THIS IS A NEW SPECIFICATION

OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE

BIOLOGY

Molecules, Biodiversity, Food and Health

F212

Candidates answer on the Question Paper

OCR Supplied Materials:
- Insert (inserted)

Other Materials Required:
- Electronic calculator
- Ruler (cm/mm)

Tuesday 8 June 2010
Morning

Duration: 1 hour 45 minutes

* F 2 1 2 *

* O C E / 1 6 4 4 0 *

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **100**.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
-  Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- This document consists of **24** pages. Any blank pages are indicated.

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Answer **all** the questions.

1 **(a)** Milk is considered to be a complete food containing most of the components of a balanced diet.

A student carried out a series of food tests on a sample of milk. The student's observations and conclusions are shown in Table 1.1.

(i) Complete Table 1.1 by

- naming the molecule being tested for
- stating whether this molecule is present or absent.

The first row has been completed for you.

Table 1.1

reagent	observation	molecule being tested for	present or absent
ethanol and water	white emulsion	lipid	present
Benedict's solution	brick-red precipitate		
biuret I and II	lilac colour		
iodine solution	yellow / brown		

[3]

(ii) Although the student entered 'present' for lipid in the first row of the table, he was unsure whether the result was correct.

Suggest why the student was unsure if the positive result for lipid was correct for the milk sample.

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..... **[1]**

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(iii) Triglycerides are a type of lipid found in milk.

Describe the structure of a triglyceride molecule.

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..... **[3]**

(b) State **three** roles of lipids in living organisms.

1 .....

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2 .....

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3 .....

..... **[3]**

(c) Human populations with diets high in animal fats have a lower life expectancy than those with diets high in vegetable oils.

(i) Suggest **one** difference between lipids from animals and those from plants.

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..... **[1]**

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Animal fats are thought to raise blood cholesterol levels. High blood cholesterol levels can lead to premature death.

Fig. 1.1 shows the relationship between blood cholesterol level and annual death rate per 10 000 of the population.

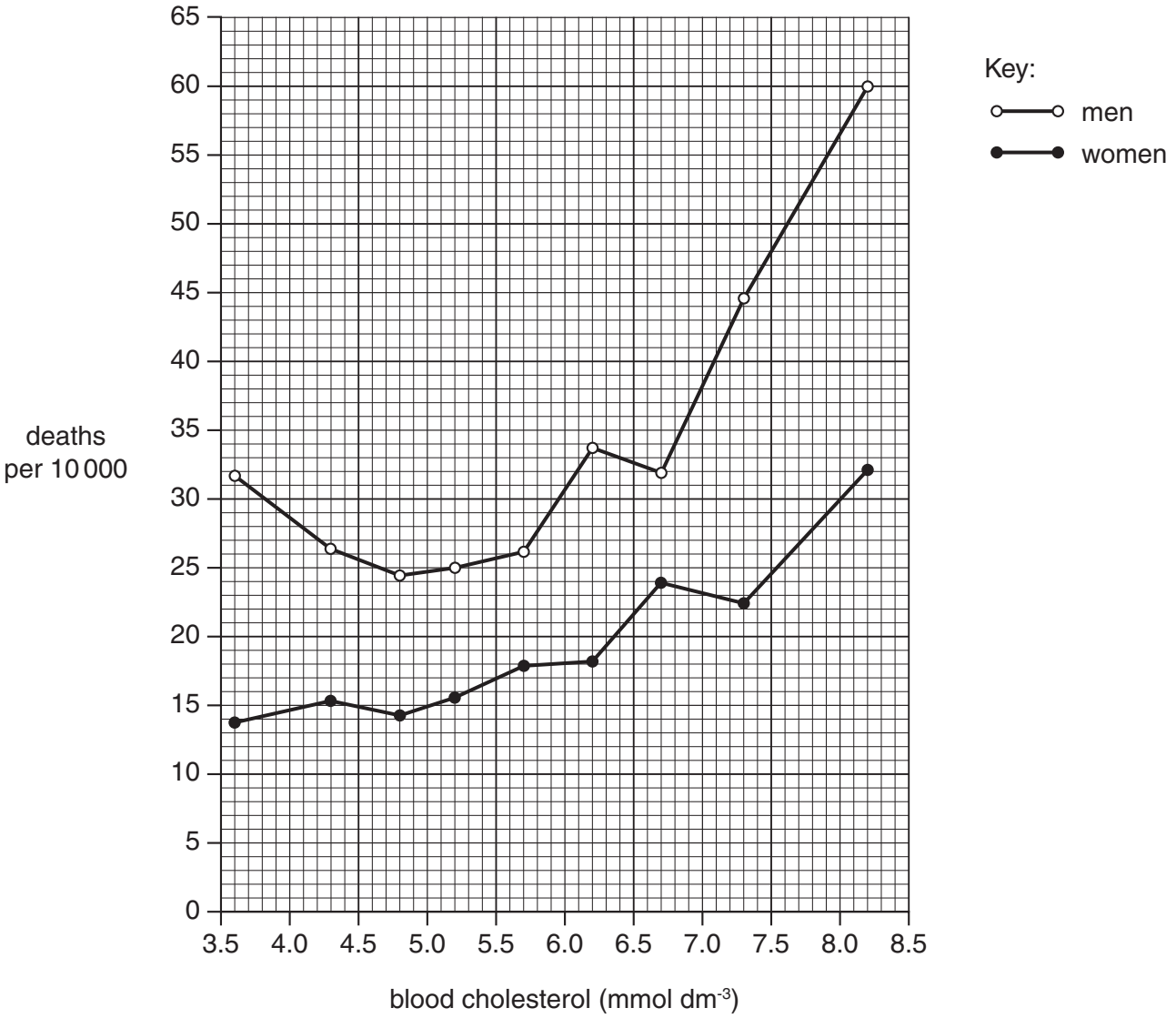


Fig. 1.1

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(ii) Describe the trends shown in Fig. 1.1.

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..... **[3]**

(iii) Increased blood cholesterol levels are associated with certain medical conditions.

Suggest **two** medical conditions that may be associated with increased blood cholesterol levels.

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..... **[2]**

[Total: 16]

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2 When a new species is discovered, it needs to be classified.

(a) Define the term *classification.*

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..... **[2]**

(b) **(i)** Suggest what criteria a taxonomist may take into account when classifying a new species.

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..... **[3]**

(ii) Table 2.1 shows the main taxonomic groups. The groups are **not** in the correct order.

Table 2.1

	Q	**R**	**S**	**T**	**U**	**V**	**W**
taxonomic group	species	order	class	phylum	genus	kingdom	family

Place the **letters** representing the taxonomic groups into the correct order.

The first one has been done for you.

V

…… …… …… …… …… …… …… **[3]**

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(c) The classification of organisms into domains is relatively new.

Describe the differences between a classification system based on domains and one based on kingdoms.

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..... **[4]**

[Total: 12]

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3 **(a)** In Scotland, in 2007, there was a major food poisoning outbreak that killed three people.

Suggest **one** group in the population that is more likely to die from food poisoning **and** give a reason for your suggestion.

group .....

reason .....

..... **[2]**

(b) The food poisoning outbreak involved the bacterium *Escherichia coli* 0157 (*E. coli* 0157) which had been responsible for contaminating meat products. The meat had been stored at 11 °C rather than the recommended 5 °C and this led to meat spoilage.

(i) Explain how bacteria cause food spoilage.

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..... **[3]**

(ii) Food normally spoils much faster if stored at temperatures higher than 5 °C.

Explain why food spoils faster at higher temperatures.

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..... **[3]**

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(iii) Food can be preserved by keeping it at low temperature in a refrigerator or freezer.

Name **two other** methods of food preservation and state how each method works.

method .....

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how the method works .....

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method .....

.....

how the method works .....

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..... **[4]**

QUESTION 3(c) STARTS ON PAGE 10

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(c) Microorganisms, such as the fungus *Fusarium*, can be grown and then purified to produce mycoprotein. This mycoprotein can be used as a food source for humans.

Table 3.1 compares mycoprotein with beef.

Table 3.1

food	content per 100g					
	energy (kJ)	protein (g)	carbohydrate (g)	total fat (g)	saturated fat (g)	iron (mg)
mycoprotein	357	12	9	2.9	0.6	0.1
beef	1163	26	0	18.2	7.0	2.6

Use the data in Table 3.1 to **describe and explain** the advantages and disadvantages of using microorganisms to produce food for human consumption.



In your answer you should make comparisons using the information in Table 3.1.

advantages .....

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disadvantages .....

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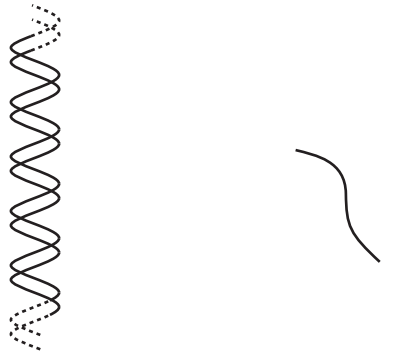
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[Total: 20]

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4 **(a)** Fig. 4.1 is a drawing that represents molecules of DNA and messenger RNA (mRNA).



DNA **mRNA**

Fig. 4.1

The mRNA molecule is shorter than the DNA molecule.

(i) State, using **only** the information in Fig. 4.1, **one other** way to distinguish between DNA and mRNA.

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..... **[1]**

(ii) Give **one** further difference in **structure** between DNA and RNA.

.....

..... **[1]**

DNA and mRNA are both involved in protein synthesis. The mRNA molecule, carrying the code for protein, leaves the nucleus and attaches to a ribosome. The ribosome is the site where a protein molecule is formed.

(iii) Complete the following statement:

A sequence of DNA nucleotides that codes for a protein is a ..... **[1]**

(iv) Suggest why DNA is not able to leave the nucleus.

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..... **[1]**

(v) Explain why the mRNA molecule is shorter than a DNA molecule.

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..... **[2]**

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(b) Enzymes are involved in the production of mRNA in eukaryotic cells. One enzyme is inhibited by the toxin, α-amanitin.

Fig. 4.2 shows the effect when α-amanitin attaches to this enzyme.

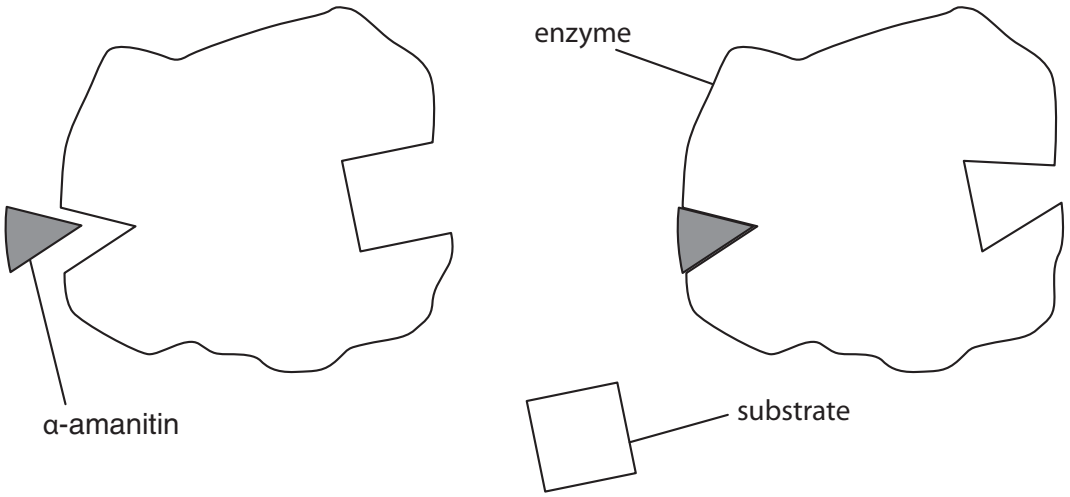


Fig. 4.2

(i) Explain how α-amanitin stops the formation of an enzyme-substrate complex during RNA production.

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..... **[2]**

(ii) The Roman Emperor Claudius was poisoned by his wife Agrippina when she gave him death cap fungus to eat. The death cap fungus contains α-amanitin.

Suggest how the toxin α-amanitin may lead to the death of an organism.

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..... **[2]**

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(c) (i) Enzymes are globular proteins with a specific three dimensional shape. The shape is determined by the primary structure.

State the meaning of the term *primary structure*.

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..... **[1]**

Fig. 4.3 shows some of the chemical bonds that hold the **tertiary** structure of a protein together.

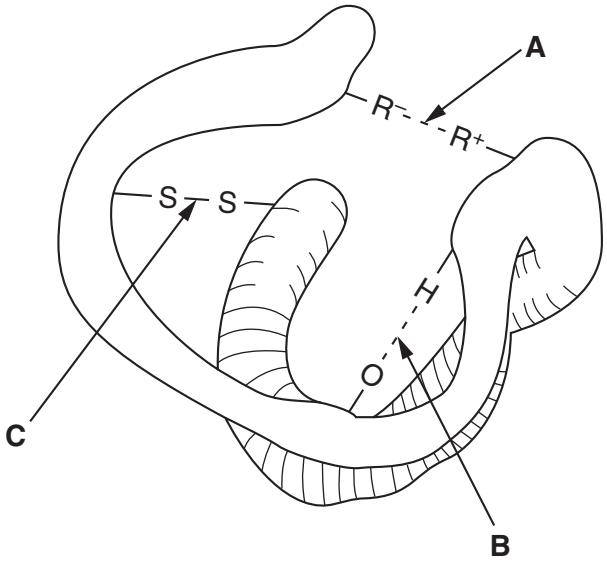


Fig. 4.3

(ii) Name the bonds labelled **A**, **B** and **C**.

A.....

B.....

C .....

[3]

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(d) When proteins are heated to a high temperature, their tertiary structure is disrupted.

Explain how this occurs.

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..... **[3]**

[Total: 17]

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5 **(a)** Smoking increases the risk of lung infections.

(i) Explain how the mucus and the cilia in the air passages reduce the chance of developing lung infections.

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..... **[2]**

QUESTION 5 CONTINUES ON PAGE 16

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In an individual with bronchitis, the mucus contains a large number of pathogenic bacteria. Phagocytic white blood cells destroy the bacteria.

Fig. 5.1 shows the sequence of events that results in the destruction of a bacterium.

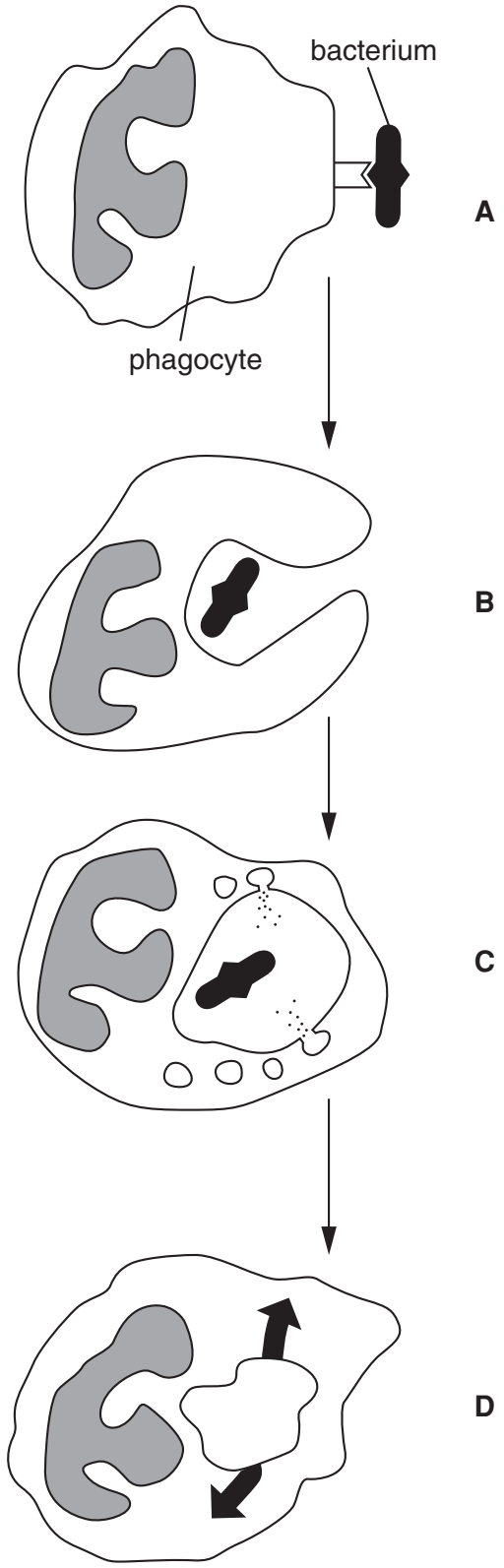


Fig. 5.1

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(ii) Describe the events taking place at stages **A**, **B**, **C** and **D**, in sequence.

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..... **[6]**

(b) The immune system will produce specific antibodies in response to infection.

(i) Name the type of cell that produces antibodies.

..... **[1]**

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(ii) Describe how the structure of an antibody molecule is related to its function.



In your answer you must clearly link structure and function.

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(iii) Identify the type of immunity provided by antibodies in breast milk.

Place a tick (✓) in the correct box.

type of immunity

artificial active	
artificial passive	
natural active	
natural passive	

[1]

[Total: 17]

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6 **(a)** Before any major development can take place, an Environmental Impact Assessment (EIA) needs to be carried out.

One such development is the proposed extension to the M27 motorway in Hampshire. This extension would cut through an important heathland ecosystem.

Suggest **three** aspects of this development that would need to be considered when carrying out the EIA.

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..... **[3]**

(b) An ecologist carried out a survey of butterfly species on the heathland.

The ecologist walked along a marked path on four different days in June. She counted

- the number of butterfly species
- the number of individual butterflies of each species.

(i) Suggest how this method of collecting data could be improved.

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(ii) The ecologist's results are shown in Table 6.1.

These results can be used to calculate the Simpson's Index of Diversity (D) for butterflies in this heathland using the formula:

$$D = 1 - [\Sigma (n/N)^2]$$

where n = number of individuals of a species in the sample
N = total number of individuals of all species in the sample

Complete the table by filling in the **three** missing values.

Table 6.1

species	n	n/N	$(n/N)^2$
Grayling (*Hipparchia semele*)	3	0.0968	0.09370
Large Heath (*Coenonympha tullia*)	11	……	0.12588
Gatekeeper (*Pyronia tithonus*)	6	0.1935	0.03744
Green Hairstreak (*Callophrys rubi*)	2	0.0645	0.00416
Silver-studded Blue (*Plebeius argus*)	2	0.0645	0.00416
Small Heath (*Coenonympha pamphilus*)	7	0.2258	0.05099
		Sum (Σ)	……
		1 – Σ	D = ……

[3]

(iii) Suggest the implications of a high value of Simpson's Index of Diversity on planning decisions.

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..... **[2]**

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(c) (i) The six species of butterfly identified by the ecologist in the survey are shown **on the insert** in Fig. 6.1.

The ecologist used a dichotomous key to identify these butterflies. This key is shown below:

Key:

Question 1	Round spots on the under wing	yes	go to question 2
		no	go to question 4
Question 2	Orange upper wing	yes	go to question 3
		no	**Silver-studded Blue**
Question 3	One spot on upper wing	yes	**Gatekeeper**
		no	**Large Heath**
Question 4	Spots on upper wing	yes	go to 5
		no	**Green Hairstreak**
Question 5	One spot on upper wing	yes	**Small Heath**
		no	**Grayling**

Identify the butterflies shown in Fig. 6.1 using the key.

Complete Table 6.2 below. One butterfly has been identified for you.

Table 6.2

species	letter
Grayling (*Hipparchia semele*)	
Large Heath (*Coenonympha tullia*)	
Gatekeeper (*Pyronia tithonus*)	
Green Hairstreak (*Callophrys rubi*)	
Silver-studded Blue (*Plebeius argus*)	
Small Heath (*Coenonympha pamphilus*)	E

[5]

QUESTION 6(c)(ii) STARTS ON PAGE 24

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(ii) State why Small Heath and Large Heath butterflies both share part of their scientific name.

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..... **[2]**

[Total: 18]

END OF QUESTION PAPER

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