Level 3 exemplar

2019-DSE
BIO
PAPER 1B

B

HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY

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.

* A 1 3 0 E 0 1 B *

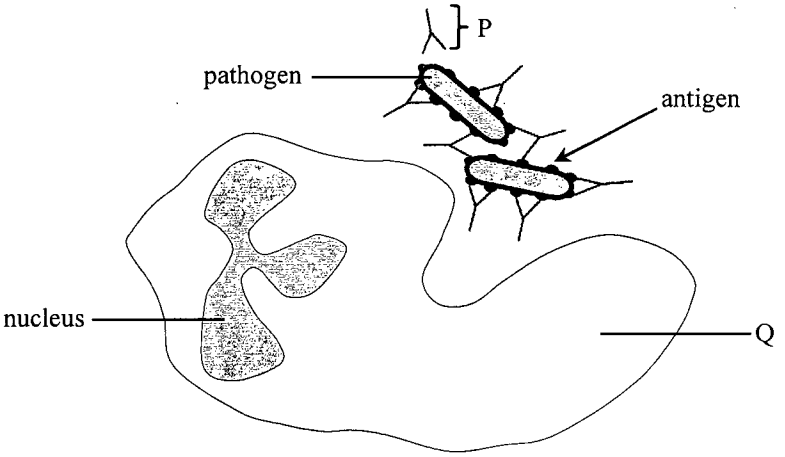
SECTION B

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)

Column I		*Column II*	
(i)	physical barrier	A , D	A. skin
			B. tear
(ii)	chemical barrier	B, C, E	C. antibody
			D. blood clot
			E. gastric juice

(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.



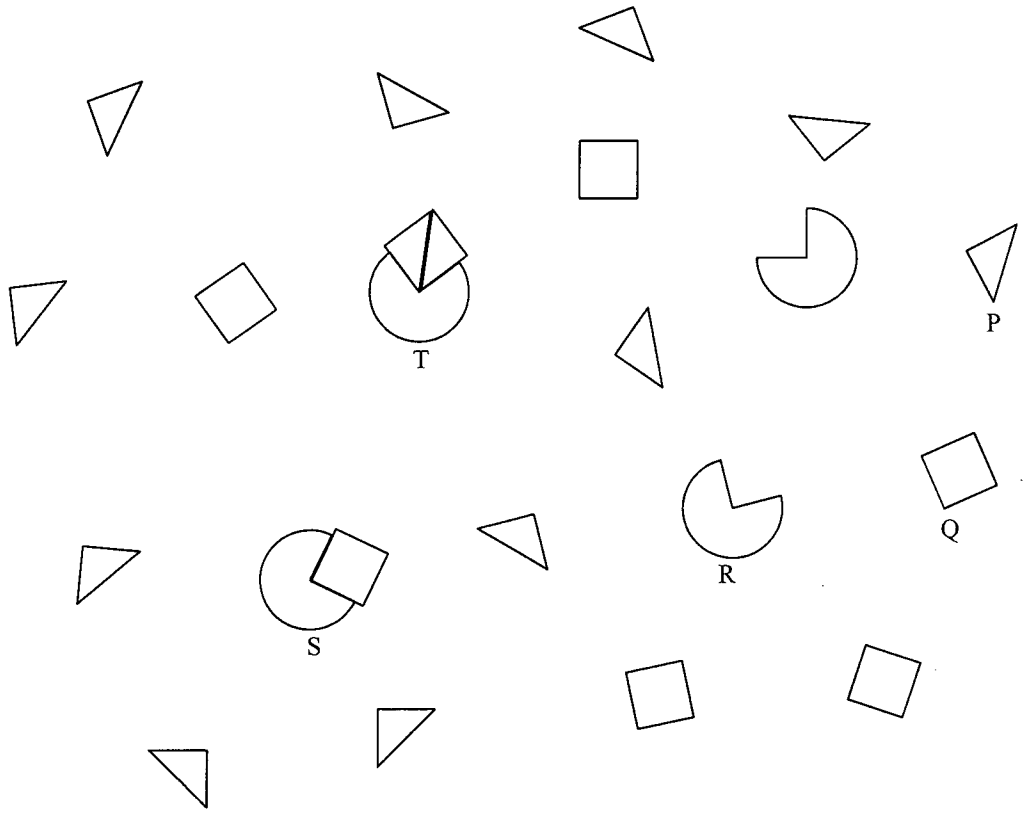
Describe the function of P in phagocytosis. (3 marks)

P is antibody that reconign the pathogen and bind to it. P lets the pathogen clump together so the pathogen cannot replicate and help phagocyte easy to detect the pathogen due to the large size.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

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:



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

R, because only R has a space to let other fit into,

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

Q, because only Q can fit into R perfectly.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

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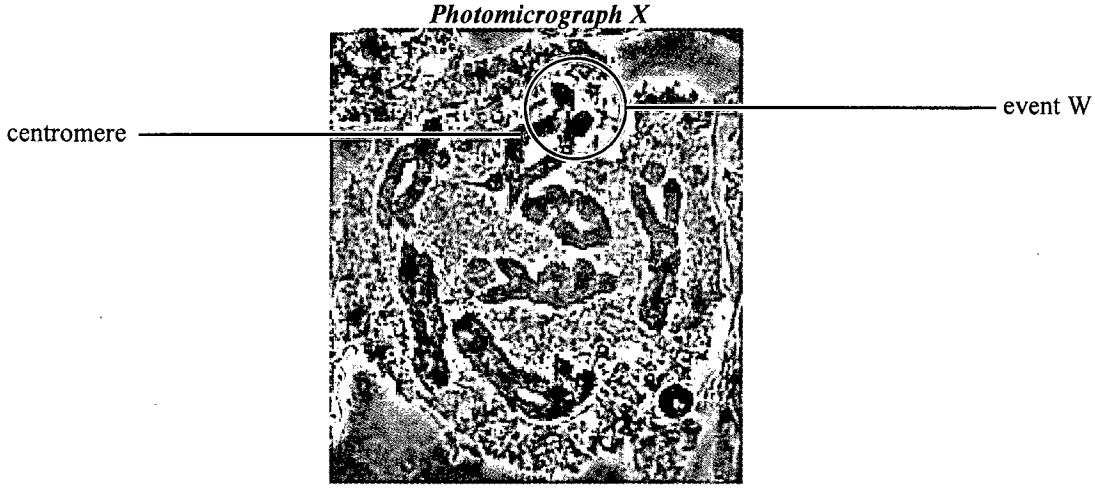
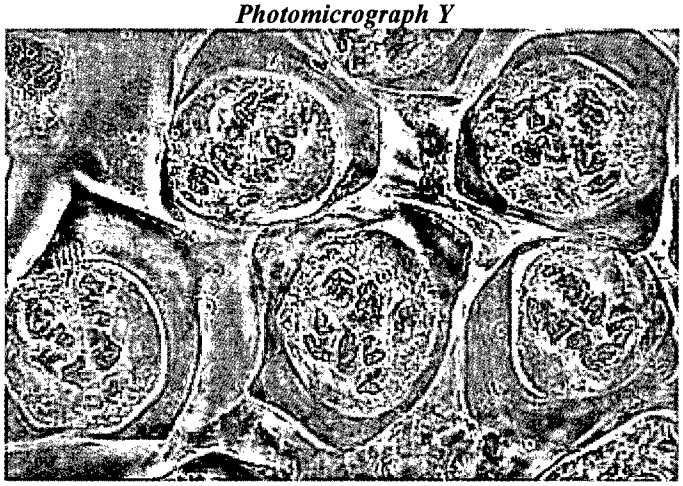
3. The photomicrographs below show some stages of meiosis taking place in a flower:

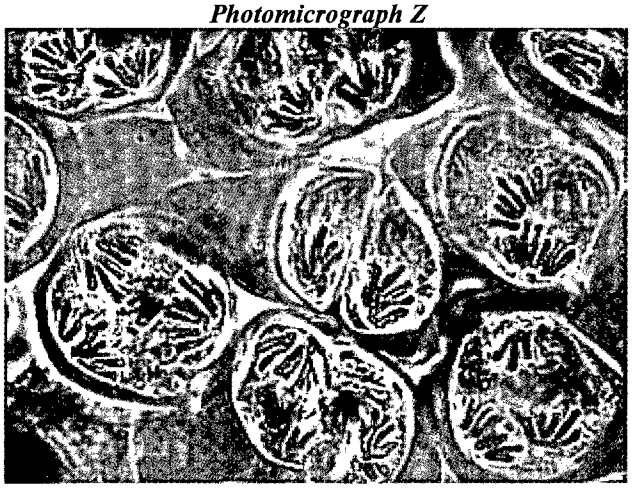
Photomicrograph X



Photomicrograph Y



Photomicrograph Z



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Answers written in the margins will not be marked.

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

Ovary

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

Crossing - over

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

Crossing - over happens in event W to exchange the gene in chromosome. It help the gamete contains different gene from their parents.

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

Y, because Y represent the anaphase of first meiotic division and from the photomicrograph, Y is still in one cell but Z is already divide to two cell.

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

First meiotic division involve crossing - over to exchenge the gene from chormosome and second meiotic division is aim to seperate the chromosome, divide it into 4 cell.

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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

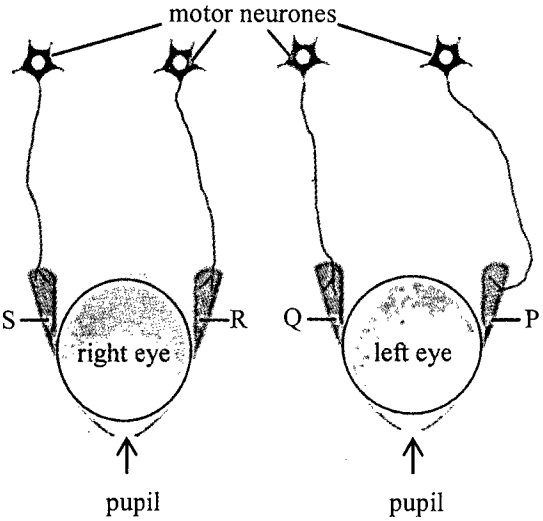
Diagram I

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)

Q and S

(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)

The end of axon of motor neurones fail to release neurotransmitter and so the nerve impulse cannot pass through to the muscle.

The motor neurone of right eye cannot function well.

Answers written in the margins will not be marked.

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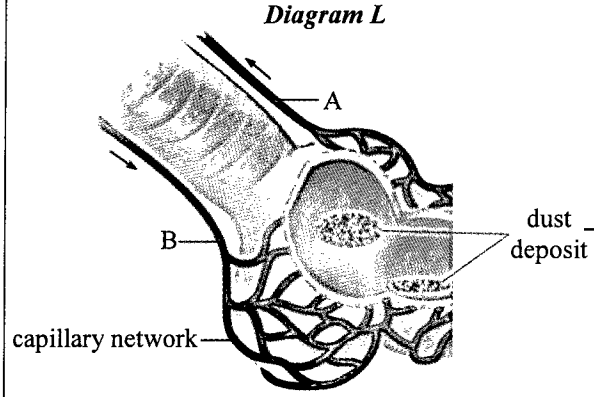
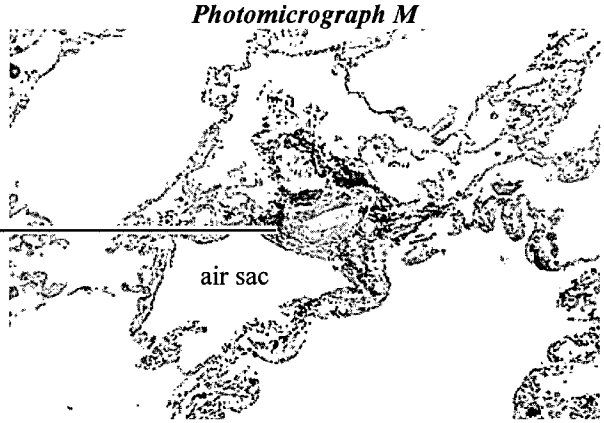
5. Diagram L below shows part of the lung in a patient suffering from a certain lung disease. A hardened layer of dust deposit was found on the respiratory surface of the air sacs. Photomicrograph M shows the lung tissue taken from the patient.

Diagram L



Photomicrograph M



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

The oxygen content of blood vessels B is lower than that of blood vessel A because blood vessel A, which leave the air sac, has recieve the oxygen from the air sac.
The glucose content of the blood vessel B is higher then that of vessel A because vessel B contain higher glucose content for supply the air sac.

(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)

The dust deposit lower the volume of air sac, cause the patient's gas exchange volume decrease.
The dust deposit affect the pulmonary atary and pulmonary vein at air sac to diffuse the gas efficiently.

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Answers written in the margins will not be marked.

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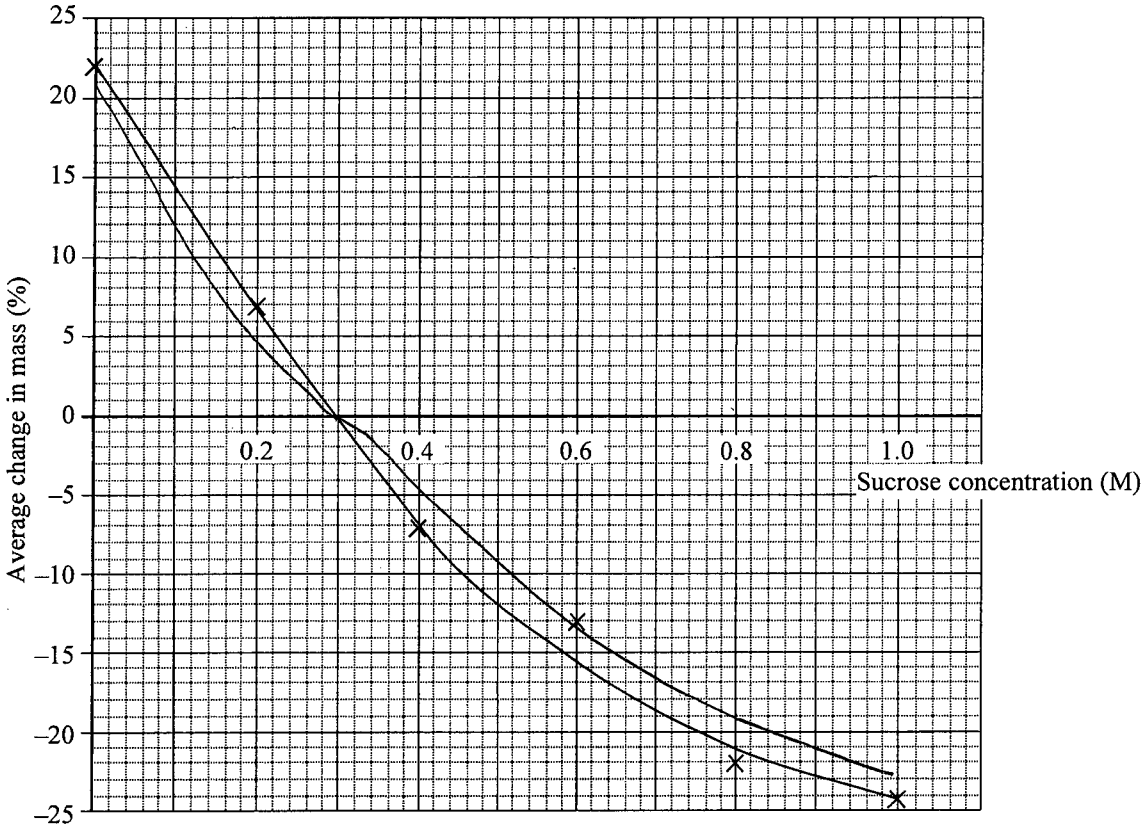
6. Johnny conducted an experiment to determine the water potential of potato tuber cells. He measured the masses of fresh potato cylinders before and after immersing them in sucrose solutions at different concentrations (0M, 0.2M, 0.4M, 0.6M, 0.8M, and 1.0M). Below shows the major steps in the experiment:

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)

0.3 M, because at 0.3 M, there're no average change in mass. It represents no net movement of sucrose solution is occur in 0.3 M and it has a same water potential with potato cell.

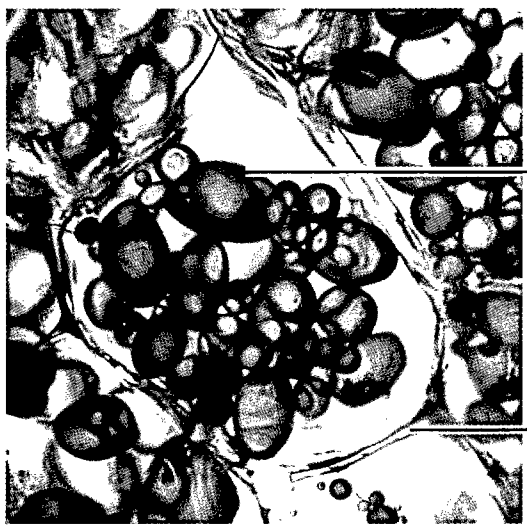
Answers written in the margins will not be marked.

(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)

To calculate the adverage change of mess that makes the result more accurate.

(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: mitochrondion

Y: cell wall

(e) In the middle of the 19th 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 ($mg\ g^{-1}$)	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)

Secondary succession, because before landslide, there is already have plant species.

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

Before landslide, there're 6 mg g^{-1} soil nitrogen content, After landslide for 2 years, it drops to 1 mg g^{-1} and increase to 3 mg g^{-1} that 20 years after landslide.

(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)

After landslide 2 years ago, soil nitrogen content drop from 6 mg g^{-1} to 1 mg g^{-1}, it cause the woody plants cannot absorb enough mineral and so the number of woody plant drop from 15 to 2. While the herbaceous plant increase from 10 to 17 due to the drop of woody plants. 20 years after, the soil nitrogen content increase so the woody plants increase too. While the herbaceous plant slightly drop due to the competition of resource.

Answers written in the margins will not be marked.

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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 18th 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.
1930s	Pierce	He developed an apparatus that could detect ultrasound.
1938	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)

Bat has a clear sensory organ to detect the change arround it.

(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	1930s, Pierce developed an apparatus that could detect ultrasound. And 1938s, Griffin use Pierce's apparatus to show that bats emitted ultrasound.
Technology has impacts on the development of science	1930s, Pierce developed an apparatus that could detect ultrasound. And 1938s, Griffin show that bat emitted ultrasound, so together with Galambos, they work out how bat used the ultrasound they produced in navigation.

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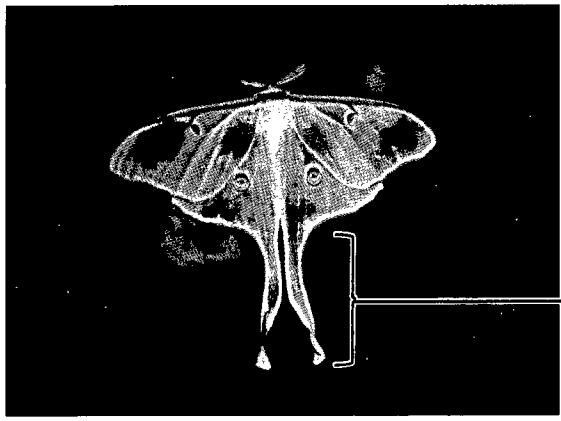
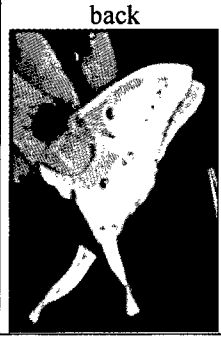
(b) Bats prey on moths. The photograph below shows a type of moth which has long wing tails:



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)

Cut and glued back the wing tails would not affect the successful rate of escape of the moth.

The purpose of treatment B is aimed to investigate whether the moth's wing tails is actively move by itself for successful escape.

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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	The cutting of wing tail on the moth drops its successful rate of escape.
A and D	The longer the wing tail, the higher the successful rate of escape.

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

The wing tails helps the moth to escape and the successful rate of escape base on the length of the wing tails.

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

There're two different moths, one with long wing tails and one with short wing tails due to the genetic variation. As the long wing tails moths has a higher chance of survive so it is selected for. The long wing tails moths are survive and reproduce. They pass on the favourable character to the offspring so there're large population of long wing tails moth after many generation.

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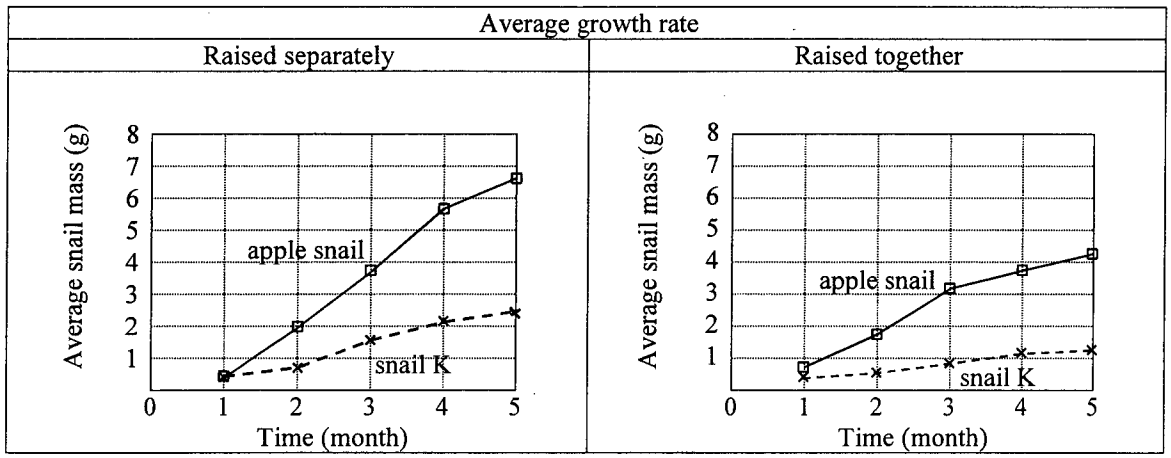
9. The apple snail originates from South Africa. It was first imported to Asian countries for human consumption. However, it escaped to the local wetland habitat. Below are data regarding the average growth rates of apple snail and a local snail species K when they were raised separately and raised together:



(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)

The population of snail K would decrease and apple snail would decrease too, while apple snail still have a higher adverage mass than snail K. Once they raised together, they have a competition between each other for competition of limited resources, snail K may fail to get many resources so some of it died.

(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)

It cannot adept the environment and at local wetland habitats, there're no enough wetland plant to feed on.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(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)

There are no predation occur for prey.

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

Deforestation.

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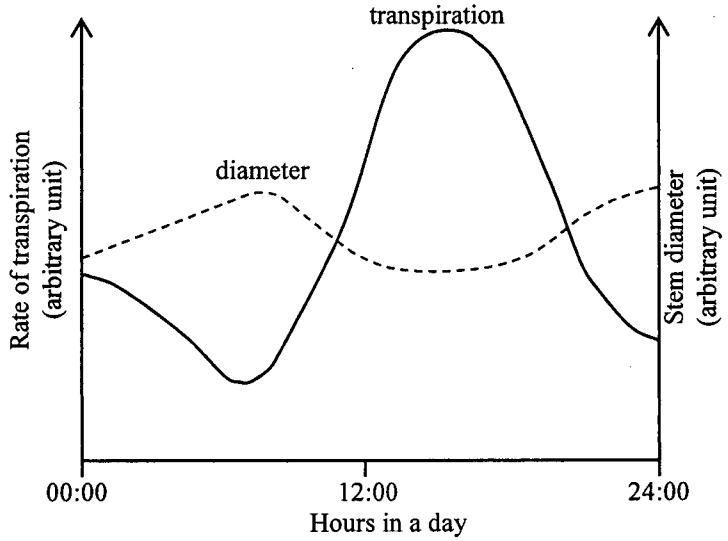
Answers written in the margins will not be marked.

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



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

When transpiration rate increase, stem diameter decrease. When transpiration rate decrease, stem diameter increase.

(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)

When photosynthesis occur, water may evaporate to the surrounding and creat a transpiration pull. The higher rate of loss of water, the lower diameter of stem.

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

Xylem vessels contain a hollow tube that reduce the resistance of transporting water.

Xylem vessels is combine" cell to cell and the end is break down that let water transport along the vessels.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

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)

Genetic disease is often carry by recessive allele because the disease is unnormal. If it carry by dorminant allele, a lot of organism may easy get the disease by heredity.

If pure-bred pets has a genetic disease, it has a high chance to pass on to the offspring by heredity. While hybrid pets involve the different gene crossing-over, the offspring may just is the carrier but not have the genetic diseases.

Random fertilisation occur in hybrid pet that lower the chance of getting the genetic disease.

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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.

Answers written in the margins will not be marked.

Do not write on this page.

Answers written on this page will not be marked.

2019 DSE (C)

香 港 考 試 及 評 核 局
HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY

香 港 中 學 文 憑 考 試
HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION

答 題 簿
ANSWER BOOK

考生須知

(一) 宣布開考後，考生須首先在第 1 頁之適當位置填寫考生編號，並在第 1、3 及 5 頁之適當位置貼上電腦條碼。

(二) 每題 (非指分題) 必須另起新頁作答，並須在每一頁的相應試題編號方格填畫「X」號，以表示選答的題號 (見下例)，並在第一頁之適當位置填寫作答的試題編號。

(三) 紙張兩面均應使用，並應每行書寫。不可在各頁邊界以外位置書寫。寫於邊界以外的答案，將不予評閱。

(四) 如有需要，可要求派發方格紙及補充答題紙。每一紙張均須填寫考生編號、填畫試題編號方格、貼上電腦條碼，並用繩縛於**簿內**。

(五) 試場主任宣布停筆後，考生不會獲得額外時間貼上電腦條碼及填畫試題編號方格。

INSTRUCTIONS

(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 and 5.

(2) Start each question (not part of a question) on a new page. Put 'X' in the corresponding question number box on each page to indicate the appropriate question number (see the example below), and write the question number(s) of the question(s) attempted in the space provided on Page 1.

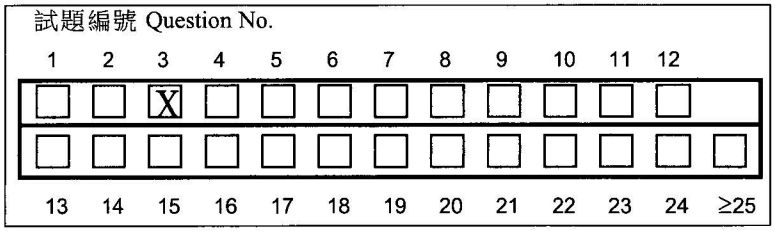
(3) Write on both sides using each line. Do not write in the margins. Answers written in the margins will not be marked.

(4) Graph paper and 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 book.

(5) 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.

例 Example:

試題編號 Question No. = 3



由考生填寫 To be filled in by the candidate	
試題編號 Question No.	A (1)
	B (2)

試題編號 Question No.

1	2	3	4	5	6	7	8	9	10	11	12
X											

13	14	15	16	17	18	19	20	21	22	23	24	≥25

每題另起新頁作答。
Start each question on a new page.

寫於邊界以外的答案，將不予評閱。
Answers written in the margins will not be marked.

(1a)(i)(1) The plasma oestrogen level is decrease from day 24 of cycle I to day 3 of cycle II because menstuation is occur between the days.

(i) (2) The plasma oestrogen level is increase because after menstuation, oestrogen level increase to thicken the uterine lining and as FSH in high level, it stimulate the secretion of oestrogen.

(ii) (1) FSH stimulate the secretion of oestrogen. Oestrogen stimulate the secretion of FSH and luteinising hormone at high level. While luteinising hormone stimulate the secretion of oestrogen and progesterone. Oestrogen and progesterone inhibit the secretion of FSH.

(ii) (2) Oestrogen together with progesterone will inhibit the secretion of follicle stimulating hormone and so no follicle is develop and no ovulation is occured. Oestrogen maintain the utering lining thicken.

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Answers written in the margins will not be marked.

寫於邊界以外的答案，將不予評閱。
Answers written in the margins will not be marked.

試題編號 Question No.

1	2	3	4	5	6	7	8	9	10	11	12
X											

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每題另起新頁作答。
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(1b)(i) The hydrated group's cardiac output is slightly lower than that of dehydrated group while the duration of exercise is 10 minutes. However, hydrated group has a higher cardiac output when the duration of exercise is longer, because the hydrated group drink the fluid to reduce water loss, it gives energy for stronger and rapidly cardiac output.

(ii)(1) Stroke volume.

(iii)(2) Mitochrondion release more energy to reach a higher stroke volume.

(iii) They have no enough water in their body so that the heart beat is greater increase to reduce heat loss.

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(2a)(i) First, the screen remove the large solid. Then the grit chamber remove the grit. Sedimentation tank settle down the suledge and some are pass to the digestor to form bio gas as fuel. Some pass through the tank contain decomposor for decompose and then effluents.

(ii)(1) Organic nitrogen content in sewage treatment plant is 3 mg L^{-1}, which fewer than that of artificial wetland, 12 mg L^{-1}. It's because organic nitrogen in sewage treatment plant is supply to the organic matter and algae. The nitrogen convert to nitrate for supplying to algae while in artificial wetland, there're no algae bloom occur and so the organic nitrogen content won't drop and higher then that of sewage treatment plant.

(ii)(2) The phosphate can be synthesis to be protein that is nutrient.

(iii) Artificial wetland can protect the organism from not being kill and let the organism fertilisation to maintain the biodiversity.

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(b)(i) Air pollution and deforestation.

(ii)(a) Species B contains a very high concentration of heavy metal X in root no matter it with or without fertilizer, while species A always contain low concentration of heavy metal X, Therefore, B is more suitable if remove the heavy metal X from the soil.

(ii)(2) Species B, because it contain high concentration of heavy metal X in root while species C is in shoot, Root is the main place of absorb mineral rather than shoot.

(ii)(3) They have strong adaptive ability and they can grow in the ~~testing~~ abandoned mining site.

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