

BIOLOGY PAPER 1

8:30 am – 11:00 am (2 hours 30 minutes)

This paper must be answered in English

GENERAL INSTRUCTIONS

- (1) There are **TWO** sections, A and B, in this Paper. You are advised to finish Section A in about 35 minutes.
- (2) Section A consists of multiple-choice questions in this question paper. Section B contains conventional questions printed separately in Question-Answer Book **B**.
- (3) Answers to Section A should be marked on the Multiple-choice Answer Sheet while answers to Section B should be written in the spaces provided in Question-Answer Book **B**. **The Answer Sheet for Section A and the Question-Answer Book B for Section B will be collected separately at the end of the examination.**

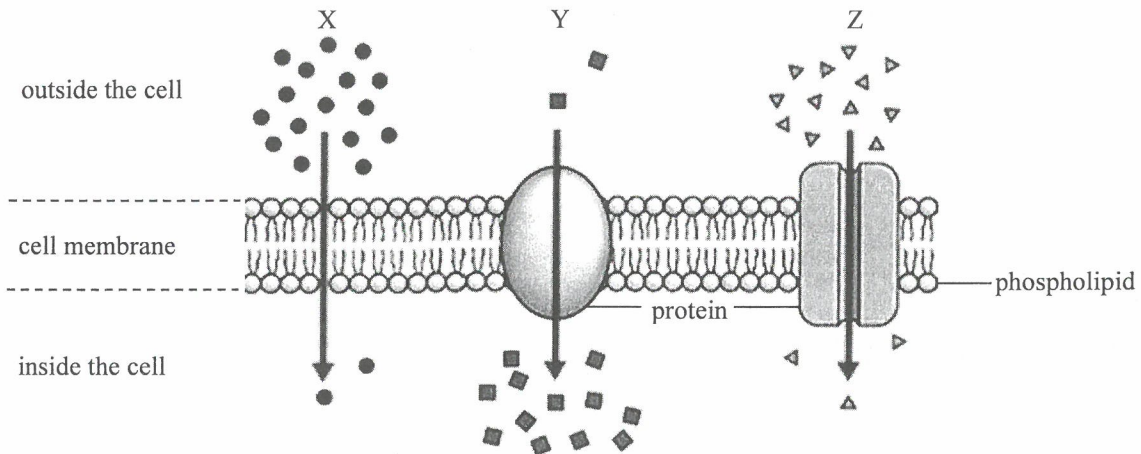
INSTRUCTIONS FOR SECTION A (MULTIPLE-CHOICE QUESTIONS)

- (1) Read carefully the instructions on the Answer Sheet. After the announcement of the start of the examination, you should first stick a barcode label and insert the information required in the spaces provided. No extra time will be given for sticking on the barcode label after the 'Time is up' announcement.
- (2) When told to open this book, you should check that all the questions are there. Look for the words '**END OF SECTION A**' after the last question.
- (3) All questions carry equal marks.
- (4) **ANSWER ALL QUESTIONS.** You are advised to use an HB pencil to mark all the answers on the Answer Sheet, so that wrong marks can be completely erased with a clean rubber. You must mark the answers clearly; otherwise you will lose marks if the answers cannot be captured.
- (5) You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.
- (6) No marks will be deducted for wrong answers.

There are 36 questions in this section.

The diagrams in this section are NOT necessarily drawn to scale.

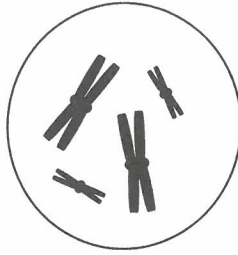
1. The diagram below shows three different ways by which substances pass through a cell membrane:



Which of the following combinations correctly matches the substances with their corresponding ways of passing through the cell membrane?

- | | | | |
|----|----------|----------|----------|
| | X | Y | Z |
| A. | oxygen | glucose | water |
| B. | glucose | water | oxygen |
| C. | water | oxygen | glucose |
| D. | water | glucose | oxygen |
2. Adenine (A) and cytosine (C) together make up 50% of the total amount of nitrogenous bases in DNA molecules. Which of the following features of DNA provide the basis to explain this phenomenon?
- (1) DNA has a helical structure.
 (2) DNA is a double-stranded molecule.
 (3) The nitrogenous bases are paired complementarily.
- A. (1) and (2) only
 B. (1) and (3) only
 C. (2) and (3) only
 D. (1), (2) and (3)
3. In Mendel's experiment, he proposed that a characteristic of the pea plants was controlled by a pair of 'heredity factors'. These factors can be separated in a 'process' before passing to the offspring. According to the current understanding of genetics, what do the 'heredity factors' and the 'process' represent respectively?
- | | | |
|----|-------------------------|------------------------------|
| | Heredity factors | Process |
| A. | alleles | first meiotic cell division |
| B. | alleles | second meiotic cell division |
| C. | chromosomes | first meiotic cell division |
| D. | chromosomes | second meiotic cell division |

Directions: Questions 4 and 5 refer to the diagram below, which shows the appearance of chromosomes in a cell at the early stage of meiotic cell division.

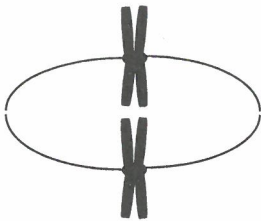


4. What is the chromosome number in the somatic cells of this organism?

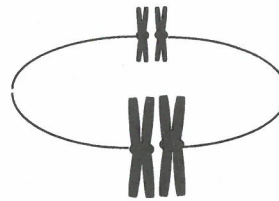
- A. 2
- B. 4
- C. 8
- D. 16

5. Which of the following diagrams correctly shows the arrangement of chromosomes found at a later stage of the cell division?

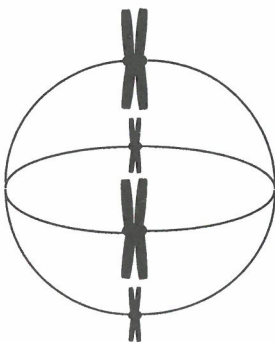
A.



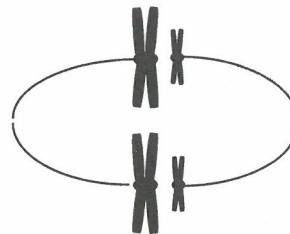
B.



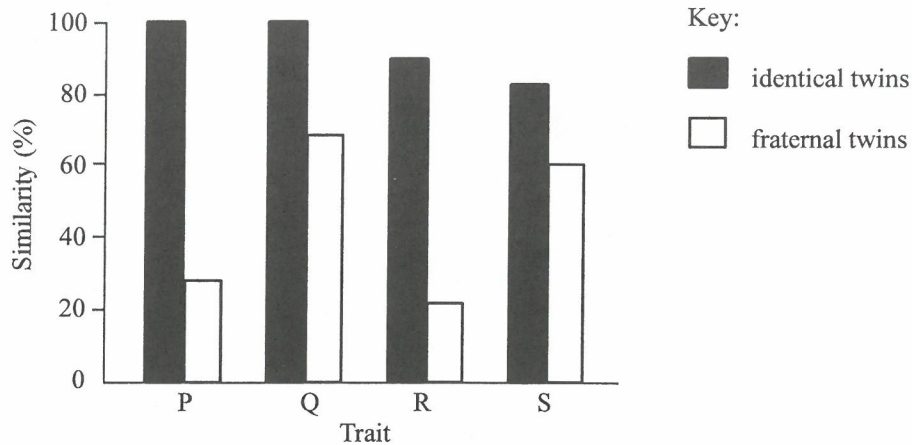
C.



D.



6. A large survey about the inheritance of four traits in identical twins and fraternal twins has been conducted. The similarity of these four traits among the individuals in each type of twins are shown in the graph below:



Which trait is most affected by environmental factors?

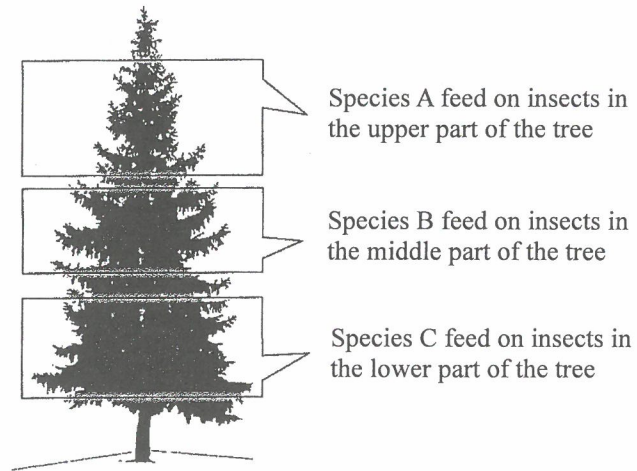
- A. P
 - B. Q
 - C. R
 - D. S
7. The table below shows the comparison among three groups of organisms X, Y and Z:

	X	Y	Z
Cell wall	Present	Present	Absent
Similarity of the amino acid sequence of a protein found in all three organisms (X as a reference)	100%	45%	55%

With reference to the information above, which of the following can be deduced?

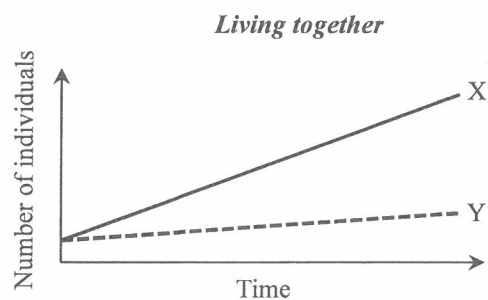
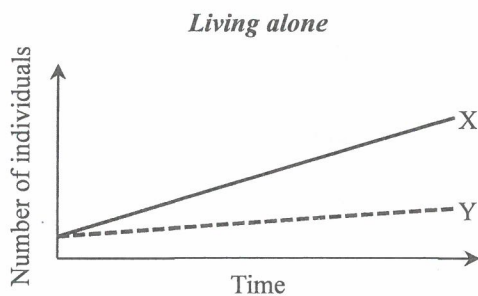
- A. Both X and Y are prokaryotes.
 - B. Y is least advanced among the three.
 - C. X has a closer phylogenetic relationship with Z than Y.
 - D. Y has a closer phylogenetic relationship with Z than X.
8. Decomposers can speed up the process of ecological succession because they
- A. break down rocks into soil particles.
 - B. remove dead organic matter from the soil.
 - C. release carbon back into the atmosphere in the form of carbon dioxide.
 - D. release nitrogen back into the soil in the form of ammonium compounds.

9. Three bird species are living on the same tree species for years. They feed on the insects found at different regions of the tree as shown in the diagram below:



Which of the following can be deduced from the above phenomenon?

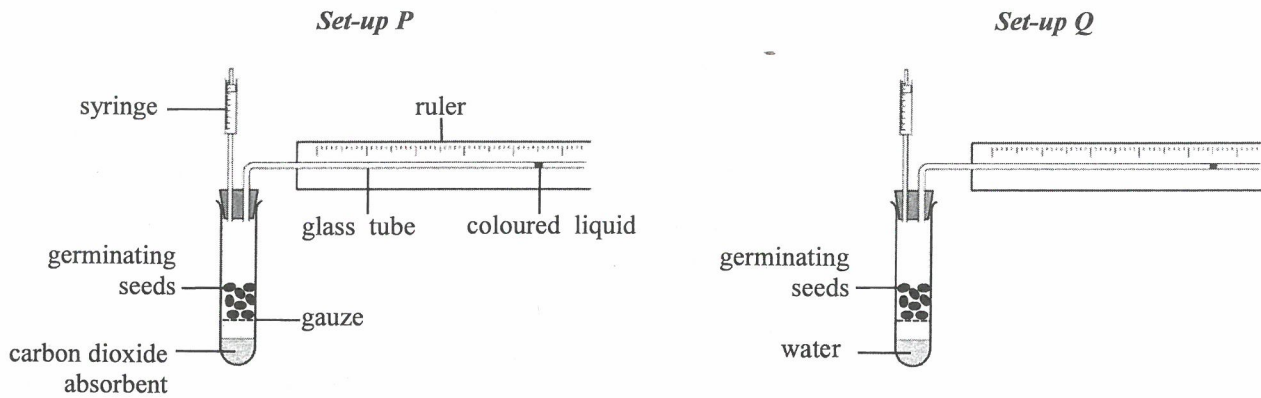
- (1) The insects are evenly distributed on the tree.
 (2) Birds species A, B and C have different ecological niches.
 (3) There is less interspecific competition among bird species A, B and C.
- A. (1) and (2) only
 B. (1) and (3) only
 C. (2) and (3) only
 D. (1), (2) and (3)
10. The graphs below show the changes in the population sizes of organisms X and Y over a period of time when they are living alone or living together.



Which of the following correctly describes the ecological relationship of X and Y?

- A. predation
 B. mutualism
 C. competition
 D. commensalism

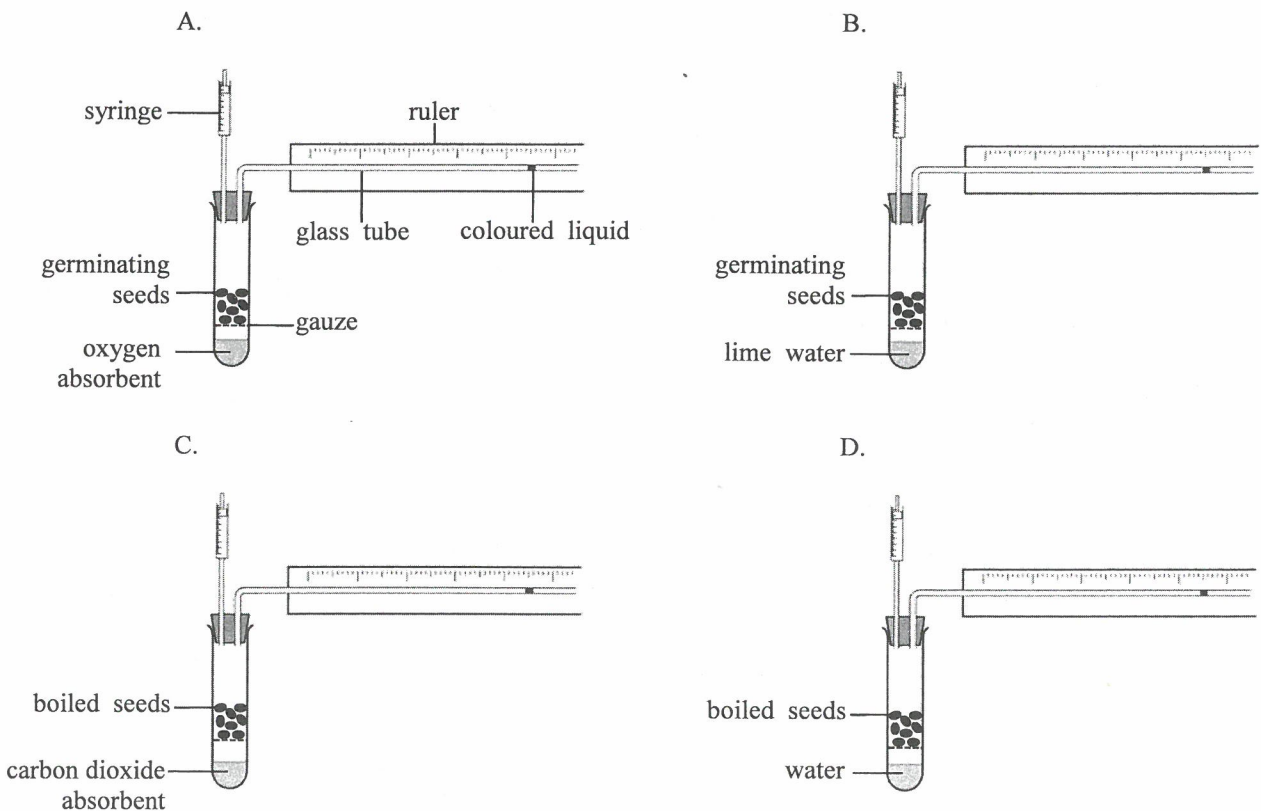
Directions: Questions 11 and 12 refer to the diagram below, which shows two set-ups used for the investigation of the gas exchange in germinating seeds:



11. Assuming that the environmental conditions are the same, what will happen to the coloured liquid in each set-up?

- | | <i>Set-up P</i> | <i>Set-up Q</i> |
|----|--------------------|--------------------|
| A. | moves to the right | moves to the left |
| B. | moves to the left | stays still |
| C. | stays still | moves to the left |
| D. | stays still | moves to the right |

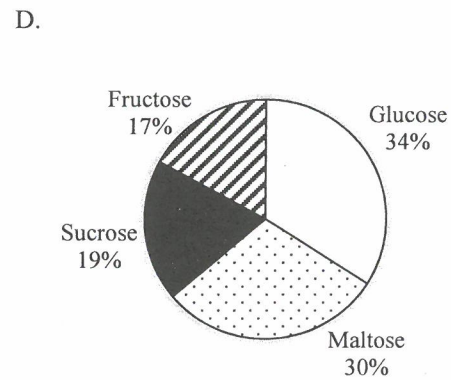
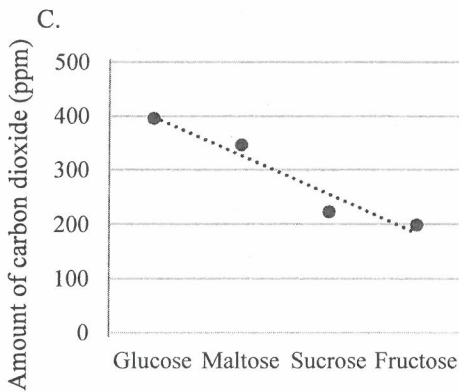
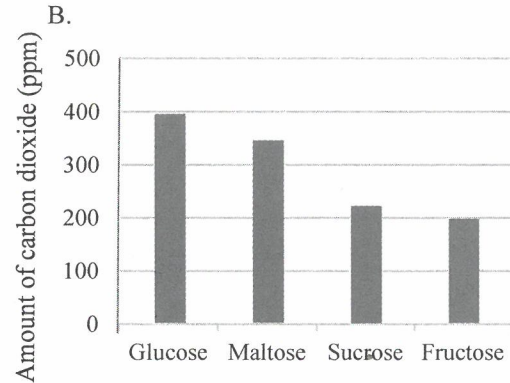
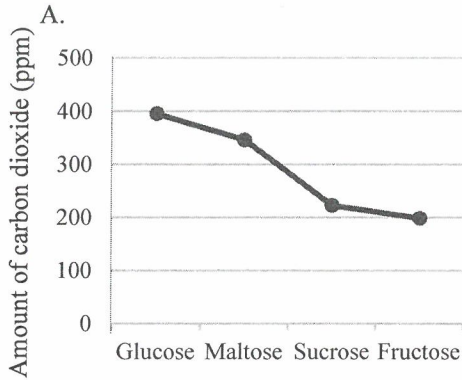
12. Which of the following modified set-ups can be used to show the identity of the gas produced in the investigation?



Directions: Questions 13 and 14 refer to the table below, which shows the effect of different substrates on the rate of anaerobic respiration of yeast:

Substrate	Average amount of carbon dioxide produced after 10 min (ppm)
Glucose	395.2
Maltose	345.8
Sucrose	222.2
Fructose	198.2

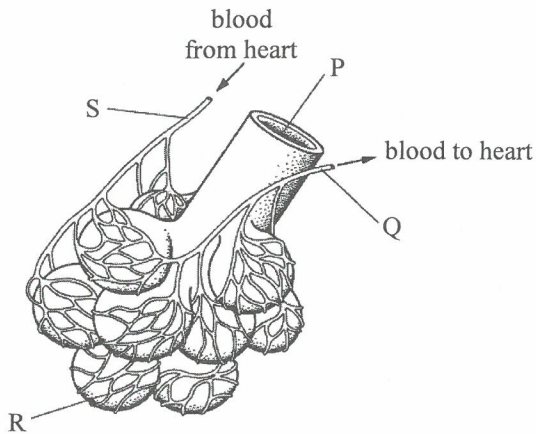
13. Which of the following graphs is most suitable for presenting the data in the table?



14. In this investigation, which part of the yeast cell produces carbon dioxide?

- A. cytoplasm
- B. cell membrane
- C. matrix of mitochondria
- D. inner membrane of mitochondria

Directions: Questions 15 and 16 refer to the diagram below, which shows the end of the respiratory tract and the associated blood vessels in humans:



15. Which labelled part has the highest concentration of carbon dioxide?
- P
 - Q
 - R
 - S
16. Which of the following adaptive features for gas exchange can be illustrated in the above diagram?
- The respiratory tract ends in numerous spherical structures.
 - The end of the respiratory tract has a thin wall.
 - The end of the respiratory tract is covered with blood vessels.
- (1) and (2) only
 - (1) and (3) only
 - (2) and (3) only
 - (1), (2) and (3)

Directions: Questions 17 and 18 refer to the diagrams below. Diagram I shows a device which is used to monitor the breathing pattern of a person. It consists of an elastic band strapped around a person's chest and a sensor which detects the tension of the elastic band. Diagram II shows the change in the tension of the elastic band during breathing.

Diagram I

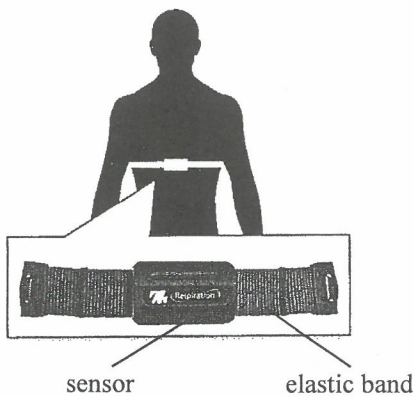
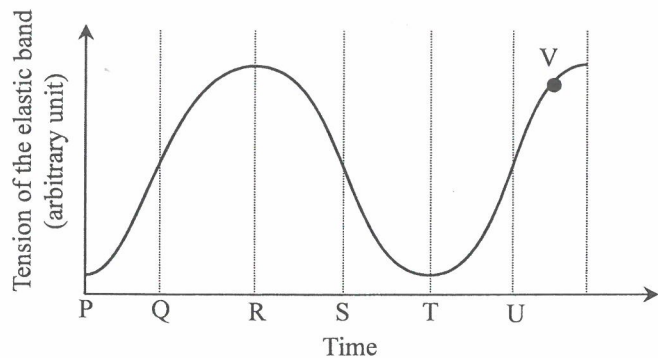


Diagram II



17. Exhalation takes place during period

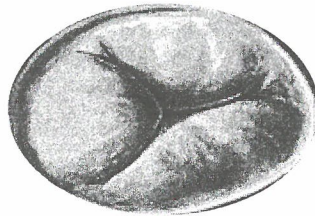
- A. PR.
- B. QS.
- C. RT.
- D. SU.

18. Which of the following interpretations about Diagram II is/are correct?

- (1) The diaphragm is contracting during period QR.
- (2) Air pressure inside the lungs increases during period TU.
- (3) Air pressure inside the lungs is greater than atmospheric pressure at point V.

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

19. Imagine that you were a red blood cell travelling along a blood vessel and had reached the heart. After passing through the 'gate' shown in the diagram below, there was another 'gate' ahead. Which heart chamber were you situated now?

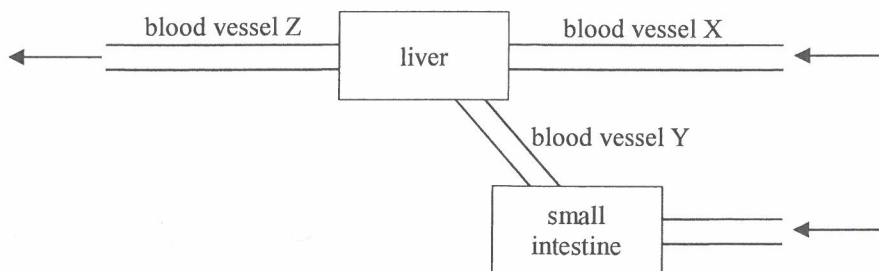


- A. left atrium
- B. left ventricle
- C. right atrium
- D. right ventricle

20. Some babies are born with a heart defect which is a hole in the septum separating the left and right ventricles. When the ventricles contract at the same time, some blood flow will deviate from the normal route. Which of the following is most likely the deviated route?

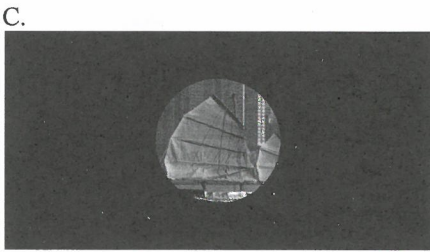
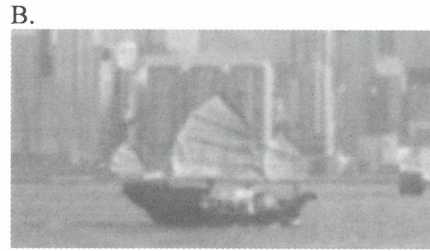
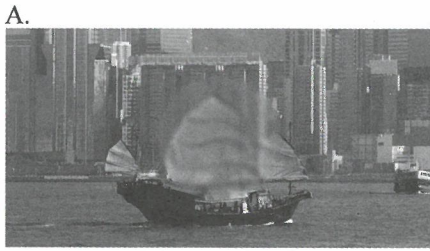
- A. left ventricle → right ventricle → aorta
- B. left ventricle → right ventricle → pulmonary artery
- C. right ventricle → left ventricle → aorta
- D. right ventricle → left ventricle → pulmonary artery

Directions: Questions 21 and 22 refer to the diagram below, which shows part of the human circulatory system and the associated organs:

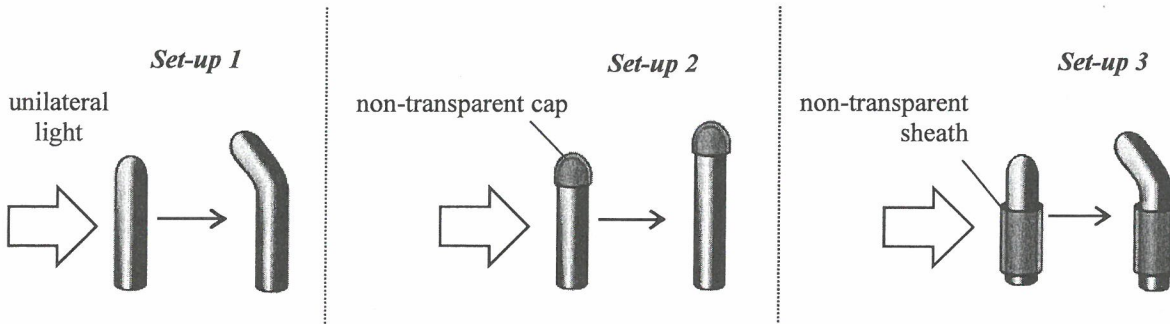


21. Which of the following correctly compares the blood glucose concentration in blood vessels X, Y and Z when a person is fasting?
- A. $X > Z > Y$
 - B. $Y > X > Z$
 - C. $Z > Y > X$
 - D. $Z > X > Y$
22. Which of the following descriptions about blood vessel Y are correct?
- (1) It transports hormones.
 - (2) It carries deoxygenated blood.
 - (3) It has capillary networks at both ends.
- A. (1) and (2) only
 - B. (1) and (3) only
 - C. (2) and (3) only
 - D. (1), (2) and (3)
23. Which of the following structures are the components of a joint?
- (1) bone
 - (2) tendon
 - (3) ligament
- A. (1) and (2) only
 - B. (1) and (3) only
 - C. (2) and (3) only
 - D. (1), (2) and (3)

24. During aging, some people may suffer from an eye defect which is caused by the degeneration of light-sensitive cells in the yellow spot. Which of the following diagrams is the most likely vision perceived by a person suffering from this eye defect?



25. Darwin performed some experiments on the study of the phototropic response of coleoptiles of young seedlings. The coleoptile in each set-up was exposed to a unilateral light source and the appearance of the coleoptiles after three days are shown below:

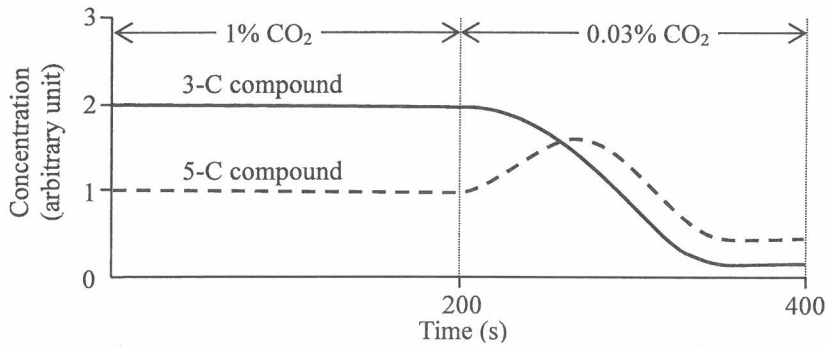


Which of the following can be deduced from Darwin's experiment?

- (1) Auxins is produced from the tip of the coleoptile.
- (2) The coleoptiles show positive phototropic response.
- (3) The tip of the coleoptile detects the direction of light.

- A. (1) and (2) only
- B. (1) and (3) only
- C. (2) and (3) only
- D. (1), (2) and (3)

Directions: Questions 26 and 27 refer to an experiment in which a green algal culture was supplied with 1% carbon dioxide for 200 s and then followed by 0.03% carbon dioxide for another 200 s. The changes in the relative concentrations of a 3-C compound and a 5-C compound in the Calvin cycle of the green algae are shown below:



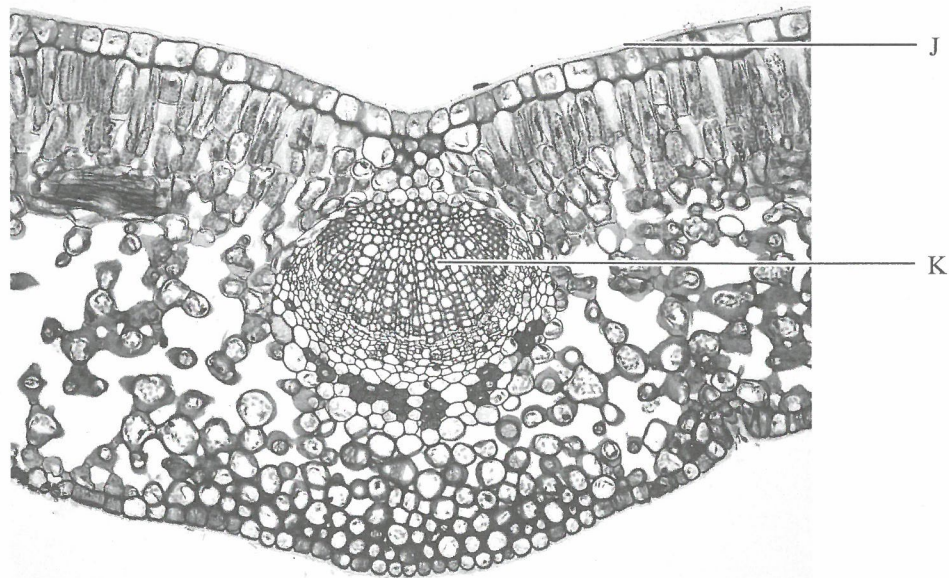
26. When the carbon dioxide concentration switched from 1% to 0.03%, which of the following combinations correctly shows the initial change of the concentration of the compound and its explanation?

	<i>Initial change in concentration</i>	<i>Explanation</i>
A.	3-C compound decreases	reduction of 3-C compound has increased
B.	3-C compound decreases	ATP from photochemical reactions has decreased
C.	5-C compound increases	carbon fixation has decreased
D.	5-C compound increases	regeneration of carbon dioxide acceptor has increased

27. Which of the following factors should be kept constant throughout the experiment?

- (1) pH
 (2) temperature
 (3) light intensity
- A. (1) and (2) only
 B. (1) and (3) only
 C. (2) and (3) only
 D. (1), (2) and (3)

Directions: Questions 28 and 29 refer to the photomicrograph below, which shows a section of a leaf:



28. Which of the following correctly describes the major function of layer J?
- It reduces water loss.
 - It allows light to pass through.
 - It protects the leaf from infection.
 - It increases the photosynthetic rate.
29. Which of the following substances will move out of the leaf through stomata from cell K in the daytime?
- water
 - oxygen
 - mineral
 - carbon dioxide

Directions: Questions 30 and 31 refer to the investigation below. Diagram I shows a set-up for measuring the transpiration rate of a leafy shoot under different environmental conditions. For each treatment, the experiment was conducted for three hours. Table II shows the initial and final readings of the water level in different treatments.

Diagram I

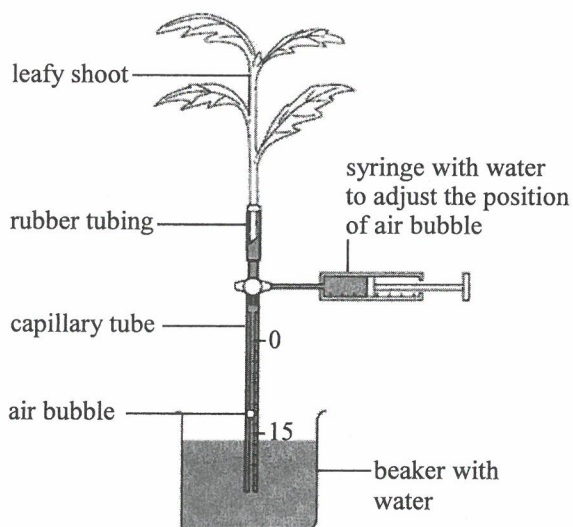
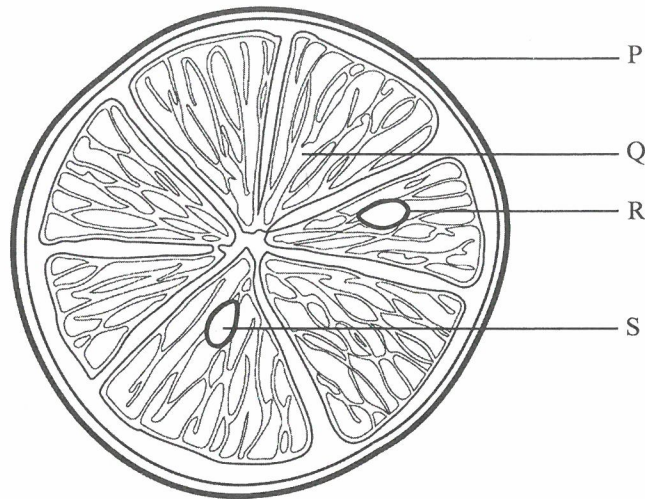


Table II

Treatment	Environmental conditions		Initial reading (cm)	Final reading (cm)
	Light intensity	Humidity		
1	Low	Low	14	7.4
2	Low	High	15	12.5
3	High	Low	15	5.6
4	High	High	14	10.6

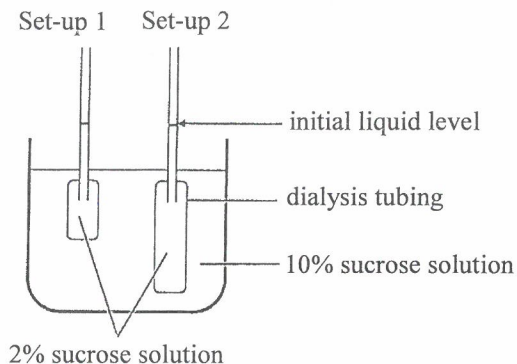
30. In which treatment does the leafy shoot have the highest transpiration rate?
- 1
 - 2
 - 3
 - 4
31. According to the results of the investigation, which of the following changes in environmental conditions will lead to a greater reduction in the transpiration rate of the leafy shoot?
- At low humidity condition, adjust the light intensity from high to low.
 - At high humidity condition, adjust the light intensity from high to low.
 - At low light intensity, adjust the humidity from low to high.
 - At high light intensity, adjust the humidity from low to high.

Directions: Questions 32 to 34 refer to the following diagram which shows a section of a fruit:

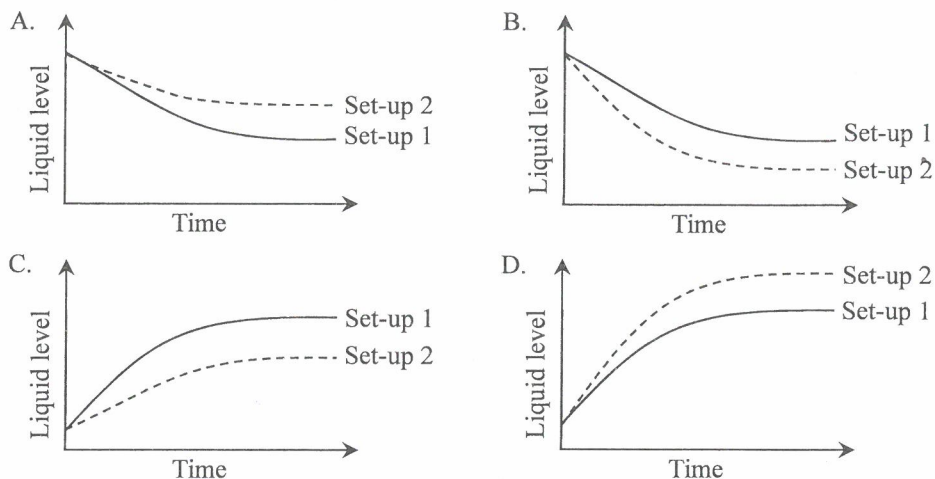


32. Which of the following structures is developed from the ovum?
- A. P
 - B. Q
 - C. R
 - D. S
33. Which of the following pairs of structures have the same genetic composition?
- (1) P and Q
 - (2) Q and R
 - (3) R and S
- A. (1) only
 - B. (3) only
 - C. (1) and (2) only
 - D. (2) and (3) only
34. Which of the following statements correctly describes the major role of Q?
- A. It protects the seeds by acting as a cushion.
 - B. It provides nutrients to the seeds for germination.
 - C. It helps seed dispersal by attracting animals to eat the fruit.
 - D. It allows the seeds to survive through adverse conditions by storing food.

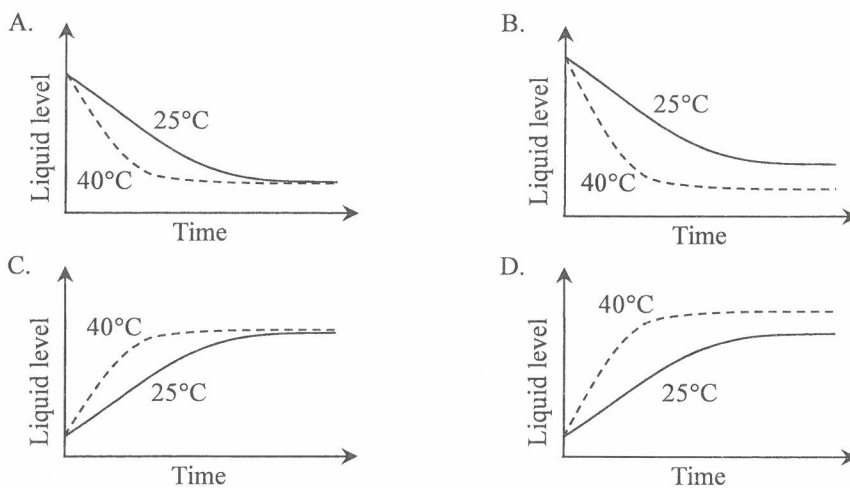
Directions: Questions 35 and 36 refer to the diagram below, which shows two set-ups used for investigating osmosis. Two dialysis tubings of different lengths were filled with 2% sucrose solution and then submerged in 10% sucrose solution. All solutions were kept at 25°C.



35. Which of the following graphs correctly shows the change in the liquid levels of set-ups 1 and 2?



36. If the experiment was repeated with the same setting except that the solutions were kept at 40°C, which of the following graphs correctly shows the change in the liquid levels of set-up 1 at different temperatures?



END OF SECTION A

Go on to Question-Answer Book B for questions on Section B

BIOLOGY PAPER 1

SECTION B : Question-Answer Book B

This paper must be answered in English

INSTRUCTIONS FOR SECTION B

- (1) After the announcement of the start of the examination, you should first write your Candidate Number in the space provided on Page 1 and stick barcode labels in the spaces provided on Pages 1, 3, 5, 7 and 9.
- (2) Refer to the general instructions on the cover of the Question Paper for Section A.
- (3) Answer **ALL** questions.
- (4) Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins. Answers written in the margins will not be marked.
- (5) Supplementary answer sheets will be supplied on request. Write your candidate number, mark the question number box and stick a barcode label on each sheet, and fasten them with string **INSIDE** this Question-Answer Book.
- (6) Present your answers in paragraphs wherever appropriate.
- (7) The diagrams in this section are **NOT** necessarily drawn to scale.
- (8) No extra time will be given to candidates for sticking on the barcode labels or filling in the question number boxes after the 'Time is up' announcement.

Please stick the barcode label here.

Candidate Number

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--



SECTION B

Answer ALL questions. Write your answers in the spaces provided.

1. The following are some life processes in humans:

- Egestion (A)
- Excretion (B)
- Feeding (C)
- Growth (D)
- Respiration (E)

(a) Use the letters to construct an equation showing the relationship of these processes in energy flow. (1 mark)

$$\boxed{} = \boxed{} - \boxed{} - \boxed{} - \boxed{}$$

(b) In terms of the energy value of each process, explain why the D/C ratio for vegetarians is lower than that for non-vegetarians. (3 marks)

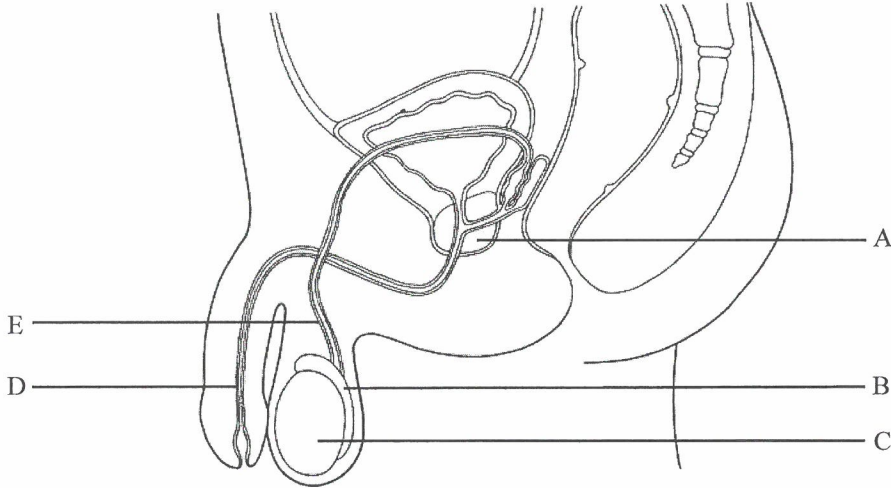
Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Please stick the barcode label here.

2. The diagram below shows the human male reproductive system and its associated structures:



(a) In which structure does meiosis take place? Give your answer using the letters in the diagram. (1 mark)

.....

(b) State the functions of structures A and B respectively. (2 marks)

.....
.....

(c) Vasectomy is an operation for achieving permanent contraception in males.

(i) Using the letters in the diagram, state the structure which is affected in this contraceptive method. (1 mark)

.....

(ii) What is the biological basis of this contraceptive method? (2 marks)

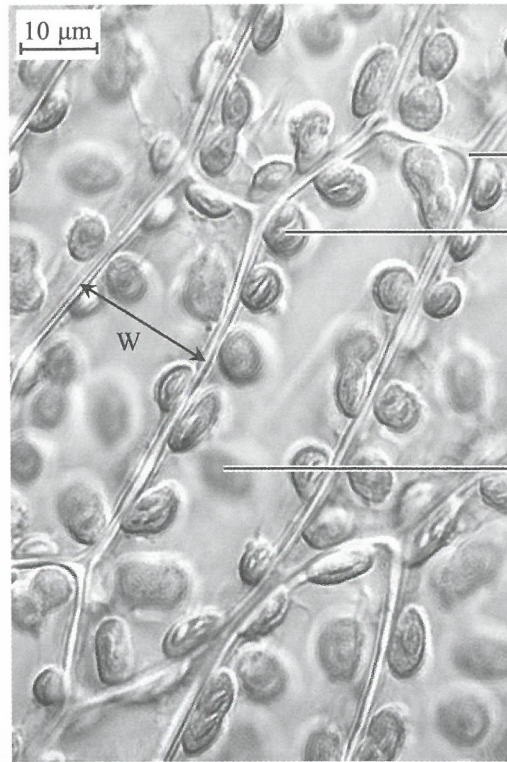
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Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

3. The photomicrograph below shows some unstained plant cells:



M : _____

chloroplast 1

chloroplast 2

(a) Label structure M. (1 mark)

(b) What is the actual length of W shown in the photomicrograph? (1 mark)

(c) Chloroplast 1 appears sharp in this photomicrograph while chloroplast 2 appears blurred. To obtain a sharper image of chloroplast 2, how should you operate the microscope? (1 mark)

(d) Some structures of chloroplast cannot be distinguished in this photomicrograph. State *one* of these structures. (1 mark)

(e) Give *one* equipment that can be used to observe the structure stated in (d). (1 mark)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Please stick the barcode label here.

4. The photomicrograph below shows the karyotype of a patient who is suffering from a certain brain disease:



(a) What is the gender of this patient? Describe *one* observable feature from the karyotype to support your answer. (2 marks)

(b) (i) Describe the abnormality shown in the karyotype. (1 mark)

(ii) State the type of mutation involved in this abnormality. (1 mark)

(iii) How would this abnormality affect the mRNA level in the brain cells of this patient? (1 mark)

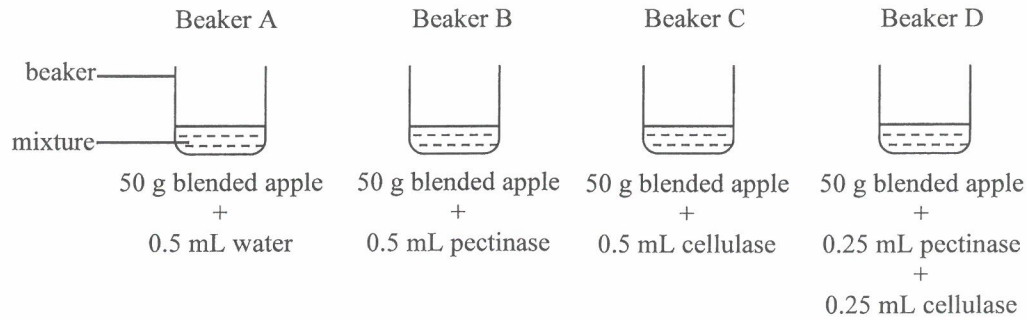
(c) The cerebellum is one of the regions affected by this disease. In relation to the function of the cerebellum, suggest *one* difficulty that would be experienced by this patient. (1 mark)

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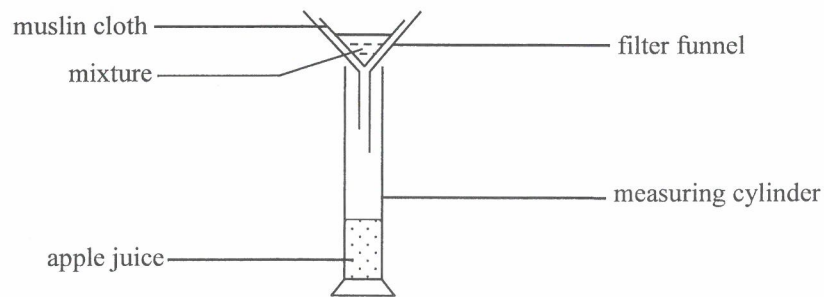
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5. Pectinase and cellulase are enzymes that break down the chemical components of plant cell walls. The following experiment investigates the effects of these two enzymes on the production of apple juice:



↓
stir each mixture for 10 minutes
and then carry out filtration



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The experiment was repeated three times and the results are shown below:

Beaker	Mixture	Volume of apple juice produced (mL)				Cost of enzyme(s) for producing 1 mL apple juice
		Trial 1	Trial 2	Trial 3	Average	
A	0.5 mL water + 50 g blended apple	2.0	1.0	3.0	2.0	---
B	0.5 mL pectinase + 50 g blended apple	33.5	31.0	28.5	31.0	
C	0.5 mL cellulase + 50 g blended apple	4.5	4.0	3.5	4.0	
D	0.25 mL pectinase + 0.25 mL cellulase + 50 g blended apple	34.0	32.0	36.0	34.0	

- (a) State the independent variable and dependent variable of this experiment. (2 marks)

- (b) Why are three trials better than one trial? (1 mark)

- (c) The enzyme solutions used in the experiment were at the same concentration. The prices of 0.5 mL pectinase and 0.5 mL cellulase were \$13 and \$7 respectively. Complete the above table to show the cost of enzyme(s) for producing 1 mL of apple juice. (2 marks)

- (d) Based on the answer in (c), which is the most cost-effective means for producing apple juice? (1 mark)

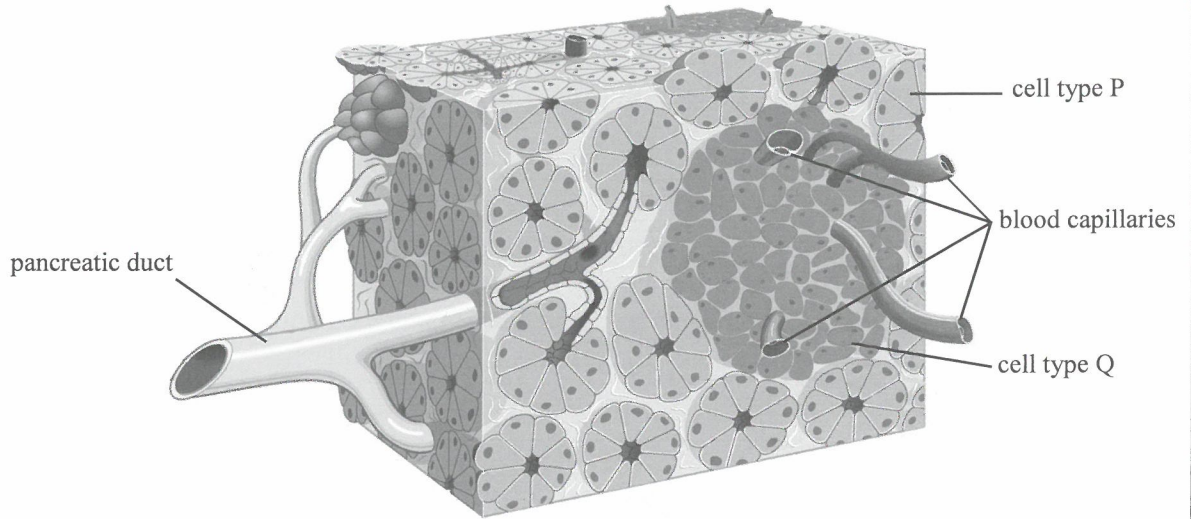
- (e) Explain why the apple juice collected from Beaker D is clearer than that from Beaker A. (1 mark)

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6. The schematic diagram below illustrates the distribution of different cell types in the human pancreas:



(a) Which type of cells, P or Q, secretes hormones? Support your answer with *one* observable feature illustrated in the diagram. (3 marks)

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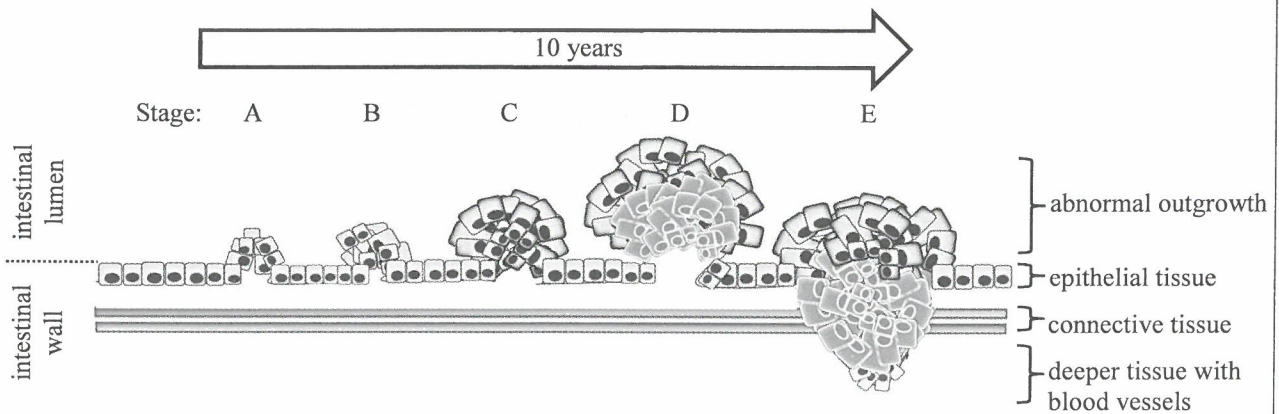
- (b) A person jogs slowly for an hour. Describe how the hormones from the pancreas can regulate the blood glucose level of the person while jogging. (4 marks)

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7. Colorectal cancer is one of the most common cancers in Hong Kong. The schematic diagram below shows the developmental stages of colorectal cancer over time:



(a) Which stage of colorectal cancer has a high risk of spreading? Explain your answer. (2 marks)

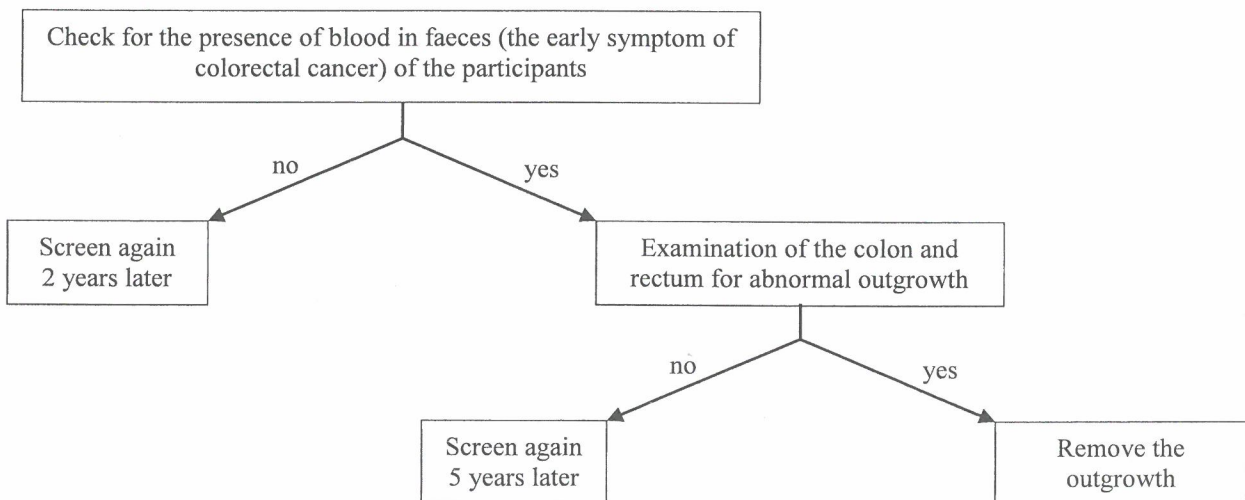
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(b) The Department of Health in Hong Kong has launched a regular screening programme for the prevention of colorectal cancer. The flowchart below illustrates the screening programme:



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- (i) The screening programme is recommended for people aged 50 or above. Give *two* reasons why this group of people is more susceptible to colorectal cancer. (2 marks)

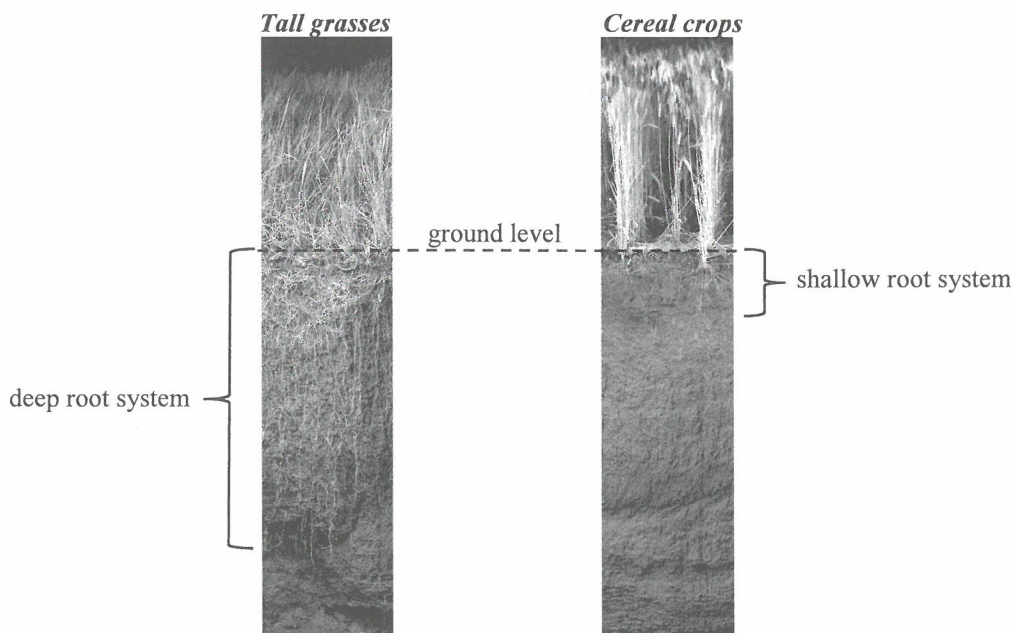
- (ii) If there is no abnormal outgrowth of the epithelium of the large intestine, the next screening can be conducted 5 years later. With reference to the developmental stages of colorectal cancer, explain this practice. (1 mark)

- (iii) Recently, there is a growing trend of people diagnosed with colorectal cancer at a younger age. Suggest *two* eating habits which may lead to this growing trend. (2 marks)

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8. Tall grasses and cereal crops belong to the same family and share a common ancestor. Cereal crops have been artificially selected for agriculture and their seeds harvested as food. The roots of the tall grasses in grasslands range in depth from 1.5 m to 4.5 m while those of cereal crops rarely exceed 1 m. The photographs below show the root depths of tall grasses and cereal crops under the same magnification:



- (a) (i) Grassland is a region of treeless plain which is mainly occupied by tall grasses. It is usually found in regions with moderate rainfall. The tall grasses have evolved with a deep root system. What is the selection pressure involved in this evolutionary process? What is the advantage of the greater root depth in tall grasses? (2 marks)

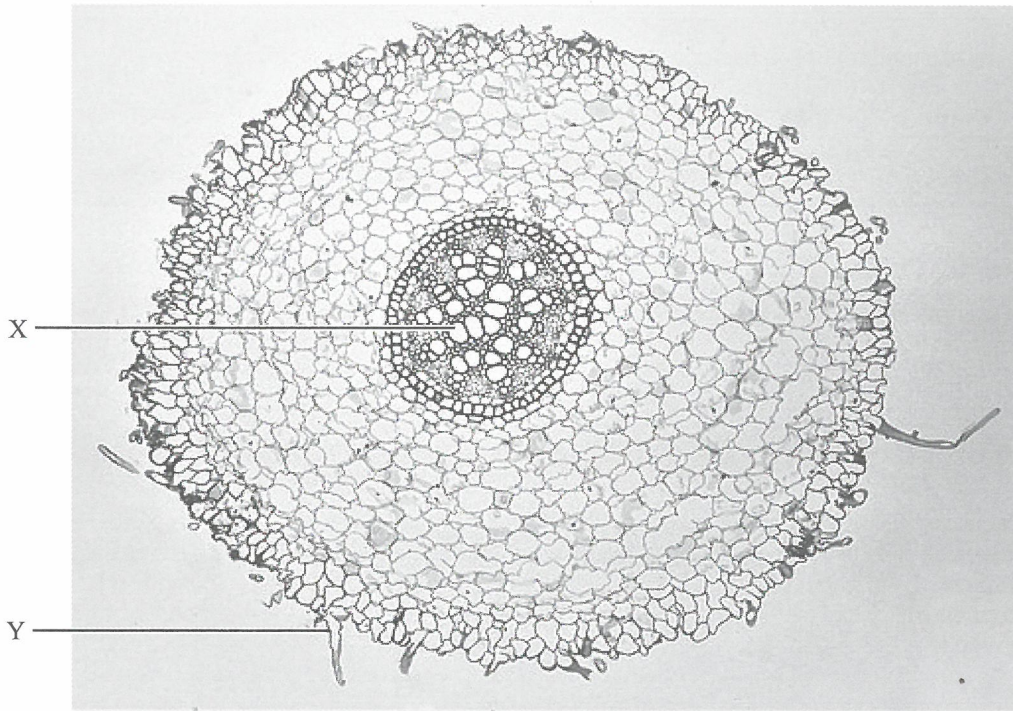
- (ii) In terms of energy usage of the plant, explain why having a shallow root system for cereal crops is considered an advantage to farmers. (2 marks)

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(b) The photomicrograph below shows the cross-section of the root of a cereal crop:



(i) Complete the table below to show how an observable feature of the structures X and Y is related to its function. (4 marks)

	Observable feature	Function
X		
Y		

(ii) Explain how water is transported from structure Y to structure X. (3 marks)

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9. Antibiotics have been widely used to treat bacterial infections. They work by killing bacteria or inhibiting their growth. However, some strains of bacteria have developed resistance to antibiotics.

(a) How can antibiotics kill bacteria or inhibit their growth? State *three* possible ways. (3 marks)

(b) Bacterium R is a pathogenic bacterium which possesses an antibiotic resistance gene. Its gene product can break down antibiotic X. Scientists have suggested a new approach to fight against bacterium R. This new approach involves the use of a synthetic polynucleotide which binds to the mRNA transcribed from the antibiotic resistance gene. The expression of the gene is then inhibited. By administering this synthetic polynucleotide together with antibiotic X, bacterium R can be killed.

The base sequences of the synthetic polynucleotide and part of the mRNA are shown below:

synthetic polynucleotide: AGT GAC TCG GTC AGC

mRNA: ... AUG UCU GUU CCA UCA UCA CUG AGC CAG UCG GCC AUU AAU GCC AAC UAG ...

(i) On the mRNA, underline the base sequence to which the synthetic polynucleotide will bind. (1 mark)

(ii) Explain how the synthetic polynucleotide can inhibit the expression of the antibiotic resistance gene. (3 marks)

(iii) Suggest *one* advantage of using synthetic polynucleotides to fight against antibiotic resistant bacteria. (1 mark)

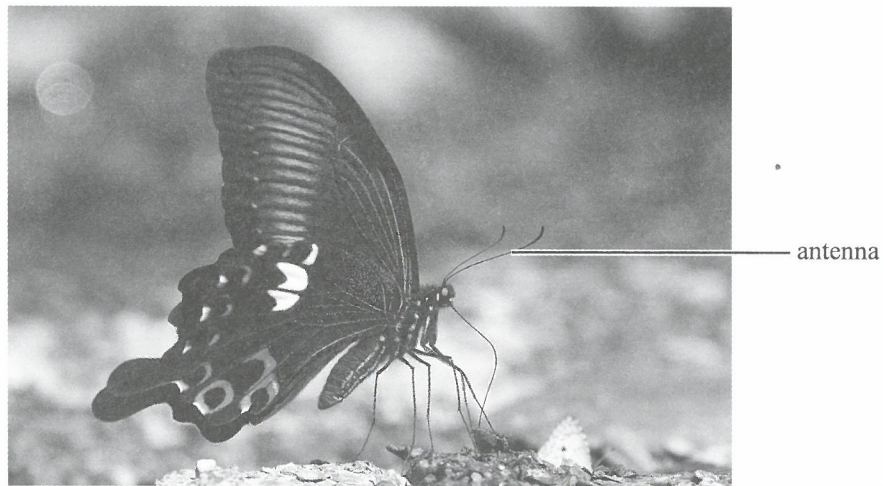
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10. *Habenaria* is a genus of orchids with dull-coloured and scented flowers, which attract moths for pollination at night. In the group, *H. rhodocheila* is an exceptional species with reddish flowers which lack a detectable scent. It was found that no insects visited the flowers of *H. rhodocheila* at night for pollination while insect species A consumed nectar from the flowers in the daytime.

(a) The following dichotomous key can be used to identify the group to which insect species A belongs:

- | | | | |
|----|-----------------------------|-------|---------|
| 1a | with wings | | 2 |
| 1b | without wings | | Group P |
| 2a | antennae longer than head | | 3 |
| 2b | antennae shorter than head | | Group Q |
| 3a | wings rest at their sides | | Group R |
| 3b | wings rest together upright | | Group S |

The photograph below shows the appearance of species A at rest. Using the above key, write down the sequence which leads to the identification. (1 mark)



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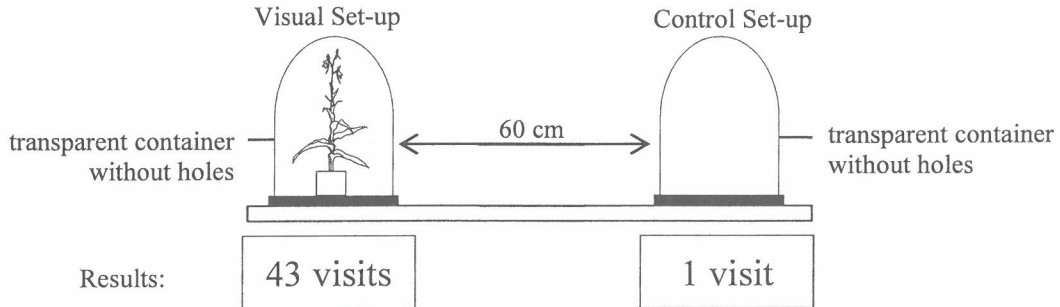
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(b) In this case, *H. rhodocheila* was evolved from other *Habenaria* species. Suggest how the speciation of *H. rhodocheila* could be facilitated by different insect pollinators. (3 marks)

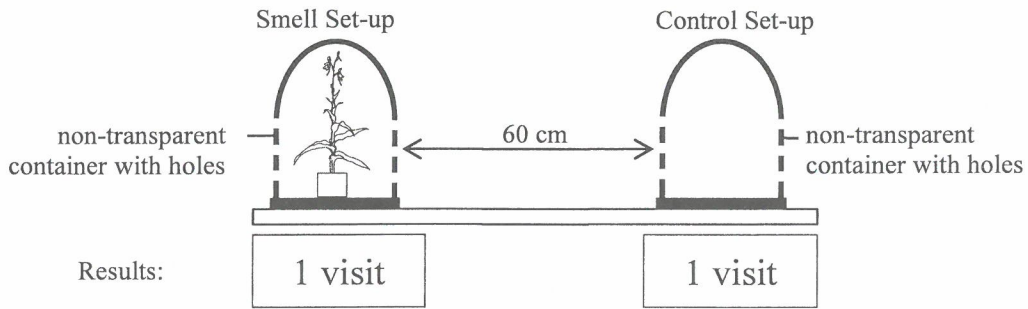
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- (c) To determine if insect species A is attracted to the flowers of *H. rhodocheila* by its appearance or its smell (if any), researchers designed an investigation as shown in the diagrams below:

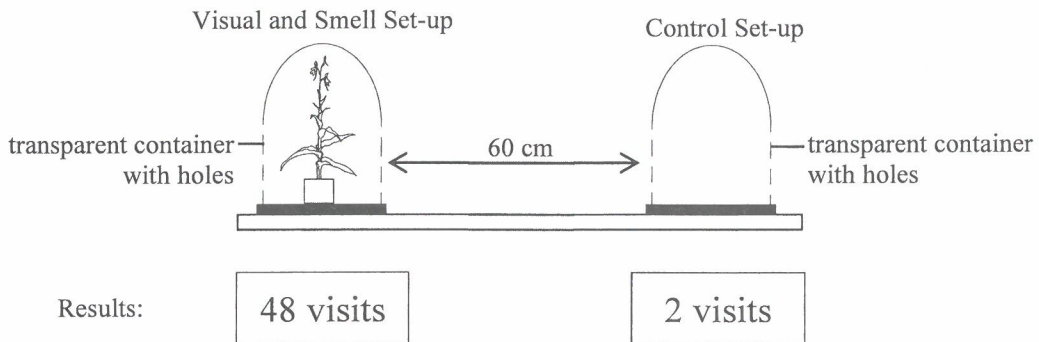
Treatment 1:



Treatment 2:



Treatment 3:



In each treatment, two set-ups were placed in an open area at a distance of 60 cm from each other for one hour. After that, the position of the two set-ups was exchanged for another hour. During the two-hour period, if an individual of species A approached any set-up to a distance of less than 10 cm, it was counted as one visit. The number of visits to each set-up is shown in the boxes in the above diagrams.

- (i) To ensure that the investigation was a fair test, exchanging the positions of the two set-ups was a necessary step. Explain why. (1 mark)

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(ii) With reference to the aim of the investigation, what conclusions can you draw from the results of Treatment 1 and Treatment 2 respectively? (4 marks)

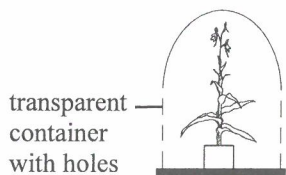
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(iii) When Ann and Ken compared the results of the three treatments, they had different interpretations. Ann thought that the larger number of visits in Treatment 3 might reflect a synergistic effect of visual and smell attractions while Ken thought that it might be simply due to random variations. To verify Ann's idea, they decided to conduct a further investigation with two more treatments for comparison.

The diagrams below show the Visual and Smell Set-up. In each treatment, complete the corresponding Control Set-up by putting a '✓' in the appropriate boxes to show the conditions that should be adopted. (2 marks)

Treatment 4:

Visual and Smell Set-up

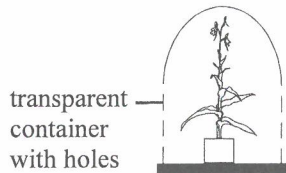


Conditions for the corresponding Control Set-up:

- with plant without plant
- transparent container non-transparent container
- container with holes container without holes

Treatment 5:

Visual and Smell Set-up



Conditions for the corresponding Control Set-up:

- with plant without plant
- transparent container non-transparent container
- container with holes container without holes

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