

Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
ADVANCED SUBSIDIARY GCE**

F212

BIOLOGY

Molecules, Biodiversity, Food and Health

TUESDAY 8 JUNE 2010: Morning

DURATION: 1 hour 45 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the Question Paper

OCR SUPPLIED MATERIALS:

Insert (inserted)

OTHER MATERIALS REQUIRED:

Electronic calculator


Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.
- 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.
- 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.

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.

[1]

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

Describe the structure of a triglyceride molecule.

[3]

(b) State THREE roles of lipids in living organisms.

1 _____

2 _____

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.

_____ **[1]**

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

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

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

[3]

Key:

○—○ men

●—● women

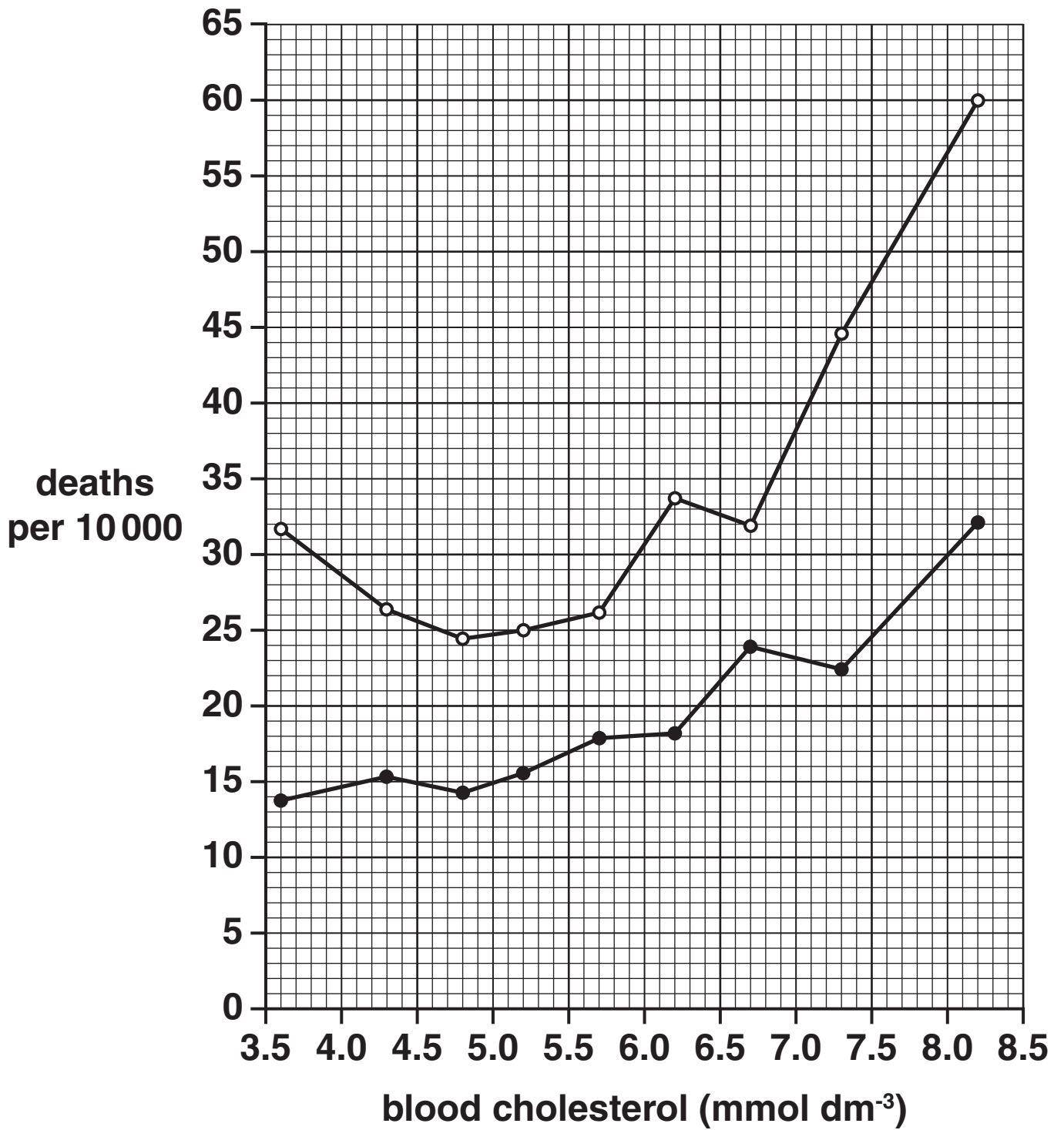


Fig. 1.1

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

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

[2]

[Total: 16]

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

(a) Define the term *classification*.

[2]

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

[3]

- (ii) Table 2.1, opposite, shows the main taxonomic groups. The groups are NOT in the correct order.

Place the LETTERS representing the taxonomic groups into the correct order.

The first one has been done for you.

V _____ _____ _____ _____ _____ _____ [3]

Table 2.1

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

- 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.

_____ [3]

- (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 _____

how the method works _____

method _____

how the method works _____

_____ [4]

QUESTION 3(c) STARTS ON PAGE 16

- (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, on the INSERT, compares mycoprotein with beef.

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 _____

disadvantages _____

_____ **[8]**

[Total: 20]

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

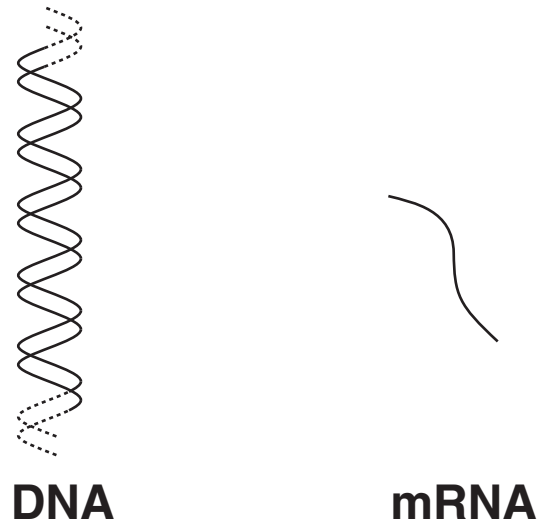


Fig. 4.1

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.

_____ [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.

_____ [1]

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

_____ [2]

(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.

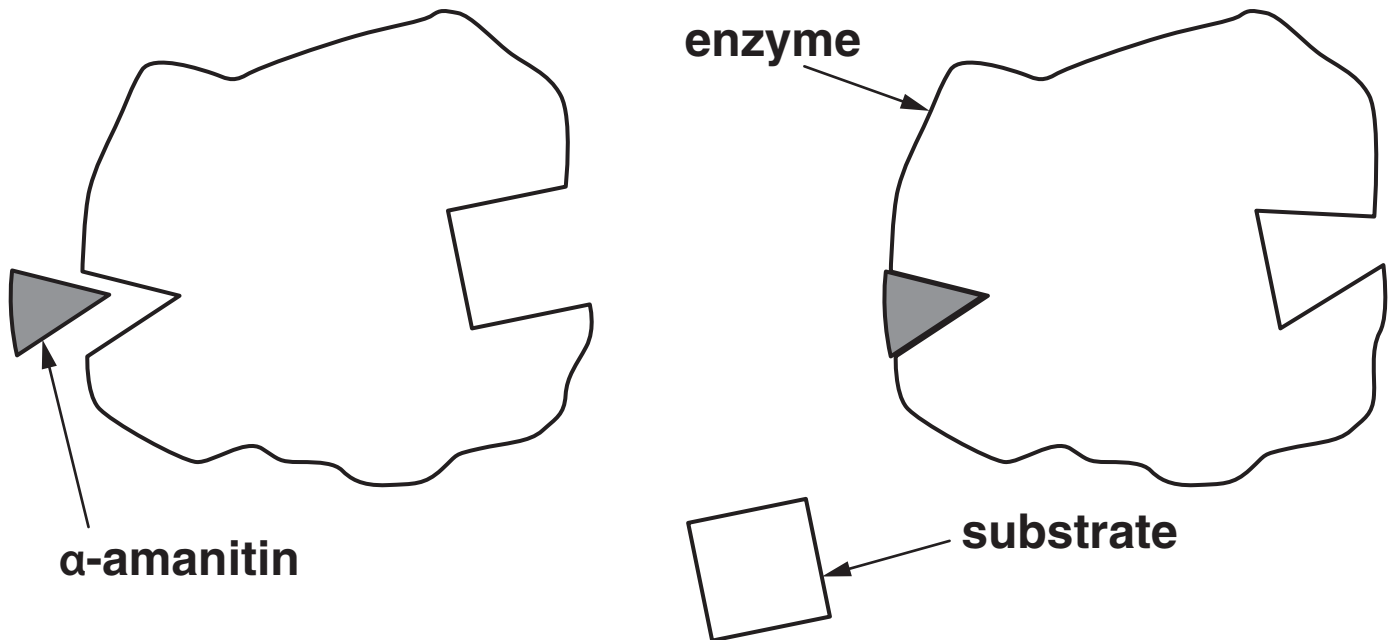


Fig. 4.2

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

[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.

[2]

- (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*.

_____ [1]

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

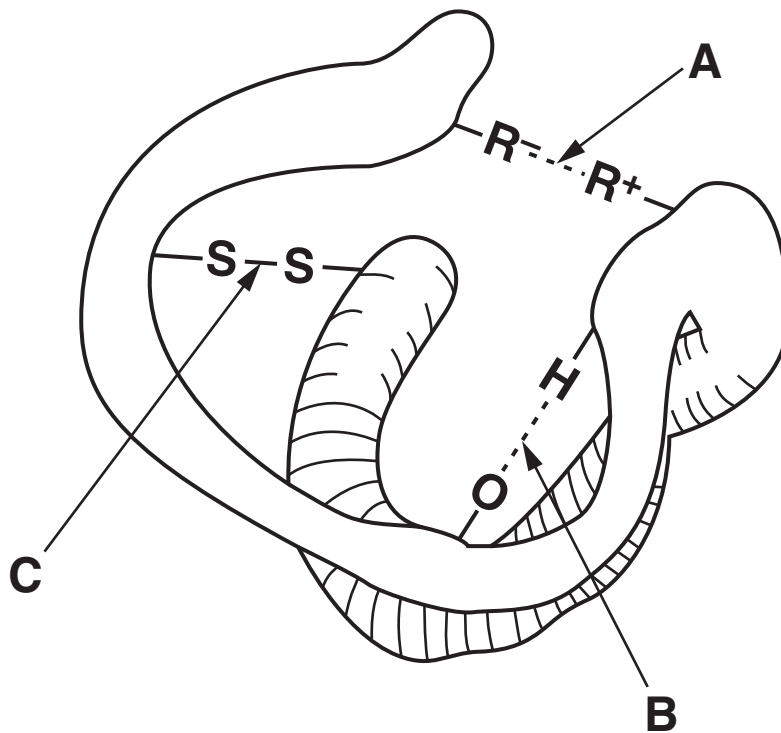


Fig. 4.3

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

A _____

B _____

C _____

[3]

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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.

[2]

QUESTION 5 CONTINUES ON PAGE 26

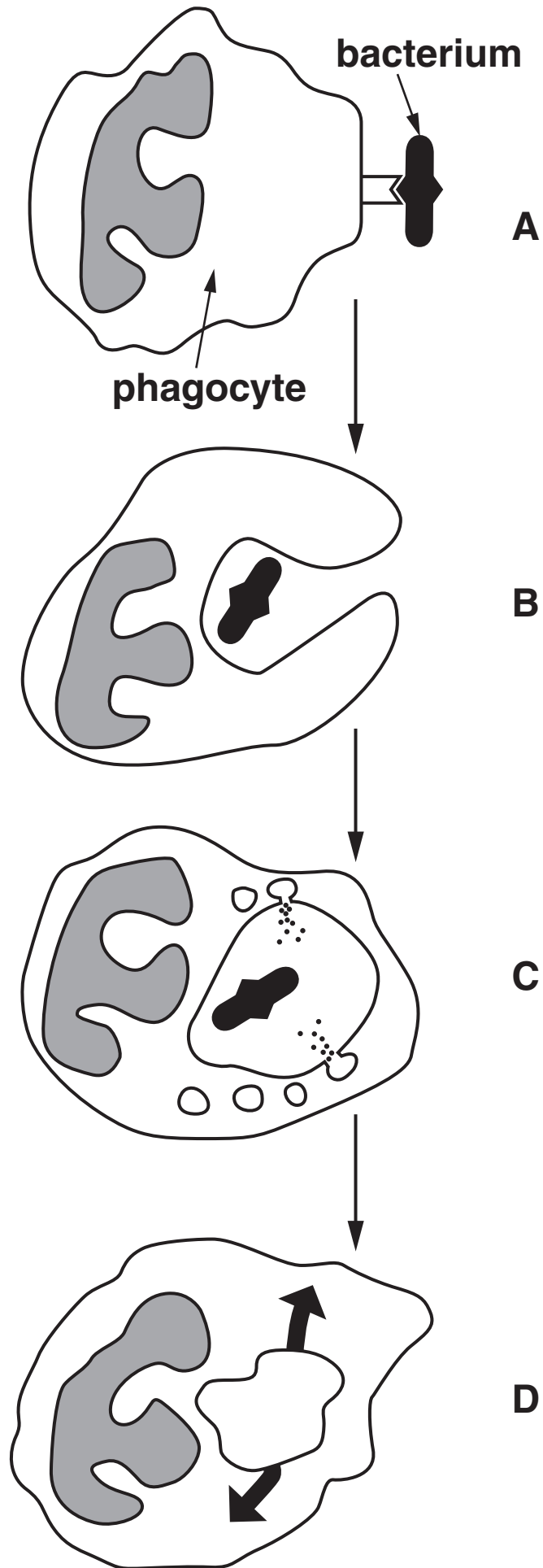


Fig. 5.1

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

Place a tick (✓) in the correct box.

type of immunity

artificial active	<input type="checkbox"/>
--------------------------	--------------------------

artificial passive	<input type="checkbox"/>
---------------------------	--------------------------

natural active	<input type="checkbox"/>
-----------------------	--------------------------

natural passive	<input type="checkbox"/>
------------------------	--------------------------

[1]

[Total: 17]

BLANK PAGE

QUESTION 6 STARTS ON PAGE 32

- 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.

[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.

[3]

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

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

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

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 (<i>Hipparchia semele</i>)	3	0.0968	0.09370
Large Heath (<i>Coenonympha tullia</i>)	11	_____	0.12588
Gatekeeper (<i>Pyronia tithonus</i>)	6	0.1935	0.03744
Green Hairstreak (<i>Callophrys rubi</i>)	2	0.0645	0.00416
Silver-studded Blue (<i>Plebeius argus</i>)	2	0.0645	0.00416
Small Heath (<i>Coenonympha pamphilus</i>)	7	0.2258	0.05099
		Sum (Σ)	_____
		1 - Σ	D = _____

[3]

QUESTION 6(b)(iii) STARTS ON PAGE 36

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

[2]

BLANK PAGE

QUESTION 6(c)(i) STARTS ON PAGE 38

- (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 no	go to question 2 go to question 4
Question 2	Orange upper wing	yes no	go to question 3 SILVER-STUDDED BLUE
Question 3	One spot on upper wing	yes no	GATEKEEPER LARGE HEATH
Question 4	Spots on upper wing	yes no	go to 5 GREEN HAIRSTREAK
Question 5	One spot on upper wing	yes no	SMALL HEATH GRAYLING

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

COMPLETE TABLE 6.2 ON THE OPPOSITE PAGE. One butterfly has been identified for you.

Table 6.2

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

[5]

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

[2]

[Total: 18]

END OF QUESTION PAPER



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