

HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY  
HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2019

## 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.**

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### INSTRUCTIONS FOR SECTION A (MULTIPLE-CHOICE QUESTIONS)

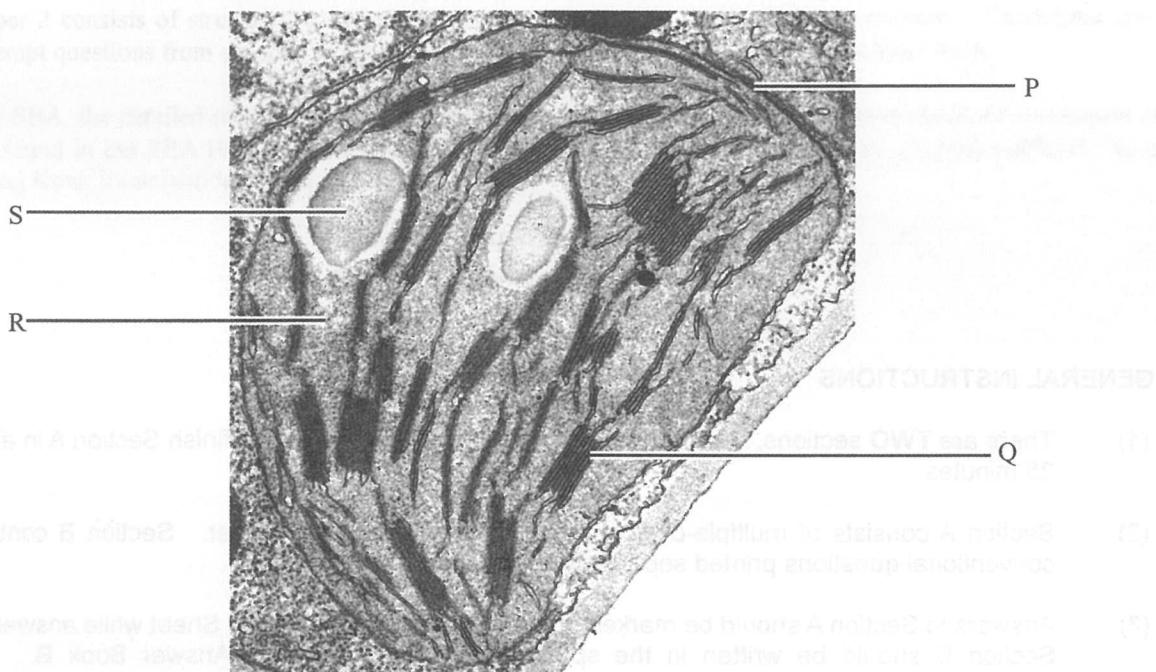
- (1) Read carefully the instructions on the Answer Sheet. After the announcement of the start of the examination, you should first stick a barcode label and insert the information required in the spaces provided. No extra time will be given for sticking on the barcode label after the 'Time is up' announcement.
- (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.

Not to be taken away before the  
end of the examination session

**There are 36 questions in this section.**

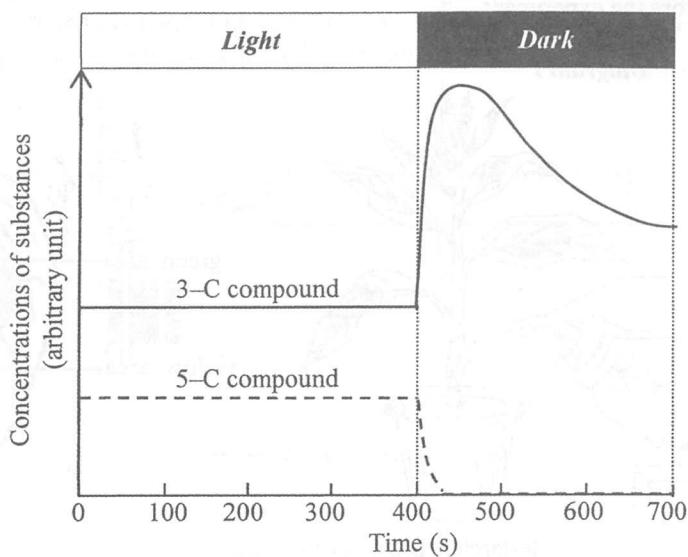
**The diagrams in this section are NOT necessarily drawn to scale.**

**Directions:** Questions 1 and 2 refer to the electron micrograph below, which shows a chloroplast of a plant cell:



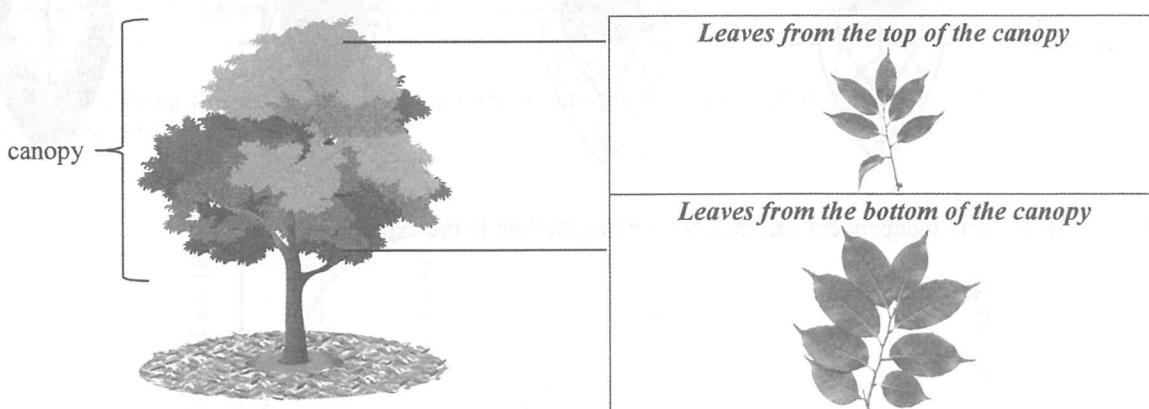
- During photosynthesis, light is captured at
  - P.
  - Q.
  - R.
  - S.
- Carbon dioxide with radioactively labelled oxygen was provided to the plant cell for photosynthesis. Radioactivity can be detected in
  - oxygen produced at Q.
  - oxygen produced at R.
  - glucose produced at Q.
  - glucose produced at R.
- Which of the following process(es) in the respiratory pathways release(s) carbon dioxide?
  - (1) Oxidative phosphorylation
  - (2) Reactions in the Krebs cycle
  - (3) Conversion of glucose to pyruvate
  - (1) only
  - (2) only
  - (1) and (3) only
  - (2) and (3) only

4. The graph below shows the changes in the relative concentrations of a 3-C compound and a 5-C compound (carbon dioxide acceptor) in the Calvin cycle in green plant cells which have been kept in bright light and then in darkness.



Which of the following is *not* a reason why the concentration of the 5-C compound decreased in the dark?

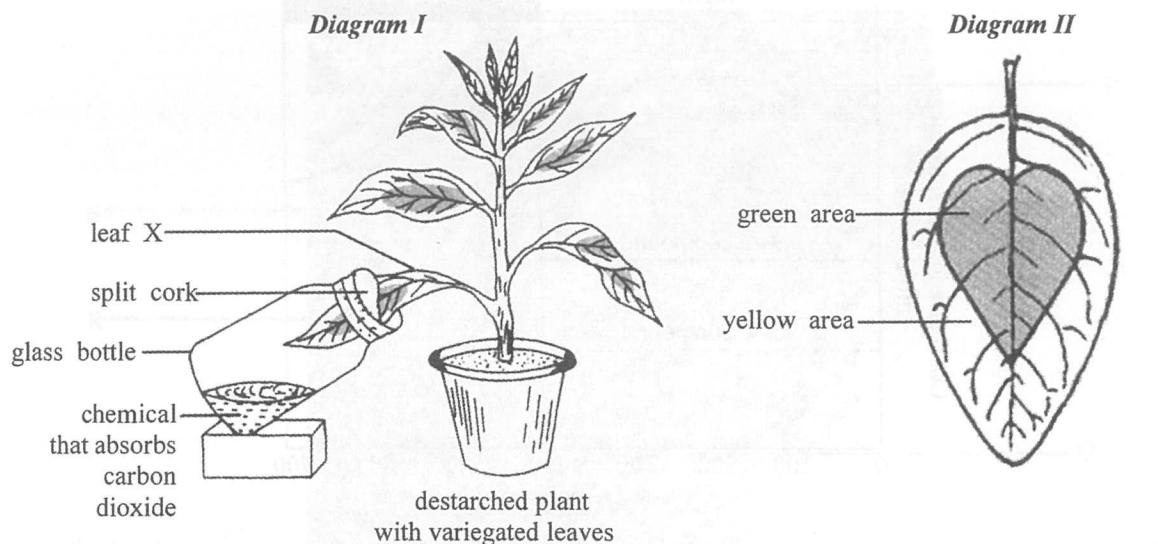
- A. The 5-C compound was converted to the 3-C compound.  
B. The 5-C compound combined with carbon dioxide to form glucose directly.  
C. Regeneration of 5-C compound stopped because there was no ATP from photochemical reactions.  
D. Regeneration of 5-C compound stopped because there was no NADPH from photochemical reactions.
5. The photographs on the right below show leaves taken from different parts of the canopy of the same tree. (Note: The photographs are of the same magnification.)



Which of the following is the most likely explanation for the differences between the leaves taken from the two parts of the canopy?

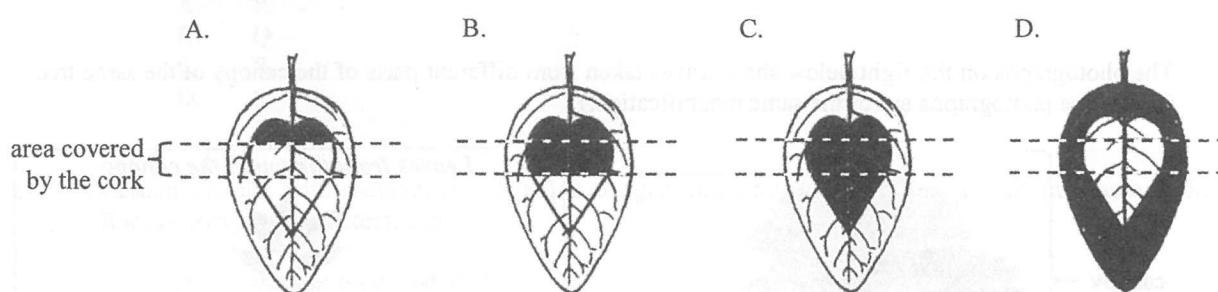
- A. The leaves from the top of the canopy are smaller because they do not receive sufficient water for growth.  
B. The leaves from the top of the canopy are smaller because they can reduce water loss due to transpiration.  
C. The leaves from the bottom of the canopy are larger because they can store more food from photosynthesis.  
D. The leaves from the bottom of the canopy are larger because they can collect light escaped through the top of the canopy.

**Directions:** Questions 6 and 7 refer to Diagram I and Diagram II below. Diagram I shows a set-up prepared by a student to study the conditions for photosynthesis. Diagram II shows the leaf surface of a variegated leaf X before the experiment.



6. After leaving the set-up under sunlight for several hours, iodine test was carried out on leaf X. Which of the following diagrams correctly shows the results?

Key:  brown  
 blue black



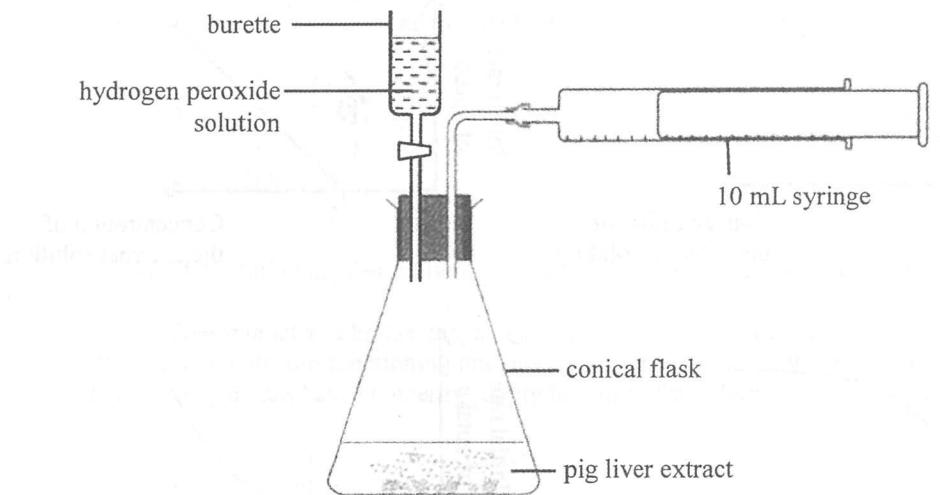
7. How many independent variables were being studied in the experiment?

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

8. According to the requirements of various methods of transport across the cell membrane, which of the following combinations is correct?

Requirements		
Energy input	Membrane protein	Concentration gradient
A. phagocytosis	active transport	osmosis
B. diffusion	osmosis	active transport
C. active transport	phagocytosis	phagocytosis
D. osmosis	diffusion	diffusion

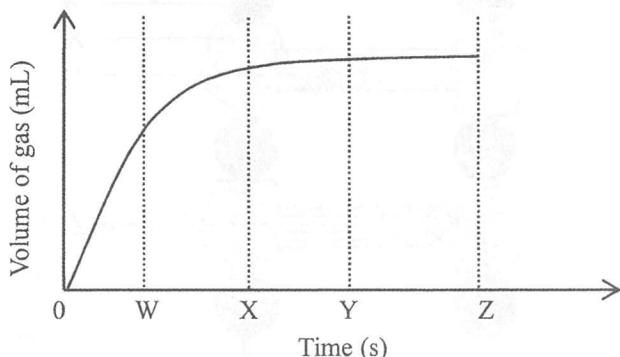
**Directions:** Questions 9 and 10 refer to the diagram below, which shows an experimental set-up prepared by a student to investigate the effect of temperature on catalase activity. Pig liver extract contains catalase which speeds up the breakdown of hydrogen peroxide into oxygen and water. A fixed volume of hydrogen peroxide solution was added to the liver extract and a 10 mL syringe was used to collect the oxygen gas released from the reaction mixture.



9. In the trial run conducted at room temperature, the student found that the volume of oxygen released was greater than the maximum collection volume of the syringe. How should he modify the set-up in order to collect valid data when repeating the experiment at different temperatures?

- (1) use a larger syringe
  - (2) use a larger conical flask
  - (3) reduce the volume of the hydrogen peroxide solution added
- A. (1) and (2) only  
B. (1) and (3) only  
C. (2) and (3) only  
D. (1), (2) and (3)

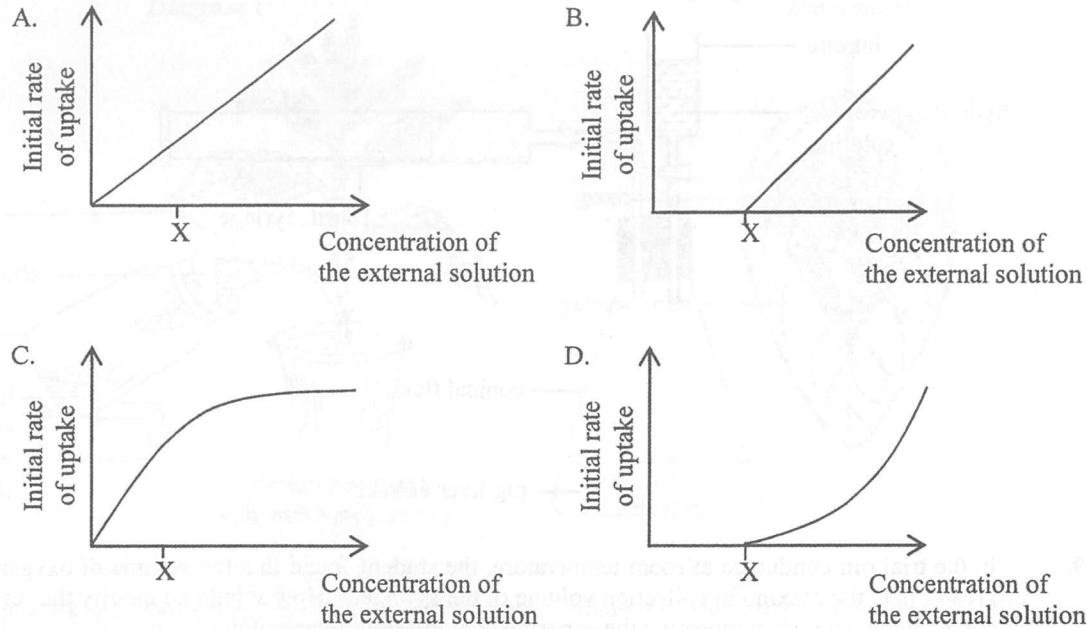
10. After modifying the set-up, the following graph was obtained which shows the volume of gas collected over time at room temperature:



The student planned to use the volume of gas collected over a fixed period of time as the dependent variable to study the effect of different temperatures on catalase activity. Which of the following is the most suitable time period for the measurement?

- A. 0 – W
- B. 0 – X
- C. 0 – Y
- D. 0 – Z

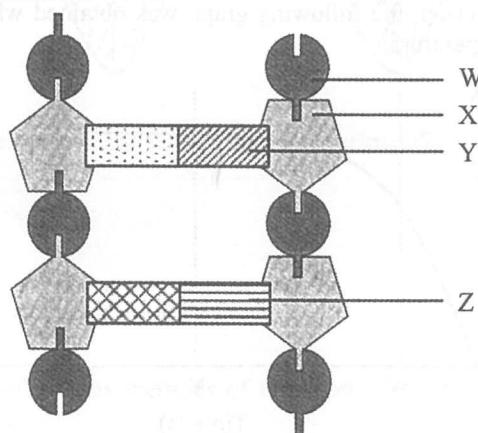
11. Solutions of different concentrations of a solute with a small molecular size were prepared and some plant cells were immersed in each of the solutions. Which of the following graphs shows the initial rate of uptake of the solute by means of diffusion?  
(Note: X is the concentration of the solute inside the plant cells)



12. Which of the following statements about the human egg and sperm is correct?

- A. Both have the same number of genes.
- B. Both have the same amount of cytoplasm.
- C. Both have the same amount of food reserve.
- D. Both have the same number of chromosomes.

13. The diagram below shows a DNA model:



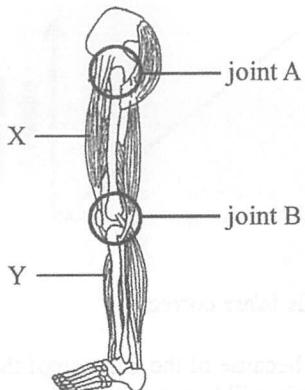
- Which of the following combinations shows the most probable identities of molecules W, X, Y, and Z?

- | <b>W</b>     | <b>X</b>  | <b>Y</b> | <b>Z</b> |
|--------------|-----------|----------|----------|
| A. sugar     | phosphate | cytosine | thymine  |
| B. sugar     | phosphate | cytosine | guanine  |
| C. phosphate | sugar     | adenine  | thymine  |
| D. phosphate | sugar     | adenine  | guanine  |

14. In a family, the father is red-green colour blind (a recessive X-linked trait) and is of blood group A, while the mother has normal vision and is of blood group B. Which of the following could be the phenotypes of their biological child?
- (1) a normal-vision girl with blood group O  
(2) a red-green colour blind girl with blood group O  
(3) a red-green colour blind boy with blood group AB
- A. (1) and (2) only  
B. (1) and (3) only  
C. (2) and (3) only  
D. (1), (2) and (3)
15. Which of the following description(s) of human red blood cells is/are correct?
- (1) They cannot synthesise enzymes or proteins for repair because of the absence of the nucleus.  
(2) They will stop functioning one day because haemoglobin will be used up.  
(3) They do not have an energy supply because of the absence of mitochondria.
- A. (1) only  
B. (2) only  
C. (1) and (3) only  
D. (2) and (3) only
16. Peter wanted to throw a crumpled paper into the rubbish bin in a dim room. He found that he could see the bin more clearly if he tried to focus on objects right next to the bin. Which of the following statements about the image formation of the bin is correct?
- A. Image of the bin is formed on the yellow spot where there are cone cells only.  
B. Image of the bin is formed on the yellow spot where there are more cone cells than rod cells.  
C. Image of the bin is formed on the periphery of the retina where there are rod cells only.  
D. Image of the bin is formed on the periphery of the retina where there are more rod cells than cone cells.
17. Wearing contact lenses for too long will have an adverse effect on the eyes because this decreases the amount of oxygen reaching the eyes. Which of the following eye structures is most affected in this case?
- A. iris  
B. lens  
C. cornea  
D. sclera
18. Which of the following organs serves both endocrine and exocrine functions?
- A. pancreas  
B. pituitary  
C. oesophagus  
D. adrenal gland

**Directions:** Questions 19 and 20 refer to Diagram I and Diagram II below. Diagram I shows a leg and its associated muscles while Diagram II shows a woman practising yoga.

**Diagram I**



**Diagram II**



19. Which of the following combinations correctly identifies joints A and B in Diagram I?

**Joint A**

- A. Hinge joint
- B. Hinge joint
- C. Ball and socket joint
- D. Ball and socket joint

**Joint B**

- Hinge joint
- Ball and socket joint
- Ball and socket joint
- Hinge joint

20. Which of the following combinations correctly indicates the state of muscles X and Y when the woman is maintaining the yoga posture shown in Diagram II?

**X**

- A. contracted
- B. contracted
- C. relaxed
- D. relaxed

**Y**

- contracted
- relaxed
- contracted
- relaxed

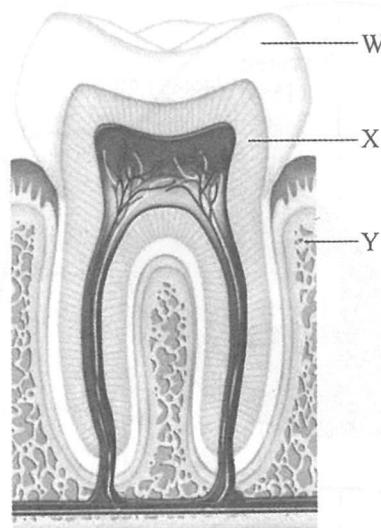
21. Daisy is very hungry. When the waiter puts her favourite dish on the table, her saliva secretion increases. Which of the following body parts controls this response?

- A. cerebrum
- B. cerebellum
- C. salivary gland
- D. medulla oblongata

22. When ventricles contract, the valves between ventricles and atria close. Which of the following is the cause of the valve closure?

- A. The heart tendons hold the valves in position.
- B. The refilling of blood at the atria pushes the valves so that they close.
- C. The closure of valves prevents the blood from flowing back to the atria.
- D. The higher blood pressure resulting from ventricular contraction pushes the valves so that they close.

**Directions:** Questions 23 and 24 refer to the diagram below, which shows a section of one type of tooth and its associated structures:



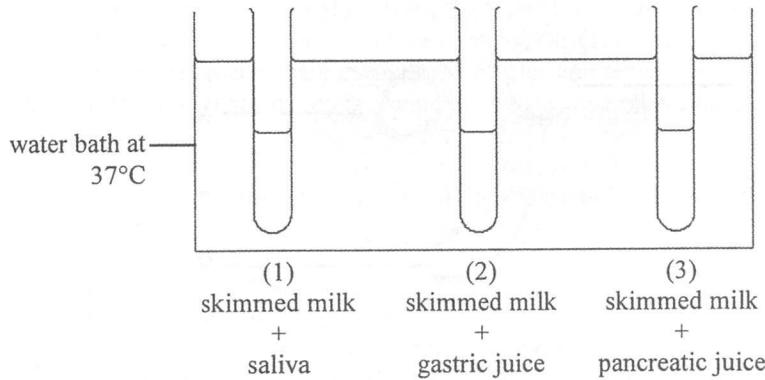
23. Which of the following are living tissues that contain a large amount of calcium salt?

- A. W and X
- B. W and Y
- C. X and Y
- D. W, X and Y

24. The number of this type of tooth in the milk dentition is

- A. 0.
- B. 4.
- C. 8.
- D. 12.

25. The diagram below shows a water bath with three test-tubes containing different mixtures:

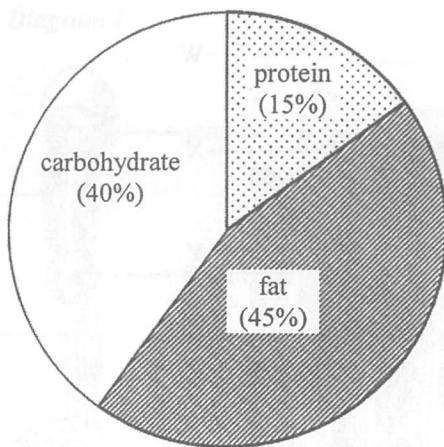


Chemical digestion of food takes place in test-tubes

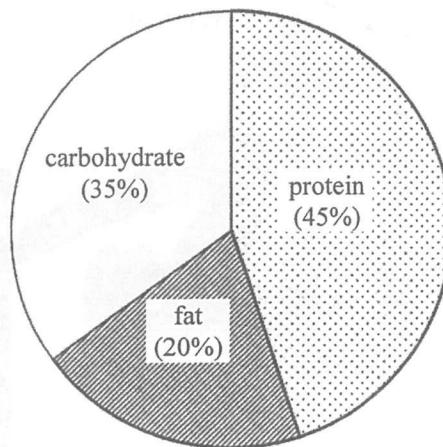
- A. (1) and (2) only.
- B. (1) and (3) only.
- C. (2) and (3) only.
- D. (1), (2) and (3).

26. The following charts show the composition of four different foodstuffs. Which foodstuff yields the highest amount of energy per gram?

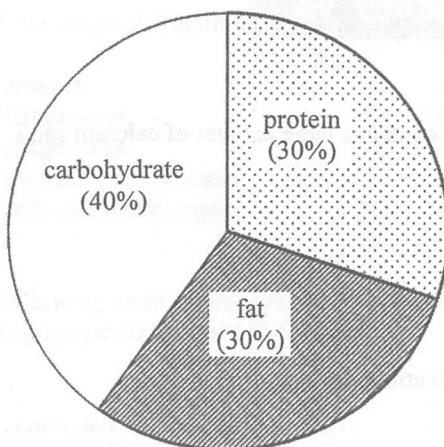
A.



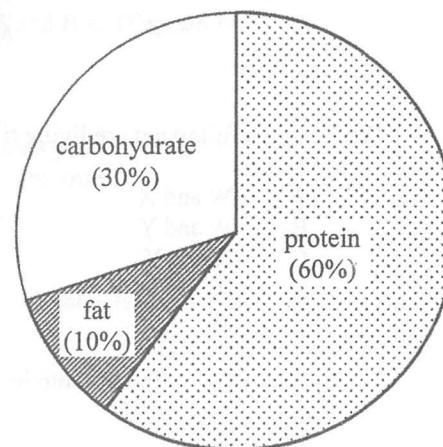
B.



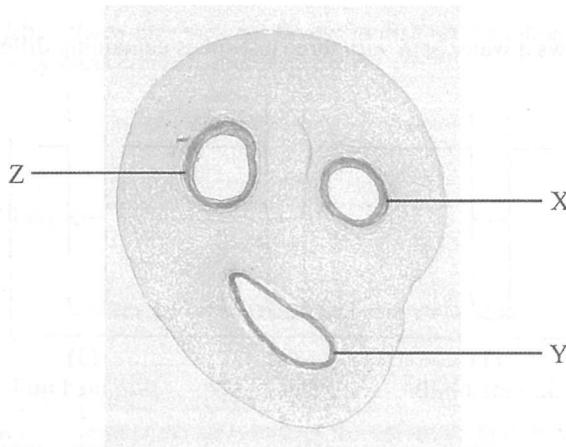
C.



D.



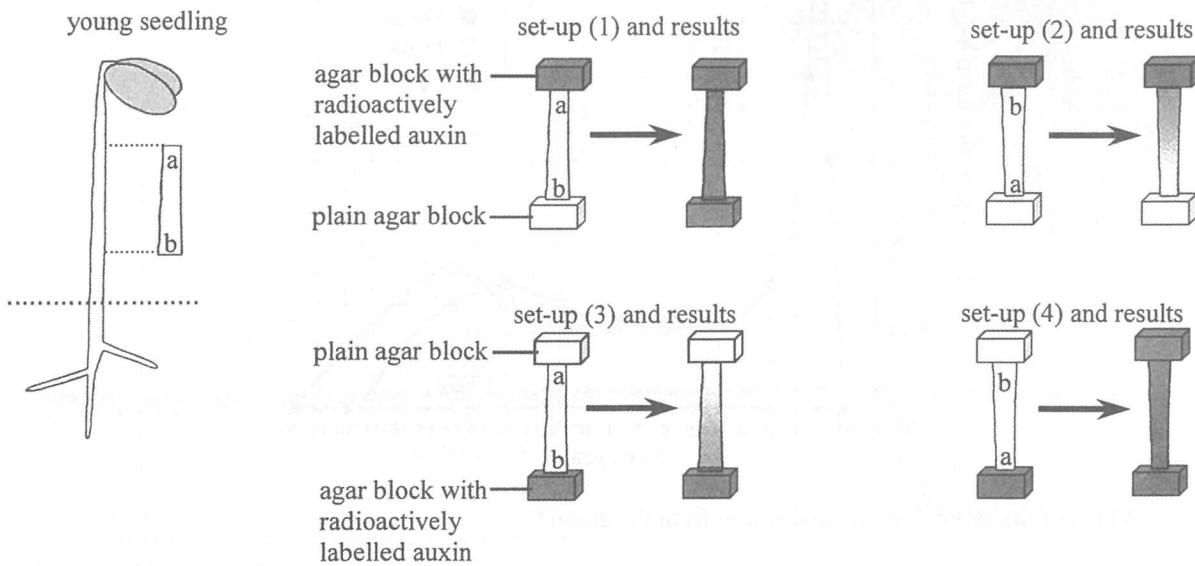
27. The photomicrograph below shows a section of a human umbilical cord with three blood vessels:



Which of the following comparisons of the content of the blood vessels is correct?

- A. The blood in vessel X has a higher oxygen content than that in vessel Y.
- B. The blood in vessel Z has a higher glucose content than that in vessel X.
- C. The blood in vessel Y has a higher amino acid content than that in vessel X.
- D. The blood in vessel Y has a higher carbon dioxide content than that in vessel Z.

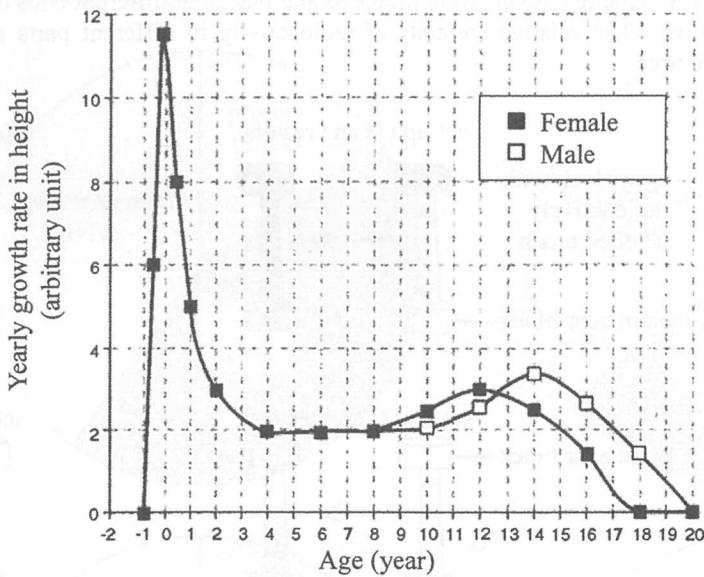
28. To investigate the transport of auxins in the stem of a young seedling, a plain agar block and an agar block soaked in radioactively labelled auxins were prepared and placed at different ends of a cut stem, as shown in the diagram below. The relative amounts of radioactivity in different parts are shown as different intensities of shaded area.



Which of the following conclusions can be drawn from the above results?

- (1) Transport of auxins in the stem is not affected by gravity.
  - (2) Transport of auxins in the stem involves an active process.
  - (3) Transport of auxins in the stem mainly takes place from a to b.
- A. (1) and (2) only  
 B. (1) and (3) only  
 C. (2) and (3) only  
 D. (1), (2) and (3)
29. If a student wants to find out whether the distribution of plant species is affected by the slope of a hillside, which of the following sampling methods should be used?
- A. Set up a line transect along the hillside and record the plant species that touch the line.
  - B. Set up a line transect around the hillside and record the plant species that touch the line.
  - C. Randomly place quadrats along the hillside and record the plant species within the quadrat.
  - D. Randomly place quadrats around the hillside and record the plant species within the quadrat.
30. Which of the following parameters is best used for recording the growth of a potted germinating seedling over a period of time?
- A. the dry mass of the seedling
  - B. the fresh mass of the seedling
  - C. the total surface area of the seedling's leaves
  - D. the time taken for the seedling's first leaf to appear

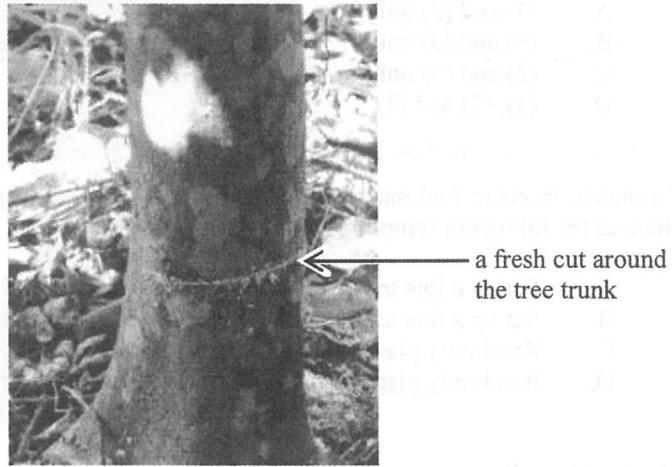
31. The graph below shows the growth rate of humans:



Which of the following can be deduced from the graph?

- A. The brain grows rapidly from age 0 to age 4.
- B. There is no more change in growth for males after age 20.
- C. The duration of adolescence is the same in males and females.
- D. Growth of the reproductive organs begins at age 10 in females.

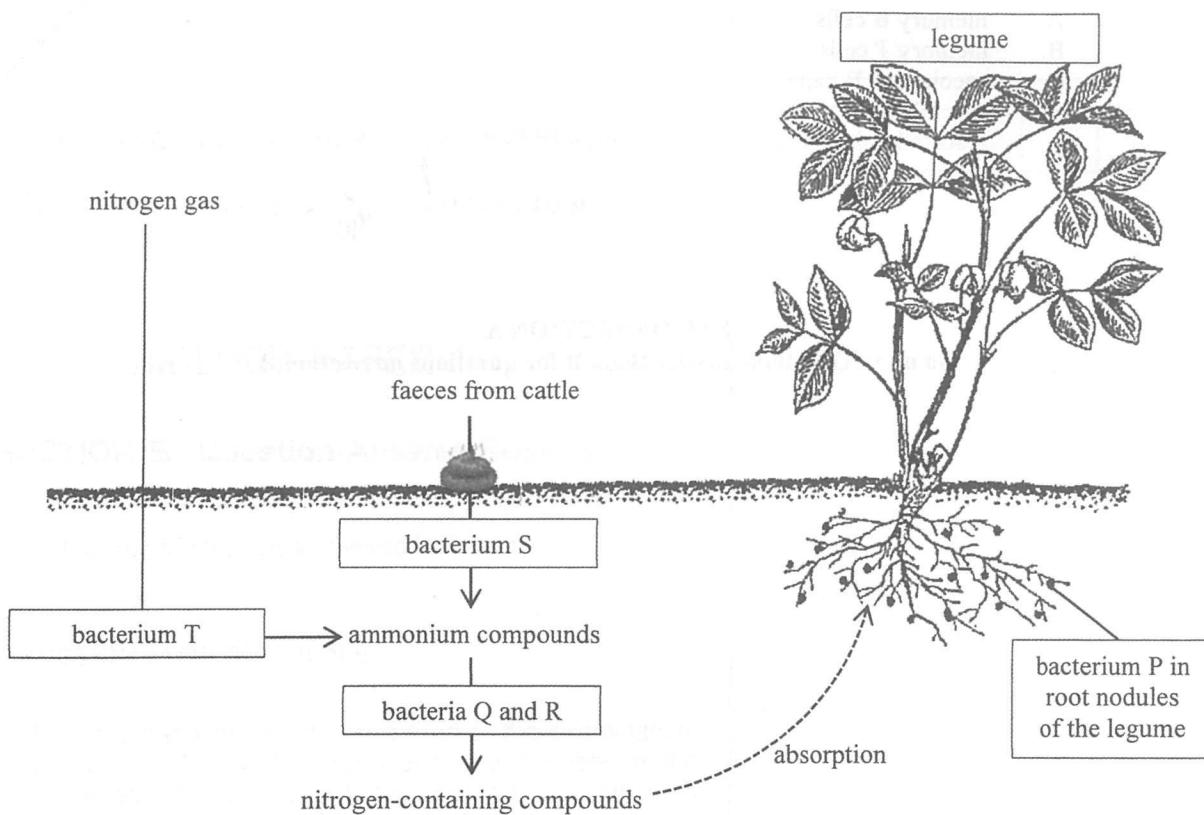
32. The photograph below shows a fresh cut around the trunk near the bottom of a tree:



The tree eventually died. Which of the following is the most likely reason for the death of the tree?

- A. Water could not be transported to the leaves for transpiration.
- B. Water could not be transported to the leaves for photosynthesis.
- C. Minerals could not be transported upward for protein synthesis.
- D. Photosynthetic products could not be transported to the roots for respiration.

**Directions:** Questions 33 and 34 refer to the diagram below, which shows some processes of the nitrogen cycle:



33. Which of the following statements about the bacteria shown in the diagram is correct?

- A. P belongs to parasitic bacteria.
- B. Q belongs to nitrifying bacteria.
- C. R belongs to nitrogen-fixing bacteria.
- D. S belongs to denitrifying bacteria.

34. Which of the following bacteria has a similar role to fungi in the cycling of materials?

- A. Q
- B. R
- C. S
- D. T

35. Type II diabetic patients may feel dizzy after prolonged exercise. Which of the following is the most likely explanation for this?

- A. Their blood glucose level has dropped to too low a level because they do not have enough stored glycogen to replenish the glucose used.
- B. Their blood glucose level has dropped to too low a level because they do not have enough glucagon to stimulate the conversion of glycogen to glucose.
- C. Their blood glucose level has risen to too high a level because they keep losing water during exercise.
- D. Their blood glucose level has risen to too high a level because they do not have enough insulin to stimulate the conversion of glucose to glycogen.

36. Antibodies are produced by
- A. memory B cells.
  - B. memory T cells.
  - C. specialised B cells.
  - D. specialised T cells.

**END OF SECTION A**

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

37. The photographs below show a plant growing in a glasshouse. Some of the parts of the plant are labeled with letters. Identify the following parts:
- (a) A leaf
  - (b) A flower
  - (c) A stem
  - (d) A root
  - (e) A seed
  - (f) A fruit
  - (g) A bud
  - (h) A petiole
  - (i) A petiole
  - (j) A petiole
  - (k) A petiole
  - (l) A petiole
  - (m) A petiole
  - (n) A petiole
  - (o) A petiole
  - (p) A petiole
  - (q) A petiole
  - (r) A petiole
  - (s) A petiole
  - (t) A petiole
  - (u) A petiole
  - (v) A petiole
  - (w) A petiole
  - (x) A petiole
  - (y) A petiole
  - (z) A petiole

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HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2019

## 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**

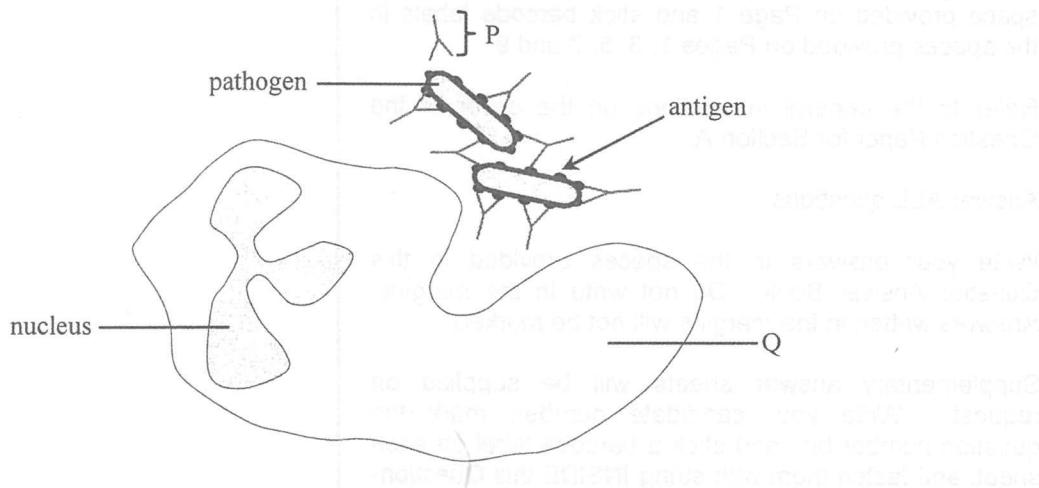
Answer **ALL** questions. Write your answers in the spaces provided.

1. (a) Physical and chemical barriers are the first line of defence in the human body. Select from Column II **all** correct example(s) that belong(s) to the two types of barriers in Column I and put the letter(s) in the spaces provided. (2 marks)

<i><b>Column I</b></i>	<i><b>Column II</b></i>
(i) physical barrier	A. skin B. tear
(ii) chemical barrier	C. antibody D. blood clot E. gastric juice

Answers written in the margins will not be marked.

- (b) The diagram below shows the process of phagocytosis. Q is a phagocyte while P is a protein molecule produced by a type of lymphocyte.



Describe the function of P in phagocytosis. (3 marks)

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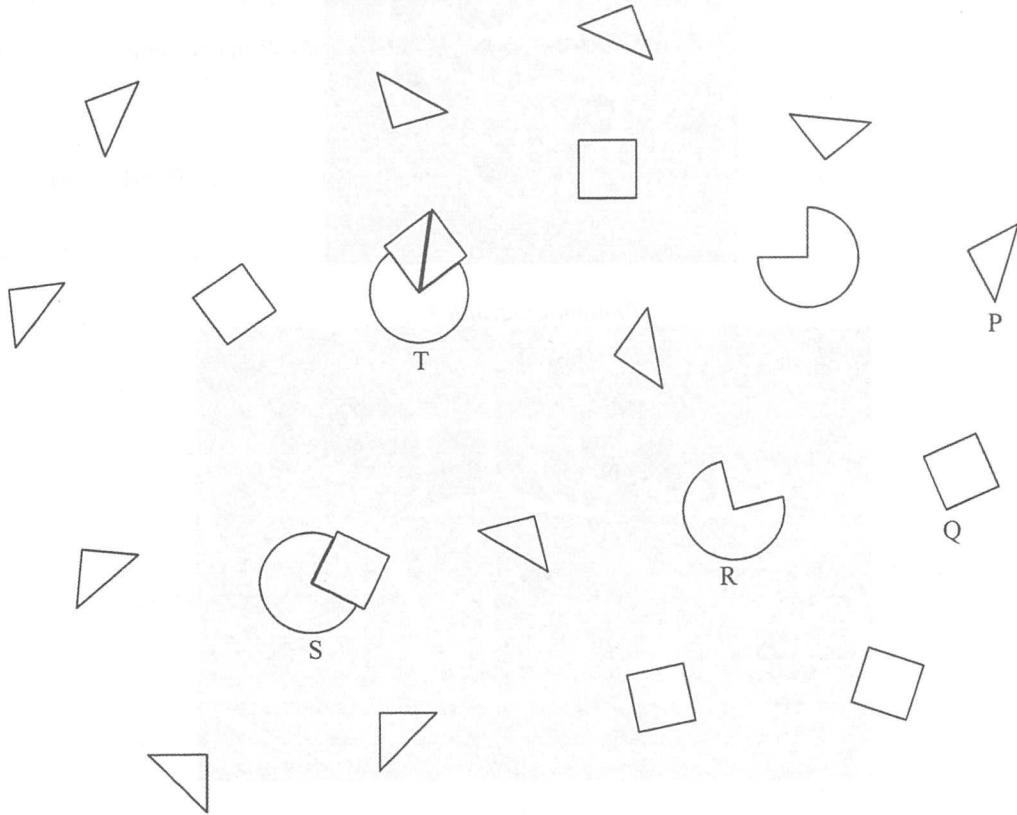
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Answers written in the margins will not be marked.

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Please stick the barcode label here.

2. The schematic diagram below shows a reaction mixture of an anabolic reaction catalysed by an enzyme. Drawings P, Q, R, S, and T represent different components of the mixture:



Answers written in the margins will not be marked.

- (a) Which drawing represents the substrate in this anabolic reaction? Explain your answer.  
(2 marks)

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- (b) Which drawing represents the enzyme? Explain your answer.  
(2 marks)

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Answers written in the margins will not be marked.

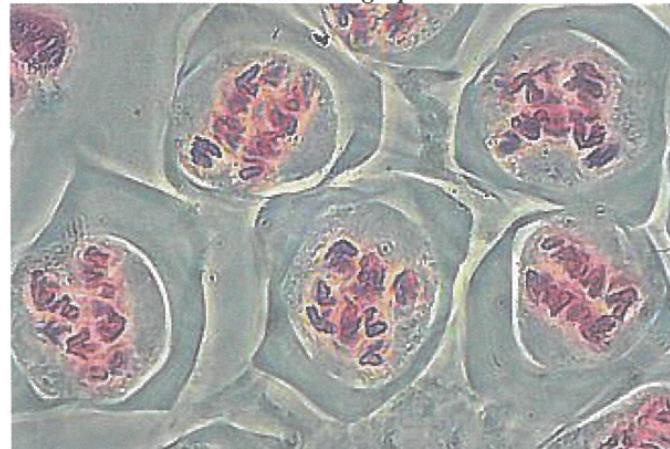
Answers written in the margins will not be marked.

3. The photomicrographs below show some stages of meiosis taking place in a flower:

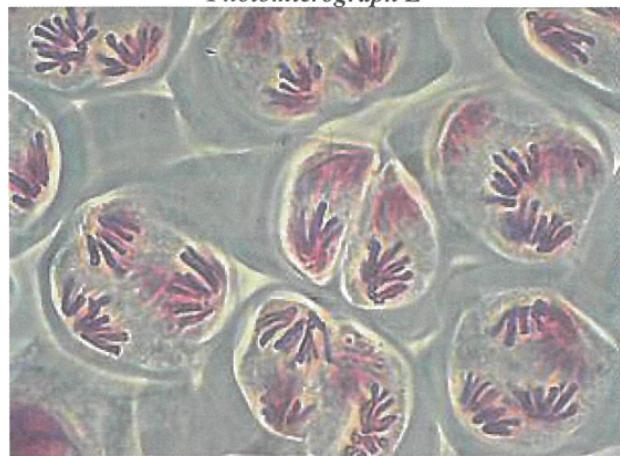
*Photomicrograph X*



*Photomicrograph Y*



*Photomicrograph Z*



Answers written in the margins will not be marked.

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Answers written in the margins will not be marked.

Please stick the barcode label here.

Answers written in the margins will not be marked.

- (a) State **one** floral structure in which this type of division takes place. (1 mark)

- (b) (i) Name event W shown in Photomicrograph X. (1 mark)

- (ii) Briefly describe what happens in event W. What is the importance of event W? (2 marks)

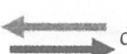
- (c) (i) Which photomicrograph, Y or Z, shows the first meiotic division? Give a piece of evidence to support your answer. (2 marks)

- (ii) What is the purpose of the first and second meiotic divisions respectively? (2 marks)

Answers written in the margins will not be marked.

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4. Diagrams I and II below show a person with both eyes moving right and then left. This eyeball movement is brought about by the coordination of different eye muscle pairs. Diagram III shows four of the muscles (P, Q, R, and S), all connected to motor neurones controlling eyeball movement.

Key:  directions of eyeball movement

*Diagram I*

right  left

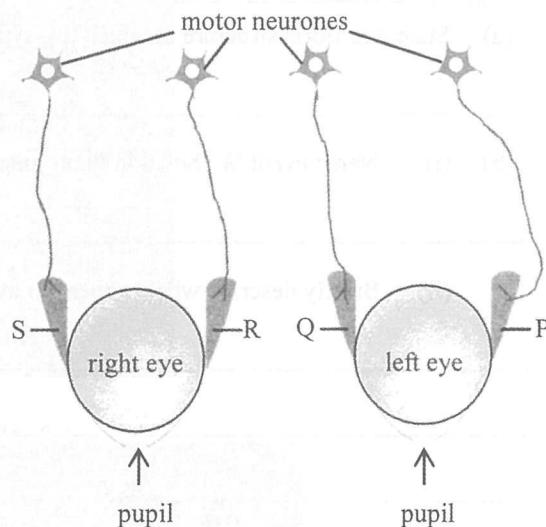


*Diagram II*

right  left



*Diagram III (top view)*



- (a) To bring about the eyeball movement shown in Diagram I, which muscle(s) (P, Q, R, or S) contract(s)? (1 mark)

- (b) A person suffers from impaired eyeball movement when turning his eyes from right to left, as shown in Diagram IV.

*Diagram IV*

right  left



It is found that one of his eye muscles cannot fully contract. Based on your knowledge of neurotransmission at the neuromuscular junction, suggest *two* possible defects that would lead to the impaired eyeball movement shown in Diagram IV. (2 marks)

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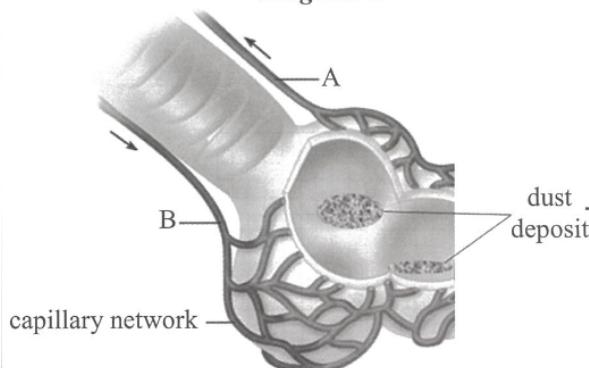
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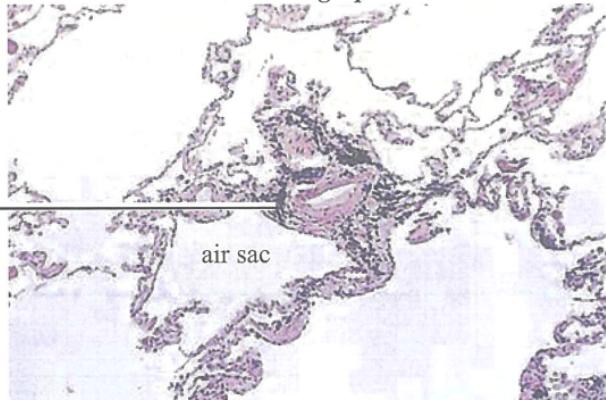
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5. Diagram L below shows part of the lung in a patient suffering from a certain lung disease. A hardened layer of dust deposit was found on the respiratory surface of the air sacs. Photomicrograph M shows the lung tissue taken from the patient.

**Diagram L**



**Photomicrograph M**



- (a) Compare the oxygen and glucose content of the blood in vessels A and B. Explain your answer.  
(4 marks)

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- (b) With reference to the above information about the lung disease, suggest **two** possible ways in which the disease adversely affects gas exchange in the patient.  
(4 marks)

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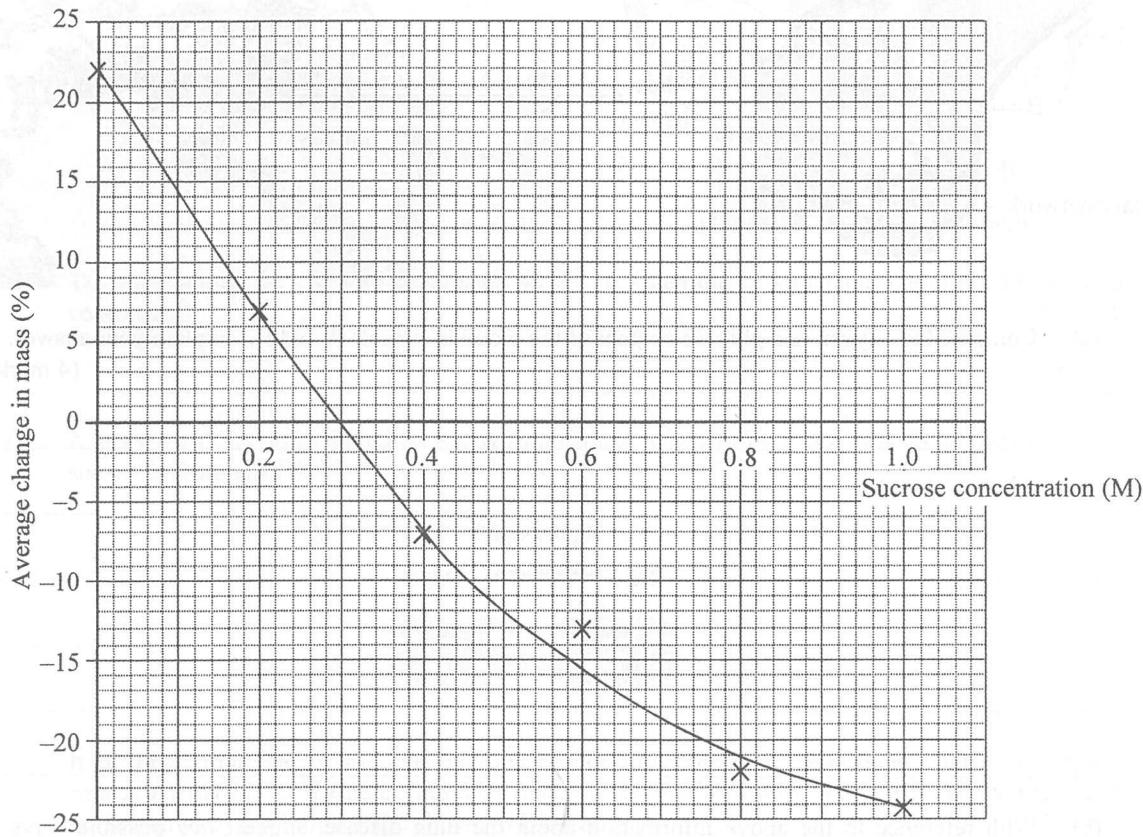
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6. Johnny conducted an experiment to determine the water potential of potato tuber cells. He measured the masses of fresh potato cylinders before and after immersing them in sucrose solutions at different concentrations (0M, 0.2M, 0.4M, 0.6M, 0.8M, and 1.0M). Below shows the major steps in the experiment:

- Step 1: Cut potato tubers into cylinders
- Step 2: Blot dry the surface of the potato cylinders
- Step 3: Weigh the potato cylinders (initial mass)
- Step 4: Immerse three potato cylinders in each concentration of sucrose solution for two hours
- Step 5: Remove and blot dry the surface of the potato cylinders
- Step 6: Reweigh the potato cylinders (final mass)
- Step 7: Calculate the average percentage change in mass of the potato cylinders in each solution

The results are shown in the graph below:



- (a) With reference to the graph, which sucrose solution concentration has the same water potential as the potato cells? Explain your answer. (3 marks)

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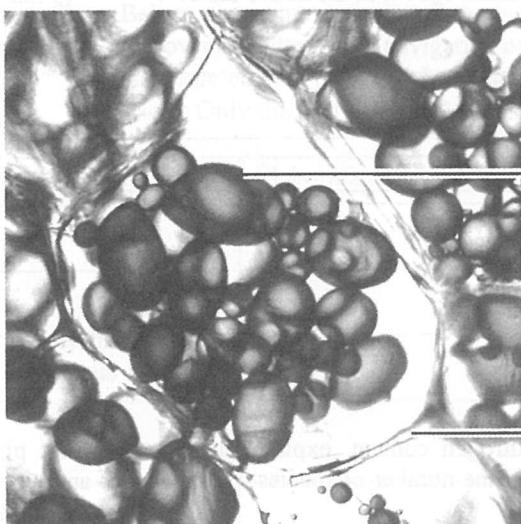
- (b) If Johnny skipped step 2 by mistake for all samples, how would this affect the curve and the deduced value of the concentration of the sucrose solution in (a)? Sketch a curve on the graph on the facing page to show the effect. (1 mark)
- (c) In terms of experimental design, what is the importance of putting three potato cylinders in each concentration of sucrose solution? (1 mark)

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- (d) Johnny prepared a slide of freshly sectioned potato cylinder and stained it with iodine solution. The photomicrograph below shows the section. Label structures X and Y. (2 marks)



X: \_\_\_\_\_

Y: \_\_\_\_\_

- (e) In the middle of the 19<sup>th</sup> century, there was a severe attack on potato crops by a plant pathogen in Ireland. As the potato was the major staple food at that time, many Irish people died of starvation. Vegetative propagation of potatoes was blamed for the high vulnerability of the potato crops. Explain the rationale for this claim. (2 marks)

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7. The table below shows the changes in soil nitrogen content and the number of species of herbaceous plants and woody plants before and after a landslide on a hillside:

	Soil nitrogen content (mg g <sup>-1</sup> )	Number of plant species	
		Herbaceous plants (e.g. grass)	Woody plants (e.g. shrubs and trees)
Before landslide	6	10	15
2 years after landslide	1	17	2
20 years after landslide	3	14	9

- (a) What type of ecological succession occurred on the hillside after the landslide? Explain your answer. (2 marks)

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- (b) (i) Explain the change in the soil nitrogen content shown in the above table. (3 marks)

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- (ii) With reference to the change in soil nitrogen content, explain the change in the plant composition after the landslide in terms of the number of species of herbaceous and woody plants. (3 marks)

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8. (a) Bats are night-time animals. The mystery of how bats avoid obstacles in darkness has puzzled scientists for centuries. Below shows some major events in the research on how bats use ultrasound to navigate as they fly:

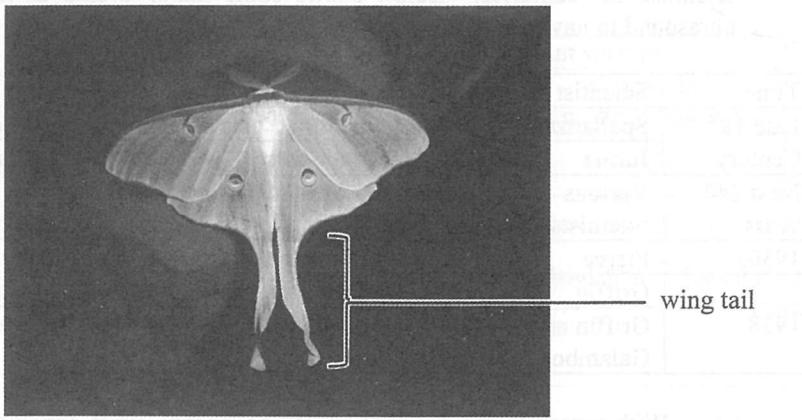
Time	Scientist	Event
Late 18 <sup>th</sup> Century	Spallanzani	He noted that blind bats could avoid obstacles.
	Jurine	He plugged the ears of bats with wax; the bats collided with obstacles.
Next 140 years	Various scientists	Despite the work of Spallanzani and Jurine, scientists continued to explore the possible use of other senses for navigation in bats.
	Pierce	He developed an apparatus that could detect ultrasound.
1930s	Griffin	He used Pierce's apparatus to show that bats emitted ultrasound.
	Griffin and Galambos	They worked out how bats used the ultrasound they produced in navigation.

- (i) With regard to the observation of Spallanzani, what conclusion can you draw about bats' ability to avoid obstacles? (1 mark)
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- (ii) Below are some aspects of the nature of science which can be demonstrated by the discovery of ultrasound navigation of bats. Choose any *two* aspects of nature of science and elaborate on how these are demonstrated in the above events. (2 marks)  
(Note: Only the first two will be marked if you give more than two aspects.)

Nature of Science	Elaboration
Science is based on evidence from experiments	
Scientists build on the work of other scientists	
Technology has impacts on the development of science	

- (b) Bats prey on moths. The photograph below shows a type of moth which has long wing tails:



After the discovery of ultrasound navigation in bats, scientists hypothesised that the wing tails of the moths may disturb the ultrasound emitted by bats and thus help moths to escape from a bat attack.

To test this hypothesis, scientists manipulated the wing tail length of the moths and then determined their rate of successful escape from bat attacks. The treatments of the wing tails and the results are shown below:

Treatment of wing tails	A: No treatment	B: Cut and glued back	C: Cut	D: Elongated
Wing tail length (cm)	5	5	2	6
Successful rate of escape (%)	57	57	26	65

- (i) What can you conclude from the results of treatment A and B? What is the purpose of treatment B in the experimental design of this study? (2 marks)

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(ii) What further conclusion can you draw when comparing the results of the following treatments? (2 marks)

Treatment	Conclusion
A and C	.....
A and D	.....

(iii) What is the overall conclusion of this study? (1 mark)

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(c) With reference to the hypothesis stated in (b), describe how the long wing tail could have evolved in the moths. (4 marks)

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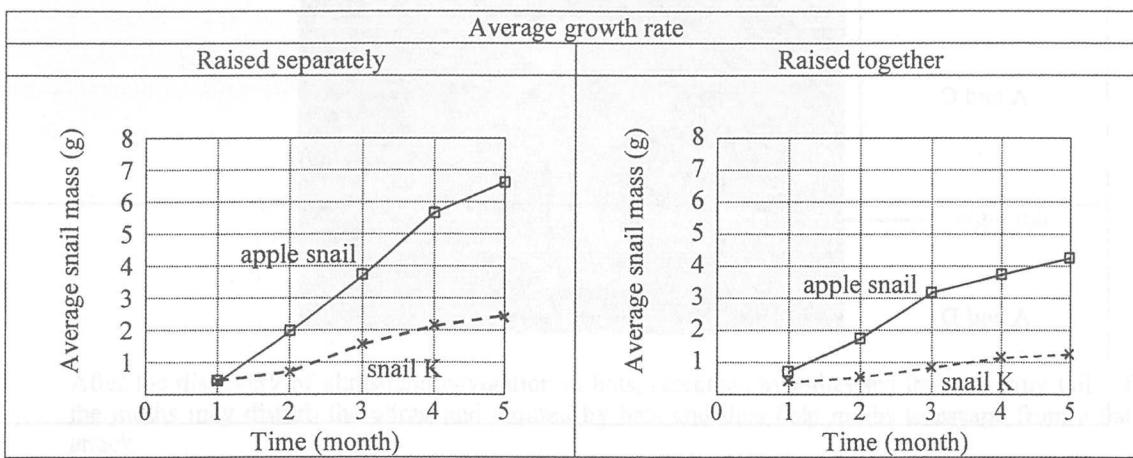
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9. The apple snail originates from South Africa. It was first imported to Asian countries for human consumption. However, it escaped to the local wetland habitat. Below are data regarding the average growth rates of apple snail and a local snail species K when they were raised separately and raised together:



- (a) With reference to the above data, what would happen to the population of snail K in the wetland habitat once the apple snails have escaped to this habitat? Support your answer with data from the graphs above. (4 marks)

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- (b) It has been noted that apple snails consume wetland plants at a high rate, especially buds and young leaves. Suggest why the feeding habits of apple snails may have an adverse effect on the community of local wetland habitats. (3 marks)

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- (c) Apart from the above, suggest another biotic factor which may explain why an imported species would turn into an invasive or dominant species. (1 mark)

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- (d) Suggest *one* human activity which might lead to an invasion of imported species in Hong Kong. (1 mark)

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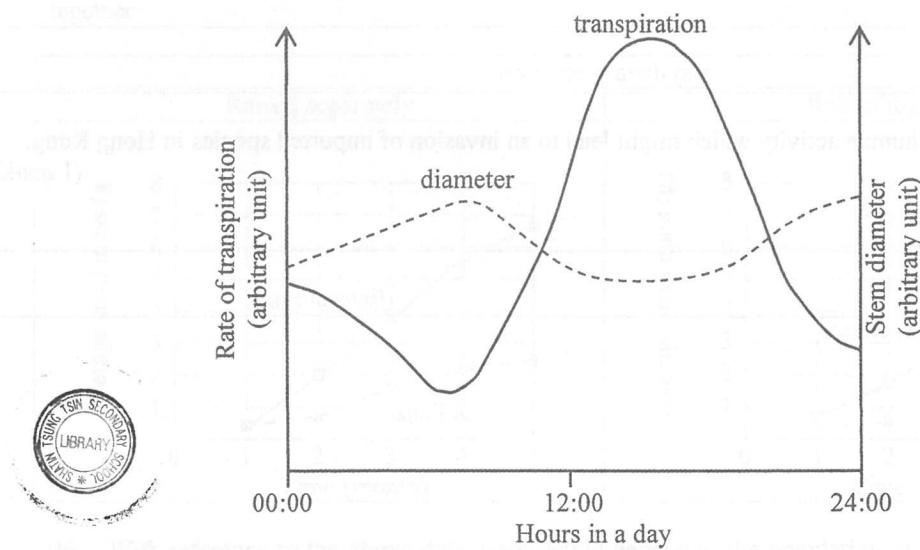
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10. The graph below shows the change in the rate of transpiration and the change in stem diameter of a plant over 24 hours:



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- (a) Describe the relationship between the rate of transpiration and stem diameter. (1 mark)

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- (b) It is known that the change in stem diameter is related to the diameter of the xylem vessels. With reference to the way in which water is transported along the stem, explain the relationship between the rate of transpiration and stem diameter described in (a). (2 marks)

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- (c) Describe and explain *two* adaptive features of xylem vessels as a structure for water transport. (4 marks)

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You are required to present your answer in essay form to the following question. Criteria for marking will include relevant content, logical presentation and clarity of expression.

11. Nowadays, keeping pets (such as dogs and cats) is becoming popular in Hong Kong. Some people prefer pure-bred pets to hybrid pets. However, pure-bred pets usually have higher risks of suffering from genetic diseases than hybrid pets because of the ways they are bred. Pure-bred pets are produced by crossing close relatives to keep a pure bloodline. Explain why genetic diseases are often carried by recessive alleles. By comparing the effects of the two breeding processes on the genetic composition of the offspring, discuss why pure-bred pets are at a higher risk of suffering from genetic diseases than hybrid pets. (11 marks)

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10. Explain the following terms with respect to the structure of the cell.

(a) Cell wall  
Cell walls are composed of a primary layer of cellulose and a secondary layer of pectin. They are found in plant cells. In animal cells, they are absent.

(b) Cytoplasm

Cytoplasm is the gel-like substance present in all living cells. It contains various organelles.

(c) Nucleus

The nucleus is the control center of the cell. It contains genetic material.

(d) Vacuole

Vacuoles are membrane-bound sacs which store water, salts, acids, bases, etc.

(e) Mitochondria

Mitochondria are the power houses of the cell. They contain energy-rich chemicals.

(f) Endoplasmic reticulum

It is a network of membranes which help in the transport of substances within the cell.

(g) Golgi apparatus

Golgi apparatus is involved in the synthesis and packaging of proteins.

(h) Lysosomes

Lysosomes are membrane-bound sacs which contain digestive enzymes.

(i) Peroxisomes

Peroxisomes are membrane-bound sacs which contain enzymes involved in the breakdown of fatty acids.

(j) Chromosomes

Chromosomes are composed of DNA and proteins.

(k) Nucleolus

Nucleolus is the site where ribosomes are synthesized.

(l) Endoplasmic reticulum

It is a network of membranes which help in the transport of substances within the cell.

(m) Golgi apparatus

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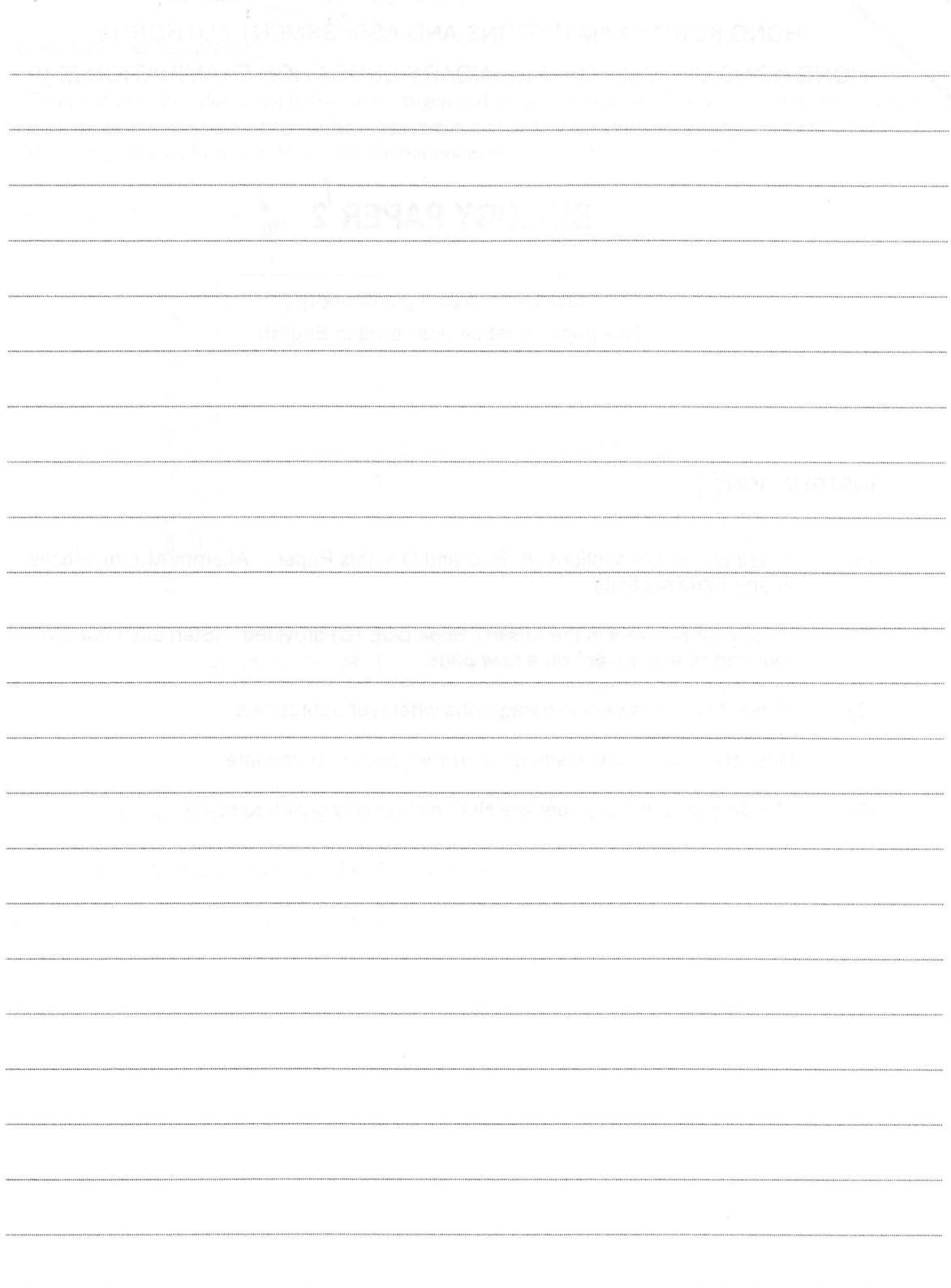
(w) Nucleolus

Nucleolus is the site where ribosomes are synthesized.

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#### **END OF PAPER**

Sources of materials used in this paper will be acknowledged in the *HKDSE Question Papers* booklet published by the Hong Kong Examinations and Assessment Authority at a later stage.

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