B

Diocesan Girls' School

2022 HKDSE MOCK EXAM

BIOLOGY PAPER 1

SECTION B: Question-Answer Book

This paper must be answered in English.

Class		Class number	
Name			
Biology Group			

	Marker's Use Only
	Marker No.
Question No.	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total	

INSTRUCTIONS

1 Write your Class, Class number, Name and Biology Group in the space provided on the right.

2 Refer to the general instructions on the cover of the Question Book for Section A.

3 The questions in this Question-Answer Book carry 84 marks. Answer **ALL** questions.

4 Write your answers to Section B 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 provided on request. Write your Class, Class number, Name, Biology Group, and the question number on each sheet. Staple them with this Question-Answer Book.

6 Present your answers in paragraphs wherever appropriate.

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

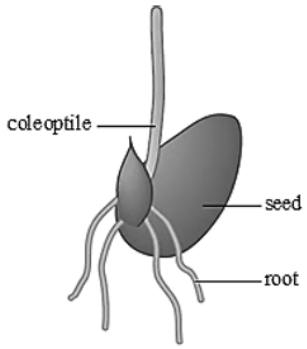
SECTION B

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

1. For each feature of the first line of defence in human body listed in column 1, select from column 2 one phrase that correctly describes its function. Put the appropriate letter in the space provided. (3 marks)

Column 1		***Column 2***
(a) Dead cells of epidermis of intact skin	_____	A. To sweep pathogens out of the body.
(b) Hair at nostril	_____	B. To act as filter to trap pathogens.
(c) Secretions from sebaceous gland	_____	C. To inhibit growth of pathogens.
		D. To act as physical barrier to pathogens.

2. The diagram below shows a grass seedling with a growing coleoptile.



An experiment was carried out to study the effect of auxins on the growth of coleoptiles, 10 mm sections of coleoptiles were obtained from a number of grass seedlings. The sections were put into auxin solutions of different concentrations respectively. The final length of the sections were measured after two days.

The results are shown in the table below.

Auxin concentration (ppm)	**Final length of the coleoptile section (mm)**
0 (control)	12.0
10^{-3}	13.0
10^{-2}	14.1
10^{-1}	15.7
1	17.0
10	16.2
10^{2}	11.6

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(a) (i) On the diagram, circle the region of the coleoptile where the 10 mm sections should be obtained. (1 mark)

(ii) Explain your answer in part (a)(i). (2 marks)

(b) Calculate the percentage stimulation on the growth of coleoptile by auxins of 10^{-3} ppm. (2 marks)

(c) With reference to the above results, suggest how the auxin concentration with the greatest stimulatory effect on the growth of coleoptile can be more accurately found. (1 mark)

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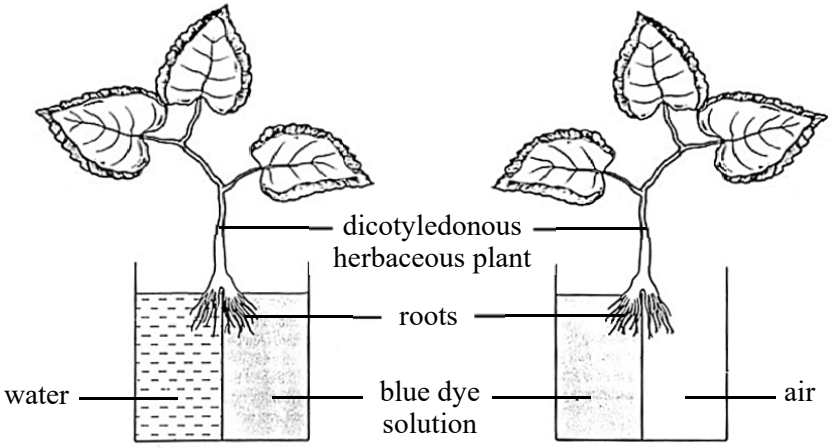
3. A student carried out an experiment with two set-ups, each containing a dicotyledonous herbaceous plant. The roots of each plant were kept in two separate compartments of a container in the set-up as shown below.



The following table records the observations made on the leaves after the set-ups were left for three hours.

Set-up	Final observation
I	Only some leaf veins appeared blue.
II	All leaf veins appeared blue.

(a) Explain the results of the experiment. (5 marks)

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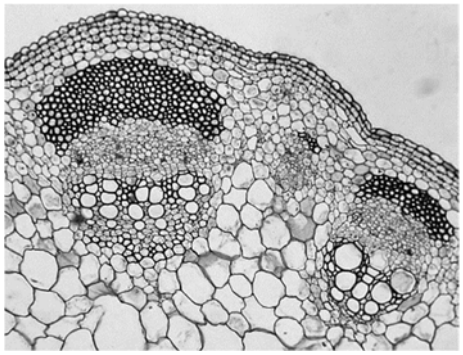
(b) The photomicrograph below shows the transverse section of the stem of the plant.

On the photomicrograph, outline the tissue that would be most heavily stained by the blue dye. (1 mark)



(c) Besides its roles in transport in the plant, explain another function of the tissue outlined in part (b). (2 marks)

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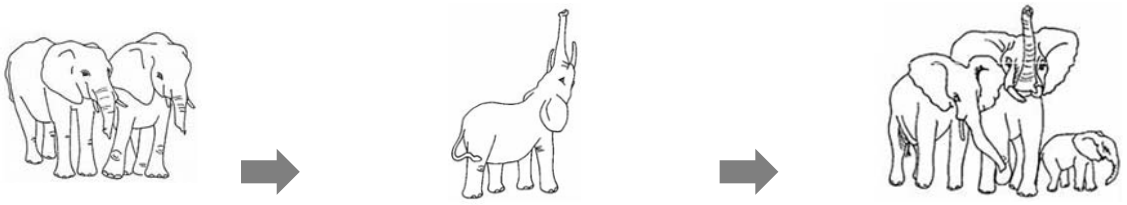
4. *Elephas maximus* (*E. maximus*) is commonly known as the Asian elephant. It is the largest living terrestrial animal in Asia.

(a) Complete the following table to show the classification of *Elephas maximus*. (3 marks)

Domain	_____
Kingdom	Animalia
_____	Chordata
Class	_____
_____	Proboscidae
Family	Elephantidae
Genus	_____
Species	_____

(b) The trunk of existing elephants has evolved to become longer than that of their ancestor.

The evolution of the elephant's long trunk as explained by the theory proposed by Lamarck is illustrated below.



Ancestral elephant species had short trunk.

Generations of elephants stretched their trunk to reach for more food on the trees.

The offspring inherited the stretched trunk from their parents and the trunk length of elephants increased over generations.

(i) Based on the current understanding of evolution, explain the evolution of elephant's long trunk. (4 marks)

(ii) Describe ONE concept in Lamarck's theory of evolution that differs from the current understanding of evolution. (1 mark)

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(c) To study the phylogenetic relationships of *E. maximus* and four other animal species, the base sequences in some common genes in the five species are compared. The table below shows an index indicating the relative difference between the base sequences in the genes of each pair of species. The maximum index is 1, which indicates the greatest relative difference.

	Relative difference between the base sequences in the common genes				
Species	*E. maximus*	*L. africana*	*L. cyclotis*	*M. americanum*	*M. primigenius*
E. maximus		0.4	0.4	0.6	0.2
L. africana			0.2	0.6	0.4
L. cyclotis				0.6	0.4
M. americanum					0.6
M. primigenius					

(i) Based on the data above, construct an evolutionary tree to represent the phylogenetic relationships of the five species. (3 marks)

(ii) Explain the principle behind your answer in part (c)(i). (2 marks)

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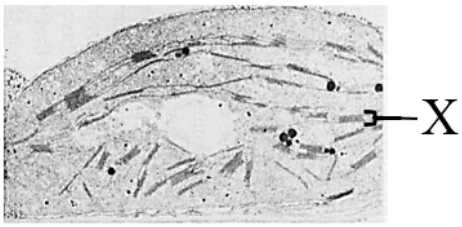
5. Two similar soybean plants were grown in different light conditions in the laboratory. The electron micrographs below show the structures of a chloroplast from a leaf of each plant under the same magnification.

Chloroplast from plant A

Chloroplast from plant B



(a) Name structure X. (1 mark)

(b) Compare structure X in plants A and B. (2 marks)

(c) With reference to your answer in part (b) and the role of structure X in photosynthesis, deduce which plant is grown under low light intensity. (5 marks)

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6. Seasonal influenza is an acute illness of the respiratory tract. Influenza vaccination is an effective way to prevent influenza.

(a) State the route of transmission of influenza. (1 mark)

(b) Describe how vaccination provides protection against influenza. (4 marks)

(c) Explain why the World Health Organization makes recommendations on the formulation of influenza vaccine every year. (3 marks)

(d) (i) Explain why antibiotics should not be used to treat influenza. (1 mark)

(ii) Suggest a potential harm of the indiscriminate use of antibiotics stated in part (d)(i). (1 mark)

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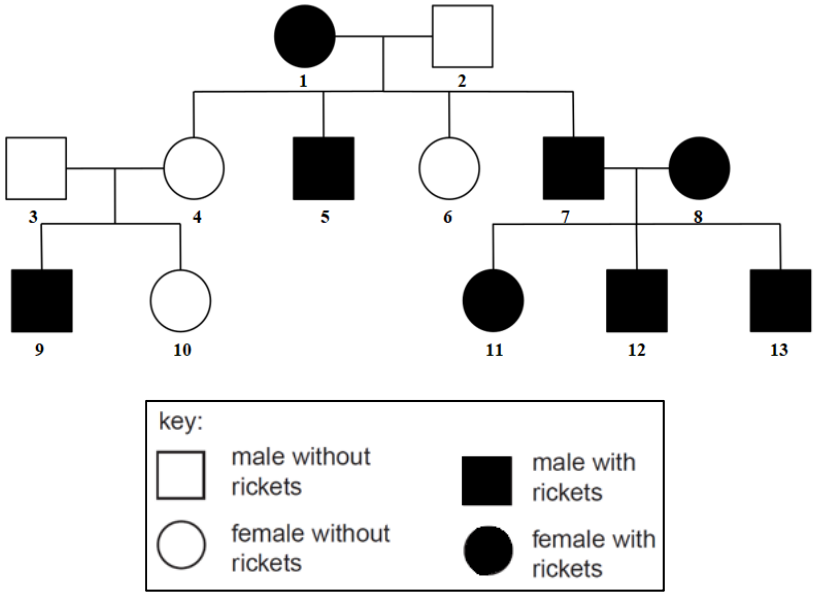
7. Rickets is a vitamin deficiency disease that results in softening and weakening of bones in children. A rare form of rickets that cannot be successfully treated with vitamin supplement is caused by a mutated recessive allele on the X chromosome in human. The pedigree below shows the inheritance of this rare form of rickets in a family:



(a) (i) State the common cause of rickets. (1 mark)

(ii) Describe how the vitamin deficiency brings about softening and weakening of bones. (2 marks)

(iii) Suggest how rickets can be diagnosed. (2 marks)

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(b) (i) Using the information in the pedigree for individuals 1 and 4, deduce the genotypes of individual 4. (Marks will not be awarded for genetic diagrams) (3 marks)

(ii) Hence, state the possible genotype(s) of individual 10. Explain your answer. (3 marks)

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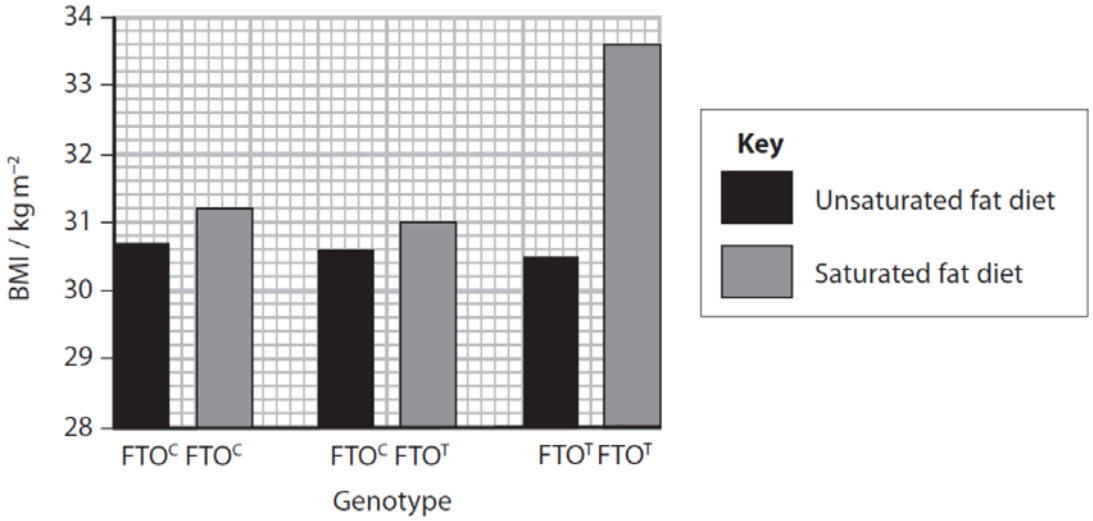
8. Obesity can be affected by both genetic and dietary factors. Body mass index (BMI) (body mass divided by the square of the body height) of individuals can be calculated in order to determine the severity of obesity. Fat mass and obesity associated (FTO) gene has been widely reported to be associated with obesity in humans. FTO gene has two alleles FTO^C and FTO^T.

An investigation is carried out to study how the type of fat in diet and the FTO gene associate with obesity. The effect of type of fats in diet on the BMI in three obese individuals with different FTO genotypes is shown in the graph below.



(a) Describe and explain how BMI can be used to assess the severity of obesity. (2 marks)

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(b) (i) With reference to the aim of the investigation, what conclusions can be drawn from the data? Explain your answer. (5 marks)

(ii) Hence, discuss how genetic testing can help an individual to lower the risk of obesity. (2 marks)

(iii) How would you modify the experiment to confirm the conclusions you drawn in part (b)(i)? (2 marks)

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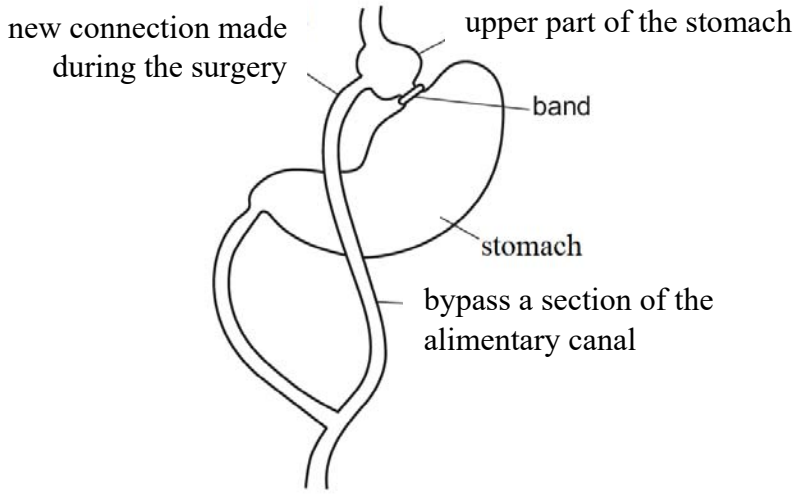
(c) Gastric bypass surgery can be used to help obese patients to lose weight. The diagram below shows the result of this surgery.



Describe how this surgery can help an obese patient to lose weight. (3 marks)

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

9. The successful transfer of gametes is crucial in sexual reproduction. Contrast the processes of gamete transfer in flowering plants and humans and describe the common adaptations of their gametes for sexual reproduction. (11 marks)

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END OF PAPER

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