(b) | stigma produces sugary fluid which stimulates the pollen grain to germinate; pollen tube grows, secretes enzymes to digest tissues of the stigma and style; pollen tube enters the ovule through the micropyle; male gametes are released, nuclei of the male and female gametes fuse; through the process of fertilisation, to form a zygote; after which the ovule develops into a seed; | 6 |

