



22136017

**BIOLOGY**
STANDARD LEVEL
PAPER 2

Candidate session number

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Monday 13 May 2013 (afternoon)

1 hour 15 minutes

Examination code

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INSTRUCTIONS TO CANDIDATES

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all questions.
- Section B: answer one question.
- Write your answers in the boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is [50 marks].



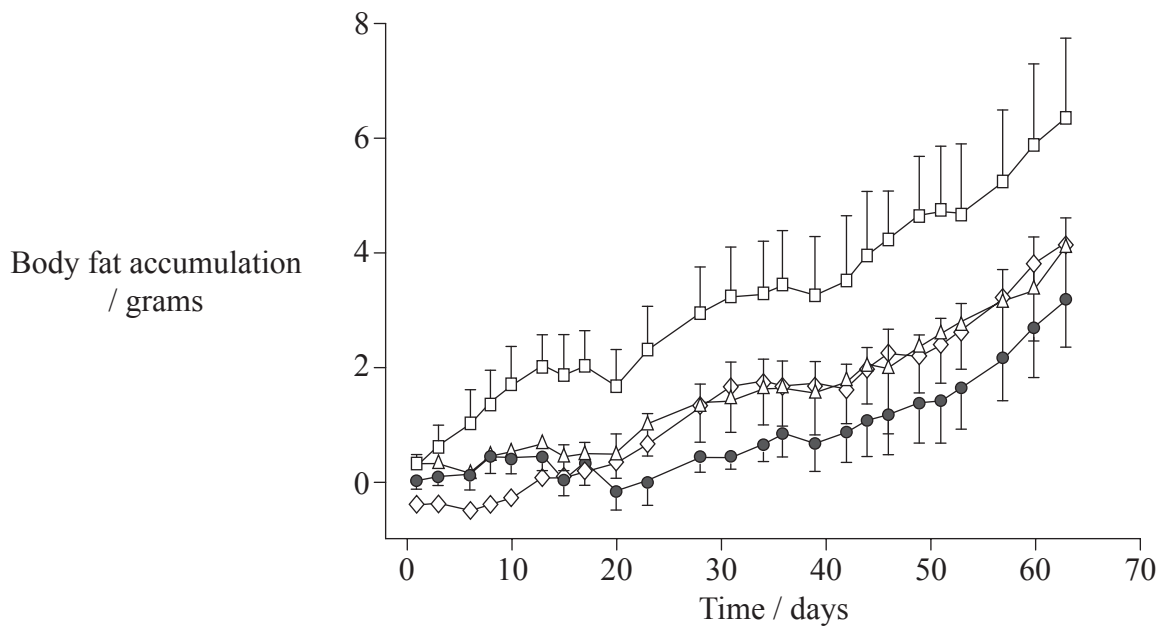
0116

SECTION A

Answer **all** questions. Write your answers in the boxes provided.

1. Obesity (excessive weight) is recognized as a global health problem and has been correlated with a large number of health issues, diseases and deaths. The increased consumption of fructose, now widely used as a sweetener, has been associated with the increase in obesity.

In a study, mice were divided into four groups. Each group was given the same amount of food and either a soft drink with a different sweetener or water.



Key: □ soft drink (fructose) △ diet soft drink (artificial sweetener)
◇ soft drink (sucrose) ● water

[Source: adapted from H Jürgens, *et al.*, (2005), *Obesity Research*, 13(7), pages 1146–1156]

- (a) Describe the overall trend in body fat accumulation for the four groups of mice. [1]

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(Question 1 continued)

(b) Compare the body fat accumulation between the four groups.

[2]

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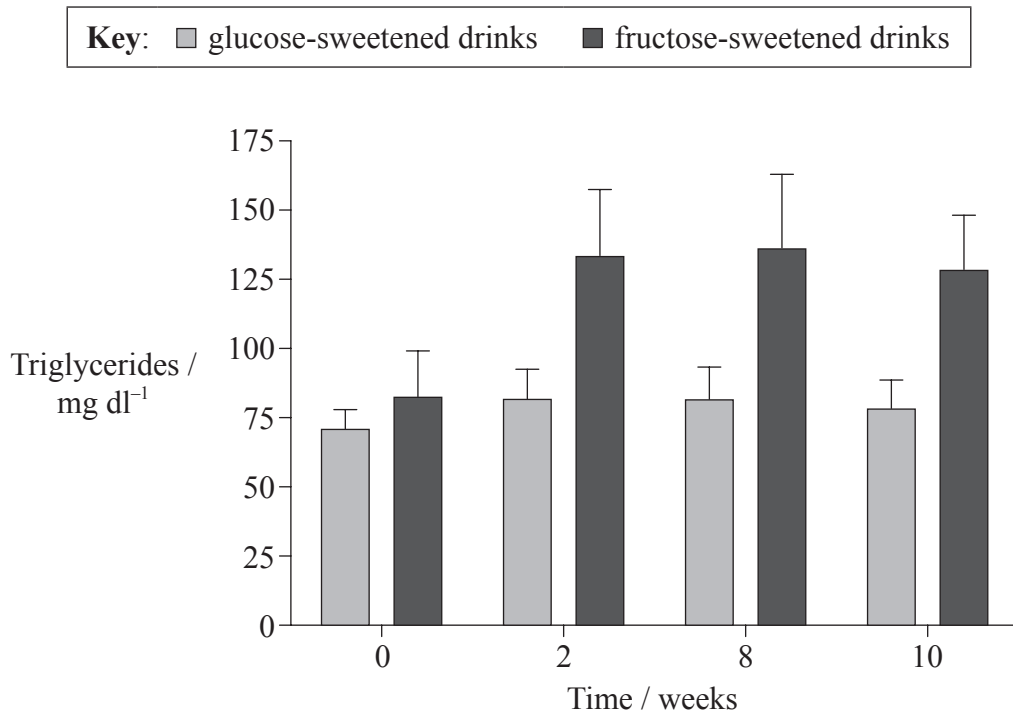


0316

Turn over

(Question 1 continued)

As it has been shown that high triglyceride levels correlate to obesity, another study was undertaken with humans. Over a ten-week period, one group was given glucose-sweetened drinks and the other fructose-sweetened drinks. Triglyceride levels in blood were measured throughout the study.



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(c) Distinguish between the results for the two groups.

[2]

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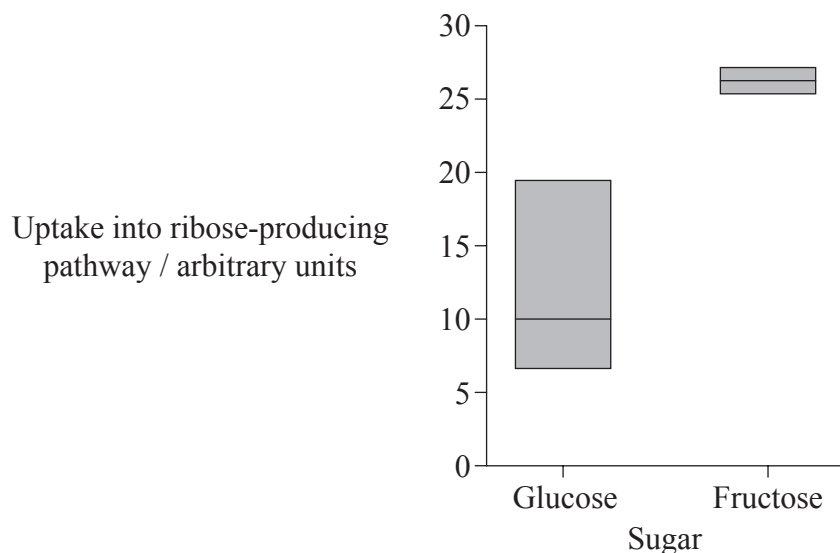
(Question 1 continued)

This study also showed a significant reduction in insulin sensitivity when participants were given fructose-sweetened drinks, but not when they were given glucose-sweetened drinks.

(d) State the disease that could be caused by excessive consumption of fructose. [1]

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Studies investigated the role of glucose and fructose in the development of pancreatic cancer cells. Pancreatic cancer cells were grown in equal concentrations of each sugar and the uptake of each into ribose-producing pathways was measured. The graph shows the range of uptake of sugars and the mean value.



[Source: adapted from H Liu, *et al.*, (2010), *Cancer Research*, 70(15), pages 6368–6376]

(e) Discuss whether the results provide clear evidence of a difference in uptake. [2]

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Turn over

(Question 1 continued)

- (f) Determine which sugar is **primarily** used in the production of ribose. [1]

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- (g) Suggest how sugar uptake might be related to pancreatic cancer. [2]

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- (h) Using all of the data, evaluate the evidence that suggests the consumption of large amounts of fructose poses a risk to human health. [3]

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2. (a) (i) Using the table, state whether recessive, dominant and codominant alleles are expressed in heterozygous and homozygous genotypes by writing yes, no **or** both. [2]

	Recessive allele	Dominant allele	Codominant alleles
Heterozygous genotype			
Homozygous genotype			

- (ii) State **two** alleles in blood groups that are codominant. [1]

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- (b) Clouded leopards live in tropical rainforests of South-East Asia. The normal spots (brown with a black outline) are dominant and black spots are recessive. The trait is sex-linked. A male with black spots was crossed with a female with normal spots. She had four cubs, two males and two females. For each sex, one cub had normal spots and the other cub had black spots.

Deduce the genotype of the mother. Show your work in a Punnett grid. [3]

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3. (a) List **two** factors that could cause an increase in the size of an animal population. [2]

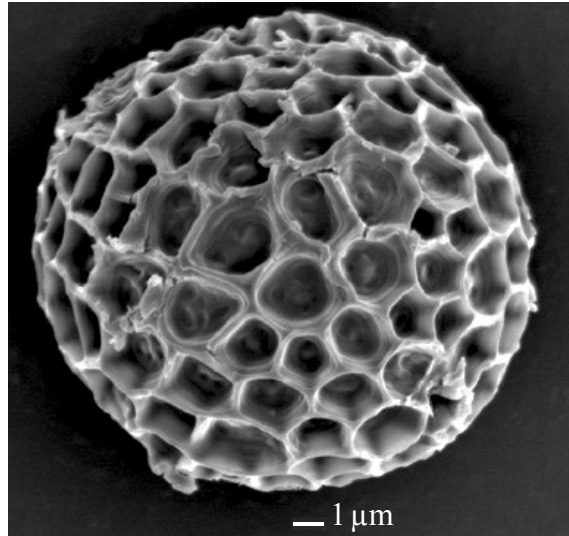
1.
2.

(b) Outline how overpopulation of a species in a given environment may lead to evolution. [4]

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4. (a) The electron micrograph is of a spore of a fungus (*Tilletia controversa*) which affects wheat.



[www.padil.gov.au/pbt/index.php?q=node/15&pbtID=163]

Determine the magnification of the spore in the electron micrograph. The scale bar represents 1 μm. Show your working. [2]

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- (b) Explain the importance of surface area to volume ratio as a limit to cell size. [2]

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SECTION B

*Answer **one** question. Up to two additional marks are available for the construction of your answer. Write your answers in the boxes provided.*

5. (a) State the source, substrate, products and optimal pH condition for lipase in the human digestive system. [4]
- (b) Outline the use of **named** enzymes in gene transfer using plasmids. [6]
- (c) Explain the effect of changes of pH, substrate concentration and temperature on enzyme activity. [8]
6. (a) State the functions of the following organelles of a eukaryotic animal cell: lysosome, Golgi apparatus, free ribosomes, plasma membrane, rough endoplasmic reticulum. [5]
- (b) Distinguish between anaerobic and aerobic cell respiration in eukaryotes. [4]
- (c) Explain the mechanism of ventilation in the lungs in order to promote gas exchange for cell respiration. [9]
7. (a) Outline how and where energy is stored in plants. [4]
- (b) Ecologists sometimes display data from an ecosystem using a diagram called a pyramid of energy. Describe what is shown in pyramids of energy. [6]
- (c) Explain the control of body temperature in humans. [8]



[Lined writing area with 30 horizontal dotted lines]



A large rectangular area containing horizontal dotted lines for writing.



A large rectangular area for writing, containing numerous horizontal dotted lines for text entry.



A large rectangular box with a thin black border, filled with horizontal dotted lines. The lines are evenly spaced and extend across the width of the box, providing a guide for writing.