

Name	Subject Class	Class	Candidate Number
	2BIX01		



ANGLO-CHINESE JUNIOR COLLEGE
Preliminary Examination 2017

BIOLOGY

HIGHER 1

8875/02
17 AUGUST 2017
2 hours

Paper 2

Additional Material: Writing Paper

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on this answer booklet.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.

Section A

Answer **all** questions.

Section B

Answer any **one** question.

At the end of the examination, circle the number of the Section B question you have answered in the grid opposite.
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	
Section B	
4 or 5	
Total	60

SECTION A
Answer all questions.

1 Fig. 1.1 shows part of a cell.

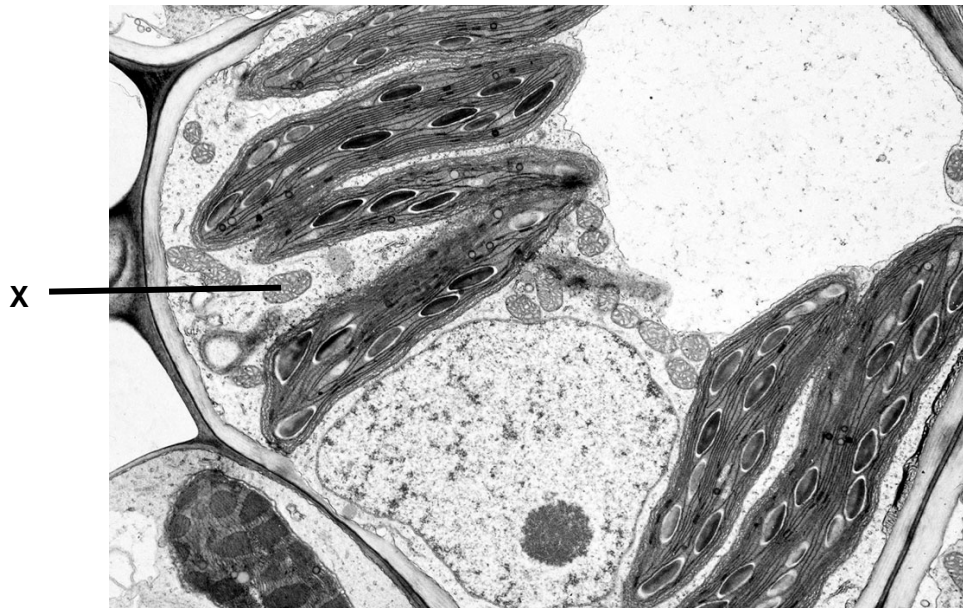


Fig. 1.1

(a) (i) Outline the role of the organelle labelled X.

[2]

(ii) Identify two molecules with different modes of transport across the double membrane of X and explain their modes of transport.

[4]

(b) (i) Explain the significance of glycolysis in aerobic respiration.

[4]

An experiment was carried out to investigate the effect of temperature on respiration in isolated mitochondria extracted from a worm. Respiratory substrate was provided and oxygen consumption was monitored at 15°C, 25°C and 35°C. Fig. 1.2 shows the temperature coefficients, Q_{10} , when temperature is increased from 15°C to 25°C and from 25°C to 35°C. Q_{10} measures the ratio of the rate of respiration when the temperature increases by 10°C.

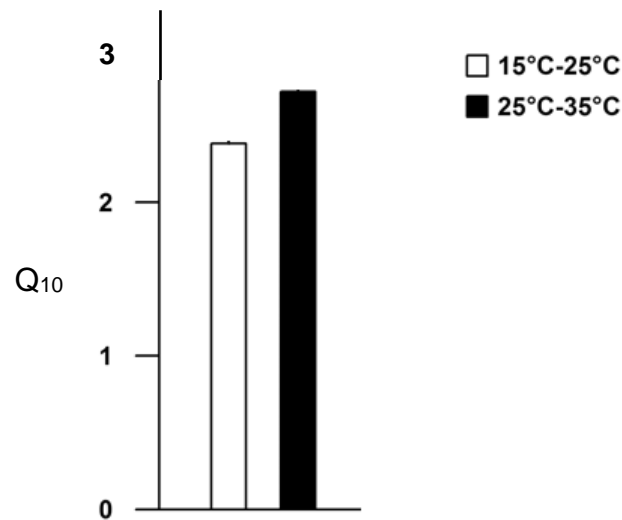


Fig. 1.2

(ii) Describe and explain the effect of temperature on the Q_{10} of mitochondria respiration.

[3]

[Total: 13 m]

- 2 Fig. 2.1 shows plant cells undergoing mitosis. Each of the cells A, B, C and D is in a different stage of mitosis.

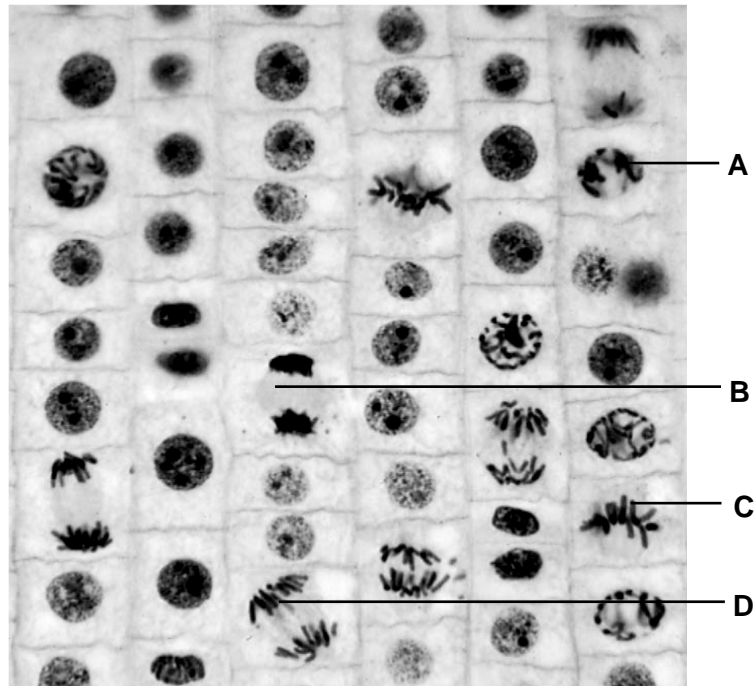


Fig. 2.1

- (a) (i) Using the letters provided, write the correct order of the stages in mitosis.

.....[1]

- (ii) Describe the stage of mitosis in cell B.

.....

[3]

Fig. 2.2 shows the change in DNA content of a plant cell during one cell cycle

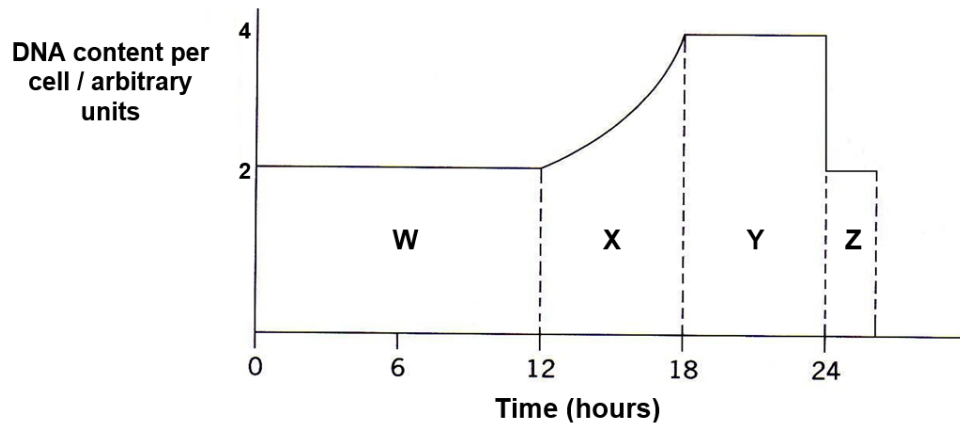


Fig. 2.2

- (b) (i) With reference to Fig. 2.2, identify which period (W to Z) of the cell cycle the radioactivity of the nuclei would first increase if radioactive thymine was added to the cell culture at 0 hours. Explain your answer.

[3]

- (ii) Explain why it is necessary for the cell cycle to be tightly regulated at various checkpoints that control the rate of cell division.

[1]

Horses were found to have three different coat colours – chestnut (brown), white and roan (patches of brown and white). The hair found on horses may be curly or smooth. These two traits are determined by two genes found on separate chromosomes, and each gene has two allelic forms.

When a true breeding chestnut horse with smooth hair was mated with a white horse with curly hair, all the progeny foals have roan coats with smooth hair.

- (c) Using appropriate symbols, construct a genetic diagram to show the expected genotypes and phenotypes of the F_2 progeny when two horses in the F_1 generation are crossed.

[5]

[Total: 13 m]

- 3 Arthropods are a vast group of animals that have been on earth for about 500 million years. Fig. 3.1 shows the dorsal (top) and ventral (bottom) views of the horseshoe crab (genus *Limulus*) and some characteristics representative of all arthropods. Fig. 3.2 shows a fossil and an artist's impression of the *Sanctacaris*, which is one of the earliest arthropods and proposed by some scientists to be the ancestor of the horseshoe crab.

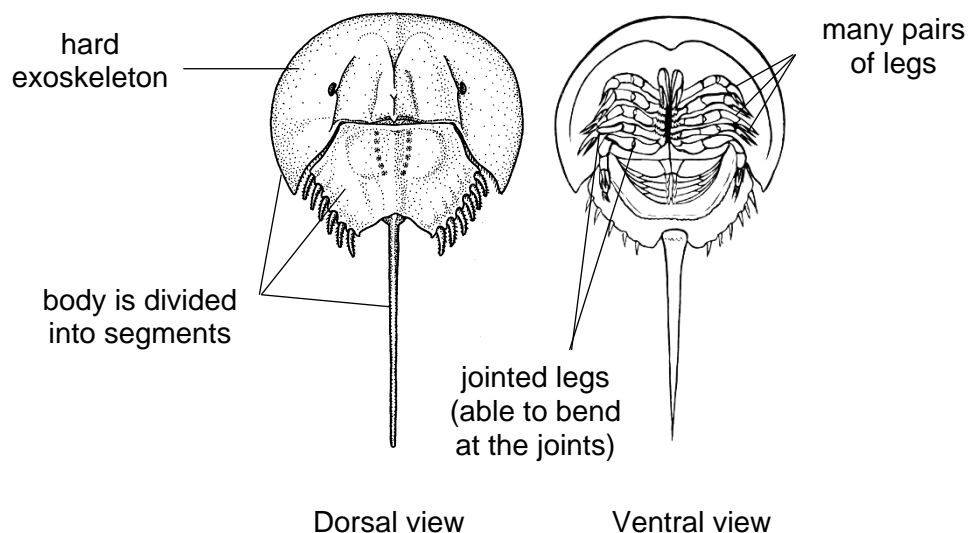


Fig. 3.1

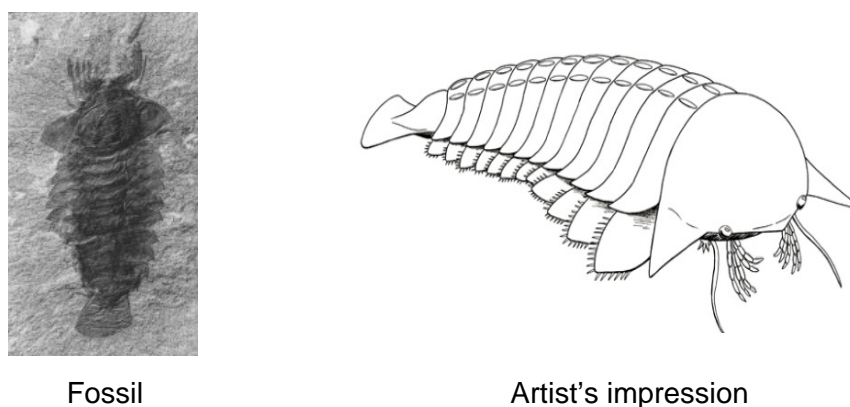


Fig. 3.2

- (a) (i) With reference to Figs. 3.1 and 3.2, explain why anatomy can be used to establish evolutionary relationships between fossils and their living descendants.

[3]

- (ii) Based on its flap-like appendages, Sanctacaris was believed to be an aquatic arthropod. The horseshoe crab, however, utilises land habitats for certain parts of its life cycle - the eggs are laid on the coast and juveniles are found on the sandy tidal flats. Adults are found deeper in the ocean until they return to the beach to lay their eggs.

Using the theory of natural selection, suggest how horseshoe crabs evolved from Sanctacaris.

[4]

- (b) (i) Explain why molecular homology is preferred over anatomical homology in determining relationships between organisms.

[2]

- (ii) Suggest why molecular homology was not used in establishing the relationship between the horseshoe crab and the Sanctacaris.

[1]

- (c) Genetic variation is essential for evolution. Explain how DNA mutations give rise to phenotypic variation.

[4]

[Total: 14 m]

Section BAnswer **EITHER 4 OR 5.**

Write your answers in the lined pages 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.

EITHER

- 4 (a)** Compare the structure of collagen and DNA. [6]
- (b)** With reference to the fluid mosaic model, describe the roles of phospholipids and proteins in a cell surface membrane. [8]
- (c)** Discuss the ethical concerns that have arisen from the human genome project. [6]

[Total: 20 m]

OR

- 5 (a)** Explain the roles of membranes in transcription and translation. [6]
- (b)** Describe the role of enzymes in the cloning of human Insulin gene from mRNA using *E. coli*. [8]
- (c)** Explain the normal functions and features of two named stem cells in a living organism. [6]

[Total: 20 m]

END OF PAPER