

JURONG JUNIOR COLLEGE
JC 2 PRELIMINARY EXAMINATIONS
Higher 1

CANDIDATE
NAME

CLASS

BIOLOGY

8875/02

Paper 2 Core Paper

26 August 2016

Additional Materials: Answer Paper

2 hours

READ THESE INSTRUCTIONS FIRST

Write your name and class on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Section A

Answer **all** questions in the spaces provided on the question paper.

Section B

Answer any **one** question on the answer paper provided.
Circle the question number of the question attempted.

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	
Section A	
1	
2	
3	
4	
Section B	
5 / 6	
Total	

This document consists of **12** printed pages and **2** blank pages.

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Section A

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

- 1 Fig. 1.1 shows the effect of increasing temperature on the activity of an enzyme required in the synthesis of proteins.

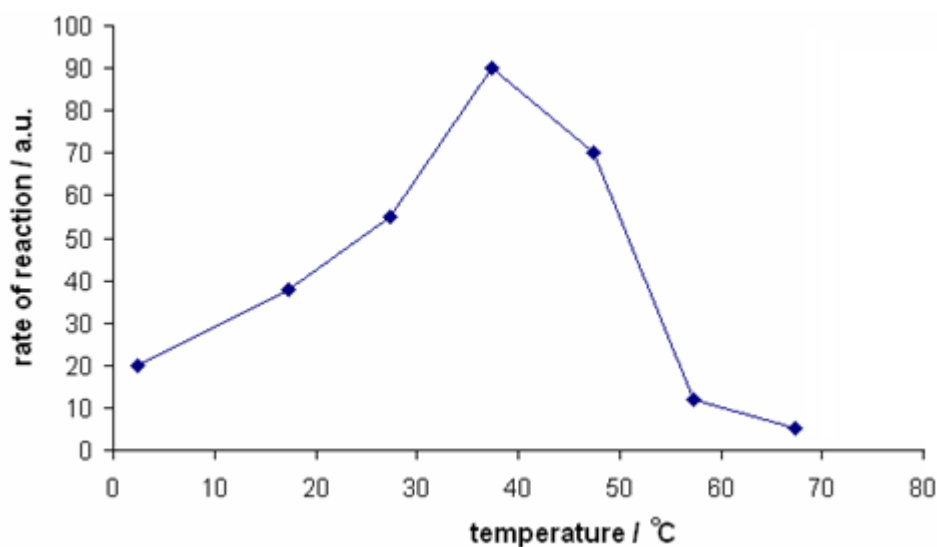


Fig. 1.1

- (a) With reference to Fig. 1.1, describe and explain the effect of increasing temperature above 37°C for this enzyme. [3]

Fig 1.2 shows an event occurring during synthesis of the enzyme.

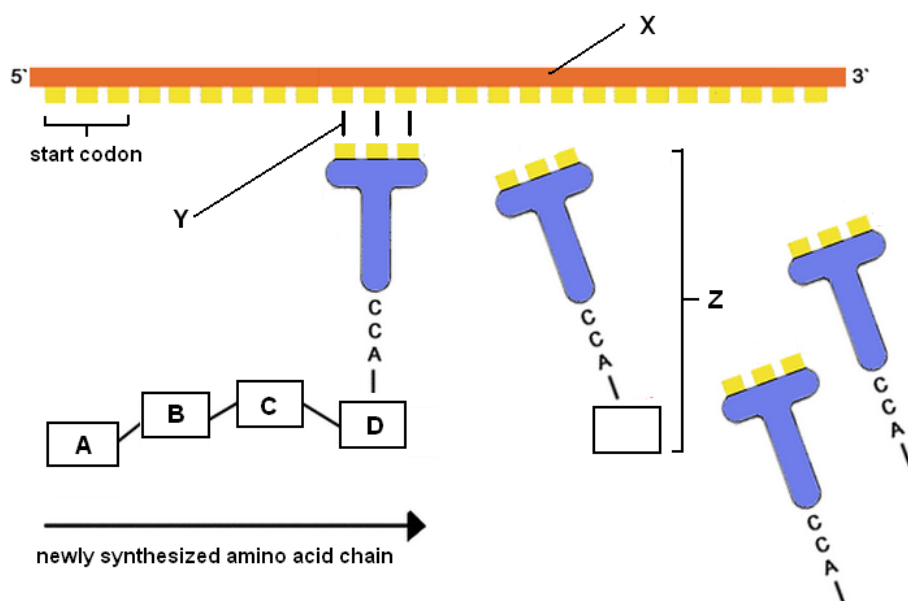


Fig. 1.2

(b) With reference to Fig. 1.2,

(i) identify [1]:

Molecule **X**: _____

Bond **Y** : _____

(ii) state the sequence of DNA bases (including the 5' and 3' orientation) coding for amino acid **A**; [1]

(iii) describe how molecule **Z** is formed. [2]

Fig 1.3 shows the structure of a release factor consisting of a polypeptide made up of 722 amino acids. It is involved in the termination stage of protein synthesis in eukaryotes.

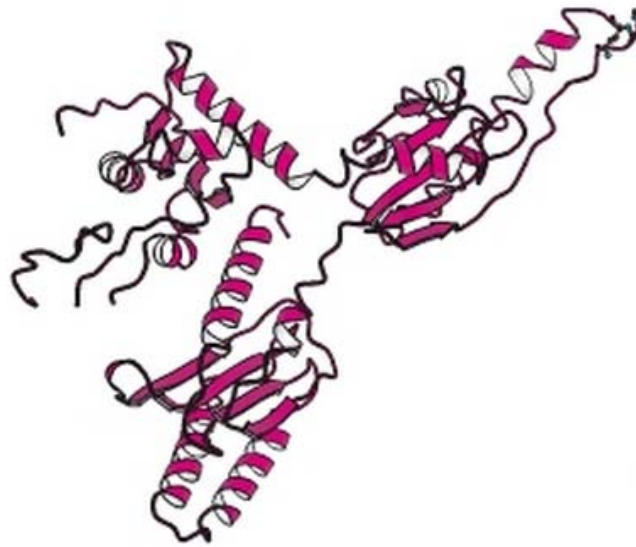


Fig. 1.3

(c) Using your biological knowledge,

(i) describe the termination stage of protein synthesis; [3]

(ii) suggest why it is important for the release factor to be similar to tRNA in structure. [1]

[Total: 11]

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- 2** A pure-breeding variety of tomato plant, variety A, produced red fruits with green bases even when ripe.

Plants of variety A were crossed with another pure-breeding variety, B, with orange fruits which have no green bases when ripe. The F₁ generation plants all had red fruit with green bases.

(a) Define what is meant by a pure breeding plant. [1]

(b) Using the symbols,

G/g to represent allele for green-based or non green-based fruit
R/r to represent allele for red or orange fruit;

state the genotypes of variety **A** and **B**. [1]

- (c) (i) Plants from the F₁ generation were crossed to variety B and the offspring were recorded:

red fruit, green base	55
red fruit, non-green base	56
orange fruit, green base	54
orange fruit, non-green base	55

Draw a genetic diagram to show that the expected phenotypic ratio of offspring phenotypes is 1:1:1:1. [4]

- (ii) State the name of this type of cross. [1]

The genes for fruit base colouration and fruit colour were found on chromosome 9 and 18 of the tomato plant genome respectively.

It was found that prolonged exposure of plants to a chemical, ethyl methanesulfonate (EMS) led to plants with chromosomal abnormality. Fig 2.1 shows the karyotypes of a normal plant and plant that has been exposed to EMS. Plants exposed to EMS tend to have fruits with pale colour without any base colour.

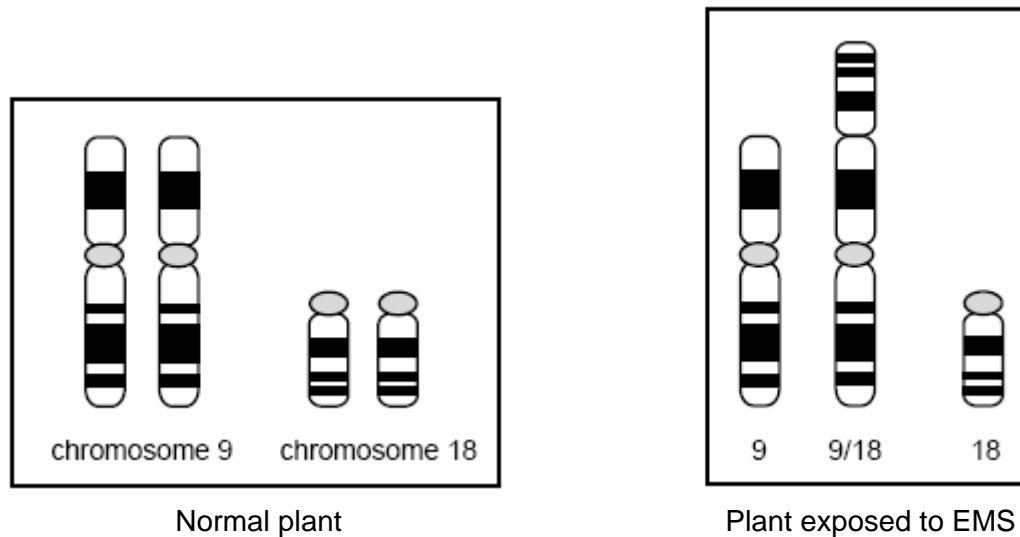


Fig. 2.1

(d) With reference to Fig. 2.1, suggest why plants treated with EMS had fruits with pale colour without base colour. [2]

[Total: 9]

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- 3 Hawaiian honeycreepers are a family of small birds native Hawaiian Islands. Fig. 3.1 shows the evolutionary relationships of Hawaiian honeycreepers and its distribution at various islands. All species of Hawaiian honeycreepers evolved from a single ancestral species, which arrived on the islands long ago. Each species has a unique beak shape.

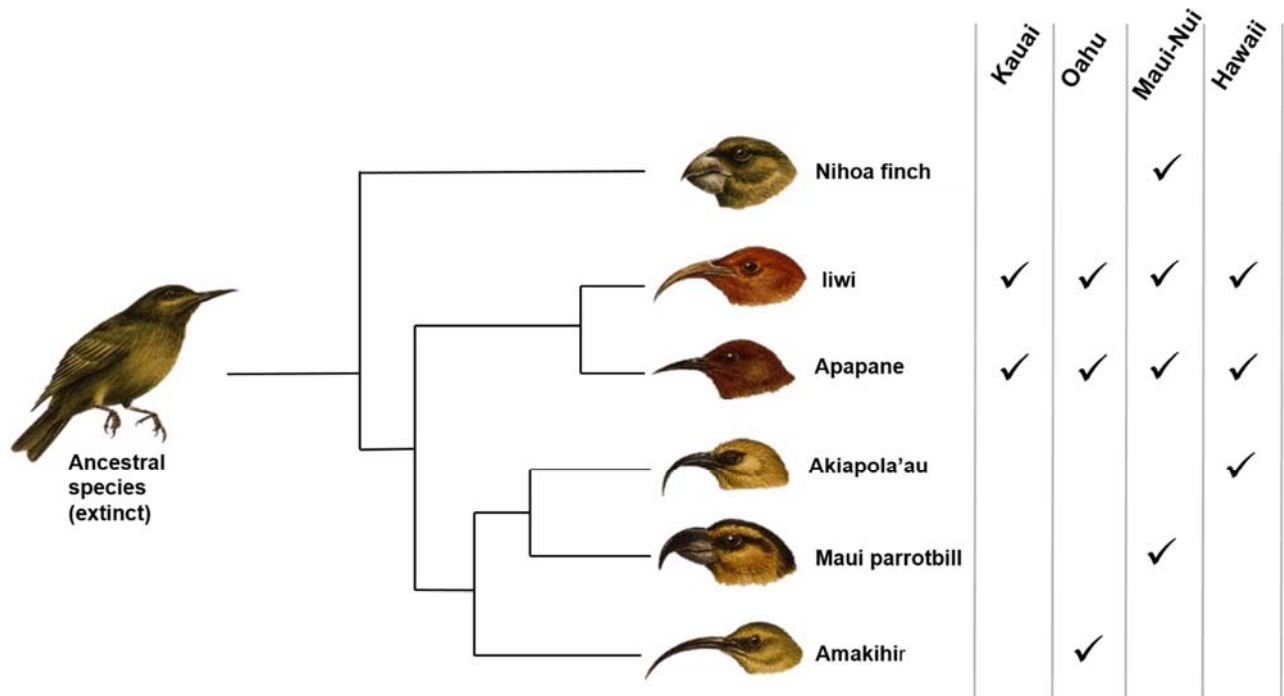


Fig. 3.1

- (a) Explain how natural selection leads to different beak shape in Hawaiian honeycreepers on different islands. [5]

- (b)** Although most species only inhabit one island, some species such as liwi and Apapane can thrive on all the four islands.

With reference to the evolution of beak shape, suggest why this is possible. [1]

- (c)** The beak shapes in Fig. 3.1 is an example of anatomical homology and can be used as an evidence of evolution.

- (i)** Explain what is meant by 'homology'. [1]

- (ii)** Describe with example, one other type of homology used to support evolution. [2]

[Total: 9]

- 4 Plants in the milkweed family are an important food source of the Monarch butterfly larvae. During corn pollen shedding, corn pollen can fall on the leaves of milkweed plants when they occur in or near cornfields. Any Monarch larvae that feed on these plants are potentially exposed to corn pollen. A study was carried out to determine if pollen from Bt corn could be harmful to the larvae of the Monarch butterfly. The results are shown in Table 4.1.

Table 4.1

	Pollen density/grains per cm²	Average length of larvae/mm	Mortality rate after 5 days of exposure/%
Larvae feeding on leaves coated with Bt pollen	0	27.4	10.0
	14	26.9	10.6
	75	26.5	11.3
	200	24.0	40.2
Larvae feeding on leaves coated with non-Bt pollen	0	27.8	10.5
	14	27.1	10.7
	75	26.9	10.0
	200	27.5	10.5

- (a) With reference to Table 4.1, describe the effects of Bt pollen density on the mortality rate of the larvae after 5 days of exposure. [2]

- (b) Discuss the extent to which the results in Table 4.1 confirm that growing Bt corn is harmful to the larvae of the Monarch butterfly. [2]

- (c)** Other than potential environmental impact mentioned in (b), discuss the ethical issues involved in the production of genetically modified (GM) food. [2]

The polymerase chain reaction (PCR) is a molecular technique which amplifies a section of DNA from a minute starting amount.

- (d)** Using your biological knowledge,

- (i)** explain why the nucleotide sequence of the DNA primers is critical to its function in PCR; [2]

- (ii)** explain how the ability of Taq polymerase to function at high temperature is an advantage in PCR. [2]

PCR is also used as part of the protocol for detecting DNA sequences from GM foods. PCR can be used to amplify specific DNA sequences which are unique to GM foods. The PCR products can then be used for analysis to identify these unique sequences.

- (e)** Suggest how PCR can be used to detect these unique sequences in GM foods. [1]

[Total: 11]

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

- 5 (a) Describe the specific roles of the cell surface membrane components. [8]
- (b) Describe how substances can be brought across a membrane by facilitated diffusion, active transport, endocytosis and exocytosis. [8]
- (c) Distinguish between non-cyclic and cyclic photophosphorylation. [4]

[Total: 20]

- 6 (a) Describe the structure and function of the rough endoplasmic reticulum and chloroplast. [8]
- (b) Describe how the chromosomes behave during mitotic cell cycle. [8]
- (c) Identify the causative factors which increase the chances of cancerous growth and explain how uncontrolled cell division can lead to cancer. [4]

[Total: 20]