



MERIDIAN JUNIOR COLLEGE
JC2 Preliminary Examinations 2016
Higher 1

CANDIDATE
NAME

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CIVICS
GROUP

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INDEX
NUMBER

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H1 BIOLOGY

8875/02

Paper 2 Core Paper

16 September 2016

2 hours

Additional Materials: Answer papers

READ THESE INSTRUCTIONS FIRST

Do not open this booklet until you are told to do so.

Write your name, civics group and index number on all the work you hand in.

Write in dark blue or black pen on both sides of the paper.

You may use a soft pencil for any diagrams, graphs or rough working.

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

Section A

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

Section B

Answer **one** question on the answer paper provided.

At the end of the examination,

1. Fasten your answer papers to section B securely together.
2. Hand in the following separately:
 - Section A
 - Section B

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

For examiner's Use	
Section A	
1	/ 11
2	/ 9
3	/ 9
4	/11
Section B	
5 / 6	/ 20
Total	/ 60

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

[Turn over]

Section A

For
Examiner's
Use

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

QUESTION 1

The structure of the tubulin dimer, the protein that forms microtubules by polymerisation, is shown in **Fig. 1.1**.

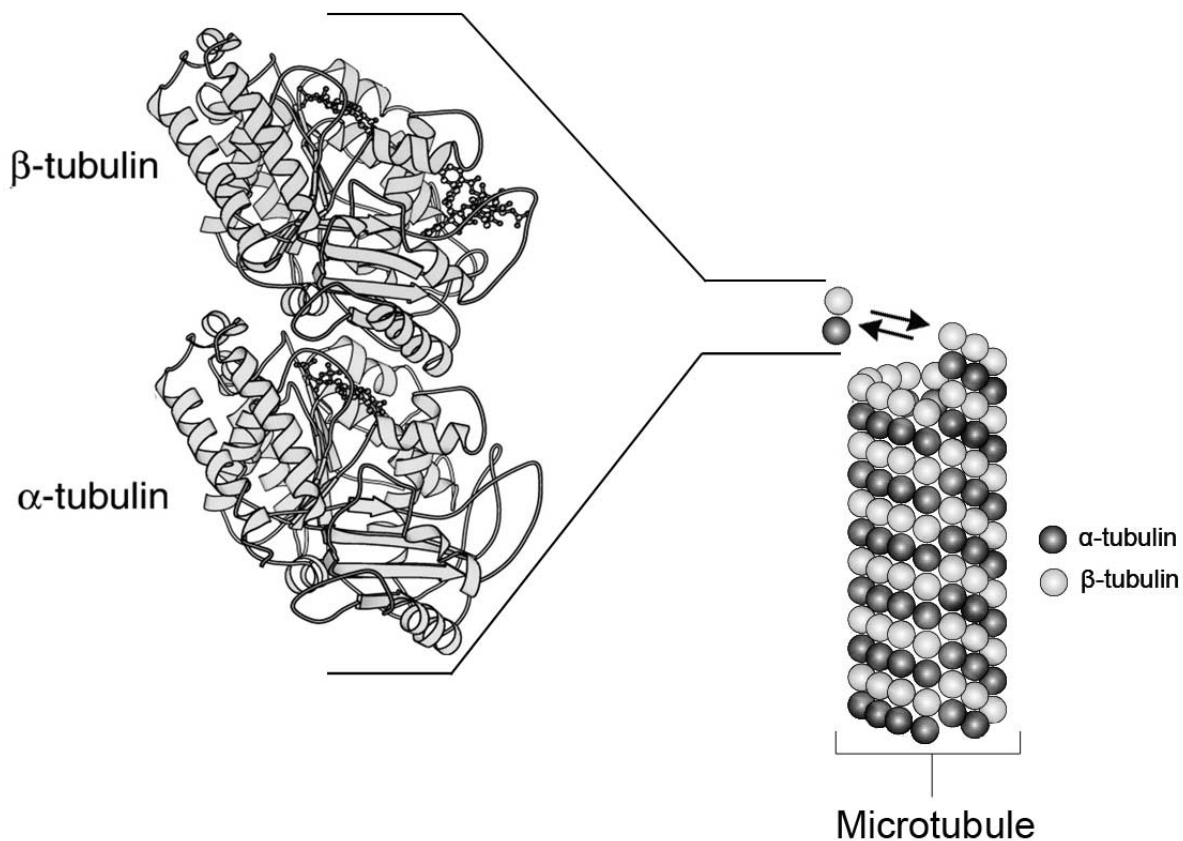


Fig. 1.1

- a) With reference to **Fig. 1.1**, describe how tubulin attains its three-dimensional structure. [4]

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Tubulin inhibitors like paclitaxel and vinblastine have been utilised in chemotherapy drug trials to treat cancers. All tubulin inhibitors are known to bind to the β -tubulin subunit.

b) Explain how tubulin inhibitors reduce tumour formation. [3]

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c) Suggest and explain why tumour cells may exhibit resistance to the chemotherapy drugs. [2]

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Fig. 1.2 shows the changes in the number of small vesicles in an animal cell that is undergoing mitosis.

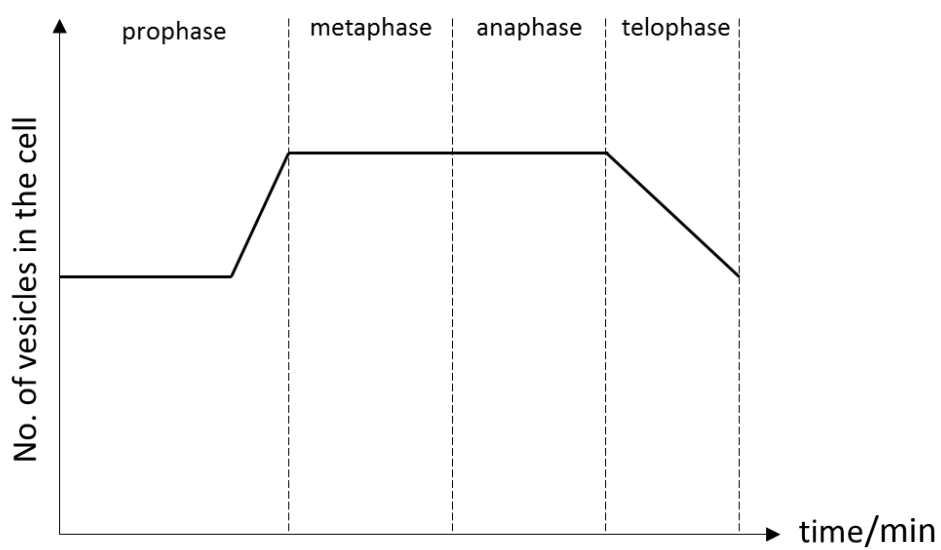


Fig. 1.2

d) Suggest reasons for the changes in the number of vesicles during mitosis. [2]

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[Total: 11]

QUESTION 2

Fig. 2.1 shows the process of translation.

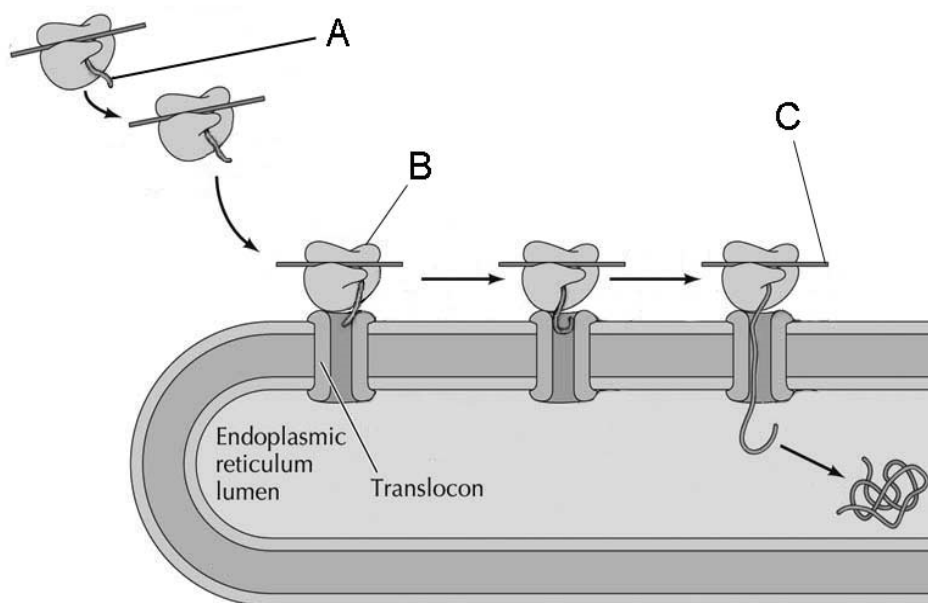


Fig. 2.1

a) (i) Label structures **A**, **B** and **C**.

[3]

A:

B:

C:

(ii) Suggest the role of the translocon in protein synthesis.

[1]

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b) List two ways in which transcription differs from DNA replication.

[2]

1.
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2.
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- c) Explain how complementary base pairing facilitates the storage and transmission of genetic information. [3]

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[Total: 9]

QUESTION 3

Sickle cell anaemia is a genetic disorder caused by the presence of two abnormal copies of the gene which codes for the β -globin chain in haemoglobin. Individuals heterozygous for sickle cell anaemia are phenotypically normal, but exhibit symptoms like sickle-shaped red blood cells when oxygen levels are low.

- a)** Explain why individuals heterozygous for sickle cell anaemia are said to exhibit codominance. [3]

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Fragile X Syndrome (FXS) is a sex-linked recessive genetic disease in human that causes intellectual disabilities ranging from mild to severe.

A woman who is a carrier of both FXS and sickle cell anaemia married a man who is suffering from FXS with no family history of sickle cell anaemia. Their first son was born after 2 years of marriage.

- b) (i)** Using a genetic diagram, show the possible offspring produced by the couple. [4]

(ii) The couple decided to have a second child.

Determine the probability that their first son is phenotypically normal for both sickle cell anaemia and FXS and their second child has FXS and is a carrier of sickle cell anaemia. Show your working in the space below. [2]

Probability:

[Total: 9]

QUESTION 4

The quantity of product formed from the Polymerase Chain Reaction (PCR) catalysed by *Taq* Polymerase was measured across a range of temperatures and three different durations. The results were plotted on the graph shown in **Fig. 4.1**.

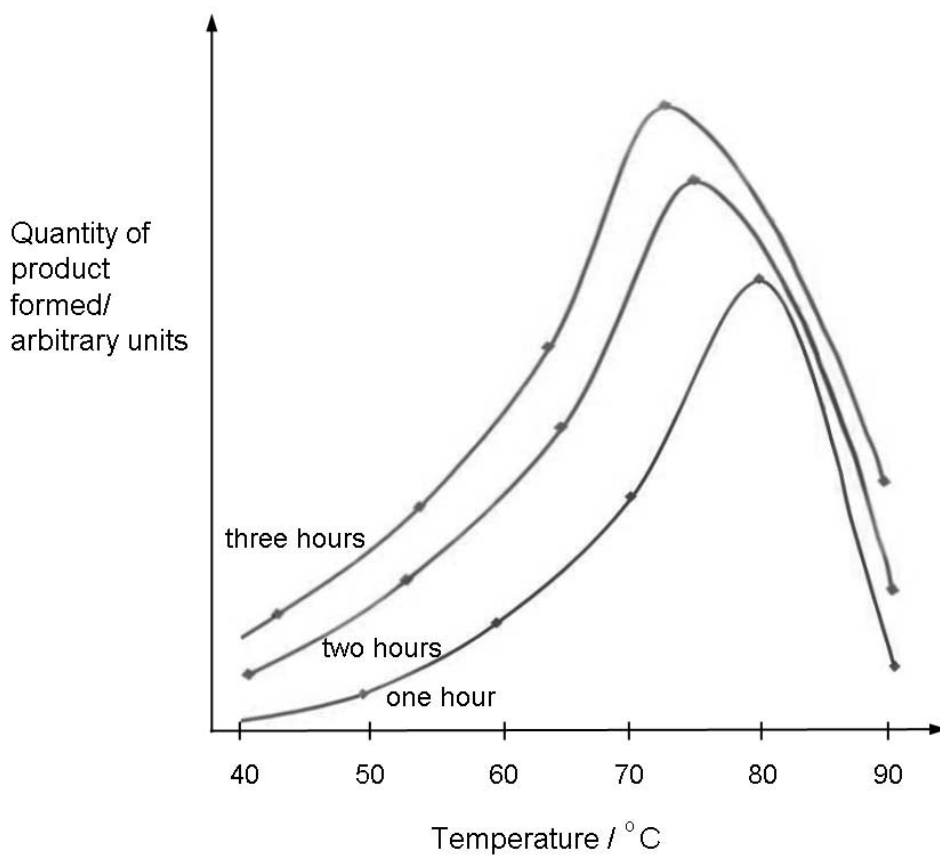


Fig. 4.1

- a) Explain the effect of increasing temperature on the quantity of product formed for the sample kept for one hour. [4]

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- b) Explain why the optimum temperature is lower if the quantity of product formed is measured after three hours rather than one hour. [2]

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- c) The products of PCR can then be analysed using gel electrophoresis.

Fig. 4.2 shows some of the steps involved in gel electrophoresis.

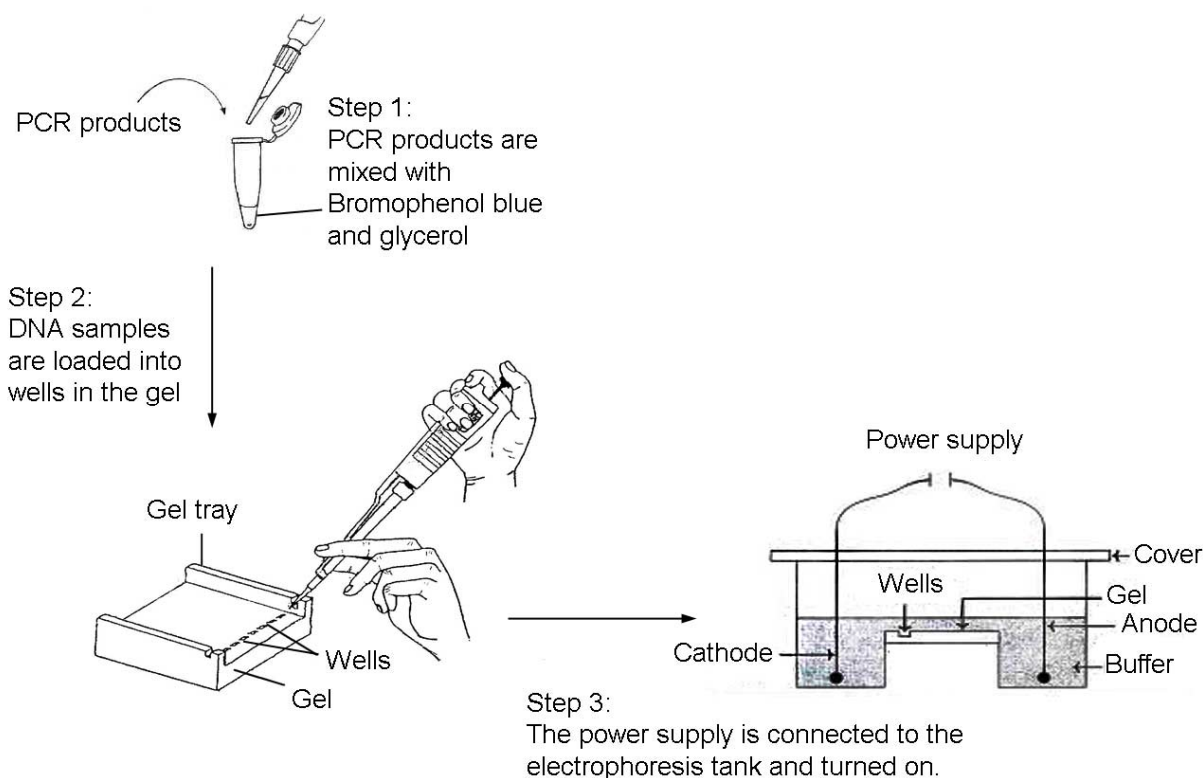


Fig. 4.2

- (i) Explain the rationale behind Step 1. [2]

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- (ii) Suggest the purpose of the buffer solution in Step 3. [1]

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Hunting's disease (HD) is an autosomal-dominant disorder that results from the presence of 36 or more CAG repeats in the HD gene. **Fig. 4.3** shows the normal allele and the disease-causing allele.

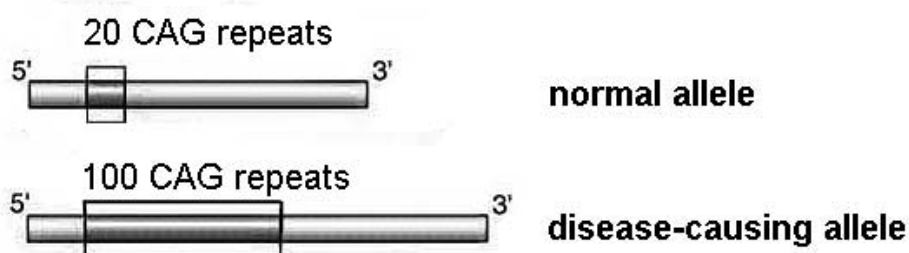


Fig. 4.3

- d) Explain why the normal HD allele and the disease-causing HD allele can be differentiated by gel electrophoresis. [2]

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[Total: 11]

Section B
Answer **one** question.

*For
Examiner's
Use*

Write your answers on the separate answer paper provided.
Your answers should be illustrated by large, clearly labeled diagrams, where appropriate.
Your answers must be in continuous prose, where appropriate.
Your answers must be set out in questions **a)**, **b)**, etc., as indicated in the question.

QUESTION 5

- a) Describe the structure of collagen and how it is related to its function. [6]
- b) Discuss the role of named proteins in photosynthesis. [8]
- c) Describe the roles of vesicles in a cell. [6]

QUESTION 6

- a) Describe how ATP is synthesised by anaerobic respiration in yeast. [6]
- b) Explain why variation is important for natural selection and how variation arises in a population. [6]
- c) Discuss the detrimental environmental and economic effects of growing genetically modified herbicide resistant crops. [8]

[Total: 20]

• END OF PAPER 2 •