2018-DSE
BIO
PAPER 1B

B

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HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY

HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2018

Candidate Number

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.

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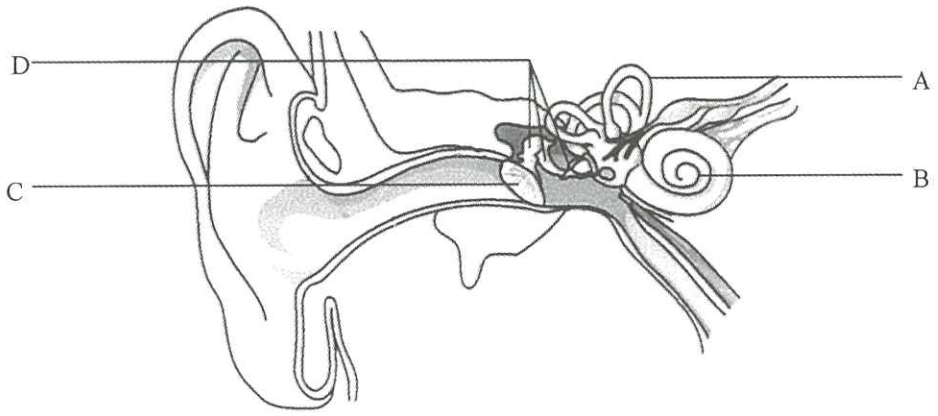
SECTION B

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

1. The diagram below shows the human ear and its associated structures:



(a) The table below lists two types of hearing loss. Using the label(s) in the above diagram, indicate which structure(s) is / are most likely to be defective in each case. (2 marks)

	Type of hearing loss	Structure
X	Damage to sensory hair cells	
Y	Failure of sound conduction	

(b) Ludwig van Beethoven, a famous 18th century composer, suffered from type Y hearing loss in his 20s and became deaf in his 40s. Some records say that he could hear music through his jawbone and skull by biting on a metal rod attached to his piano. Based on the structures and functions of human ears, complete the following flow chart to show the major steps involved in his method of hearing music. (4 marks)

(i)_____ of the metal rod

↓

transmission through bones to reach (ii)_____

↓

detection of (iii)_____ movement by sensory hair cells

↓

generation and transmission of nerve impulses through (iv)_____

↓

interpretation at the sensory area of the cerebrum

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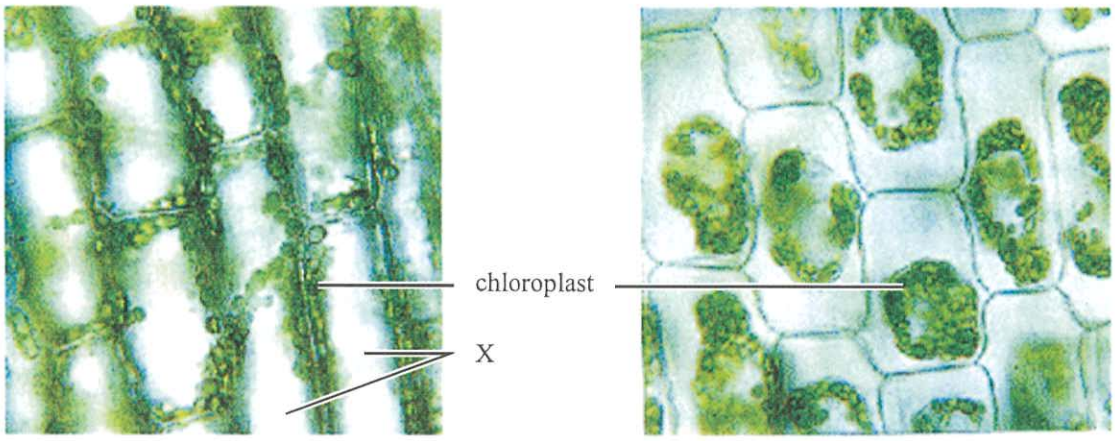
2. The leaf of an aquatic plant was placed in a concentrated sucrose solution and observed under a light microscope. Photomicrographs A and B show the appearance of the cells at the beginning of the experiment and after five minutes respectively:

Photomicrograph A – at the beginning ***Photomicrograph B – after five minutes***



(a) X is an organelle which is invisible without staining. Name this organelle. (1 mark)

(b) Comparing the two photomicrographs, state ***two*** observable changes in the appearance of the cells after five minutes. (2 marks)

(c) Explain how the observable changes stated in (b) are brought about. (2 marks)

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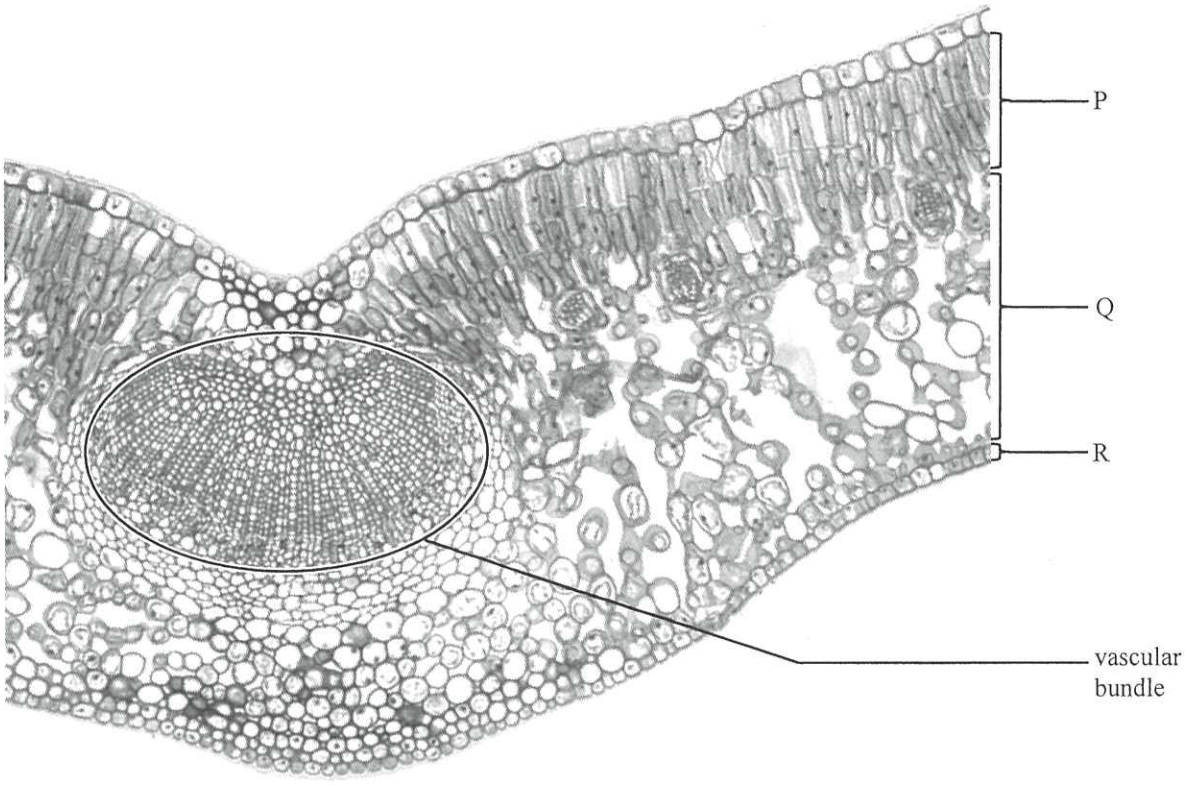
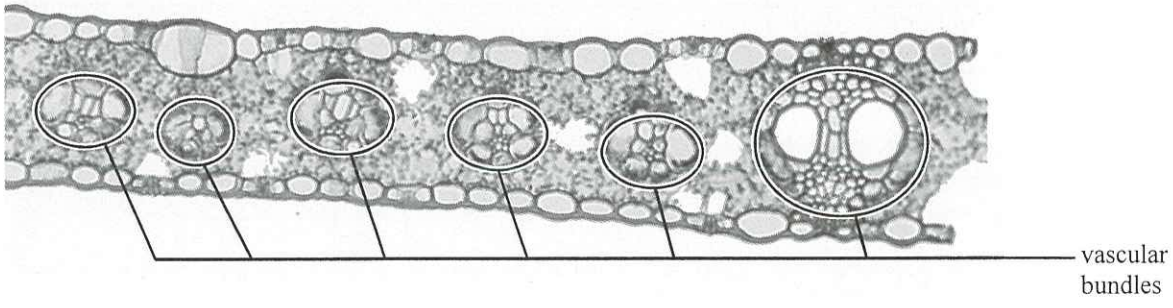
Photomicrograph X



Photomicrograph Y



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3. Photomicrographs X and Y on the opposite page (page 4) show the cross sections of two leaves taken from different plant species.

(a) (i) Comparing the cell shapes of both leaves, which labelled tissue (P, Q or R) in Photomicrograph X is absent from Photomicrograph Y? (1 mark)

(ii) With reference to Photomicrograph X, what is the observable adaptive feature of the tissue identified in (i)? What is the significance of this adaptive feature? (2 marks)

(b) The leaf in Photomicrograph Y was taken from a plant species with leaves oriented vertically, as shown in the following photograph:

Explain how the distribution of the photosynthetic tissue in these leaves is related to the vertical orientation of the leaves. (3 marks)

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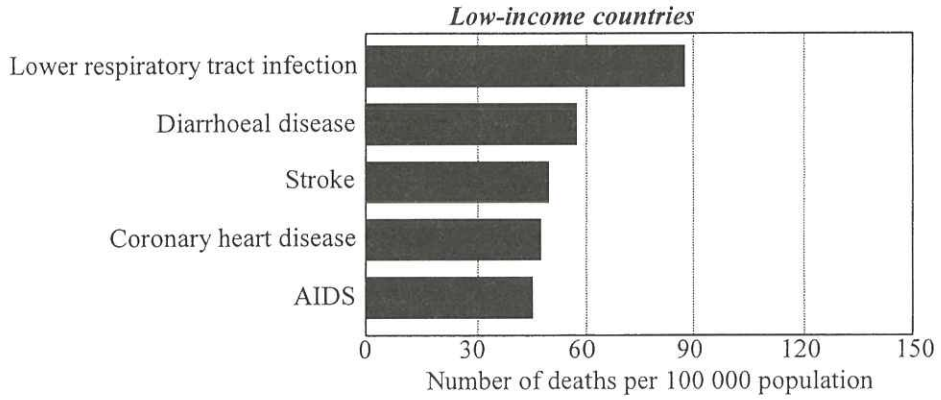
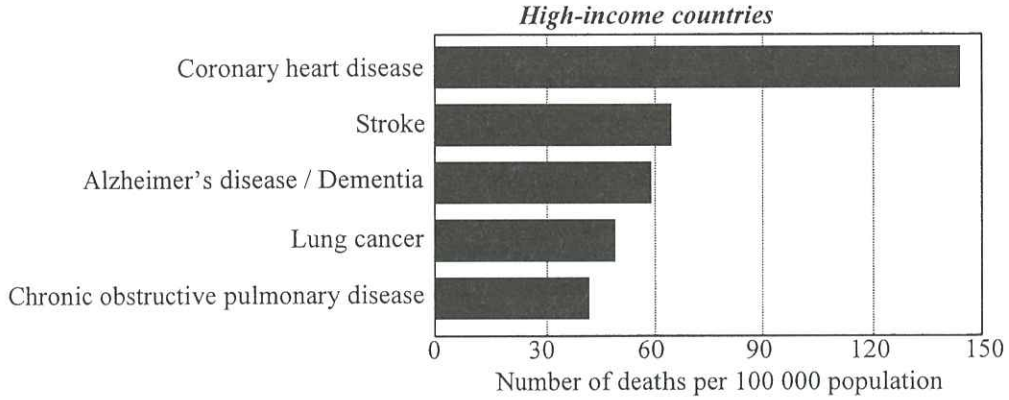
4. The bar charts below show the top five diseases that caused death in low-income countries and high-income countries respectively in the year 2015:





(a) With reference to the bar charts, which countries (low-income or high-income) have more infectious diseases as the top five diseases that caused death? (1 mark)

(b) Suggest ***two*** reasons to account for the phenomenon stated in (a). (2 marks)

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(c) Coronary heart disease is the top cause of death in high-income countries. Explain how ***one*** of the lifestyle habits in high-income countries is related to coronary heart disease. (4 marks)

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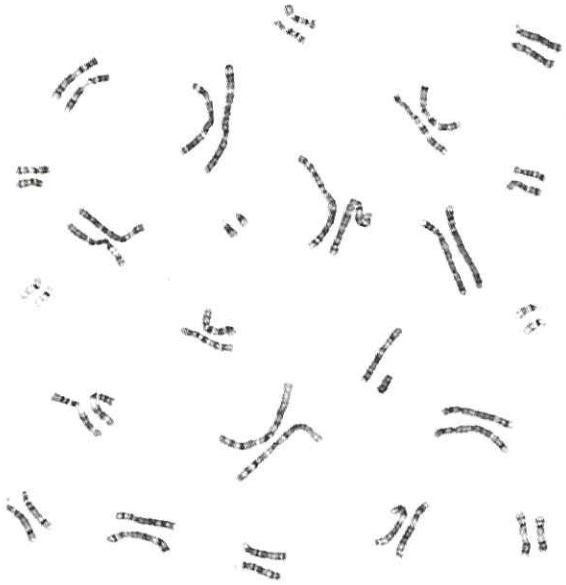
5. The photomicrograph below shows the paired homologous chromosomes of a normal boy for karyotyping:



(a) Circle the sex chromosomes on the above photomicrograph. (1 mark)

(b) State the type of cells, somatic cells or gametes, from which the karyotype was obtained. Explain your answer. (2 marks)

(c) It is commonly thought that the sex of offspring is mainly determined by the mother. Explain why this is ***not*** true. (3 marks)

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6. Hong Kong Red Cross Blood Transfusion Service keeps stocks of different blood groups to ensure that there is enough blood supply for transfusion in hospitals.

(a) Of all the blood groups, blood group O is in greatest demand in the Accident and Emergency Departments of hospitals. Suggest why the demand for blood group O is the greatest. (3 marks)

(b) The table below shows some recommendations for adult female and male donors:

	Female donors	Male donors
Maximum number of donations in a year	4	5
Interval between donations	No less than 105 days	No less than 75 days

Suggest why there are different recommendations for female and male donors. (3 marks)

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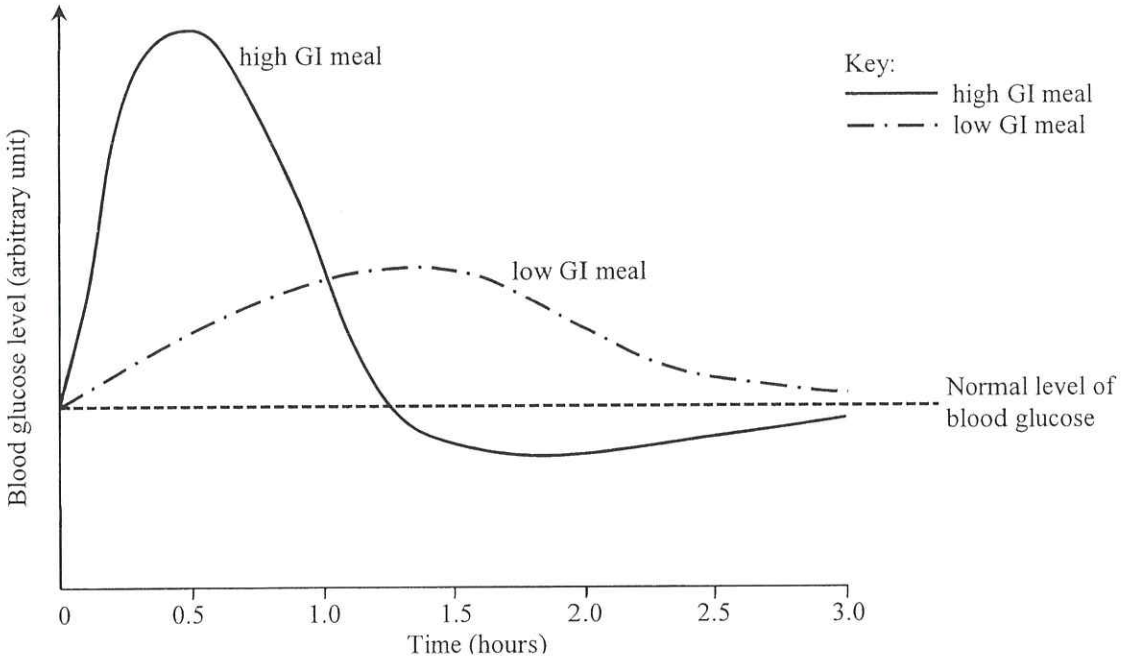
7. The glycemic Index (GI) is an indication of the effect of food on the blood glucose level. The higher the GI value of a food, the quicker is the rise in blood glucose level. The graph below shows the changes in the blood glucose level of a healthy individual after consuming the same quantity of a low GI or high GI meal over a period of three hours:



(a) Describe how the consumption of a meal leads to an increase in the blood glucose level. (2 marks)

(b) (i) Name the key hormone which lowers the blood glucose level. (1 mark)

(ii) Describe how this hormone lowers the blood glucose level. (3 marks)

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(iii) On the graph on the opposite page (page 10), sketch a curve to show the change in the level of this key hormone in response to the consumption of a high GI meal by the healthy person. (2 marks)

(c) Explain why diabetic patients should consume low GI meals. (2 marks)

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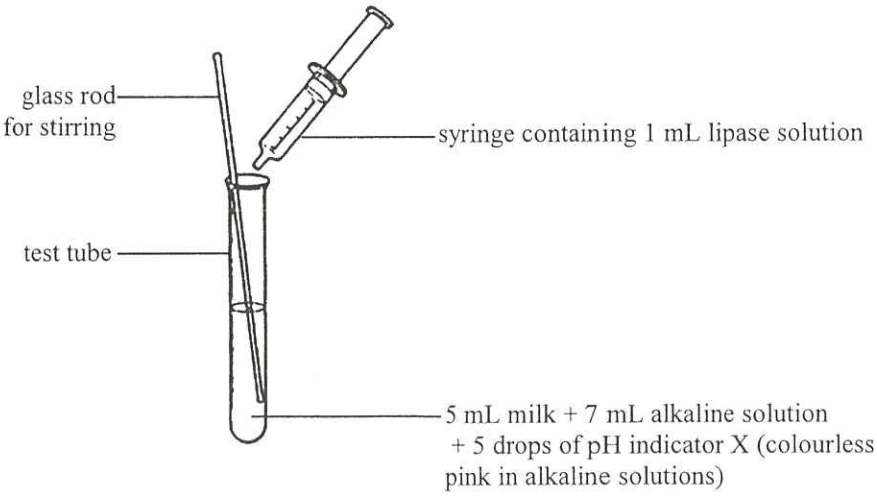
8. A student used the following set-up to compare the fat digestion of full fat fresh milk and half fat fresh milk:



(a) Write a simple word equation of fat digestion. (2 marks)

(b) Two test tubes, each with a different type of milk, were prepared. The colour of each mixture was recorded immediately after the addition of lipase solution, and then monitored until there was no more change in colour. The colours of the mixtures at the beginning and the end are shown in Diagram I and Diagram II respectively:

Diagram I (at the beginning)

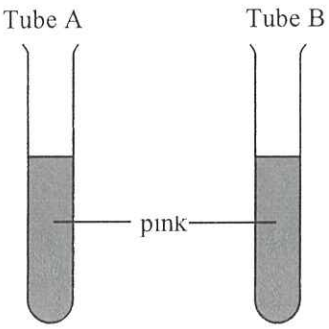
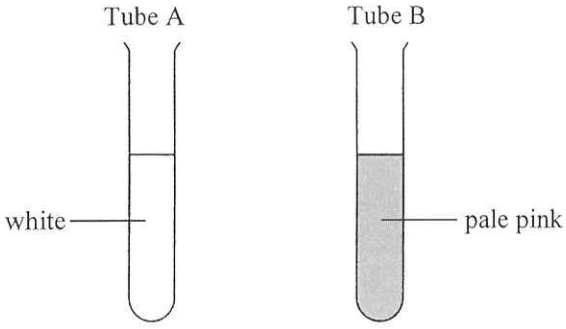


Diagram II (at the end)



(i) What is the independent variable in this investigation? (1 mark)

(ii) Describe the results of this investigation. (2 marks)

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(iii) Which test tube (A or B) was the one with full fat fresh milk? Explain your answer.

(4 marks)

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9. Although most DNA is stored in the nucleus, mitochondria also have a small amount of their own DNA. The mitochondrial DNA contains some genes coding for enzymes which are essential for oxidative phosphorylation. Mutations of these mitochondrial genes cause Leigh syndrome, which is a rare and fatal metabolic disease.

(a) Explain why gene mutations in the mitochondrial DNA can affect oxidative phosphorylation. (4 marks)

(b) What are the major products of oxidative phosphorylation? State their significance. (4 marks)

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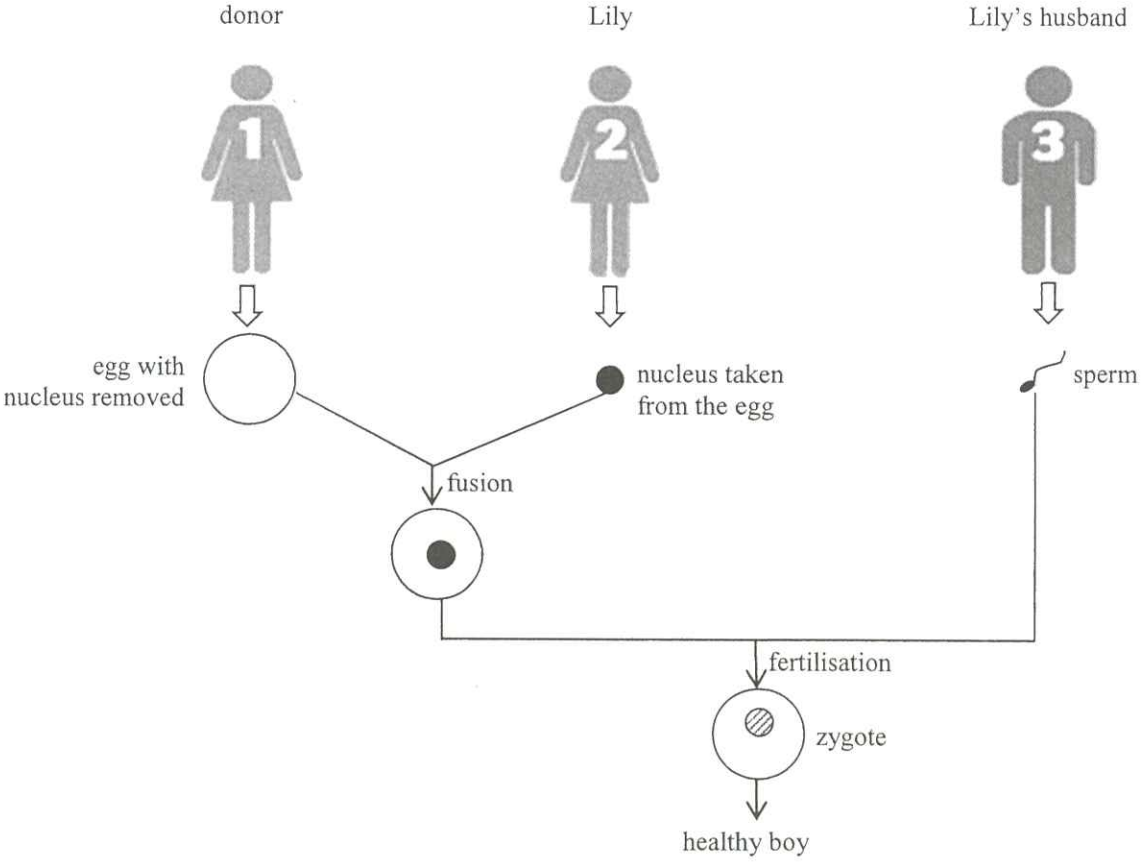
(c) Lily had two children who died from Leigh syndrome. It was found that her eggs contained mutated mitochondrial genes. Her children suffered from the disease because normally mitochondria in zygotes come from the eggs while sperms do not contribute any.

(i) With regard to the fertilisation process and the structure of sperms, suggest why sperms do not contribute any mitochondria to zygotes. (1 mark)

(ii) By using a new method called the 'three-parent baby' technique, Lily gave birth to a healthy boy in 2016. Below are the main steps in the technique:



Identify the source(s) of DNA of the nucleus and mitochondria in the boy's cells. (2 marks)

Nucleus:

Mitochondria:

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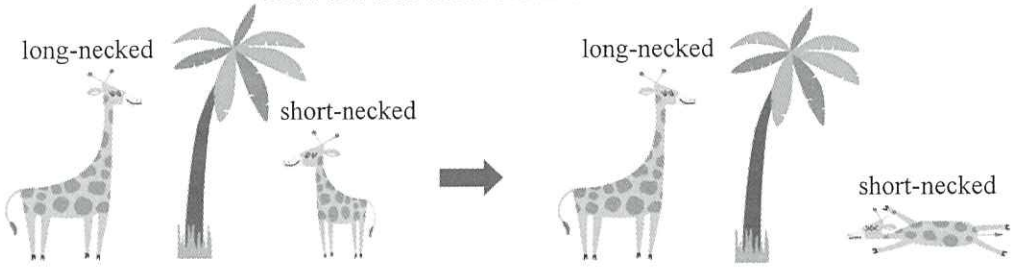
10. Both Lamarck and Darwin contributed greatly to the understanding of evolution. They proposed different explanations for the evolution of long necks in giraffes, as shown below:

Lamarck's idea about evolution

Long necks evolved as generations of giraffes stretched their necks to feed on leaves at high level above the ground

Darwin's idea about evolution



Giraffes with long necks were born by chance and had more offspring due to their competitive advantage over those with short necks

(a) Put a '✓' in the appropriate box to indicate whether the ideas listed were proposed by the scientists. You may put more than one '✓' for each idea. (2 marks)

	Lamarck	Darwin
Characters acquired during life time can be passed on to the next generation		
Organisms become more adaptive to the environment over the generations		

(b) Based on the current understanding of evolution, elaborate on the view of Darwin on the evolution of the giraffe's long neck. (4 marks)

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(c) In Darwin's era, his idea caused intense debates. The concept of humans evolving from common ancestors along with other species was unacceptable to many people due to their religious belief. What does this tell us about the nature of science? (1 mark)

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

11. Sharon was told that she might be breathing out carbon dioxide containing carbon which was once a part of the body of a dinosaur, buried underground for millions of years. Use your biological knowledge to describe the journey of the carbon. The journey should include how it is possible for the carbon derived from a dinosaur buried underground to go through millions of years and appear in the form of carbon dioxide in Sharon's breath. (11 marks)

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END OF PAPER

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

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