



**TEMASEK JUNIOR COLLEGE
PRELIMINARY EXAMINATION
JC 2/ IP YEAR 6 2017**

CANDIDATE
NAME

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CENTRE
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INDEX
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H1 BIOLOGY

Paper 2 Structured Questions

8875/02

Tuesday 12 September 2017

2 hours

READ THESE INSTRUCTIONS FIRST

Write your name, Centre number, index number and class in the spaces at the top of the page.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graph.

Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions in the spaces provided on the Question Paper.

The use of an approved scientific calculator is expected, where appropriate.

You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

For Examiner's Use	
Paper 1	/30
Paper 2	/60
Q1	/12
Q2	/13
Q3	/15
Essay	/20
Total	/90

This document consists of **12** printed pages.

Section A

Answer **all** the questions in this section.

- 1 Fig. 1.1 shows an electron micrograph of a plant cell.

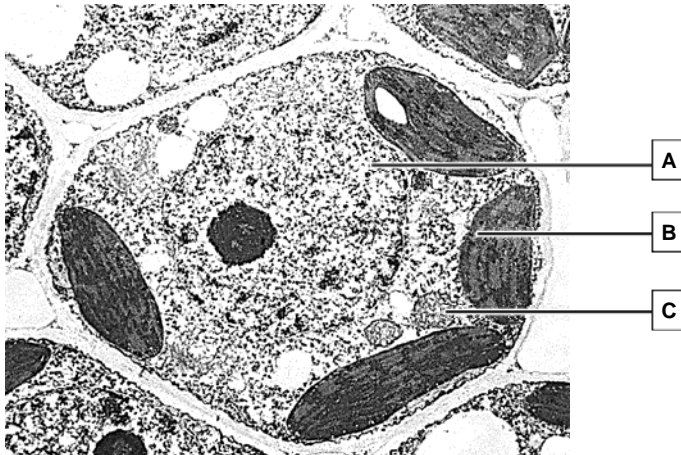


Fig. 1.1

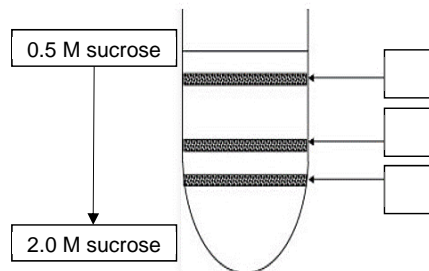
- (a) Identify organelles **B** and **C**.

Organelle **B**: _____ [1]

Organelle **C**: _____ [1]

- (b) Extracts from the homogenised plant cells in Fig. 1.1 were added to a sucrose density gradient and centrifuged at high speed to separate the various organelles.

- (i) Label the bands where organelles **A**, **B** and **C** can be found after centrifugation.



[3]

(ii) Explain your answer in (b)(i).

[2]

In a separate experiment, protoplasts (plant cells with cell wall removed) were first treated with three different reagents – ethanol, distilled water and buffer solution, for two hours. The treated cells were then subjected to the density gradient centrifugation.

Fig. 1.2 shows the thickness of the lowest band for each type of treated cell after density gradient centrifugation.

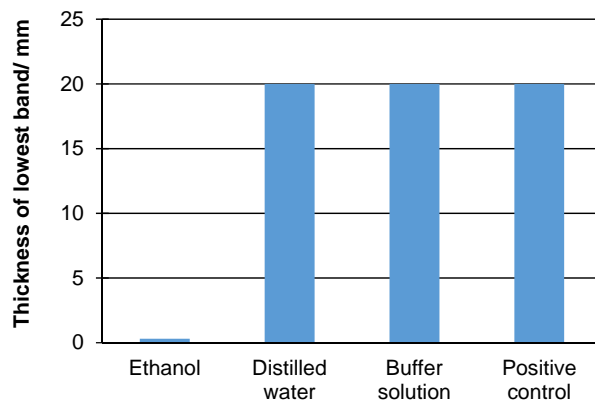


Fig. 1.2

(c) Explain the effects of the different reagents on the thickness of the lowest band.

[3]

Fig. 1.3 shows another component found in animal cell membranes.

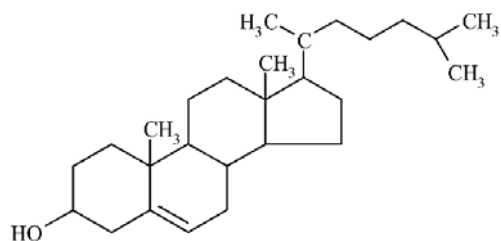


Fig. 1.3

(d) Explain how the molecule shown in Fig. 1.3 performs its function in cell membranes.

[2]

[Total: 12]

- 2 (a) Explain why mRNA is formed as a continuous strand during transcription while one of the DNA strands is formed discontinuously during replication.

[3]

- (b) Outline the process of transcription.

[3]

Several types of rRNA and tRNA are transcribed as a single strand precursor RNA. Following transcription, each rRNA (16S, 23S, 5S) and tRNA molecule is cleaved in a process known as RNA trimming to form mature rRNA and tRNA molecules, as shown in Fig. 2.1.

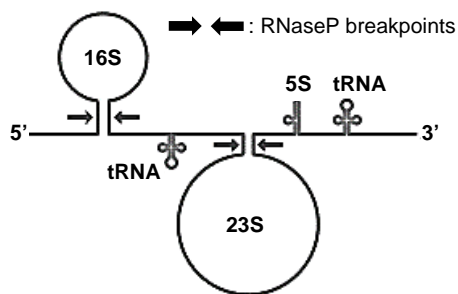


Fig. 2.1

- (c) State where rRNA genes are found.

[1]

6

(d) Compare the process of RNA trimming and post-transcriptional modification for mRNA.

[2]

(e) Relate how the single-stranded structure of rRNA and tRNA facilitates their roles.

[4]

[Total: 13]

- 3 Anole lizards are found throughout the Caribbean and the surrounding mainland. An investigation was carried out to determine the relationships between these lizard species using DNA analysis. Fig. 3.1 shows a continuous part of the base sequence of a region of DNA that is read in the 5' → 3' direction. The base number of the first nucleotide of each row is shown on the left of the sequence.

001	TTTTTTTGT	CATGCTGTGT	CTTCTGGACT	GCAATACTAT	ATCTGCTAGA
051	ATGATTTC	TGGGTAACGA	TGTCCCCTGG	ATCCTGATTT	TTGCCGTTCT
101	CCCAAATTCT	GGTTGTATTA	AATGCTGTAA	ATGTCTCCAT	AACATGTCTC
151	ATTGCTATAC	CATGTCTCCC	AAAACCCAAT	TTGTTCATAT	TATGTACCCA
201	AGACTCTGGT	ACTATGTTTC	CTGGGGCATA	ATTTTGGCAC	AATCTCTCTC
251	CCTCGCCCTG	TTCCTGCAG	GAAAGTATGG	TGCCTTGGAT	GCGGGGGCTC
301	TGCTGGCGCT	GCTGCCACTA	ACGGAAGACC	AGGAGAGCAA	GGTGCGCCTC
351	TATGCCCTGA	AGGCTCTGAC	TGTCTTGGCT	GTATTTCGTAC	GAGACCCAGT
401	ACCCCTCCTG	CCCCACATCC	CTCTGCTGCA	GGAGCGCAGC	CAGGATCCCA

Fig. 3.1

- (a) Design two 12bp long primers **X** and **Y** that can be used to amplify the sequence that spans from nucleotide 052 and 392.

Primer **X**: _____

Primer **Y**: _____ [2]

Fig. 3.1 shows the phylogenetic relationships among Anole lizards. The results from gel electrophoresis of amplified *rtdr1y* and *kank1* sequences are also shown.

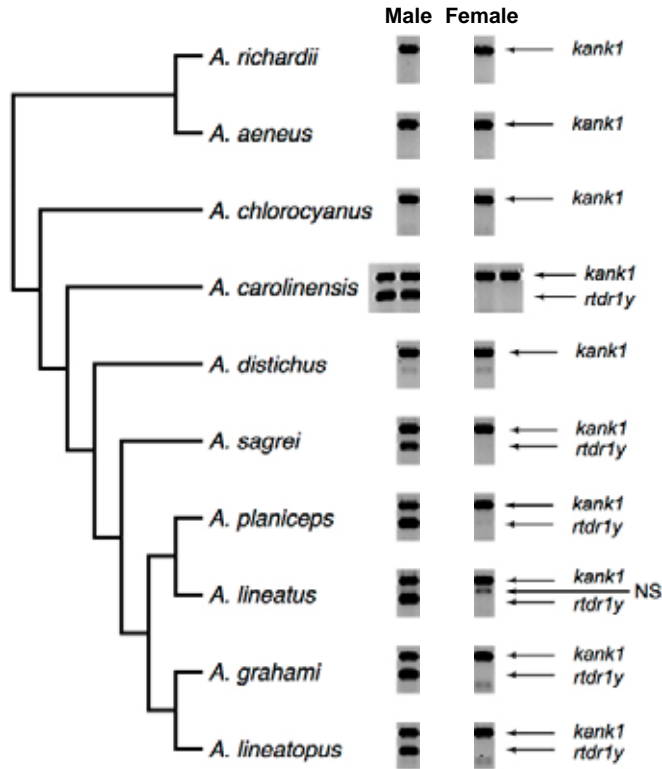


Fig. 3.1

(b) Explain which type of chromosome *rtdr1y* sequence is found on.

Commented [OKE1]: State the type of chromosome on which the *rtdr1y* sequence is found on.

[2]

The phylogenetic relationship between organisms is typically established through the use of *cytochrome c* gene, which is encoded in the nuclear DNA.

(c) Explain why *cytochrome c* gene is used for phylogenetic studies.

[3]

Fig. 3.2 shows the process in which cytochrome c is involved in.

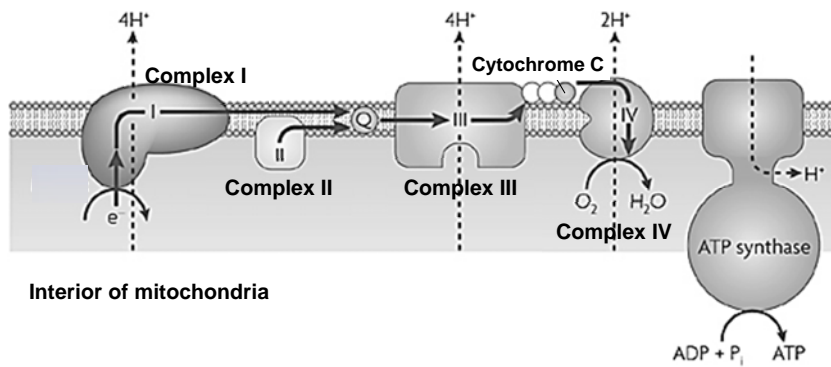


Fig. 3.2

(d) Explain the significance of cytochrome c in the process shown.

[3]

Anole lizards are found in different ecological niches throughout the Caribbean and the surrounding mainland as shown in Fig. 3.3. Each species is found only on one island or a small group of islands, apart from *Anolis carolinensis* which is found in mainland Florida.

Some species live on twigs, others in the trunk, and others in the grass. Species that live on twigs have long tails and short legs; species that live in the grass have short tails; and species that live on low tree trunks have long legs. The species that live on twigs all look similar, whether they are the species from Cuba, Hispaniola, Jamaica, or Puerto Rico.

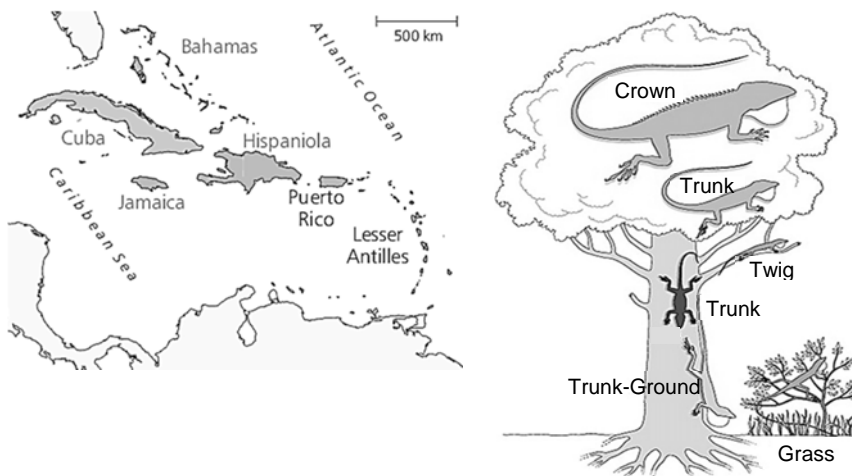


Fig. 3.3

Fig. 3.4 shows phylogenetic relationship of *Anolis* found in different ecological niches on four Caribbean islands.

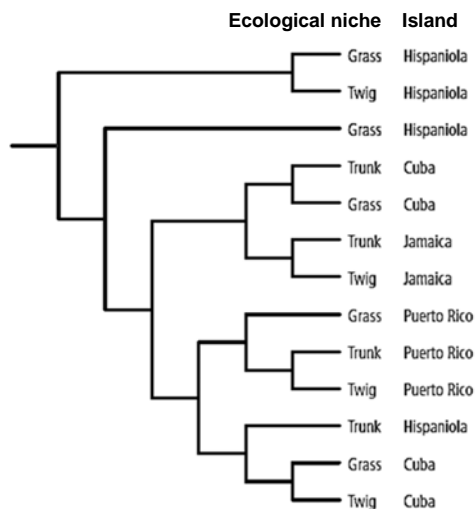


Fig. 3.4

- (e) Explain how the different species of lizards that are morphologically similar might have arisen in different islands.

[5]

[Total: 15]

Section B

Answer **one** question.

Write your answers on the separate answer paper provided.

Your answers should be illustrated by large, clearly labelled diagrams, where appropriate.

Your answers must be in continuous prose, where appropriate.

Your answers must set out in sections **(a)**, **(b)** etc., as indicated in the question.

EITHER

- 4 (a) Discuss the pros and cons of using embryonic stem cells in medical research. [7]
- (b) Using Bt corn as an example, discuss the potential benefits and issues of genetically modified crops. [8]
- (c) Describe the natural and applied roles of restriction enzymes. [5]

[Total: 20]

OR

- 5 (a) Describe the factors affecting the rate of photosynthesis. [8]
- (b) Distinguish between the structures of the polysaccharides found in plant cells. [5]
- (c) Explain how the double membrane organelles in a plant cell synergize to ensure the cell's survival. [7]

[Total: 20]