TABLE OF CONTENTS

Level 3 Exemplar 1

2024-DSE
BIO
PAPER 1B

B

HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY

HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2024

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.

A130E01B

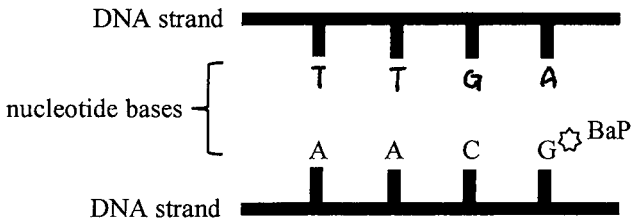
SECTION B

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

1. Fill in the table below to compare the characteristics of nervous and hormonal controls. (3 marks)

		Nervous control	*Hormonal control*
(a)	Signalling molecule	neurotransmitters	
(b)	Transmission pathway	neurones	blood vessels
(c)	Comparison of the time taken to induce responses	Nervous control responses instantly while hormonal control takes a longer time	

2. BaP is a carcinogenic chemical which is commonly found in grilled meats. It can attach randomly to the nucleotides of DNA molecules. When it is attached to guanine (G), this G will be misread as thymine (T). The diagram below shows part of nucleotide sequence of one strand of a DNA molecule with BaP attached to a G:



(a) On the above diagram, write down the nucleotide sequence found in the opposite strand of the DNA when misreading happens. (1 mark)

(b) Suggest *one* reason why this type of mutation may *not* affect the functioning of the protein formed. (1 mark)

The sequence of the protein may be identical to other proteins that is functional in the body.

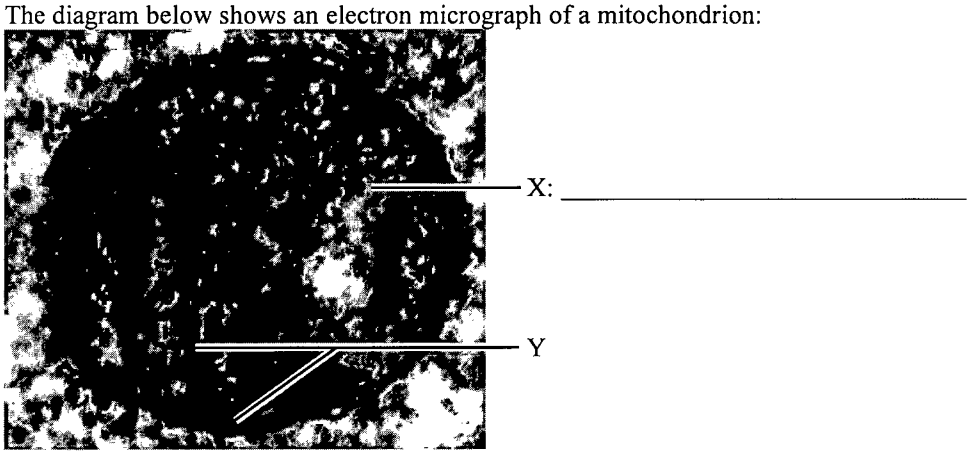
(c) If this type of mutation accumulates over time in the DNA molecules, there is a chance that it will affect the functioning of the protein formed and subsequently lead to tumour formation. Suggest which cellular process this protein controls. (1 mark)

The mitosis division

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

3. The diagram below shows an electron micrograph of a mitochondrion:



(a) Label X in the above diagram. (1 mark)

(b) Describe *one* observable feature of Y and explain how this feature is related to the functioning of mitochondria. (2 marks)

Y is double-bounded.

(c) Chemical Z can inhibit an enzyme found in X.

(i) Which key process of respiration would be inhibited? (1 mark)

Suppling energy for respiration

(ii) If chemical Z is added to a plant cell culture, how would this affect the respiratory pathway? (3 marks)

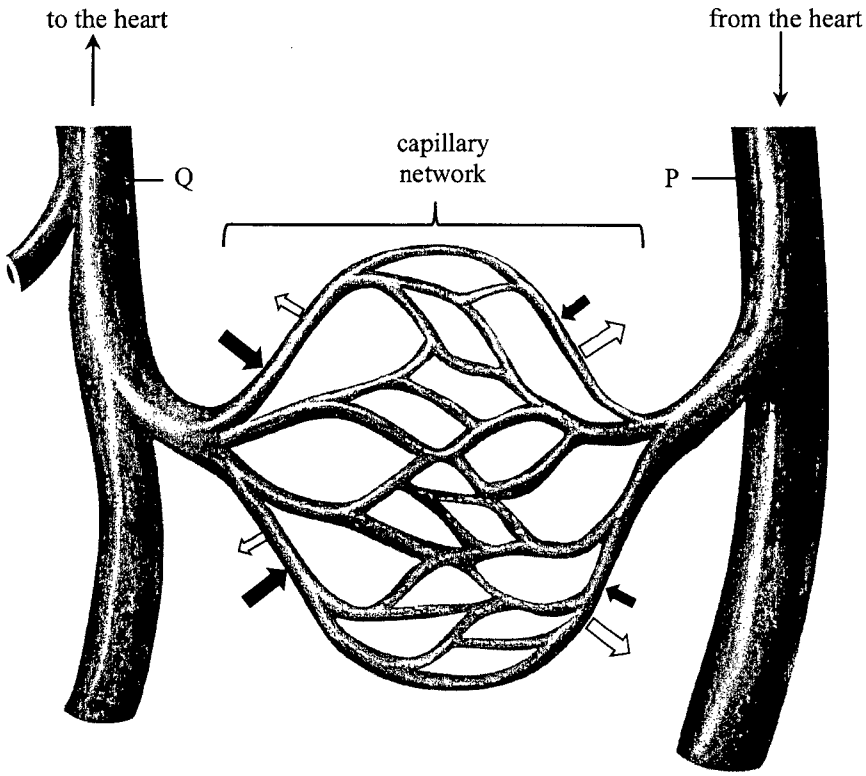
Chemical Z will inhibit the enzyme in X, stopping X from converting energy for the use of respiration. With the energy production decreased, the respiratory pathway cannot function effectively, decreasing the respiration rate.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Go on to the next page

4. The schematic diagram below shows the arrangements of some blood vessels:



(a) The two types of arrows (black and white) represent two factors which govern the movement of fluid into or out of the capillary network. Identify these two factors. (2 marks)

➡ :

⇨ :

(b) The sizes of the arrows in the above diagram represent the magnitudes of the factors. Explain the change in the factors denoted by ⇨ as the blood flows from P to Q. (3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(c) The capillary network is the location where exchange of materials occurs between the blood and tissue fluid. When the blood flows through the capillary network of a particular organ, some substances will be taken up into the blood.

Complete the table below to show the organ where the capillary network is found. Provide your explanation. (3 marks)

	Organ	*Substance taken up into the blood*	*Explanation*
(i)	pancreas	insulin	Insulin is secreted from the organ in response to the change of the blood glucose level.
(ii)	kidneys	urea	urea will be collected by the kidneys when blood pass through, while half of the urea will be reabsorbed by the blood

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

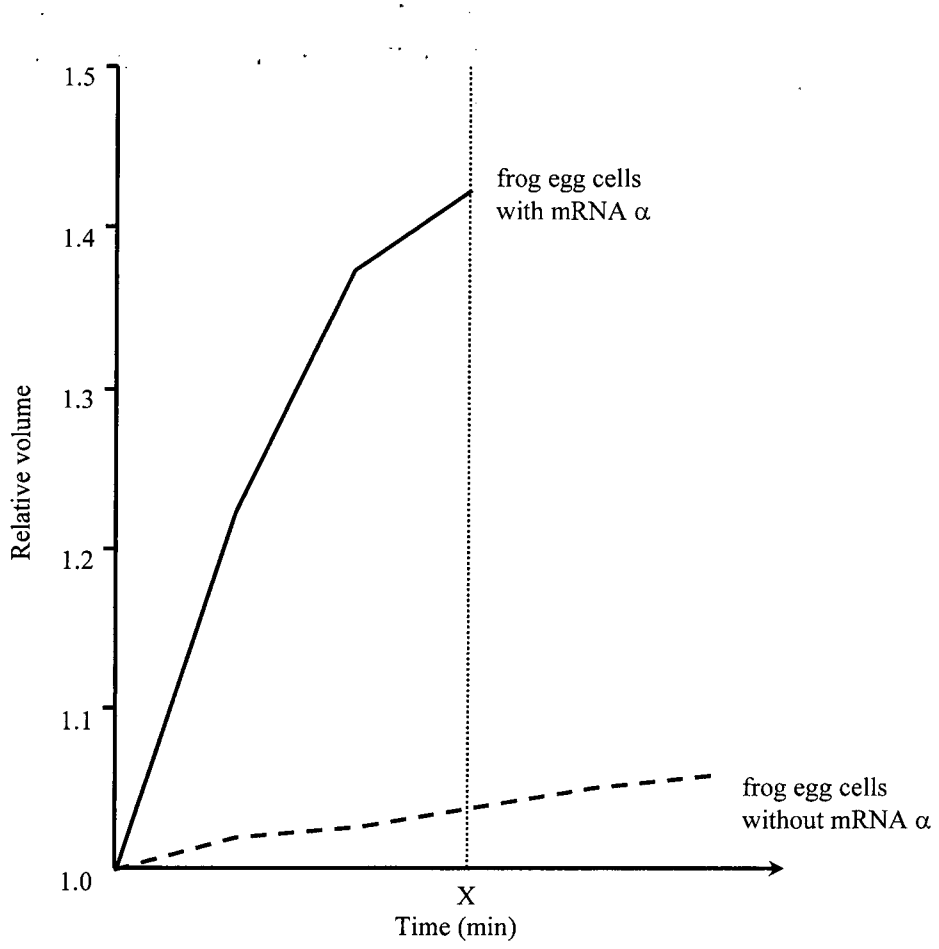
Go on to the next page

5. In an experiment, mRNA α was isolated from a mammalian cell and then injected into a frog egg cell. The expression of mRNA α eventually led to the presence of protein α on the cell membrane of the frog egg.

(a) Describe how the injected mRNA α led to the presence of protein α on the cell membrane of the frog egg. (3 marks)

After mRNA α is injected, the mRNA will go through translation. It will binds with the tRNA in the frog egg and form the protein α 's sequence to produce protein α.

(b) In another experiment, frog egg cells received an injection of a fixed amount of water with or without mRNA α. After that, these two types of frog egg cells were transferred to pure water. The changes in the relative volumes ($\frac{\text{new volume}}{\text{original volume}}$) of these two types of frog egg cells are shown in the graph below:



Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(i) Explain why there was an increase in the relative volume of the frog egg cells without mRNA α after they were transferred to pure water. (2 marks)

As the water inside the frog egg cells have other materials while pure water don't, the water potential of outside is higher than inside of the frog egg cells, therefore water will enter the cells through osmosis and increase the relative volume.

(ii) Based on the difference shown in the results of the two types of frog egg cells, deduce the function of protein α on the cell membrane. (3 marks)

Protein α can absorb water into cells through active transport.

From the graph, cells with mRNA α have a much faster increase in relative volume than the cells without mRNA α after transferred to pure water. Showing that protein α can absorb water actively so the cells' volume will increase rapidly.

(iii) Suggest why no data were obtained from frog egg cells with mRNA α after X minutes. (1 mark)

The frog egg cells bursts as it absorbs too much water.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Go on to the next page

6. Shirley came across an article about some beans containing an amylase inhibitor as a defence against insects. She wondered if the amylase inhibitor would also work in the human body and if it did, whether it could be used as a food supplement for weight management. She discussed the idea with her classmate Johnson. They had different ideas:

Shirley: I think we should test if the bean extract can inhibit pancreatic amylase.

Johnson: Perhaps we can use salivary amylase instead of pancreatic amylase.

(a) With reference to the process of digestion, which amylase would produce more valid results for developing a food supplement that targets weight management? Explain your answer. (3 marks)

Pancreatic amylase. Salivary amylase, which functions in our mouth, can only breaks down a limited amount of carbonhydrates. While pancreatic amylase, which functions in the stomach, can break down nearly all the carbonhydrates we ate. So in order to manage weight, pancreatic amylase should be inhibited to reduce the sugar broken down and absorbed.

(b) The table below shows the reaction mixtures prepared for the investigation:

Solution	*Volume of solution used in each set-up (mL)*	
	Set-up I	*Set-up II*
1% starch solution	15	15
Amylase solution	5	5
Bean extract	0	5
Buffer solution (to maintain the pH)	5	5
Water	5	0

(i) Explain the purpose of adding water to set-up I. (2 marks)

To ensure that the amylase is inhibited because of the amylase inhibitor in the bean extract.

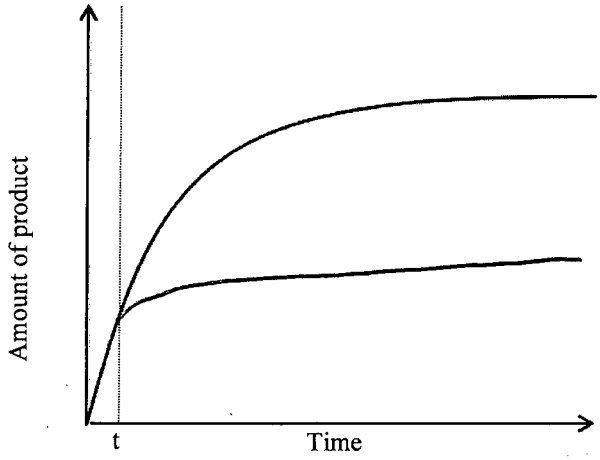
(ii) Suggest *one* method to determine the rate of starch digestion and state clearly the measurement taken to show the rate of starch digestion. (2 marks)

Mixing the solution with iodine solution after different minutes passed and compare the change of the colour of the solution.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(c) The graph below shows the amount of product formed over time when amylase is working normally:



The experiment was repeated with the addition of bean extract at time t. If the bean extract can inhibit the amylase being studied, what will be the change in the amount of product formed? On the above graph, sketch a line to show the results. (1 mark)

(d) Shirley and Johnson shared their ideas with their professor. Their professor suggested that they should conduct an *in vivo* experiment using mice with the control group fed with starchy food and the experimental group fed with a mixture of starchy food and bean extract.

(i) Explain why the result of an *in vivo* experiment is more valid than that of *in vitro* experiment in this case. (1 mark)

(ii) Apart from monitoring the change in body weight of the mice, their professor suggested that they should take blood samples from the mice after the meals for analysis. Which component of the blood should they monitor? What would be the expected results of the control group and the experimental group if their ideas actually worked? (2 marks)

They should monitor the amount of glucose in the blood.
The experimental group's glucose amount should be lower than the control group.

(e) Suggest how the amylase inhibitor helps the bean defend against insects. (1 mark)

Insects cannot gain energy from the beans so they will choose not to eat it.

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.

7. The following photograph was generated by an artificial intelligence programme using the following sentence:

'A photograph capturing Hong Kong students on a field trip to a rocky shore, studying the distribution and abundance of organisms along the shore.'

(a) The photograph does not truly reflect the requirement in the sentence because two pieces of essential equipment are missing.

(i) List the *two* pieces of essential equipment for the study. (1 mark)

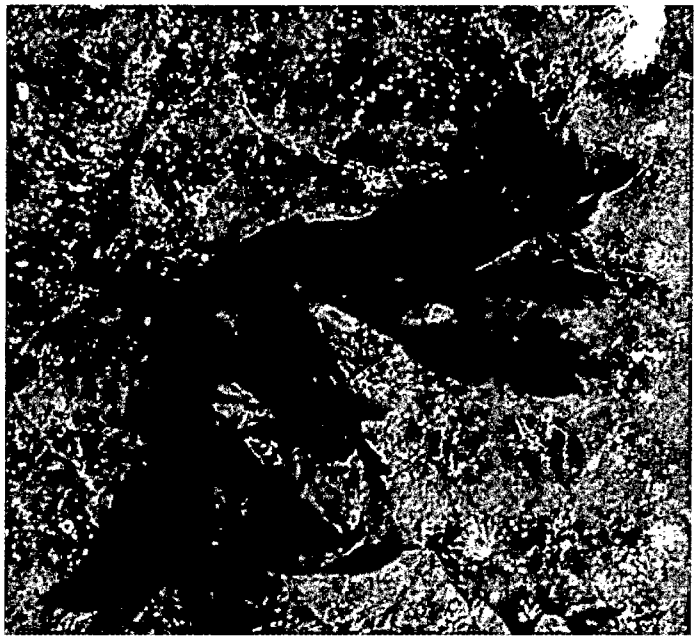
quadrets and cameras

(ii) How could you use the equipment listed in (i) to collect the data needed for the study? (2 marks)

Place the quadret randomly and take a photo within the area inside the photo so the number of organisms can be counted as data for the study. in the area

Answers written in the margins will not be marked.

(b) In a field trip to a rocky shore, a student found a thin brown sheet lying on a rock. The student suspected that it was an alga. A small piece of the sample was taken back to school for further study.



5 cm

Using apparatus and reagents available in a school laboratory, design a set-up which can be used to show whether the sample of this thin sheet can undergo respiration. In the space below, draw a simple labelled diagram of this set-up. (3 marks)

Title: A set-up for demonstrating if respiration occurs in the sample

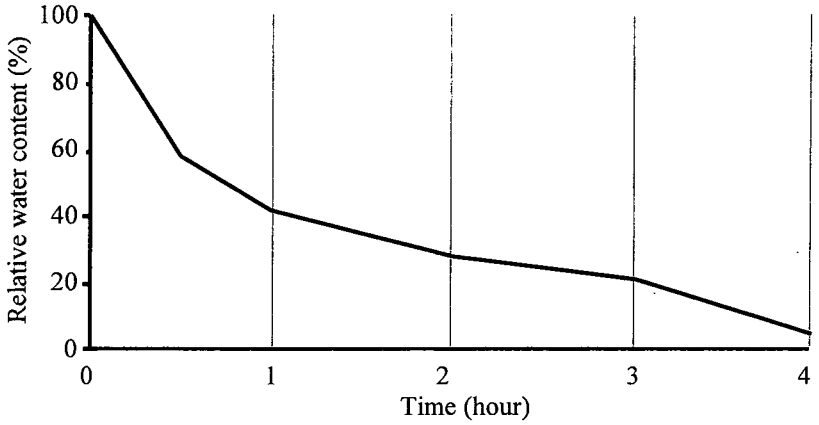
Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(c) Under normal circumstances, the level of free radicals in algal tissues is kept at a certain level as a result of homeostasis. In response to dehydration, algal tissues will be stimulated to produce free radicals which can cause damage to the cell components if there is an accumulation.

Graph I shows the change in relative water content of algal tissue samples during a period of four hours of dehydration:

Graph I



With reference to Graph I, what would be the expected change in the level of free radicals found in the algal tissue samples during the four hours of dehydration? (1 mark)

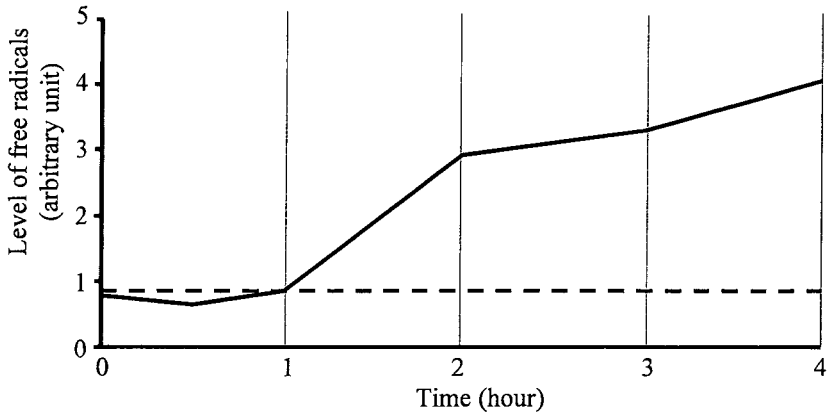
The free radicals will increase rapidly.

Answers written in the margins will not be marked.

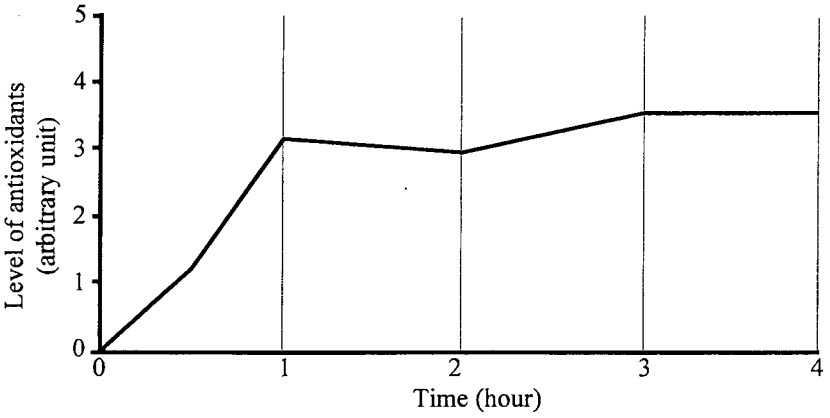
Answers written in the margins will not be marked.

(d) Graph II and Graph III respectively show the actual change in the level of free radicals and the change in the level of antioxidants found in the algal tissue samples of the alga during the same period of dehydration:

Graph II



Graph III



Based on your answer in (c) and the data shown in Graph II and Graph III, suggest the role of antioxidants in helping the algae to cope with the dehydration. Give ***two*** pieces of evidence from the data shown. (3 marks)

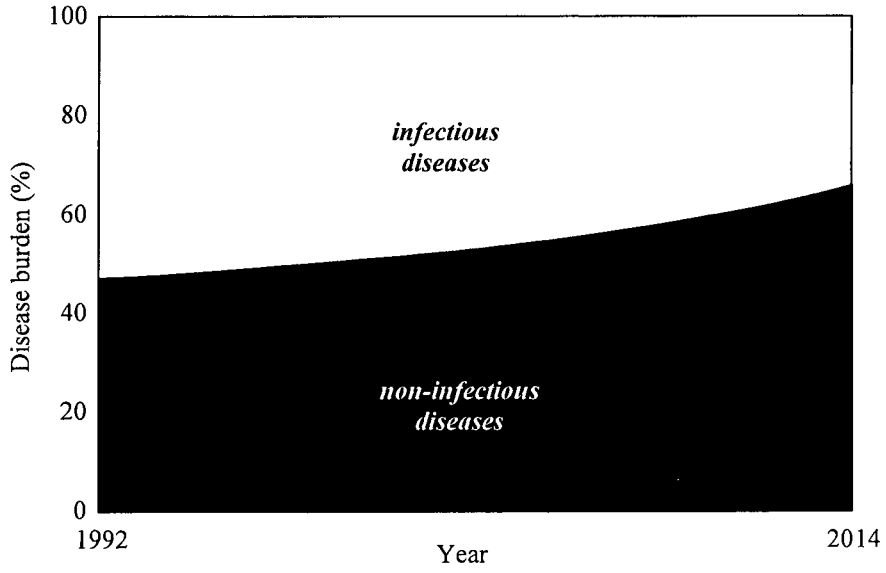
Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Go on to the next page

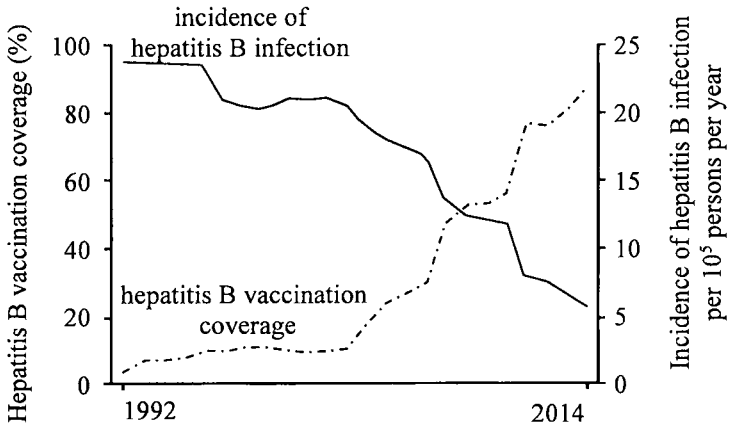
8. Disease burden is a measure of population health that aims to quantify the potential loss of lifespan and health outcomes due to illness as compared to the ideal of living to a ripe old age and in good health. The graph below shows the percentage share of disease burden caused by infectious diseases and non-infectious diseases in Country X from 1992 to 2014:



(a) Describe the change in the percentage shares of the disease burden of Country X from 1992 to 2014.
(1 mark)

The non-infectious diseases' percentage shares increase nearly 10%.

(b) The graph below shows the impact of hepatitis B vaccination on the incidence of hepatitis B infection in Country X from 1992 to 2014:



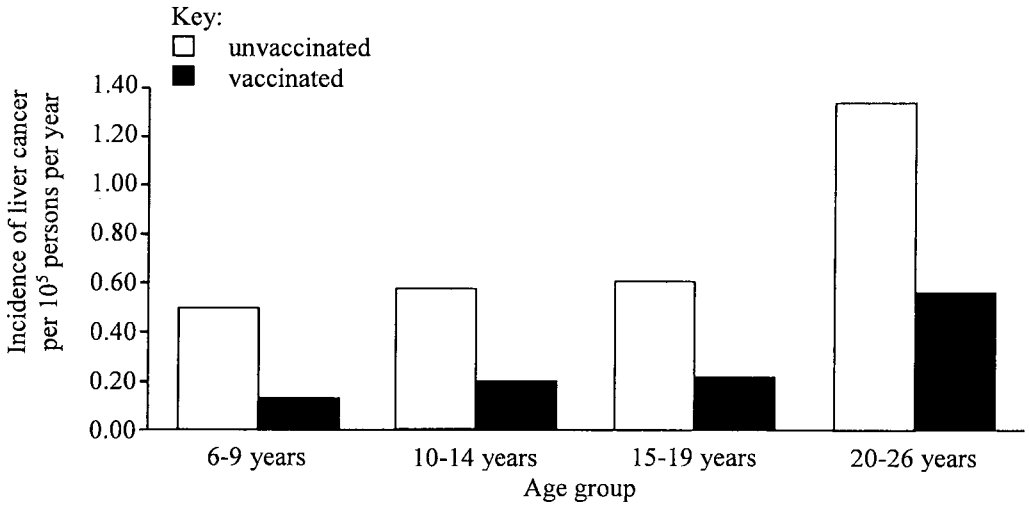
With reference to the principle of vaccination, explain the relationship shown in the above graph.
(4 marks)

Vaccination is a kind of specific defence in humans. By vaccination, people can gain antibodies against the specific kinds of bacteria or virues. In the graph, with more people received vaccination, more people

will have the antibodies for hepatitis B. Therefore less people will be infected by it.

(c) With reference to the information from (a) and (b), suggest the role of vaccination in the change of disease burden in Country X. (1 mark)

(d) The graph below shows the incidence of liver cancer among different age groups who have or have not been vaccinated against hepatitis B in Country X:



What can you conclude about the relationship between hepatitis B and liver cancer? Support your answer with evidence from the graph. (2 marks)

Hepatitis B is one of the reasons that liver cancer develops. Since the unvaccinated people, which is more likely the be infected by hepatitis B, have a higher chance of developing liver cancer than those vaccinated.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

9. Hormone X is a plant hormone which is produced in leaves of plant P when water supply is inadequate. A student detached some leaves from plant P and placed them in either water or a 10 μM solution of hormone X. After two hours, the student examined the lower epidermis of the leaves under a light microscope. The photomicrographs below show the images obtained:

Water

10 μM hormone X

(a) Based on the above information, explain the importance of hormone X to the drought tolerance in plant P. (2 marks)

Hormone X can cause the stomata to close, which can decrease water loss from transpiration. So hormone X can reduce water loss under dehydration.

(b) In nature, there are varieties of plant P which produce different amounts of plant hormone X in response to drought stress. The student measured the fresh leaf masses of two different varieties (A and B) of plant P after drought treatment for two weeks. The results are shown in the table below:

Plant variety	*Treatment*	*Leaf fresh mass (g)*
A	Control	0.20
	Drought	0.18
B	Control	0.21
	Drought	0.08

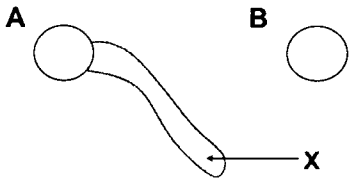
Which variety will have a higher level of hormone X produced? Explain your answer. (3 marks)

Variety A. Under drought environment, it's leaf fresh mass is more than variety B, which indicates that variety A is able to reduce water loss better than variety B. Since it is controlled by hormone X, Variety A has more hormone X.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

10. In an investigation, pollen grains collected from a single flower were cultured in an artificial medium. After 48 hours incubation, they were observed under a light microscope. Two types of pollen grains with different appearances were observed, as shown in the diagram below:



(a) The number of each type of pollen grains is approximately the same. It is known that the formation of structure X is controlled by a single gene. Deduce the genotype of the parent plant producing these two types of pollen grains. (4 marks)

The parent plant is heterozygous. since the parent plant can produce two types of pollen grains with different gene, the parent plant must contain two different types of gene in them. which means that it is heterozygous.

(b) If these two types of pollen grains land on a stigma of the flower of the same species, which type of pollen grains will lead to formation of seed? Explain your answer. (3 marks)

Type A.

(c) 100 seeds were collected from the parent plant in (a) after self-pollination. According to your answer in (b), complete the following table to show the proportion of genotypes in these seeds. (1 mark)

Genotype	Homozygous dominant	Heterozygous	Homozygous recessive
Proportion (%)	25%	50%	25%

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Go on to the next page

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

11. Carbon footprint is an estimation of the total amount of greenhouse gases (including carbon dioxide and methane) generated by our actions, e.g. our choice of food. For instance, skipping meat one day per week will help to reduce the carbon footprint.

Discuss why the practice of eating a vegetarian diet rather than a mixed diet can reduce your personal carbon footprint by referring to the biological aspects of the practice. Briefly discuss *two* other personal actions that you can do to reduce your carbon footprint from other perspectives. (11 marks)

Carbon footprint can be reduced by changing our transportation method. It is known that cars are one of the main source of the greenhouse gases. If we choose taking public transportation instead of driving private cars, the amount of greenhouse gases produced will decrease so our carbon footprint can be reduced.

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.

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.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

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.

2024 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

試題編號 Question No.

1	2	3	4	5	6	7	8	9	10	11	12	
☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
13	14	15	16	17	18	19	20	21	22	23	24	≥25

由考生填寫 To be filled in by the candidate	
試題編號 Question No.	1
	4

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.

ai) In graph I and II, both FSH and LH decreased in level after taking the contraceptive pill.

FSH is used to stimulate the growth of follicles and LH is used to release the matured follicles into the oviduct and denature yellow body. If both FSH and LH decreased in level, follicles cannot be stimulated and won't grow, and will also not be released to the oviduct. Preventing them from meeting with the sperms and getting fertilized.

aii) Protesrone. When it's level increases, it will inhibit the release of FSH and LH to prevent another follicle from developing.

aiii) If the uterine lining is too thin, the fertilized ovary cannot stablize itself on the uterine lining. Therefore cause contraception.

aiv) Since hormone X will also decrease the release of oestrogen, which is used to develop a thick uterine lining. Without enough oestrogen, the uterine lining cannot be developed to become thicker, instead remain thin.

寫於邊界以外的答案，將不予評閱。
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											

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.

bi) Volume of drink consumed - volume of urine

bii) The group drinking water have no change in their water potential in blood while the group drinking salt solution have a decrease in water potential in blood due to the absorption of salt into blood. While blood is passing through the kidneys, more water is reabsorbed from the urine and the blood due to the steeper concentration gradient. Therefore, with less amount of urine produced, the group consumed the salt solution can have a higher accumulated volume of fluid in their body.

biii) While running, their bodies will produce lots of heat due to metabolism. So excessive water is required to loss heat from the bodies through sweating. Retaining more water can help losing heat faster for a longer time, so to maintain a high metabolic rate.

寫於邊界以外的答案，將不予評閱。
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
☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐

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.

ai) X is plasmid. It act as a vector for transferring the specific gene into another organisms by having bacterias receive it and infecting target organisms.

aii 1) GM-B. GM-B can produce $150 \times 3 \div 3 = 150$ arbitrary unit of PUFAs per month. While GM-A can produce $50 \times 9 \div 6 = 75$ units of PUFAs per month and GM-C can produce $100 \times 4 \div 8 = 50$ unit of PUFAs per month, less than GM-B.

aii 2)

aiii 1) The agrobacterium in the GM crops will infect the wild relatives nearby, affecting the growth of these plants and harm the nearby environment.

寫於邊界以外的答案，將不予評閱。
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	
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.

bi)

bii) Primer R. since the position it can binds to is too far away from the mutation position.

biii)

biv) Sample well should rest on the anode side

寫於邊界以外的答案，將不予評閱。
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	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
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.

寫於邊界以外的答案，將不予評閱。
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	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
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.

寫於邊界以外的答案，將不予評閱。
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	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
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.

寫於邊界以外的答案，將不予評閱。
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	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
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.

寫於邊界以外的答案，將不予評閱。
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	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
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.

寫於邊界以外的答案，將不予評閱。
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	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
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.

寫於邊界以外的答案，將不予評閱。
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	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
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.

寫於邊界以外的答案，將不予評閱。
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.

Level 3 Exemplar 2

2024-DSE
BIO
PAPER 1B

B

HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY

HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2024

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 *

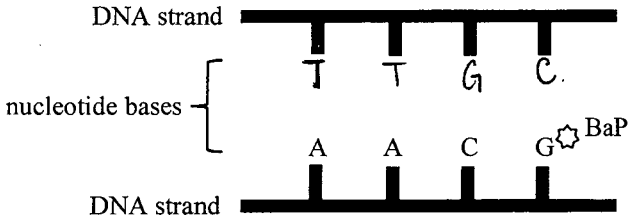
SECTION B

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

1. Fill in the table below to compare the characteristics of nervous and hormonal controls. (3 marks)

		Nervous control	*Hormonal control*
(a)	Signalling molecule	nerve impluses	hormones
(b)	Transmission pathway	neurones	bloodstream
(c)	Comparison of the time taken to induce responses	reaction time of nervous control is faster than that of hormonal control.	

2. BaP is a carcinogenic chemical which is commonly found in grilled meats. It can attach randomly to the nucleotides of DNA molecules. When it is attached to guanine (G), this G will be misread as thymine (T). The diagram below shows part of nucleotide sequence of one strand of a DNA molecule with BaP attached to a G:



(a) On the above diagram, write down the nucleotide sequence found in the opposite strand of the DNA when misreading happens. (1 mark)

(b) Suggest ***one*** reason why this type of mutation may ***not*** affect the functioning of the protein formed. (1 mark)

the mutation is not occured in the region of protein shape or function so that the shape of protein unchanged or the function will be unchanged.

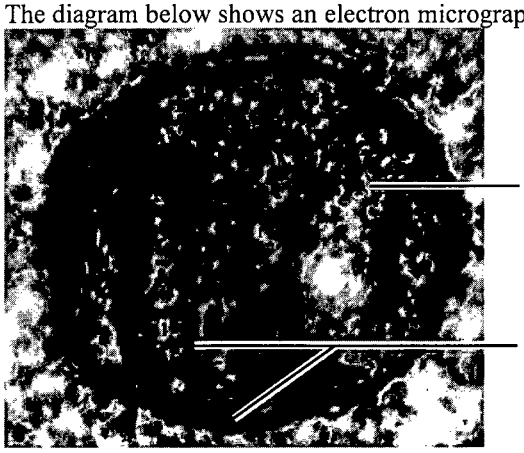
(c) If this type of mutation accumulates over time in the DNA molecules, there is a chance that it will affect the functioning of the protein formed and subsequently lead to tumour formation. Suggest which cellular process this protein controls. (1 mark)

cell differentiation

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

3. The diagram below shows an electron micrograph of a mitochondrion:



(a) Label X in the above diagram. (1 mark)

(b) Describe ***one*** observable feature of Y and explain how this feature is related to the functioning of mitochondria. (2 marks)

It is double-membrane bounded. Between two membranes, the space is for carrying respiration to release energy.

(c) Chemical Z can inhibit an enzyme found in X.

(i) Which key process of respiration would be inhibited? (1 mark)

Krebs cycle

(ii) If chemical Z is added to a plant cell culture, how would this affect the respiratory pathway? (3 marks)

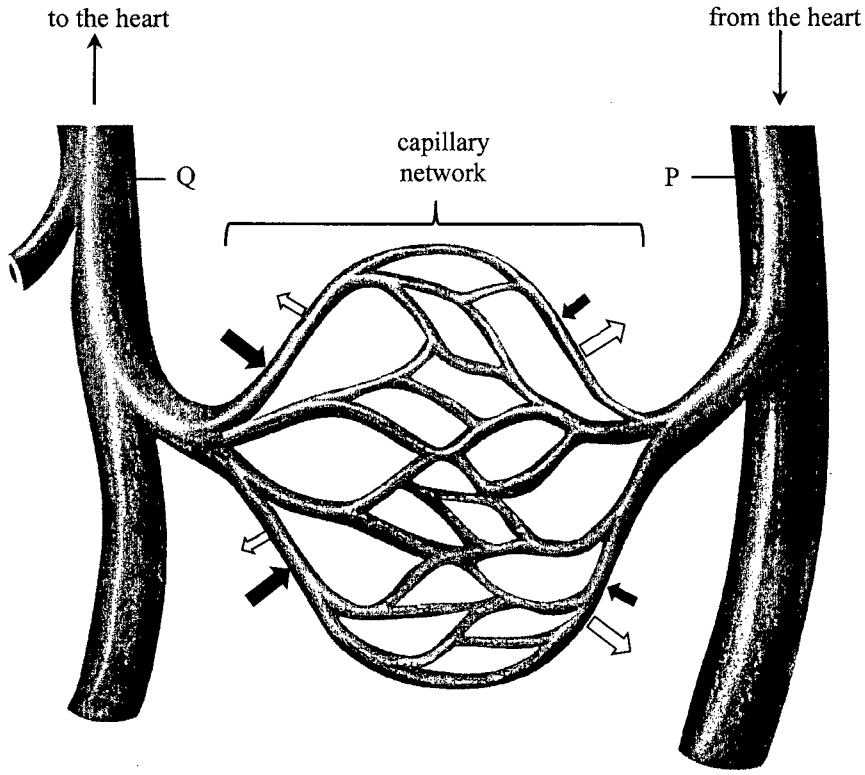
When chemical Z added, coenzyme A will be inhibited. So that 2 pyruvates cannot be converted into acetyl-CoA and carry out Krebs cycle. So arebic respiration cannot be carried out and the plant cell can only receive energy by undergo respiration.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Go on to the next page

4. The schematic diagram below shows the arrangements of some blood vessels:



(a) The two types of arrows (black and white) represent two factors which govern the movement of fluid into or out of the capillary network. Identify these two factors. (2 marks)

➡ : the water potential difference between tissue fluid and blood plasma

⟹ : the pressure difference between the tissue fluid and blood plasma

(b) The sizes of the arrows in the above diagram represent the magnitudes of the factors. Explain the change in the factors denoted by ⟹ as the blood flows from P to Q. (3 marks)

Since blood at P is from heart, it carries a high pressure. Because the blood pressure is higher than the pressure of tissue fluid, some components of blood will be forced out from blood to tissue fluid. At the venule end, the pressure difference reduced so less components will be forced out.

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.

(c) The capillary network is the location where exchange of materials occurs between the blood and tissue fluid. When the blood flows through the capillary network of a particular organ, some substances will be taken up into the blood.

Complete the table below to show the organ where the capillary network is found. Provide your explanation. (3 marks)

	Organ	***Substance taken up into the blood***	***Explanation***
(i)	pancreas	insulin	Insulin is secreted from the organ in response to the change of the blood glucose level.
(ii)	liver	urea	excess amino acids is broken down into urea in liver through deamination.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

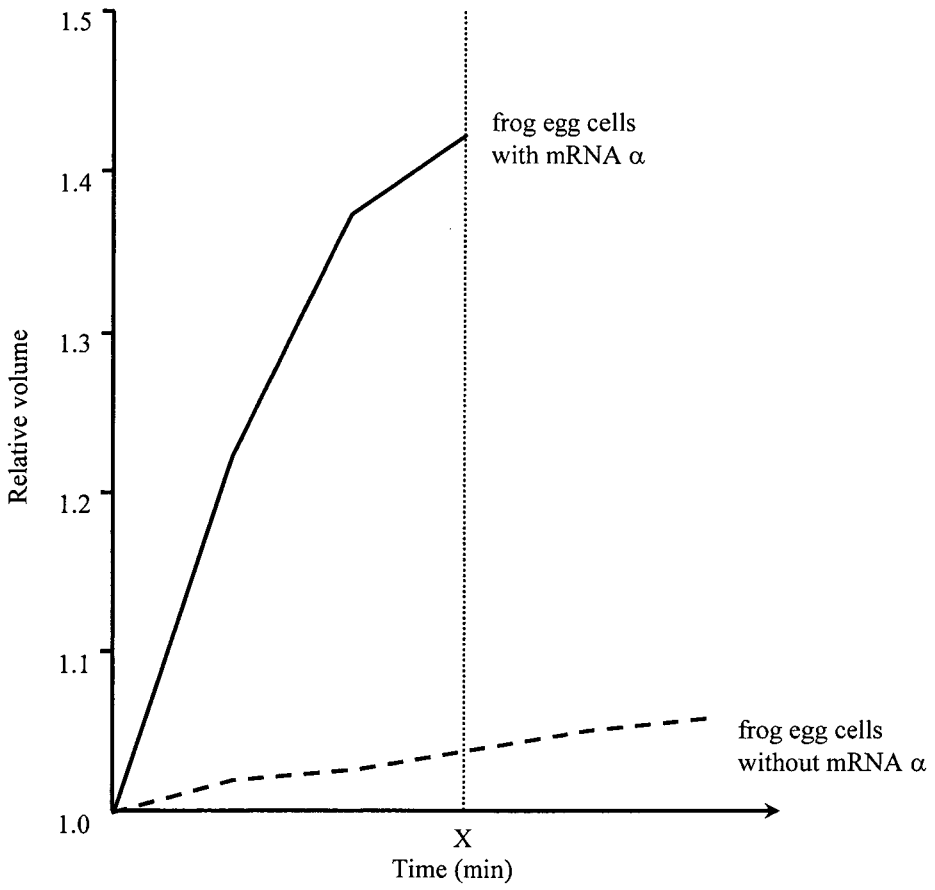
Go on to the next page

5. In an experiment, mRNA α was isolated from a mammalian cell and then injected into a frog egg cell. The expression of mRNA α eventually led to the presence of protein α on the cell membrane of the frog egg.

(a) Describe how the injected mRNA α led to the presence of protein α on the cell membrane of the frog egg. (3 marks)

the injected mRNA α will pair up with nucleotides and form tRNA α by complementary pairing. the tRNA α with match with anticodons and amino acids formed. After the linkage of amino acids (formed) by polypeptide bonds, protein α is produced.

(b) In another experiment, frog egg cells received an injection of a fixed amount of water with or without mRNA α. After that, these two types of frog egg cells were transferred to pure water. The changes in the relative volumes ($\frac{\text{new volume}}{\text{original volume}}$) of these two types of frog egg cells are shown in the graph below:



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.

(i) Explain why there was an increase in the relative volume of the frog egg cells without mRNA α after they were transferred to pure water. (2 marks)

the frog egg cells are growing by increasing its size and number of cells and its complexity.

(ii) Based on the difference shown in the results of the two types of frog egg cells, deduce the function of protein α on the cell membrane. (3 marks)

The increase in relative volume of the frog egg cells with mRNA α is greater than that without mRNA α. The relative volume is new volume over orginal volume. It shows that the volume of frog egg cells with mRNA α is greatly increased. So that protein α is for facilitating the growth of cells. while that of frog egg cells without mRNA α is lessly increased

(iii) Suggest why no data were obtained from frog egg cells with mRNA α after X minutes. (1 mark)

the relative volume has reached the maximum, such that the volume of frog egg cell increased too fast and too much.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Go on to the next page

6. Shirley came across an article about some beans containing an amylase inhibitor as a defence against insects. She wondered if the amylase inhibitor would also work in the human body and if it did, whether it could be used as a food supplement for weight management. She discussed the idea with her classmate Johnson. They had different ideas:

Shirley: I think we should test if the bean extract can inhibit pancreatic amylase.

Johnson: Perhaps we can use salivary amylase instead of pancreatic amylase.

(a) With reference to the process of digestion, which amylase would produce more valid results for developing a food supplement that targets weight management? Explain your answer. (3 marks)

pancreatic amylase. The beans will experienced an acidic gastric juice before mix with pancreatic juice. During the acidity, the beans may lose function. Salivary amylase is slightly alkaline and the beans will no lose function. So that use salivary amylase is more reliable.

(b) The table below shows the reaction mixtures prepared for the investigation:

Solution	*Volume of solution used in each set-up (mL)*	
	Set-up I	*Set-up II*
1% starch solution	15	15
Amylase solution	5	5
Bean extract	0	5
Buffer solution (to maintain the pH)	5	5
Water	5	0

(i) Explain the purpose of adding water to set-up I. (2 marks)

to make set-up I become a control set-up. It can compare with set-up 2 that when the results of two set-ups are different, it can shows that the difference is due to the bean extract.

(ii) Suggest ***one*** method to determine the rate of starch digestion and state clearly the measurement taken to show the rate of starch digestion. (2 marks)

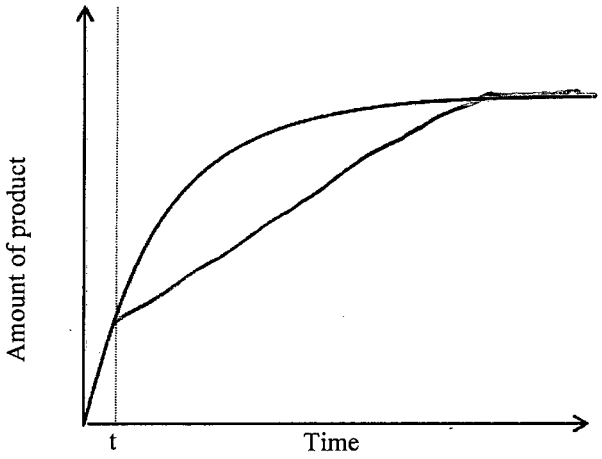
Use agar plate, make 2 holes on the plate, Add 2 solutions of set-ups into the holes respectively. Measure the size of clear zone at each 15 minutes. the rate of starch digestion is the size of clear zone over 15 minutes.

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.

(c) The graph below shows the amount of product formed over time when amylase is working normally:



The experiment was repeated with the addition of bean extract at time t. If the bean extract can inhibit the amylase being studied, what will be the change in the amount of product formed? On the above graph, sketch a line to show the results. (1 mark)

(d) Shirley and Johnson shared their ideas with their professor. Their professor suggested that they should conduct an *in vivo* experiment using mice with the control group fed with starchy food and the experimental group fed with a mixture of starchy food and bean extract.

(i) Explain why the result of an *in vivo* experiment is more valid than that of *in vitro* experiment in this case. (1 mark)

the beans must pass through the acidic stomach, and we cannot simulate the acidity of it.

(ii) Apart from monitoring the change in body weight of the mice, their professor suggested that they should take blood samples from the mice after the meals for analysis. Which component of the blood should they monitor? What would be the expected results of the control group and the experimental group if their ideas actually worked? (2 marks)

blood glucose level. the blood glucose level of control group should be high and that of experimental group should be lower than that of control group.

(e) Suggest how the amylase inhibitor helps the bean defend against insects. (1 mark)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

7. The following photograph was generated by an artificial intelligence programme using the following sentence:

'A photograph capturing Hong Kong students on a field trip to a rocky shore, studying the distribution and abundance of organisms along the shore.'

(a) The photograph does not truly reflect the requirement in the sentence because two pieces of essential equipment are missing.

(i) List the ***two*** pieces of essential equipment for the study. (1 mark)

belt and quadra

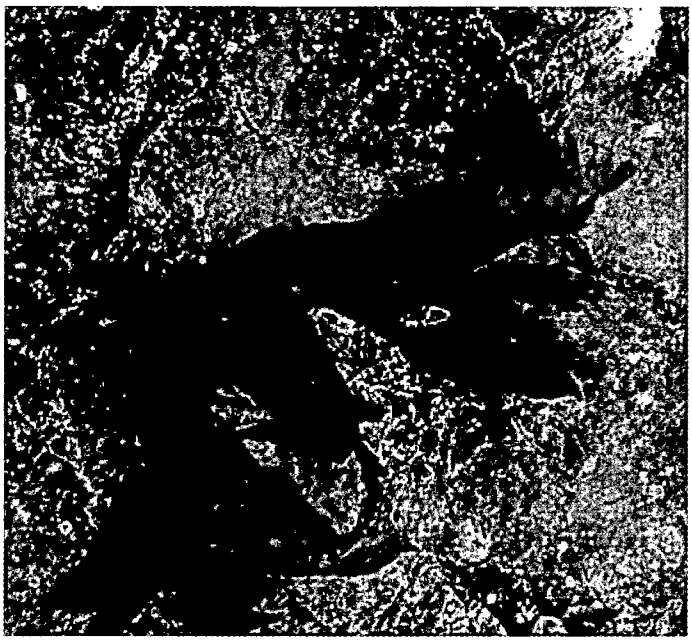
(ii) How could you use the equipment listed in (i) to collect the data needed for the study? (2 marks)

put the belt from the coastal line to the rocky shore. At each fixed distance of belt, put the quadra on the shore. Count the organisms in the shore and record it.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

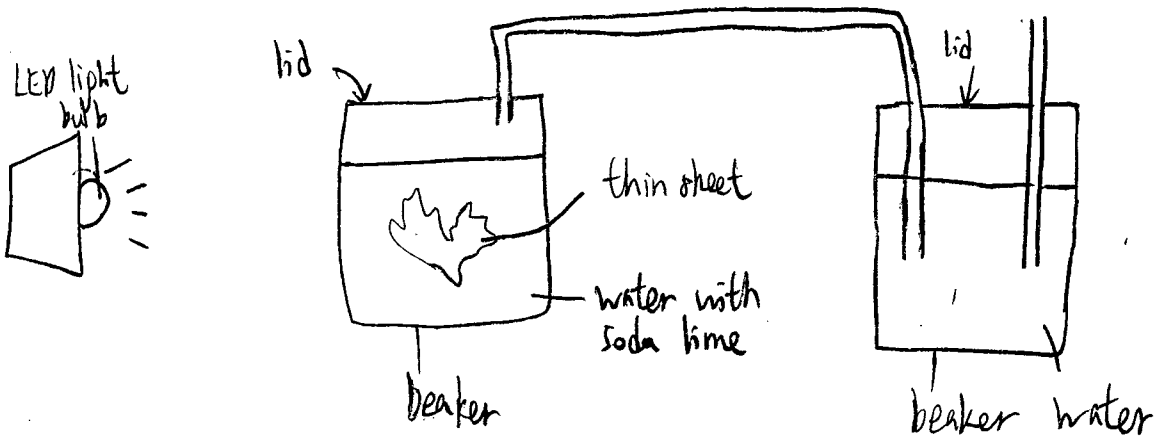
(b) In a field trip to a rocky shore, a student found a thin brown sheet lying on a rock. The student suspected that it was an alga. A small piece of the sample was taken back to school for further study.



5 cm

Using apparatus and reagents available in a school laboratory, design a set-up which can be used to show whether the sample of this thin sheet can undergo respiration. In the space below, draw a simple labelled diagram of this set-up. (3 marks)

Title: A set-up for demonstrating if respiration occurs in the sample



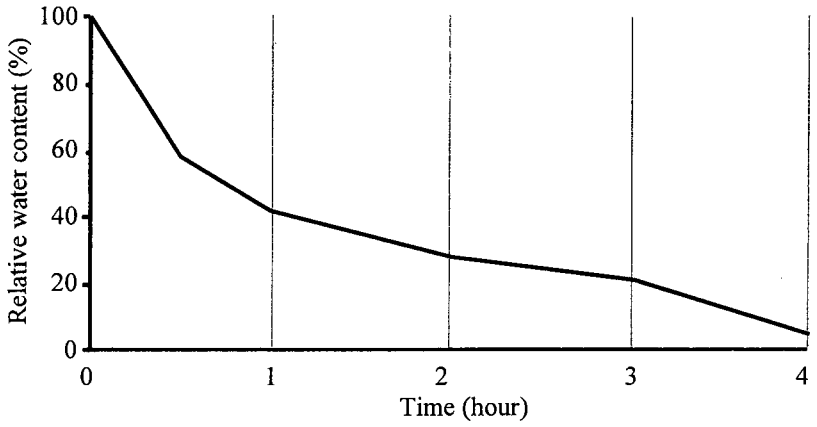
Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(c) Under normal circumstances, the level of free radicals in algal tissues is kept at a certain level as a result of homeostasis. In response to dehydration, algal tissues will be stimulated to produce free radicals which can cause damage to the cell components if there is an accumulation.

Graph I shows the change in relative water content of algal tissue samples during a period of four hours of dehydration:

Graph I



With reference to Graph I, what would be the expected change in the level of free radicals found in the algal tissue samples during the four hours of dehydration? (1 mark)

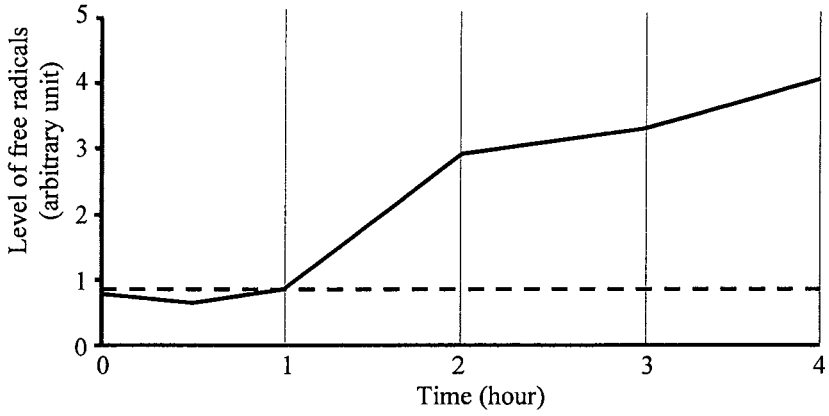
the level of free radicals will increase

Answers written in the margins will not be marked.

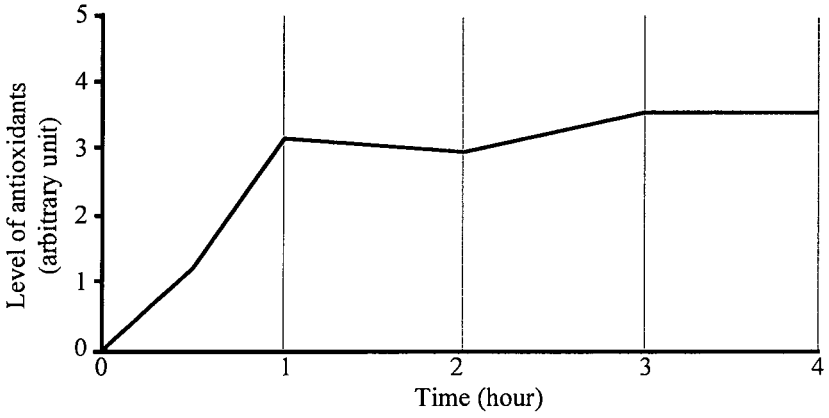
Answers written in the margins will not be marked.

(d) Graph II and Graph III respectively show the actual change in the level of free radicals and the change in the level of antioxidants found in the algal tissue samples of the alga during the same period of dehydration:

Graph II



Graph III



Based on your answer in (c) and the data shown in Graph II and Graph III, suggest the role of antioxidants in helping the algae to cope with the dehydration. Give ***two*** pieces of evidence from the data shown. (3 marks)

the amount of antioxidants increased when the dehydration started. After the secretion of antioxidants, the rate of water loss of the algae tissue (at 0 hour to 1 hour) has been decreased.

the level of free radicals (started to) increase at 1 hour to 2 hour after the secretion of antioxidants at 0 hour to 1 hour. Due to the high level of antioxidants, the level of free radicals keep increasing.

So that antioxidants can reduce water loss and stimulate the production of free radicals.

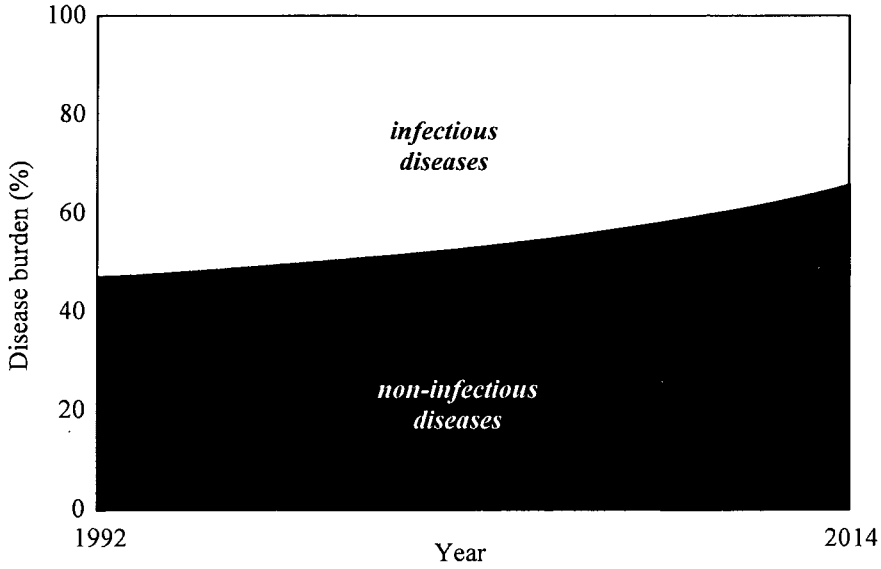
Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Go on to the next page

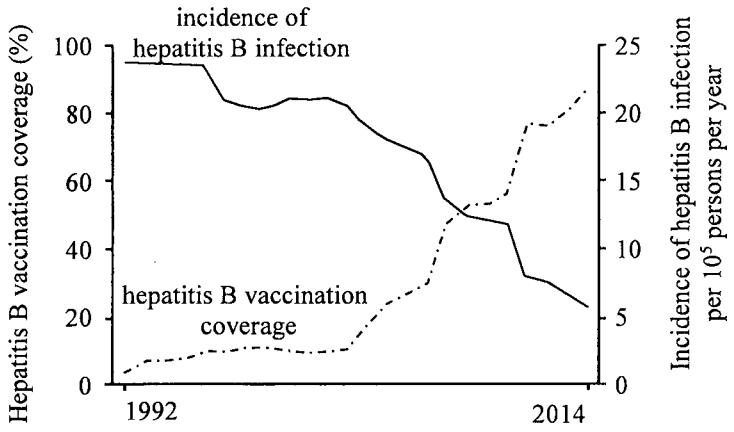
8. Disease burden is a measure of population health that aims to quantify the potential loss of lifespan and health outcomes due to illness as compared to the ideal of living to a ripe old age and in good health. The graph below shows the percentage share of disease burden caused by infectious diseases and non-infectious diseases in Country X from 1992 to 2014:



(a) Describe the change in the percentage shares of the disease burden of Country X from 1992 to 2014.
(1 mark)

the disease burden caused by non-infectious diseases increased from 50% in 1992 to more than 60% in 2014, while that by infectious disease decreased from 50% in 1992 to less than 40% in 2014.

(b) The graph below shows the impact of hepatitis B vaccination on the incidence of hepatitis B infection in Country X from 1992 to 2014:



With reference to the principle of vaccination, explain the relationship shown in the above graph.
(4 marks)

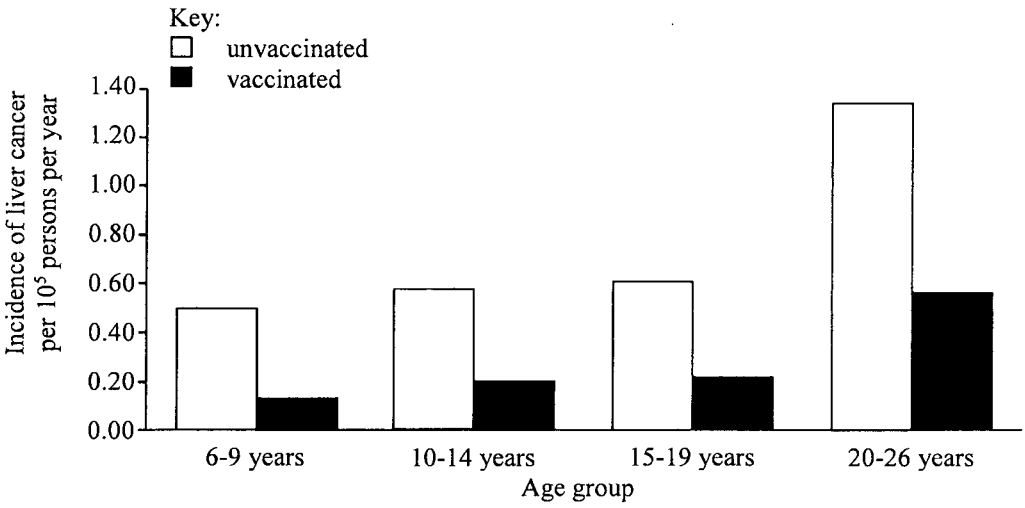
vaccination is to reduce the rate of infection by bacteria. Since the coverage of hepatitis B vaccination increased from nearly 0% in 1992 to more than 80% in 2014, the incidence of hepatitis B infection decreased from nearly

25 (incidence) per 10^5 people per year in 1992 to about 5 (incidence) per 10^5 people per year in 2014. Therefore, the larger the coverage of hepatitis B vaccination, the fewer the incidence of hepatitis B infection.

(c) With reference to the information from (a) and (b), suggest the role of vaccination in the change of disease burden in Country X. (1 mark)

Vaccination reduced the incidence of hepatitis B infection which is an infection disease so the disease burden caused by infection disease decreased.

(d) The graph below shows the incidence of liver cancer among different age groups who have or have not been vaccinated against hepatitis B in Country X:



What can you conclude about the relationship between hepatitis B and liver cancer? Support your answer with evidence from the graph. (2 marks)

In (both) four age groups, the incidence of liver cancer in people that is unvaccinated is more than that in people that is vaccinated. Therefore, the reduction of incidence of hepatitis B infection leads to (the) fewer incidence of liver cancer.

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.

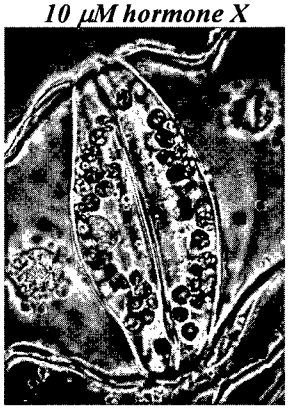
Go on to the next page

Flaccid

9. Hormone X is a plant hormone which is produced in leaves of plant P when water supply is inadequate. A student detached some leaves from plant P and placed them in either water or a 10 μM solution of hormone X. After two hours, the student examined the lower epidermis of the leaves under a light microscope. The photomicrographs below show the images obtained:

Water

10 μM hormone X



(a) Based on the above information, explain the importance of hormone X to the drought tolerance in plant P. (2 marks)

it helps to reduce water loss of ... plant P by affecting the guard cells to close the stomata.

(b) In nature, there are varieties of plant P which produce different amounts of plant hormone X in response to drought stress. The student measured the fresh leaf masses of two different varieties (A and B) of plant P after drought treatment for two weeks. The results are shown in the table below:

Plant variety	*Treatment*	*Leaf fresh mass (g)*
A	Control	0.20
	Drought	0.18
B	Control	0.21
	Drought	0.08

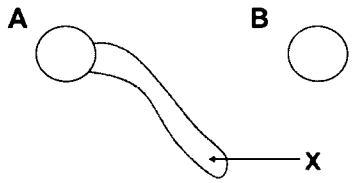
Which variety will have a higher level of hormone X produced? Explain your answer. (3 marks)

A. The mass difference between control treatment and drought treatment of variety A is 0.02 g which is less than that of variety B, which is 0.13 g. The mass difference equals to the water lost, because variety B lost more water, the guard cells may not close. And this means the hormone X is not very efficient. It shows that the amount of hormone X is not enough. So that B has a lower level of hormone X.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

10. In an investigation, pollen grains collected from a single flower were cultured in an artificial medium. After 48 hours incubation, they were observed under a light microscope. Two types of pollen grains with different appearances were observed, as shown in the diagram below:



(a) The number of each type of pollen grains is approximately the same. It is known that the formation of structure X is controlled by a single gene. Deduce the genotype of the parent plant producing these two types of pollen grains. (4 marks)

pollen grain A has structure X so it and its parents have at least one allele for forming structure X, pollen grain B has no structure X so it and its parents have at least one allele for not forming structure X. As two pollen grains are from the same parent, the parent plant contain one allele for forming structure X and one allele for not forming structure X. It shows that the parent plant is heterozygous.

(b) If these two types of pollen grains land on a stigma of the flower of the same species, which type of pollen grains will lead to formation of seed? Explain your answer. (3 marks)

pollen grain A. it is a normal pollen grain for flower plant since pollen grains need to attach to the insects in order to arrive to the stigma. Structure X can help pollen grains to attach to the insects, while pollen grain B does not have, it is unusual and it may be non-function.

(c) 100 seeds were collected from the parent plant in (a) after self-pollination. According to your answer in (b), complete the following table to show the proportion of genotypes in these seeds. (1 mark)

Genotype	Homozygous dominant	Heterozygous	Homozygous recessive
Proportion (%)	25%	50%	25%

XY XY

17 XX XY XY YY

Go on to the next page

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

11. Carbon footprint is an estimation of the total amount of greenhouse gases (including carbon dioxide and methane) generated by our actions, e.g. our choice of food. For instance, skipping meat one day per week will help to reduce the carbon footprint.

Discuss why the practice of eating a vegetarian diet rather than a mixed diet can reduce your personal carbon footprint by referring to the biological aspects of the practice. Briefly discuss *two* other personal actions that you can do to reduce your carbon footprint from other perspectives. (11 marks)

More carbon dioxide will be produced when eating a mixed diet rather than that of a vegetarian diet. First, meat is from animals. We only eat some specific region of the animal and the unwanted parts will be waste. The organic matter is these parts will become food of decomposers and they will convert the organic matter back to carbon dioxide. Second, the animals may need to travel a long distance to arrive the market throught aviation and shipping. And these transportation produced many carbon dioxide during travelling. Third, all the parts of vegetables can be eaten. And there will have less wasted food so that less carbon dioxide will be converted by decomposers.

We can reduce our carbon footprint by our own actions. First, we can use more public transportation rather than drive our own cars. It is because transportation like cars or ships or airplanes produced many carbon dioxide when they are working. We can also ride bicycle or walk by foot to reduce carbon dioxide production. Second, we can use fans rather than air-conditioners. Due to the global warming, the temperature is quite high in summer. Many people will choose turn on their air-conditioners in order for a cooler temperature. But during the production of cool air, air-conditioners released hot air and carbon dioxide at the same time. And the government has also noticed that air-conditioners and cars are the mainly producers of carbon dioxide. So

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

If we feel hot, try not to turn on the air-conditioners but fans. Fans do not produce any carbon dioxide. We can do these two actions to help reduce carbon footprint.

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.

Answers written in the margins will not be marked.

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.

2024 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

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

由考生填寫 To be filled in by the candidate	
試題編號 Question No.	1
	4

試題編號 Question No.

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

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.

1ai. From Graph I, the pill lower the level of follicle stimulating hormone, (at original period day.)
This hormone is aimed to stimulate follicle to develop.
From Graph II, the pill lower the level of luteinising hormone at orginal period day. This hormone helps to stimulate the thickness of uterine lining.
If the follicle does not develop, the uterine lining is thin, fertilization and implantation cannot occur.

aii. progesterone. It (can) inhibit the secretion of luteinising hormone and follicle stimulating hormone.

aiii. One of the methods to contraceptive is to prevent implantation. When the uterine lining is thin, the rate of successful of implantation will be lower.

aiv. From Graph III, the level of oestrogen is lower than the orginal level. The function of oestrogen is to thicken the uterine lining. When its amount reduce, its function can not be worked efficiently.

1bi. volume of drink consumed - volume of urine collected

bii. The highest accumulated volume of fluid retained of the group which consumed the salt solution is, higher than that of group which consume water, which is about 900 mL.
nearly 1400 mL, which is
The accumulated volume of fluid of the group which consume water return

寫於邊界以外的答案，將不予評閱。
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
☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

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.

back to normal at 1to minutes. But that of group which consumed the salt solution still at a higher level.

biii. During running marathon, the runners will have a larger proportion of water loss by sweating. During the marathon, the runners cannot keep having water intake regularly. So they need to reduce their water loss of body.

biv. add a group of people that do not consume any drink. Repeat the whole experiment and ask the participants to do exercise started at 0 minute.

bv. glycerol

寫於邊界以外的答案，將不予評閱。
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.

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

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

4ai: plasmid. a vector to carry the target gene.

aii. 1. GM-B crop. Its yield is the largest with 150 ρ per crop. Also, Its time required to reach seed harvest stage is the shortest with 3 month.

aii. 2. For GM-B Crop, its content of PUFAs is the least with 3 arbitrary unit per ρ of seed. Also, it will not change our DNA.

aiii. 1. it may affect the normal genetic variation of that crop.

aiii. 2.

4bi. extract the specific DNA fragment from the DNA samples. Get DNA samples of individuals again. Repeat the first step. Use the DNA fragments to do gel electrophoresis. With the same distance of the DNA fragments, the sample is from that individual.

bii. primer Q. its cut site is near to the position 285 (nucleotide number). the mutation may destroy its cut side.

寫於邊界以外的答案，將不予評閱。
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.

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
☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐

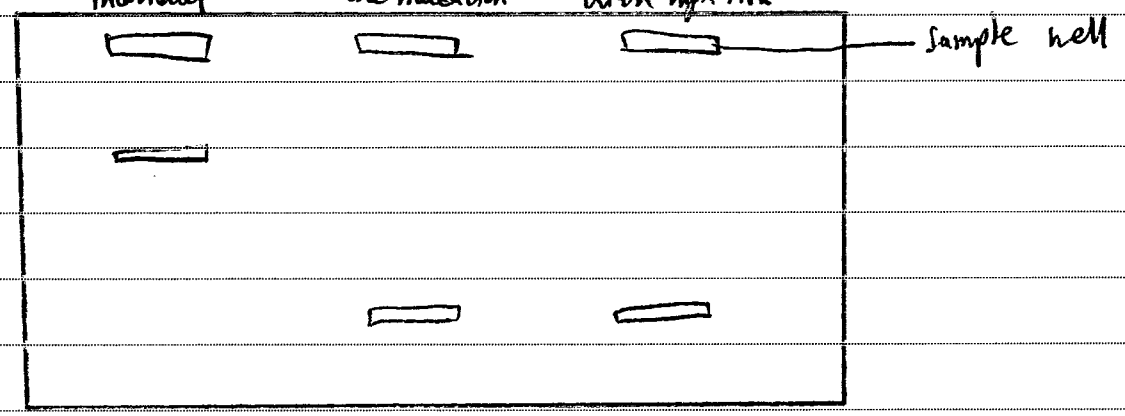
13	14	15	16	17	18	19	20	21	22	23	24	≥25
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

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.

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

bii.



biv. cathode. since DNA fragment is negatively charged. it will move to the positive side.

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	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
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.

寫於邊界以外的答案，將不予評閱。
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	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
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.

寫於邊界以外的答案，將不予評閱。
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	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
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.

寫於邊界以外的答案，將不予評閱。
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	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
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.

寫於邊界以外的答案，將不予評閱。
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	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
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.

寫於邊界以外的答案，將不予評閱。
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	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
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.

寫於邊界以外的答案，將不予評閱。
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	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
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.

寫於邊界以外的答案，將不予評閱。
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.