2022-DSE
BIO
PAPER 1B

B

CNEC CHRISTIAN COLLEGE
MOCK EXAMINATION (2021-2022)
FORM SIX

BIOLOGY PAPER 1

SECTION B: Question-Answer Book B

This paper must be answered in English

INSTRUCTIONS FOR SECTION B

1. Write your Name, Class and Class Number in the spaces provided on this cover.
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 Name and Question Number on each supplementary answer sheet.
6. Present your answers in paragraphs wherever appropriate.
7. The diagrams in this paper are NOT necessarily drawn to scale.

Name	
Class	
Class Number	

Question No.	Marker's Use Only
1	
2	
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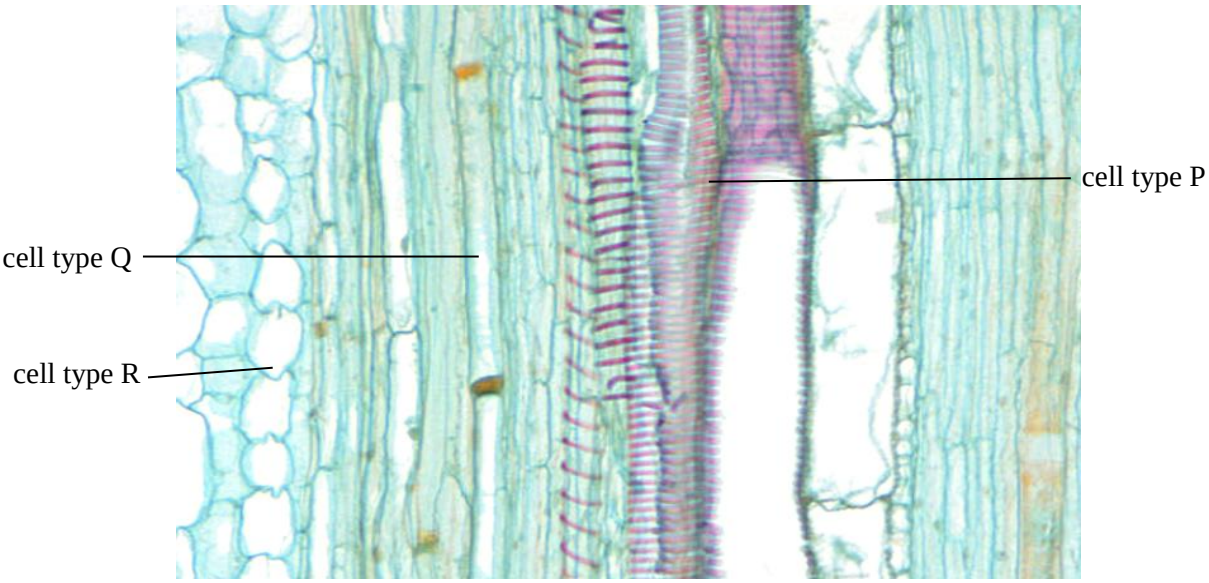
9	
10	
Total	

SECTION B

Answer ALL questions. Put your answer in the spaces provided.

1. The photomicrograph below shows the longitudinal section of part of the stem of a herbaceous plant.



(a) Based on the photomicrograph, state ***two*** observable structural differences between cell types P and Q. (2 marks)

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(b) Describe how cell type R contributes to the support of the herbaceous plant. (2 marks)

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2. The glycemic index (GI) is a ranking of carbohydrate-containing foods based on their immediate effects on blood glucose levels after consumption. The higher the GI value of a food, the quicker is the rise in blood glucose levels.
The table below shows the major food constituents and the GI values of some food items.

Food item	Major food constituents (g / 100 g)			GI value
	Carbohydrates	Fat	Proteins	
Whole milk	5.2	3.2	3.2	27
Skimmed milk	5.1	0.4	3.4	32
Whole grain bread	43.5	4.2	13.5	51
White bread	49.6	3.6	8.2	71

(a) With reference to the major constituents of whole milk and skimmed milk, suggest why whole milk has a lower GI value. (3 marks)

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(b) Mary wants to reduce body weight. She thinks that eating whole grain bread instead of white bread can help. Do you agree? Explain your answer with reference to the table. (3 marks)

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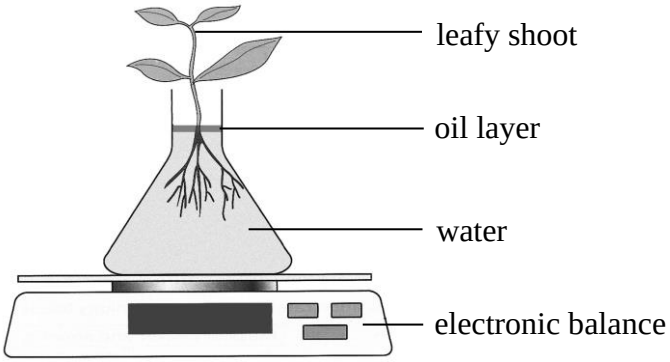
3. The diagram below shows an experimental set-up used to study the effect of different environmental conditions on the rate of transpiration of a leafy shoot.



(a) What is the purpose of adding a layer of oil on top of the water? (1 mark)

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(b) The set-up was put under different environmental conditions and the rates of transpiration were measured. The results are shown in the table below.

Environmental conditions	**Rate of transpiration (g h^{-1})**
1. In light, fan off	15
2. In light, fan on	32
3. In darkness, fan on	8

(i) State and explain the difference in the rates of transpiration under conditions 1 and 2. (3 marks)

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(ii) Based on the experimental results, explain the effect of light on the rate of transpiration. (3 marks)

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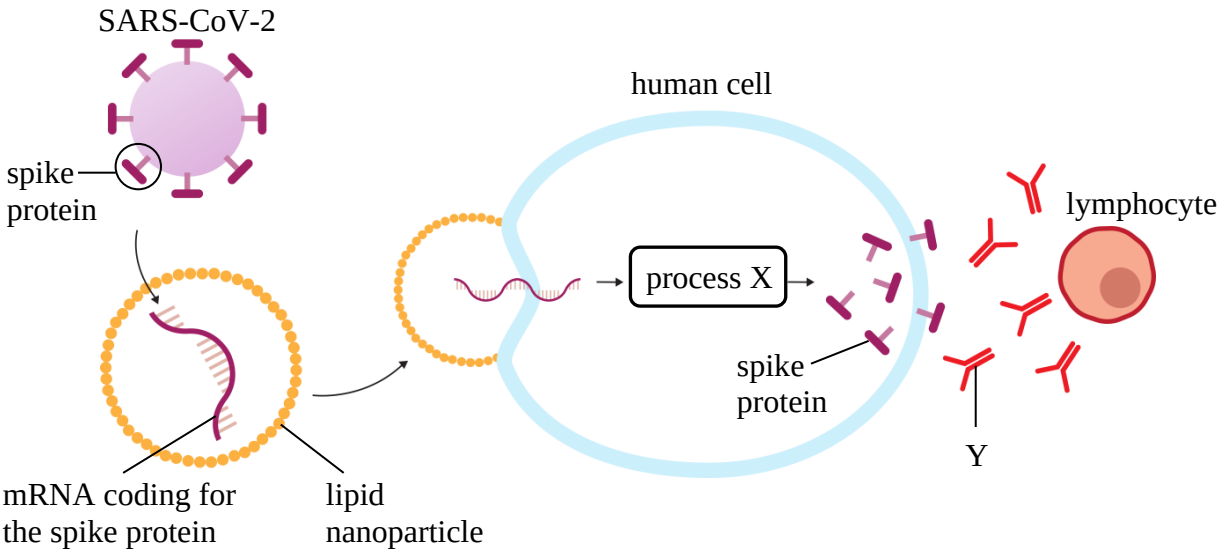
4. BNT162b2 is an mRNA vaccine against SARS-CoV-2, the virus that causes COVID-19. It is designed to instruct body cells to produce the viral spike protein (antigen) that helps stimulate an immune response. The diagram below shows how the vaccine works.



(a) Describe the events in process X which lead to the production of the viral spike protein in the human cell. (4 marks)

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(b) Y is a protein molecule produced by a type of lymphocyte. Describe the function of Y in phagocytosis against the virus. (3 marks)

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(c) To combat COVID-19, scientists all over the world are developing vaccines. Explain how vaccination can help to prevent viral infections. (4 marks)

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(d) A woman infected with SARS-CoV-2 during her pregnancy gave birth to a baby who has antibodies against the virus. Suggest ***two*** possible ways that the baby can acquire antibodies from her mother. (2 marks)

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5. The photograph below shows the record-breaker, Hou Zhihui who won the gold medal in women's weightlifting 49-kilogram final at the Tokyo Olympics.

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(a) (i) What type of movable joint does X belong to? (1 mark)

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(ii) Compare the degree of movement between joints X and Y. (2 marks)

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(b) Which muscle in her upper arms is in a contracted state when Hou Zhihui maintains the posture shown in the diagram? (1 mark)

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(c) During weightlifting, energy demand over a short time can lead to the formation of lactic acid. Describe the process that produces lactic acid and how the lactic acid is removed. (4 marks)

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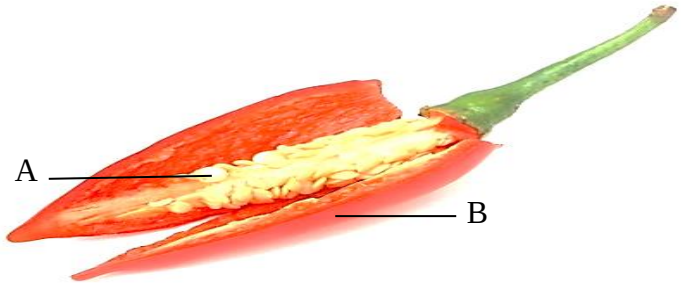
6. The photograph below shows a cut-open chili pepper.



(a) Name the floral parts from which structures A and B have developed. (2 marks)

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(b) Birds eat the chili peppers but do not digest the seeds. The seeds are dispersed when they are passed out in faeces. What is the ecological relationship between birds and chili pepper plants? (1 mark)

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(c) An experiment was conducted to study whether seed germination is enhanced by changing the seed conditions. Scientists hypothesized that passage through the digestive tract of birds enhances germination of chili pepper seeds. To test this hypothesis, three groups of chili pepper seeds were subjected to the following treatments respectively:

1. Seeds passed through the digestive tract of birds and then sown
2. Seeds removed from the fruits (depulped) and then sown
3. Seeds sown within the whole fruits

The proportion of each group of these seeds that emerged as seedlings was recorded in the table below.

	Passed by birds	**Depulped**	**Whole fruits**
Proportion of seeds emerged	0.91	0.8	0.3

(i) Suggest ***two*** variables that have to be kept constant for the results to be comparable. (2 marks)

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(ii) With reference to the aim of the experiment, what conclusions can be drawn?

(4 marks)

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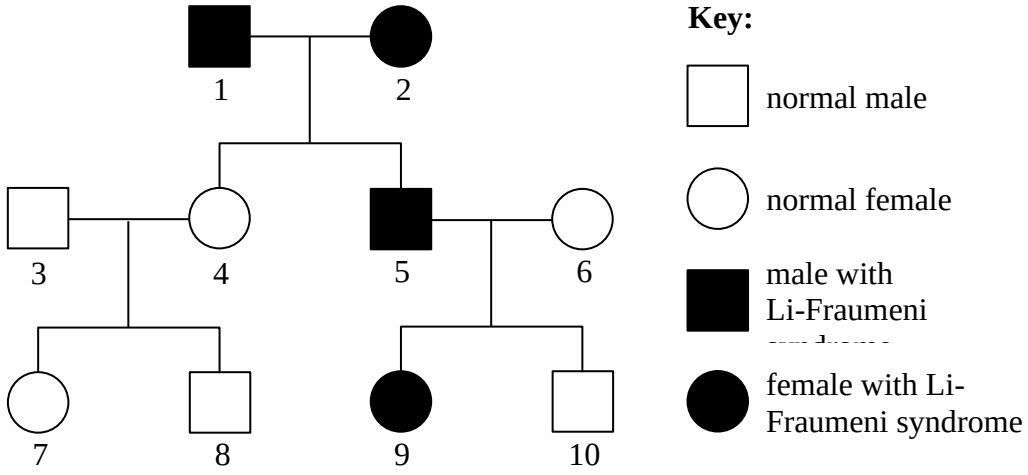
7. Li-Fraumeni syndrome is a rare genetic disorder that greatly increases the risk of developing several types of cancer, particularly in children and young adults. The pedigree below shows the inheritance of Li-Fraumeni syndrome in a family.



(a) Based on the pedigree, deduce whether the allele for Li-Fraumeni syndrome is dominant or recessive. (Note: Marks will not be awarded for genetic diagrams) (5 marks)

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(b) Li-Fraumeni syndrome is caused by a mutation affecting a tumour suppressor gene called TP53. This gene codes for a protein that regulates DNA repair and initiates the death of cells where damaged DNA cannot be repaired. The mutated TP53 gene leads to the production of a non-functional protein. Suggest how the non-functional protein may lead to cancer. (3 marks)

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8. (a) Thomas suffers from insulin-dependent diabetes. With reference to the cause of the disease, explain why his urine contains glucose. (4 marks)

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(b) Thomas adopts a daily routine to control his diabetes. He eats three meals a day: breakfast, lunch and an evening meal. He is advised to take in complex carbohydrates in his meals instead of sugar. He injects insulin once before breakfast and once before the evening meal.

The injection he uses before breakfast is a mixture of two types of insulin: a slow-acting type and a fast-acting type.

	Slow-acting insulin	**Fast-acting insulin**
Onset	1 to 3 hours	10 to 15 minutes
Peak	5 to 8 hours	1 to 2 hours
Duration	Up to 18 hours	3 to 5 hours

(i) Why should diabetic patients take in complex carbohydrates in their meals instead of sugar? (2 marks)

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(ii) Why is it beneficial to use both types of insulin before breakfast? (2 marks)

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(iii) Thomas skipped lunch one day. Even though he had injected himself with the mixture of insulin before breakfast, his blood glucose did not fall dangerously low. Suggest a reason to explain this. (1 mark)

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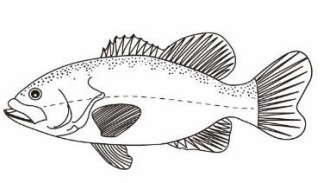
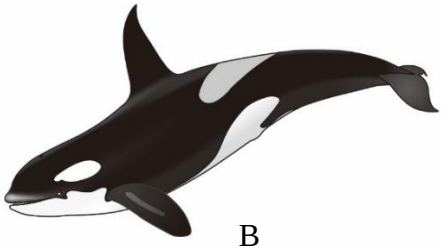
9. The pictures below show five different organisms found in two habitats.



A



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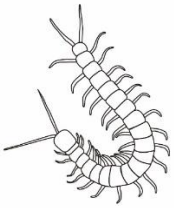
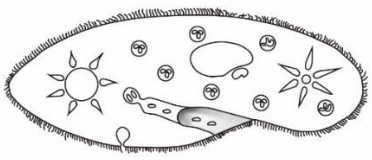
C



D



E

(a) Name the kingdom that D and E each belongs to. (2 marks)

D: …… E: ……

(b) In the space provided below, draw the pyramid of numbers for the food chain concerning A, B and E. (2 marks)

(c) Explain the shape of the pyramid drawn in (b). (3 marks)

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(d) State and explain the ecological role of C to make a forest self-sustaining. (2 marks)

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10. A man, with eyes uncovered or blindfolded, has different responses when he touches a glass of hot water. Contrast the nervous control in giving the different responses in the two cases. State the importance of each type of response in his life. (11 marks)

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