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Level 2 Exemplar 1

2023-DSE
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HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY

HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2023

# 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.



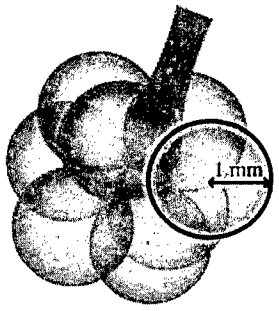
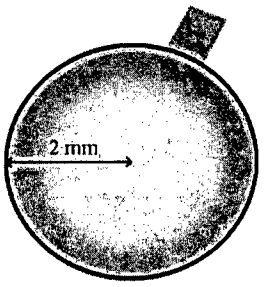


* A 1 3 0 E 0 1 B *

## SECTION B

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

1. The spheres shown in the diagram below represent the air sacs of different sizes in the lung. The total volume of the eight small spheres with a radius of 1 mm each is equal to the volume of one large sphere with a radius of 2 mm.

| |  |  |
|---|---|---|
| surface area of one sphere ($mm^2$) | 12.6 | 50.3 |

(a) Calculate the total surface area of eight small spheres. (1 mark)

$12.6 \times 8$

$= 108\ mm^2$

(b) With reference to the answer in (a), explain why having smaller air sacs in the lungs is more efficient than bigger air sacs for gas exchange. (2 marks)

Although it is small, the air sacs is present in large number, the total surface area is large and have many capilary near. It favour the gas exchange because it is a steep concentration different and a large area for gas exchange.

(c) Apart from (b), explain how air sacs are specialised at tissue level for gas exchange. (1 mark)

The oxygen and carbon dioxide and other gas are diffuse though the air sacs in and out. Only air sacs can avoid gas exchange.

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2. All cells are derived from stem cells. They undergo differentiation in which the cells change in form and shape which enable them to perform specialised functions.

(a) It is found that the lens of the eye is composed of cells without organelles. If the organelles of these cells had not been degraded during differentiation, describe how the functioning of the lens would have been affected. (2 marks)

The light can't directly diverge or converge to the retina. The organelle may block the light in, it affect the image formed in the retina.

(b) Suggest a type of plant cell which also experiences degradation of cellular components during differentiation. Explain the significance of the degradation to the function of the cell type. (2 marks)

Xylem. It have less resistance to avoid the passing of the water.



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3. Diagram I below shows the right leg with the associated joints and muscles. Diagram II shows a series of motions during running with the right leg highlighted in grey.

***Diagram I***

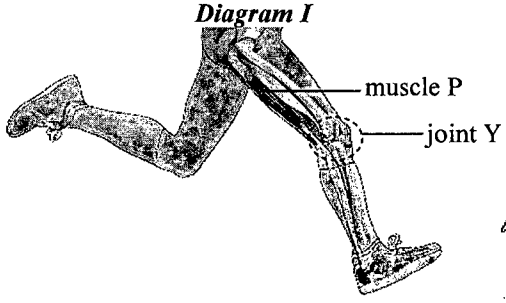
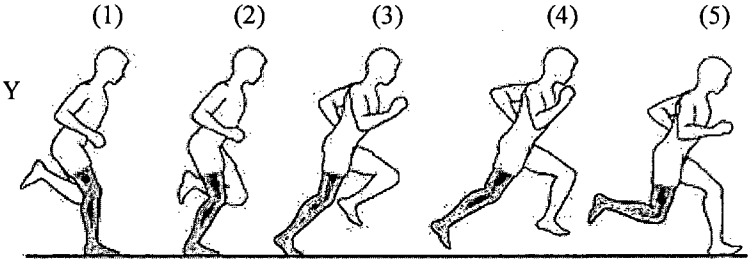



***Diagram II***




(a) In order to bring about the changes in motion from (3) to (5), what is the change of state of muscle P? (1 mark)

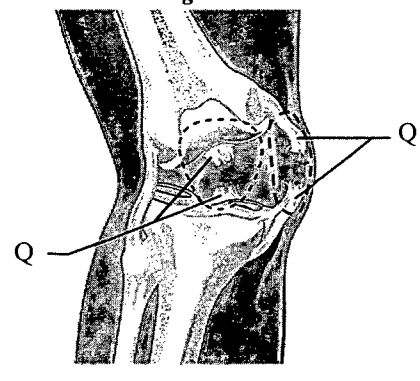
the muscle P contract.

(b) With respect to the answer in (a), state the role of muscle P by circling the following choices in (i) and complete the sentence in space (ii). (1 mark)

Muscle P is a (i) flexor / (extensor) because (ii) it move up the bone.

(c) A person injured his knee while running. Diagram III shows the condition of joint Y after the injury:

***Diagram III***




Structure Q was torn. How would this affect joint Y and its functioning? (2 marks)

The joint Y easy to move place and the leg is not function well. It difficult to receive the nerve impulse. The bone easy to move place.



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4. Dengue fever is an infection caused by the dengue viruses (DENV). It is an endemic illness in many countries in tropical and sub-tropical regions. DENV encompasses four different subtypes. Each subtype can lead to dengue fever.

(a) What is the way of transmission for dengue fever? (1 mark)

By vector

(b) Suggest ***two*** environmental factors in tropical and subtropical regions which lead to a higher risk of contracting dengue fever for people living in these regions. Explain your answer. (3 marks)

There are hot and wet climate it favour the growth of vector. Also, there have a large rainforest to provide habitat to the vector.

(c) Patients infected with a particular subtype of DENV for the first time can recover on their own after about a week without any treatment.

(i) Give ***three*** types of white blood cells that aid the recovery and describe each of their actions. (3 marks)

memory cell is 'remember' the antigen of dengue fever.
killer T cell is directly kill the viruses.
Phagocytosis is engulf the DENV.

(ii) Explain why people who have recovered from infection with a particular subtype of DENV can still be infected with other subtypes of DENV in the future. (2 marks)

The memory cell is die after a long time, the new memory cell don't 'remember' the antigen of DENV, they can't provide the same antigen to stimulate the white blood cell.

(d) Suggest ***one*** preventive measure against the spreading of dengue fever. (1 mark)

Remove the water regularly.



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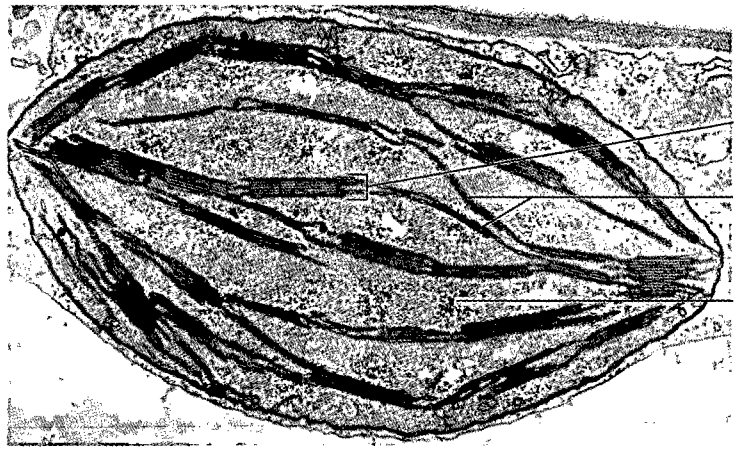
5. An electron micrograph of a chloroplast is shown below:




Y: thylakoid

(a) Label structure Y. (1 mark)

(b) State the energy conversion which takes place at X and its importance in photosynthesis. (2 marks)

The chloroplast absorb sunlight to stimulate the e to emit energy to break down the ATP to ADP. And. FADPH to FADP. The photophosphorylation. It help to provide ADP and FADP for the next stage.

(c) To which type of metabolism does the overall reaction at Z belong? Explain your answer. (2 marks)

Anabolism, it help to combine the material together. Such as ADP + P → ATP, FADP → FADPH.



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(d) Describe how the photosynthetic products of the leaves are stored in the underground tubers of a potato plant. (3 marks)

After the photosynthesis, the products pass through the grana and enter the phloem by active transport. The products will pass through the phloem to the underground tubers of a potato plant. The product stored in there for growth, repair etc it is in a suitable environment.

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6. Colour blindness is an inherited disorder due to defective functioning of the cone cells in the retina. There are many types of colour blindness. For example, people with red-green colour blindness fail to distinguish between red and green colours while those with total colour blindness experience total loss of colour vision.

(a) Based on the functioning of cone cells, suggest why the condition of red-green colour blindness is different from that of total colour blindness. (1 mark)

It is effect by the allele that is genetic pass from the parent.

(b) Red-green colour blindness is caused by a recessive allele on the X-chromosome while total colour blindness is caused by a recessive allele which is located on an autosome. The table below shows the percentage occurrence of red-green colour blindness and total colour blindness in men and women:

| | Men XY | Women XX |
|---|---|---|
| Red-green colour blindness | 8% | 0.5% |
| Total colour blindness | 0.00001% | 0.00001% |

With reference to the inheritance of the two types of colour blindness, suggest why the occurrence of red-green colour blindness in men as compared to women differs from that of total colour blindness. (4 marks)

The Y chromosome is not dominant. And Men must receive one X-chromosome.



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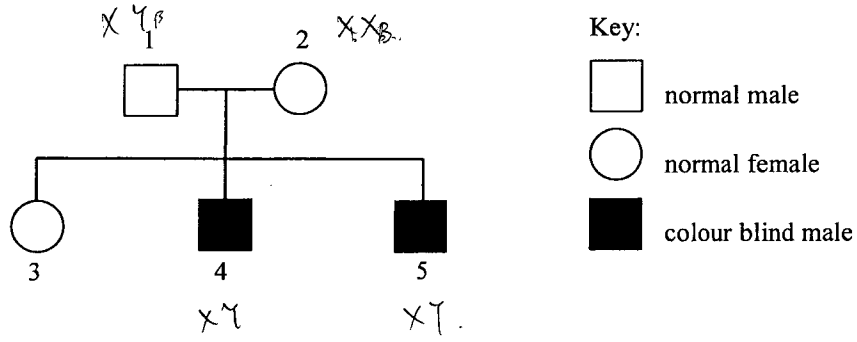
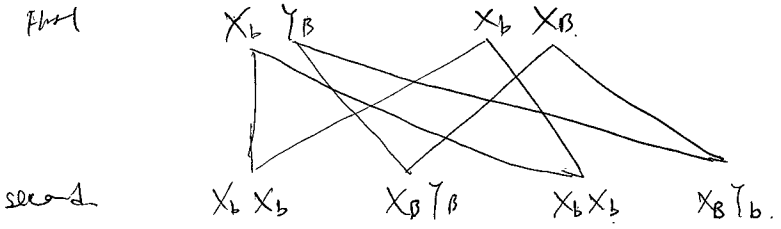
Answers written in the margins will not be marked.

(c) The pedigree below shows the inheritance of red-green colour blindness in a family:




(i) The couple is expecting another child. Using 'B' to represent the allele for normal vision and 'b' to represent the allele for red-green colour blindness, construct a genetic diagram to find out the probability of this newborn being a girl with red-green colour blindness. (4 marks)
(Note: Punnett square is not accepted.)



100%

(ii) Individuals 4 and 5 are twins. Can you determine whether they are identical twins or fraternal twins? Explain your answer. (2 marks)

They are identical twins because they are same sex.

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7. Greenhouse frog is a foreign species which is now found in many local areas according to a recent survey. There is a concern that these greenhouse frogs might threaten a local endangered species, Romer's Tree Frog.

(a) The table below provides some information about the two frog species:

| Name | Romer's Tree Frog | Greenhouse Frog |
|---|---|---|
| Size | 1.5-2.5 cm | 1.2-3.0 cm |
| Breeding site and habitat | Wetland, small and temporary water bodies; woodland; shrubland; plantations | Woodland; shrubland; agricultural field; urban park |
| Food | Small insects | Small insects and snails |

By comparing the ecological niche of the two frog species, give ***two*** pieces of evidence that support the possibility of the greenhouse frog posing a threat to the Romer's Tree Frog. Explain your answer.

(3 marks)

They both eat small insects for food. It is interspecific competition. They both in shrubland for breeding site and habitat. It may easy have interspecific competition in there.

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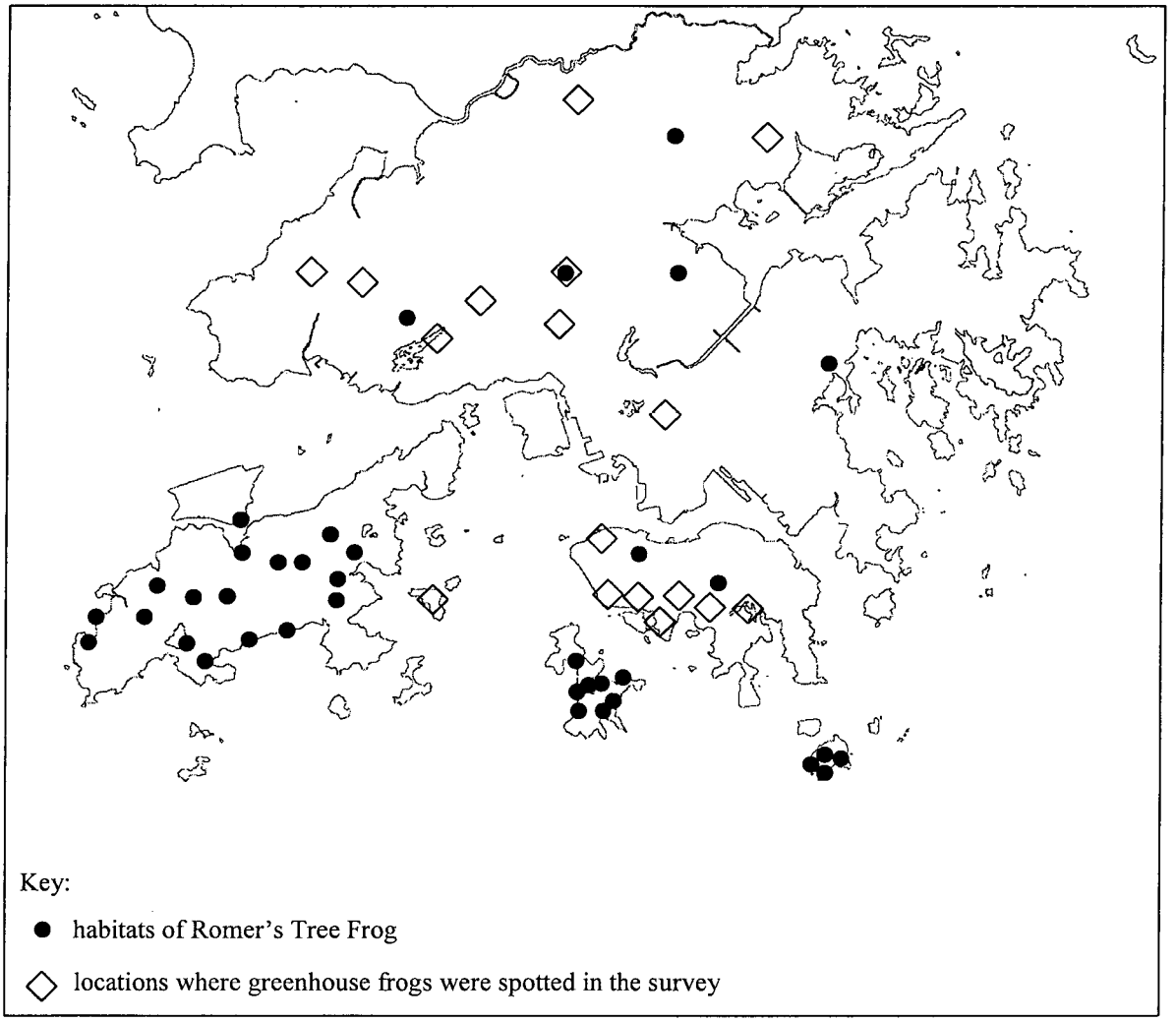
(b) The map below shows the distribution of the two frog species in Hong Kong:




Suggest why the information above ***cannot*** prove that the Romer's Tree Frog is facing a real threat from the greenhouse frogs. (1 mark)

The size of greenhouse frog only have 1.2 - 3.0 cm, it not easy to find it and spott.

(c) Suggest how you could collect data to show if Romer's Tree Frogs are facing a real threat from greenhouse frogs. (2 marks)

Use quota in the habitats of Romer's Tree Frog to find out how many of Romer's Tree Frogs and greenhouse frogs.

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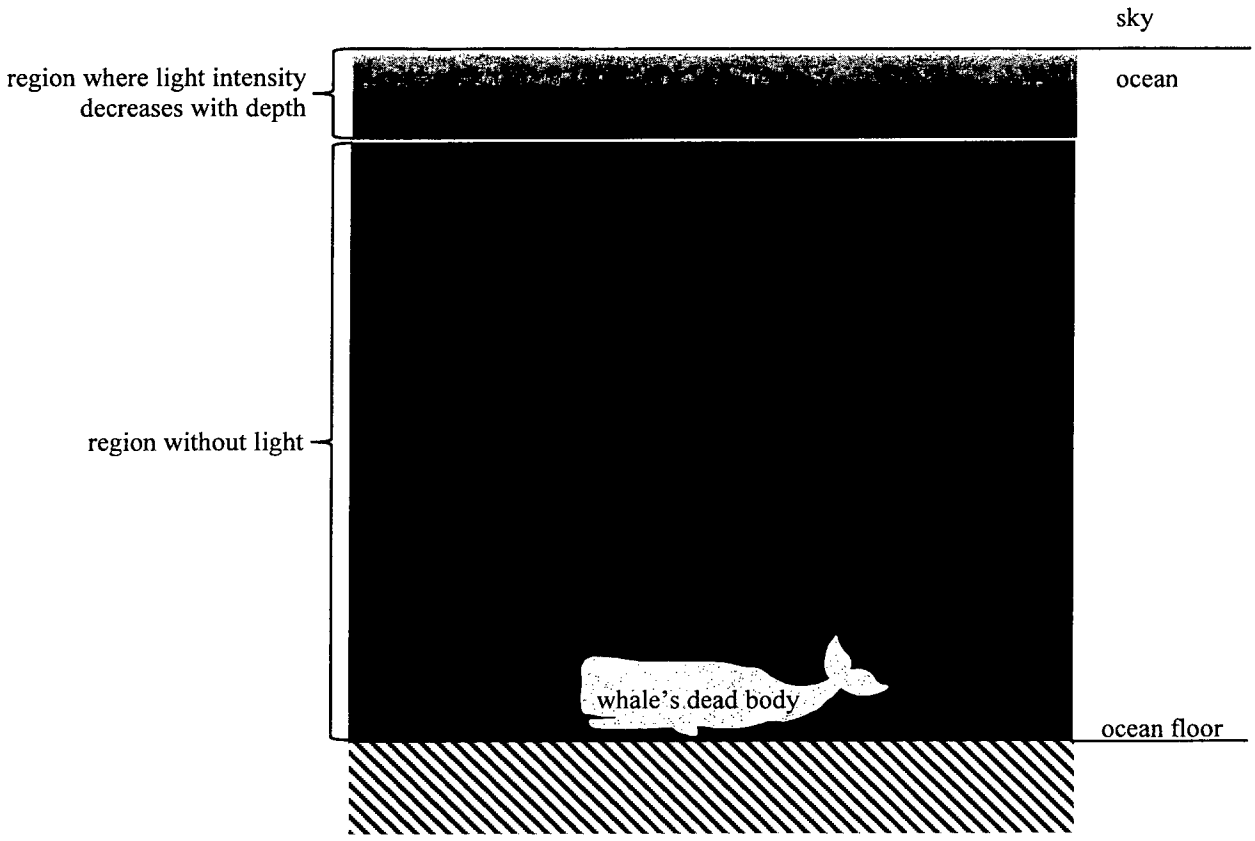
8. When whales die, their dead bodies sink to the bottom of the ocean. The whale carcasses support a unique community known as whale fall community. The diagram below shows different regions of the ocean and the location of a whale's dead body:




(a) (i) With reference to the energy flow in the ecosystem, what is the ultimate source of the energy stored inside the whale's dead body? (1 mark)

Chemical energy

(ii) With reference to the above diagram, explain the importance of the whale's dead body to the whale fall community on the ocean floor. (2 marks)

It provide different nutrients to the species when the whale fall community.

(b) What is the role of the organisms that feed on the soft tissues of the whale's dead body in the cycling of materials? (1 mark)

Decompose the materials on the soft tissues of the whale's dead body.

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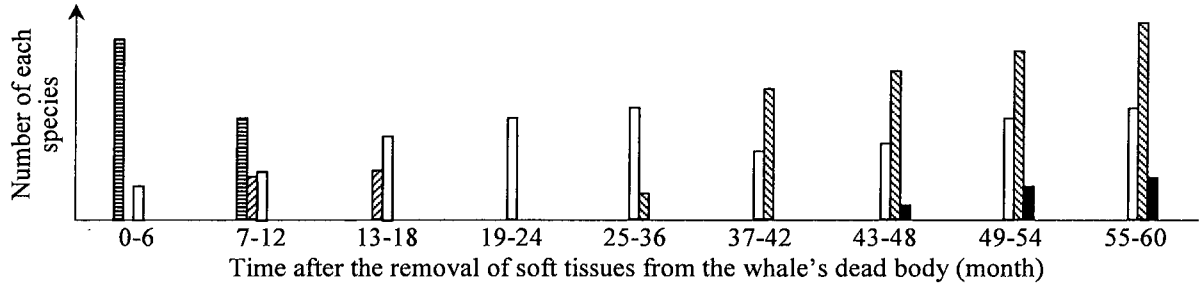
(c) After the soft tissues of the whale's dead body have been consumed, another group of organisms start to feed on the remaining nutrients from the skeleton. For an average-sized whale, it could have 2 000 – 3 000 kg lipid stored inside its skeleton. The bar chart below shows the abundance of different species that feed on the skeleton of the whale over time:




Key:

- species P
- species Q
- species R
- species S
- species T

Complete the following table with evidence from the bar chart to support that the above case is an example of ecological succession. (4 marks)

| Characteristics of ecological succession | Evidence from the bar chart |
|---|---|
| (i) Different materials can provide to different species. | There have five species can use the nutrients for their growth and life. |
| | |
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| (ii) | |
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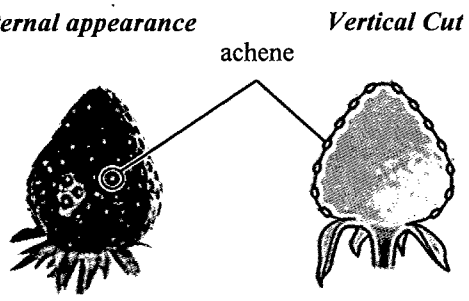
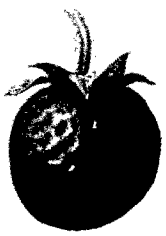
9. The diagram below shows the external appearance of a strawberry and its vertical cut. The achenes found on the surface of the strawberry are the fruits:




(a) An investigation into the role of achenes in the development of a strawberry was carried out as shown below:

| Treatment | Relative size and appearance of the strawberry | |
|---|---|---|
| | Day 1 | Day 20 |
| 1. Achenes remained intact. |  |  |
| 2. All achenes were removed on Day 1. |  |  |
| 3. All achenes were removed on Day 1 and the strawberry was then regularly sprayed with auxins. |  |  |



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(i) Complete the following table to show what deduction can be made by comparing results of the following treatments: (3 marks)

| Treatment | Deduction |
|---|---|
| 1 versus 2 | The size is small when all achenes were removed on Day 1. |
| 2 versus 3 | The size is big and shape is different |
| 1 versus 3 | The size is big and have different shape. |

(ii) Based on the results, suggest ***one*** hypothesis for the enlargement of the strawberry. (1 mark)

It effect by the achenes and auxins.

(iii) Study another treatment as follows:

| Treatment | Relative size and appearance of the strawberry | |
|---|---|---|
| | Day 1 | Day 20 |
| 4. Achenes were removed from the lower part of the strawberry on Day 1. | Achenes remained on the upper part  Achenes removed from the lower part |  |

In terms of experimental design, what is the advantage of Treatment 4 as compared to Treatments 1 and 2? (1 mark)

It show the location of achene will effect the shape of enlargement.

(b) Give ***one*** example of a growth response induced by auxins and state its significance to plants. (2 marks)

It effect the enlargement direction of plants.

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10. Cassava is a crop which grows in areas with poor soil and a low rainfall. It produces starchy root tubers which serve as a major food source in Africa.

(a) Give the location(s) where the chemical digestion of starch takes place in the human digestive tract. (1 mark)

Mouth and small intestine.

(b) Table I below shows some nutritional information of cassava while Table II lists the daily energy and protein requirements recommended for boys at age 16:

***Table I***

| | |
|---|---|
| Fresh weight (g) from which 100 g dry weight is yielded | 250 |
| Energy (kJ per 100 g dry weight) | 2 675 |
| Protein (g per 100 g dry weight) | 3.5 |

***Table II***

| | Daily requirement |
|---|---|
| Energy (kJ) | 11 100 |
| Protein (g) | 52 |

In Africa, some low-income families may rely only on cassava for food for a long period.

(i) A 16-year-old boy relies only on cassava for food. Calculate the fresh weight of cassava he needs to consume so as to meet the recommended daily energy requirement. (1 mark)

1037 g

(ii) After consuming cassava only for a period of time, this boy develops swollen feet due to the accumulation of tissue fluid.

(1) How much protein can he obtain from the amount of cassava consumed in (i)? (1 mark)

3629 g

(2) According to Table II, predict the difference of the blood protein level of this boy when compared with that of normal healthy boys of the same age. Explain your answer. (2 marks)

The difference is large between this boy and normal healthy boys. It exceeds the daily requirement of protein, it is 3577 g more than the daily requirement.

(3) Based on your answer in (2), explain why this would lead to the accumulation of tissue fluid in his feet. (2 marks)

The high blood protein level pust the tissue fluid out of the capillaries. The accumulation of tissue fluid in his feet increase.



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(c) Cassava contains a natural toxin. Consuming inadequately cooked cassava may result in cyanide poisoning. Cyanide shuts down the oxidative phosphorylation in mitochondria by inhibiting a key enzyme of the process.

(i) Name the structure of the mitochondrion where this enzyme is located. (1 mark)

Mitochondrial matrix.

(ii) A man accidentally consumed some raw cassava. How will his blood lactate level change? Explain your answer. (3 marks)

His blood lactate level will increase. The body detect the ATP is not enough. It break down the glucose to pyruvate and produce ATP and lactate to support the energy need in the body.

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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. In agricultural practice, some crops are reproduced asexually to improve production efficiency. An increase in yield of these crops is observed in recent years due to a steady increase in the average global temperature. Meanwhile, some scientists worry that crops reproduced asexually are at high risk of extinction due to environmental changes and diseases if global warming persists.

Explain the increased yield of these crops due to global warming and the rationale behind the concern of the scientists. (11 marks)

The increased yield of these crops due to global warming bring different impact and the rationale behind the concern of the scientists.

The increased yield of these crops due to global warming. Crops are reproduced asexually to improve production efficiency. The crops are reproduced asexually, they have the same gene, DNA, the characters of crops can pass to the next generation. There are no plant are needed. It have a faster reproduction.

The rationale behind the concern of the scientists is they easy have overcrowding because they are near to each other, it may occur interspecific competition. The unsuitable characteristic also pass though the next generation. The disease also pass to the next generation. There are no any variation of genetic information, the character in the crop may not favour them to live in the environment. And also, the environmental changes some of them are not

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soluble like here and die. the species may in danger.

there is the impact and. rationale behind the concern of the scientists.



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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.

# 2023 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 | |
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| 試題編號 Question No. | 1 |
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試題編號 Question No.

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| 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.

Q(i) Ovary. The oestrogen are secreted by the ovary. Ovary secrete low level of oestrogen to stimulate the uterine lining and inhibit the level of FSH.

(ii) FSH stimulate the development of follicle, and then the oestrogen inhibit the level of FSH and start increase the thickness of uterine lining. Without inadequate amount of oestrogen, the level of FSH keep in a high level. The follicle still develop. The level of FSH is much hyher than the normal.

(iii) It take the oestrogen and progesterone to have a higher level to maintain the thickness of uterine lining and inhibit the level of FSH and LH. It make the menstrual flow lasted much longer.

(iv) The level of LH should be measured. The level of LH is high to stimulate the yellow body to prod the ovule and the yellow body become degenerated.

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Start each question on a new page.

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(b) (i) When the thermoreglater detect the outer temperture and body temperature, the difference stimulate it. The outer temperture is lower than body temperature, the heat will flow to the body by conduction And the body temperature become high. The thylayms detect it. It occur vasocontract. The arterioles contracts, much blood flow near to the surface of capilaries, the blood flow near to the surface to reduce heat energy and maintain the body temperature.

(ii) (1) The arterioles relax when the body temperature increased from 36°C to 37°C. The blood flow to the muscle will more than the blood flow to the surface.

(2) They will drop the body temperature firstly, then rise up the body temperature during the exerise.

(iii) The sebaceous muscle relax to hold less air for heat loss. The swelling will increase to increase heat loss.

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Start each question on a new page.

4, (a) (i). Restriction enzyme P, the restriction enzyme R cuts at TCGA, and the DNA fragment with GFP gene is AGCT. It is the right gene encode.

(ii) Occur the result of the copy of DNA is it work. See the bacterial cell to copy the DNA.

(iii) (1) Some of the bacterial colonies can't work successfully. The copy of gene code is fail. Only some of the bacterial cell have DNA fragment with GFP gene.

(2). Easy to occur species under UV light. It favour the grouping process.

4, b (i) Agar plate.

(ii) (1) Sample Y

(2)

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Start each question on a new page.

(7ii) d/ Group 2, it have 90 number of leaves are OZ with visible injury. It is the most OZ leaf area with visible injury in four groups.

(2) Rice the sample 4 is most likely to be represented by Group 1. Group 1 have the least number of leaf are OZ leaf area with visible injury. There have large leaf area with visible injury that show there are no protection.

3, The HR gene will disappear because the life of barley is short, the HR gene can not hold a long period of time. So the results of herbicide induced injury still very a lot.

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Level 2 Exemplar 2

2023-DSE
BIO
PAPER 1B

B

HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY

HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2023

# 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.



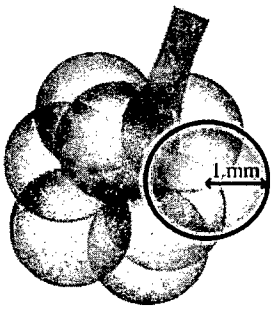
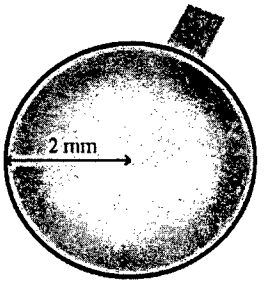


* A 1 3 0 E 0 1 B *

## SECTION B

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

1. The spheres shown in the diagram below represent the air sacs of different sizes in the lung. The total volume of the eight small spheres with a radius of 1 mm each is equal to the volume of one large sphere with a radius of 2 mm.

| |  |  |
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| surface area of one sphere ($mm^2$) | 12.6 | 50.3 |

(a) Calculate the total surface area of eight small spheres. (1 mark)

Total surface area of eight small spheres
$= 12.6 \times 8 = 100.8\ mm^2$

(b) With reference to the answer in (a), explain why having smaller air sacs in the lungs is more efficient than bigger air sacs for gas exchange. (2 marks)

are highly-folded
Numerous of smaller air sacs in the lung provide a larger surface area for efficient gas exchange, ~~as they are highly-folded which make the smaller air sacs~~ than bigger air sacs for gas exchange.

(c) Apart from (b), explain how air sacs are specialised at tissue level for gas exchange. (1 mark)

Air sacs are the important ~~and only~~ site for gas exchange. They have their unique shape and characteristics to carry out efficient gas exchange to maintain the gas supply for human. Like air sacs are responsible for gas exchange between blood in capillaries and themselves maintaining a continuous

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2. All cells are derived from stem cells. They undergo differentiation in which the cells change in form and shape which enable them to perform specialised functions.

(a) It is found that the lens of the eye is composed of cells without organelles. If the organelles of these cells had not been degraded during differentiation, describe how the functioning of the lens would have been affected. (2 marks)

The light may not enters the lens and be refracted into retina as the organelles block the light from entering. Hence, the refracting light onto the retina cannot be carried (function of lens of) out.

(b) Suggest a type of plant cell which also experiences degradation of cellular components during differentiation. Explain the significance of the degradation to the function of the cell type. (2 marks)

cotyledon. The degradation of cotyledon is to provide energy for the plant to consume and so to grow.

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3. Diagram I below shows the right leg with the associated joints and muscles. Diagram II shows a series of motions during running with the right leg highlighted in grey.

***Diagram I***

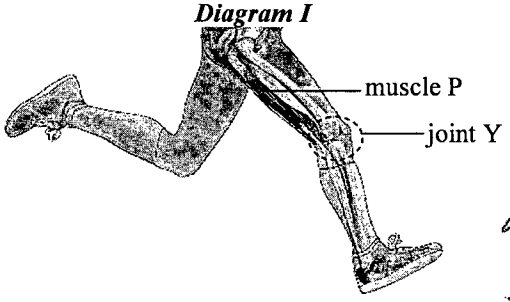
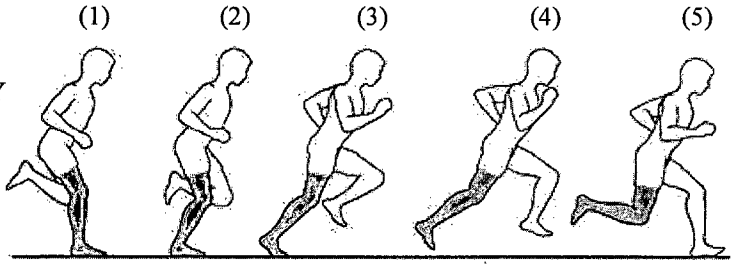



***Diagram II***




(a) In order to bring about the changes in motion from (3) to (5), what is the change of state of muscle P? (1 mark)

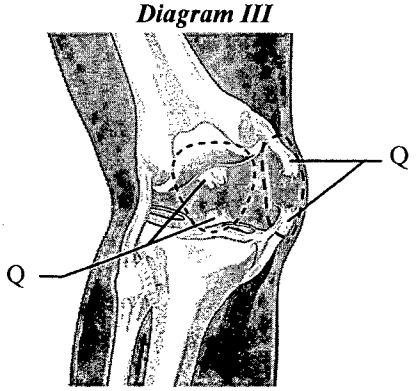
State of muscle P changes from relaxation to contraction. ~~which muscle P change from extensor to flexor~~

(b) With respect to the answer in (a), state the role of muscle P by circling the following choices in (i) and complete the sentence in space (ii). (1 mark)

Muscle P is a (i) flexor / extensor because (ii) it contracts, when joint Y bends and shortens.

(c) A person injured his knee while running. Diagram III shows the condition of joint Y after the injury:

***Diagram III***




Structure Q was torn. How would this affect joint Y and its functioning? (2 marks)

Structure Q is ligament when it was torn, it can no longer hold the two bones together. This leads to dislocation of bone and so the movement of joint Y is affected.

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4. Dengue fever is an infection caused by the dengue viruses (DENV). It is an endemic illness in many countries in tropical and sub-tropical regions. DENV encompasses four different subtypes. Each subtype can lead to dengue fever.

(a) What is the way of transmission for dengue fever? (1 mark)

By mosquitoes.

(b) Suggest ***two*** environmental factors in tropical and subtropical regions which lead to a higher risk of contracting dengue fever for people living in these regions. Explain your answer. (3 marks)

Tropical region will lead to a higher risk of contracting dengue fever for people living in there. Tropical region has a rich habitat which has abundant supply of food and place for the insects which is the medium of transmission of dengue fever to survive. People may infected by them easily as there are a large amount of mosquitoes survive.

(c) Patients infected with a particular subtype of DENV for the first time can recover on their own after about a week without any treatment.

(i) Give ***three*** types of white blood cells that aid the recovery and describe each of their actions. (3 marks)

Lymphocyte.

Phagocyte.

(ii) Explain why people who have recovered from infection with a particular subtype of DENV can still be infected with other subtypes of DENV in the future. (2 marks)

Due to mutation of the subtypes of DENV, the antibodies that can kill the (antigen of) antigen

(d) Suggest ***one*** preventive measure against the spreading of dengue fever. (1 mark)

~~Applying pesticide or~~ wearing long-sleeves clothes

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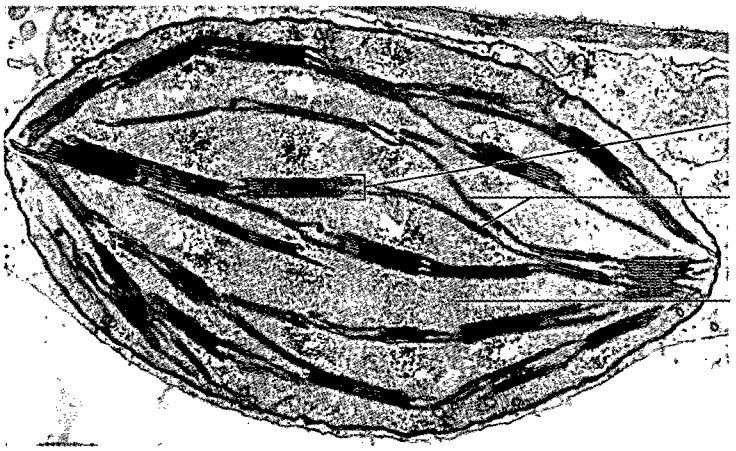
5. An electron micrograph of a chloroplast is shown below:




Stroma grain

(a) Label structure Y. (1 mark)

(b) State the energy conversion which takes place at X and its importance in photosynthesis. (2 marks)

The carbon dioxide reacts with water with the help of light and chlorophyll to produce food ; maintaining the growth of plant .

(c) To which type of metabolism does the overall reaction at Z belong? Explain your answer. (2 marks)

Anabolism. The combination of carbon dioxide and water with the help of enzyme to produce ~~a~~ food which is the enzyme-substrate product.



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(d) Describe how the photosynthetic products of the leaves are stored in the underground tubers of a potato plant. (3 marks)

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6. Colour blindness is an inherited disorder due to defective functioning of the cone cells in the retina. There are many types of colour blindness. For example, people with red-green colour blindness fail to distinguish between red and green colours while those with total colour blindness experience total loss of colour vision.

(a) Based on the functioning of cone cells, suggest why the condition of red-green colour blindness is different from that of total colour blindness. (condition of total colour blindness) (1 mark)

Cone cells detect colours except blank and white. There is presence of cone cells in the condition of red-green colour blindness while cone cells is absent or damaged in the

(b) Red-green colour blindness is caused by a recessive allele on the X-chromosome while total colour blindness is caused by a recessive allele which is located on an autosome. The table below shows the percentage occurrence of red-green colour blindness and total colour blindness in men and women:

X-linked

| | Men | | Women |
|---|---|---|---|
| Red-green colour blindness | 8% | > | 0.5% |
| Total colour blindness | 0.00001% | = | 0.00001% |

With reference to the inheritance of the two types of colour blindness, suggest why the occurrence of red-green colour blindness in men as compared to women differs from that of total colour blindness.
(4 marks)

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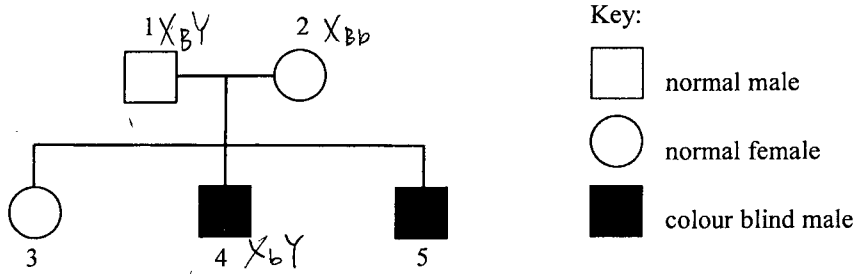
$X_B$ Y $X_B$ $X_b$

$X_BX_B$ $X_BY$ $X_Bb$ $X_b$

(c) The pedigree below shows the inheritance of red-green colour blindness in a family:




(i) The couple is expecting another child. Using 'B' to represent the allele for normal vision and 'b' to represent the allele for red-green colour blindness, construct a genetic diagram to find out the probability of this newborn being a girl with red-green colour blindness. (4 marks)
(Note: Punnett square is not accepted.)

Parent $X_BX_b$ $X_BY$

Gamete $X_B$ $X_b$ $X_B$ Y

F1 genotype $X_BX_B$ $X_BX_b$ $X_BY$ $X_bY$

F1 phenotype: Girl without red-green colour blindness; boy without red-green colour blindness; boy with red-green colour blindness

Probability of this newborn being a girl with red-green colour blindness = $\frac{1}{2}$

(ii) Individuals 4 and 5 are twins. Can you determine whether they are identical twins or fraternal twins? Explain your answer. (2 marks)

They are identical twins as they both inherited the same recessive allele from parents which both have identical gene content.

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7. Greenhouse frog is a foreign species which is now found in many local areas according to a recent survey. There is a concern that these greenhouse frogs might threaten a local endangered species, Romer's Tree Frog.

(a) The table below provides some information about the two frog species:

| Name | Romer's Tree Frog | Greenhouse Frog |
|---|---|---|
| Size | 1.5-2.5 cm | 1.2-3.0 cm |
| Breeding site and habitat | Wetland, small and temporary water bodies; woodland; shrubland; plantations | Woodland; shrubland; agricultural field; urban park |
| Food | Small insects | Small insects and snails |

By comparing the ecological niche of the two frog species, give ***two*** pieces of evidence that support the possibility of the greenhouse frog posing a threat to the Romer's Tree Frog. Explain your answer.

(3 marks)

The relationship between two species is competition. They both feed on small insects. The rate of consuming the small insects is rapid. When the small insects are consumed completely or remain less amount of them, Green house frog can feed on snails for survival. But lives of Romer's Tree Frog may be threatened due to lack of food. Also, both of the two species may appear and live in the same habitat like woodland and shrubland. This increases the food competiveness.



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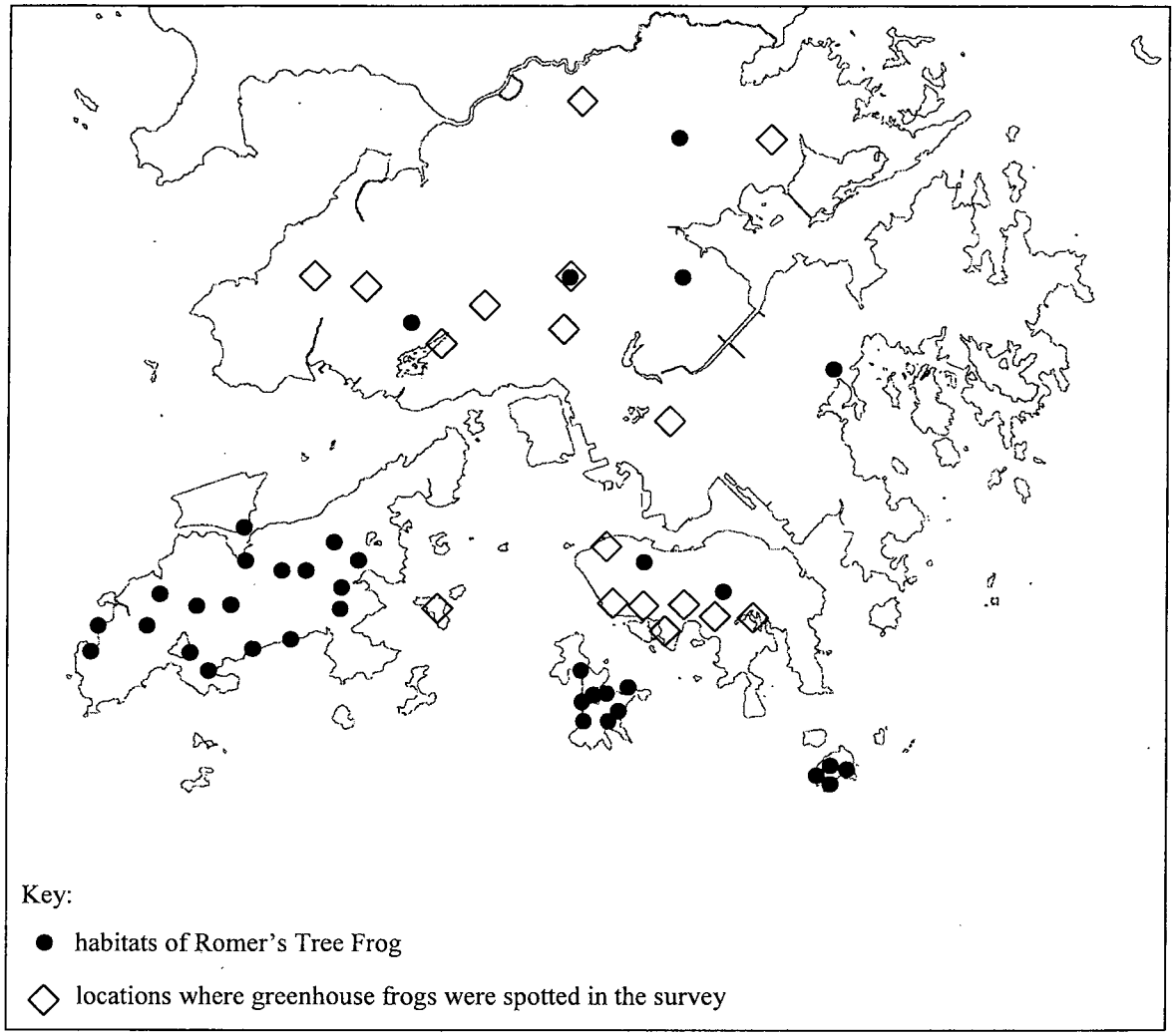
Answers written in the margins will not be marked.

(b) The map below shows the distribution of the two frog species in Hong Kong:




Suggest why the information above ***cannot*** prove that the Romer's Tree Frog is facing a real threat from the greenhouse frogs. (1 mark)

(Majority of) the locations of habitats of Romer's Tree Frog do not cover with the locations where greenhouse frogs were spotted.

(c) Suggest how you could collect data to show if Romer's Tree Frogs are facing a real threat from greenhouse frogs. (2 marks)

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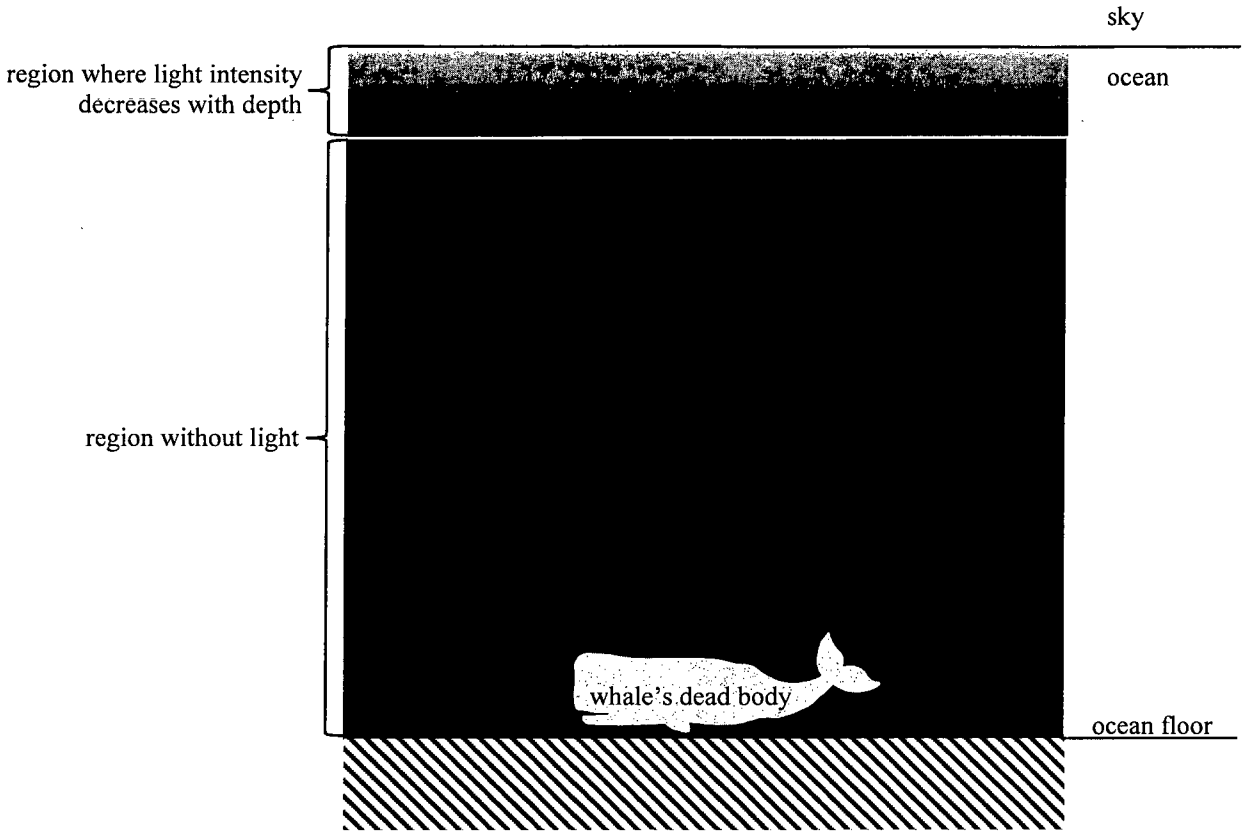
8. When whales die, their dead bodies sink to the bottom of the ocean. The whale carcasses support a unique community known as whale fall community. The diagram below shows different regions of the ocean and the location of a whale's dead body:




(a) (i) With reference to the energy flow in the ecosystem, what is the ultimate source of the energy stored inside the whale's dead body? (1 mark)

Solar energy which contain the largest amount of energy in trophic levels.

(ii) With reference to the above diagram, explain the importance of the whale's dead body to the whale fall community on the ocean floor. (2 marks)

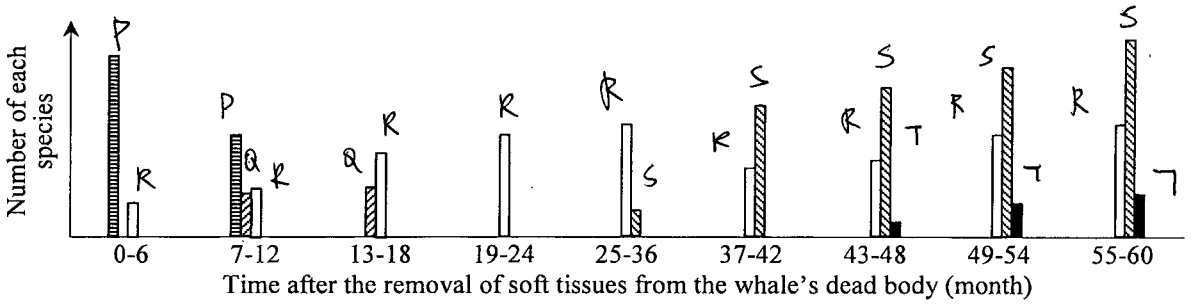
(b) What is the role of the organisms that feed on the soft tissues of the whale's dead body in the cycling of materials? (1 mark)

Decomposers.



Answers written in the margins will not be marked.

(c) After the soft tissues of the whale's dead body have been consumed, another group of organisms start to feed on the remaining nutrients from the skeleton. For an average-sized whale, it could have 2 000 – 3 000 kg lipid stored inside its skeleton. The bar chart below shows the abundance of different species that feed on the skeleton of the whale over time:




Key:

- species P
- species Q
- species R
- species S
- species T

Complete the following table with evidence from the bar chart to support that the above case is an example of ecological succession. (4 marks)

| Characteristics of ecological succession | Evidence from the bar chart |
|---|---|
| (i) | The number of species R increases in overall year. |
| | |
| | |
| | |
| | |
| | |
| | |
| (ii) | |
| | |
| | |
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| | |
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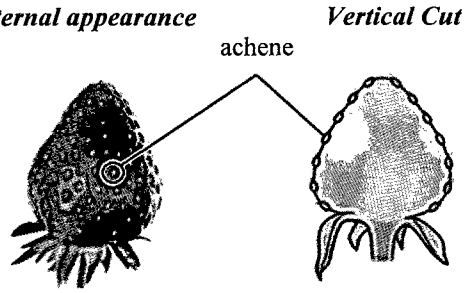
Go on to the next page

9. The diagram below shows the external appearance of a strawberry and its vertical cut. The achenes found on the surface of the strawberry are the fruits:




(a) An investigation into the role of achenes in the development of a strawberry was carried out as shown below:

| Treatment | Relative size and appearance of the strawberry | |
|---|---|---|
| | Day 1 | Day 20 |
| 1. Achenes remained intact. |  |  |
| 2. All achenes were removed on Day 1. |  |  |
| 3. All achenes were removed on Day 1 and the strawberry was then regularly sprayed with auxins. |  |  |



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(i) Complete the following table to show what deduction can be made by comparing results of the following treatments: (3 marks)

| Treatment | Deduction |
|---|---|
| 1 versus 2 | Achenes promote growth and development of strawberries. |
| 2 versus 3 | Strawberries cannot grow without achenes intact but they can grow without achenes with the help of |
| 1 versus 3 | Auxins can enlarge the size of strawberries without achenes (auxins) |

(ii) Based on the results, suggest ***one*** hypothesis for the enlargement of the strawberry. (1 mark)

Achenes inhibit the enlargement of the strawberry.

(iii) Study another treatment as follows:

| Treatment | Relative size and appearance of the strawberry | |
|---|---|---|
| | Day 1 | Day 20 |
| 4. Achenes were removed from the lower part of the strawberry on Day 1. | Achenes remained on the upper part  Achenes removed from the lower part |  |

In terms of experimental design, what is the advantage of Treatment 4 as compared to Treatments 1 and 2? (1 mark)

To ensure that the difference in size of strawberry is only due to removal of achenes.

(b) Give ***one*** example of a growth response induced by auxins and state its significance to plants. (2 marks)

For example, applying auxins to a root which root tip is cut and apply a plate on another root which root tip is cut too. The root with auxin will grow taller while the one without auxin remain in original height. Auxins promote growth in plant. Hence,

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10. Cassava is a crop which grows in areas with poor soil and a low rainfall. It produces starchy root tubers which serve as a major food source in Africa.

(a) Give the location(s) where the chemical digestion of starch takes place in the human digestive tract. (1 mark)

small intestine.

(b) Table I below shows some nutritional information of cassava while Table II lists the daily energy and protein requirements recommended for boys at age 16:

***Table I***

| | |
|---|---|
| Fresh weight (g) from which 100 g dry weight is yielded | 250 |
| Energy (kJ per 100 g dry weight) | 2 675 |
| Protein (g per 100 g dry weight) | 3.5 |

***Table II***

| | Daily requirement |
|---|---|
| Energy (kJ) | 11 100 |
| Protein (g) | 52 |

In Africa, some low-income families may rely only on cassava for food for a long period.

(i) A 16-year-old boy relies only on cassava for food. Calculate the fresh weight of cassava he needs to consume so as to meet the recommended daily energy requirement. (1 mark)

250 ÷ $\frac{1}{1}$ for = 4.81 g

(ii) After consuming cassava only for a period of time, this boy develops swollen feet due to the accumulation of tissue fluid.

(1) How much protein can he obtain from the amount of cassava consumed in (i)? (1 mark)

(2) According to Table II, predict the difference of the blood protein level of this boy when compared with that of normal healthy boys of the same age. Explain your answer. (2 marks)

The blood protein level of this boy is lower than than of normal healthy boys of the same age.

(3) Based on your answer in (2), explain why this would lead to the accumulation of tissue fluid in his feet. (2 marks)

The water potential of venule end of capillaries of the boy is lower than that in tissue fluid as there is not much protein remain in these capillaries to maintain a steep concentration gradient.



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(c) Cassava contains a natural toxin. Consuming inadequately cooked cassava may result in cyanide poisoning. Cyanide shuts down the oxidative phosphorylation in mitochondria by inhibiting a key enzyme of the process.

(i) Name the structure of the mitochondrion where this enzyme is located. (1 mark)

Inner membrane of the mitochondrion.

(ii) A man accidentally consumed some raw cassava. How will his blood lactate level change? Explain your answer. (3 marks)

His blood lactate ~~el~~ level decreases.



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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. In agricultural practice, some crops are reproduced asexually to improve production efficiency. An increase in yield of these crops is observed in recent years due to a steady increase in the average global temperature. Meanwhile, some scientists worry that crops reproduced asexually are at high risk of extinction due to environmental changes and diseases if global warming persists.

Explain the increased yield of these crops due to global warming and the rationale behind the concern of the scientists. (11 marks)

Crops are reproduced asexually which can inherited the desire characteristic from its parent plant. So these crops can easily adapt to the ~~that~~ environmental change like global warming which these crop can grow under high temperature.

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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.

# 2023 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

| 由考生填寫<br>To be filled in<br>by the candidate | |
|---|---|
| 試題編號<br>Question No. | 4<br>1 |

## 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.

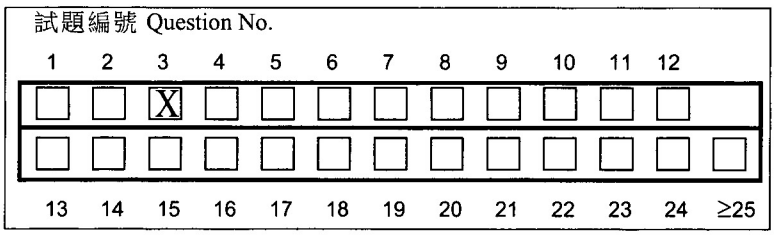
(3) Write on both sides using each line. Do not write in the margins. Answers written in the margins will not be marked.

(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.

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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) Restriction enzyme P and restriction enzyme R are used for the insertion of the GFP gene into plasmid A. As the codon ATTCGA (cut from plasmid A) can bine to codon AGCT and the codon GATCCG (cut from plasmid A) can bine to codon CTAG of DNA fragment with GFP gene (of DNA fragment with GFP gene) respectively completely without the problem of translocation, inversion, etc.

(aii) To extract the component, green fluorescence. When the bacterial cell where the recombinant plasmid contain gene for ampicillin resistance put into the agar plate with ampicillin, there will be some dots that will exposed under UV light which are the green fluorescence. As the gene of that plasmid resistance to ampicillin, those spot will remain the extraction of GFP gene.

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

aiii)(1) As those bacterial colonies ~~can~~ contain GFP gene which have green fluorescence which glow under UV light.

aiii)(2) Inserting the GFP gene into other sea species to produce a new specie ~~that~~.

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

4bi) Cloning

4bii) (1) Rice lines W, X and Z.

4bii) (2)

4biii) (1) Group 2. The overall leaf area with visible injury is the smallest.

4biii) (2) Rice line sample Y. As rice line sample Y doesn't contain herbicide resistant (HR) gene. When a large amount of herbicide is sprayed to the rice line sample Y, there is no any HR gene to prevent its leaf from being damaged.

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4b iii) (3) There will be mutation occur of the ~~HH~~ MK gene that this inserted no longer resist to the herbicide.

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1(a)(i) Her oviducts.

1(a)(ii) The hormone level of oestrogen is lower than the normal range. The fewer production of oestrogen leading to much more production of FSH. Hence, the overall result of the FSH levels in Susan's blood tests is higher than the normal range.

1(a)(iii) Due to the high level of FSH, the (high frequency of) release of follicle making the uterus lining keep maintaing in a thick layer condition. Hence, ~~HA~~ her menstrual flow lasted much longer.

1(a)(iv) The level of progesterone should be measured. If there is ovulation, the expected change for the level of this hormone would be increasing.

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Start each question on a new page.

1b(i) Due to the high temperature of the room stimulate their skin blood flow rapidly.

1b(ii)(1) The average amount of skin blood flow of the exercise group decreases when their body temperature increased from 36°C to 37°C.

1b(ii)(2) To foster the blood circulation for gas exchange which is respiration ~~in order to supply energy to skin for~~

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

(b)(iii) The average amount of skin blood flow of resting group is greater than that of exercise group. Also, the body temperature of resting group is increase from a lower temperature (36.5°C), their amount of skin blood flow starts to increase. However, the body temperature of exercise group increase at a higher temperature (37.0°C), their amount of skin blood flow starts to increases.

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