OCR
RECOGNISING ACHIEVEMENT

SPECIMEN

Advanced Subsidiary GCE

BIOLOGY

Unit F212: Molecules, Biodiversity, Food and Health

Specimen Paper

F212 QP

Candidates answer on the question paper.

Additional Materials:

Ruler mm/cm
Scientific calculator

Time: 1 hour 45 mins

Candidate Name	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

- Write your name, Centre number and Candidate number in the boxes above.
- Answer **all** the questions.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Do **not** write in the bar code.
- Do **not** write outside the box bordering each page.
- WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED.

INFORMATION FOR CANDIDATES

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

FOR EXAMINER'S USE		
Qu.	**Max.**	**Mark**
1	**19**	
2	**15**	
3	**13**	
4	**16**	
5	**18**	
6	**9**	
7	**10**	
Total	**100**	

This document consists of **17** printed pages and **3** blank pages.

Answer **all** the questions.

1 Some species of Acacia tree produce gum Arabic. Gum arabic is classed as a heteropolysaccharide. This means that it is made up of a number of different sugars.

Hydrolysis of gum arabic releases four different monosaccharides.

(a) Describe what happens during the hydrolysis of a polysaccharide molecule.

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

(b) Complete the table below, comparing gum arabic with some other polysaccharides.

	gum arabic	amylose	cellulose	glycogen
branched structure	yes		no	
heteropolysaccharide	yes		no	
found in animals/plants	plants		plants	
function in organism	healing cuts			energy store

[4]

(c) *Acacia senegal* is a species of tree which is common in the drier parts of Africa. Cattle are allowed to graze on both its leaves and the fallen seed pods. The seed pods have relatively high protein content.

(i) Describe how you would test an extract of the seed pods for protein.

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

(ii) Describe how you could compare the **reducing sugar** content of the leaves with that of the seed pods.

In your answer you should make clear how the steps in the process are sequenced.

[8]

(iii) The **seeds** of *Acacia* species are sometimes eaten by people.

Suggest why it might be better for people living in areas where the tree grows to let their cattle feed on the trees and fallen seed pods and then obtain their nutrition from the cattle.

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

Total [19]

2 DNA and RNA are nucleic acids.

(a) (i) Describe the structure of a DNA **nucleotide**.

In your answer you should spell the names of the molecules correctly.

You may use the space below to draw a diagram if it will help your description.

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

(ii) Describe how the two nucleotide chains in DNA are bonded together.

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(b) State **three** ways in which the structure of DNA differs from that of RNA.

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(c) An antibody is an example of a protein molecule**,** which has a specific 3-dimensional shape.

Fig. 2.1 shows the structure of an antibody molecule.

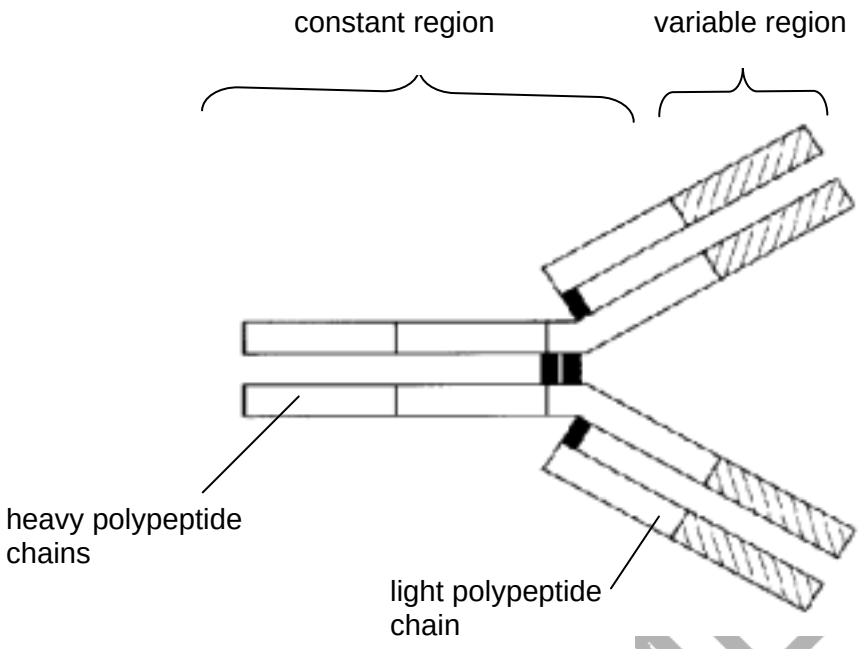

Fig 2.1

(i) Outline how the structure of an antibody molecule is related to its function.

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(ii) Suggest why the base sequence in the genes for human antibodies is more similar to that found in a chimp than to that found in a mouse.

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Total: [15]

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3 The fungus, yeast, contains the enzyme catalase.

Catalase speeds up the decomposition of hydrogen peroxide, a toxic metabolic product, to oxygen and water.

$$2\ H_2O_2 \rightarrow 2\ H_2O + O_2$$

A student decided to investigate the activity of catalase using the apparatus shown in Fig. 3.1.

The total volume of gas collected was recorded every 20 seconds.

The results are shown in Fig. 3.2.

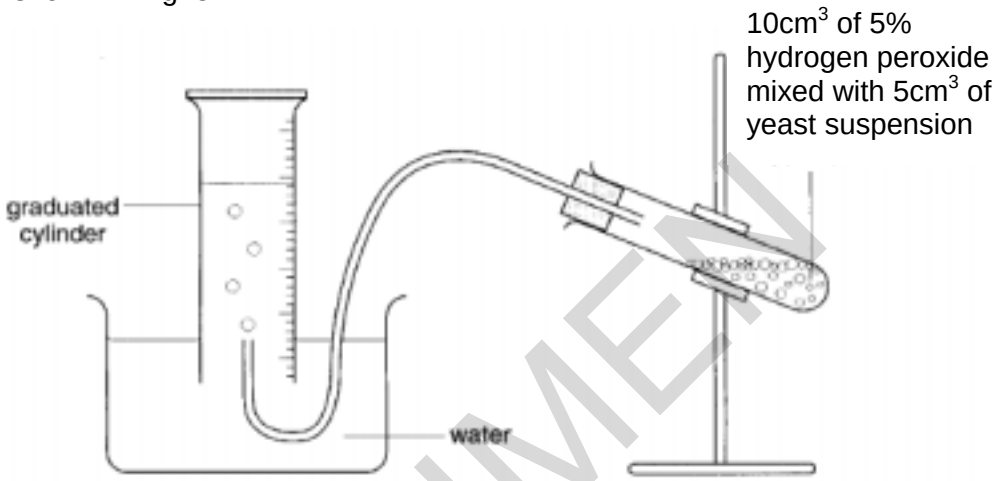

Fig. 3.1

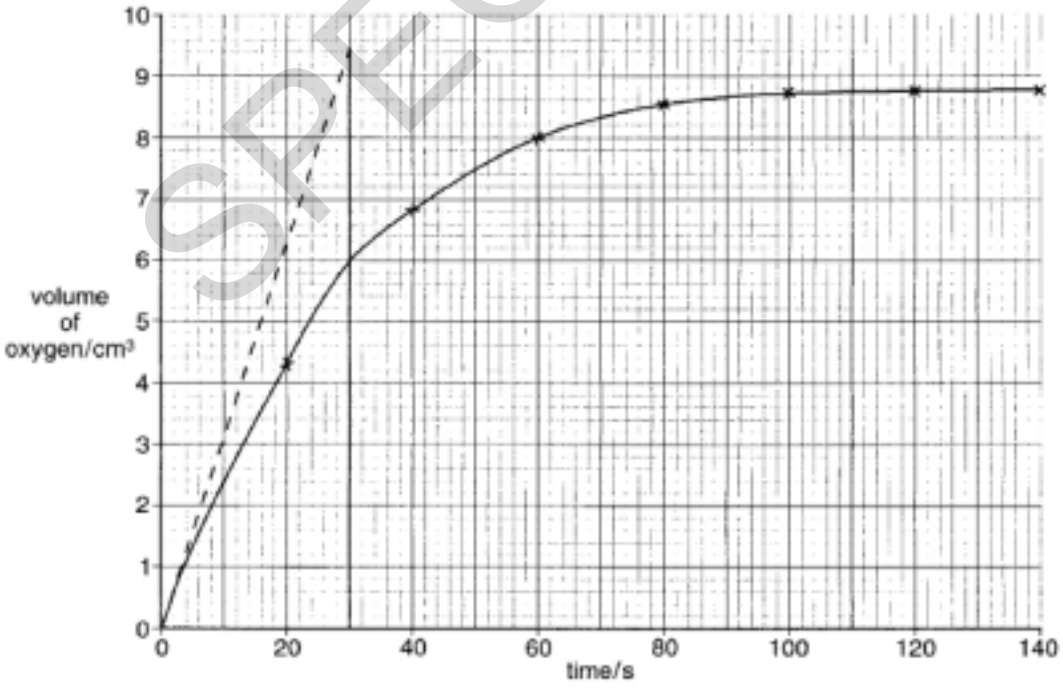

Fig. 3.2

The rate of decomposition can be calculated using the formula:

$$\text{rate of decomposition} = \frac{\text{volume of oxygen collected}}{\text{time taken for collection}}$$

(a) Calculate the rate of decomposition over the first 30 seconds.

Show your working and give your answer in **cm^3 min^{-1}**.

Answer: = ... cm^3 min^{-1} **[2]**

(b) The initial rate of decomposition is the rate measured within the first few seconds. Using the dashed line in Fig. 3.2, the initial rate of decomposition is calculated to be 19 $cm^3 min^{-1}$.

Explain why the initial rate of reaction is greater than the rate you calculated in **(a)**.

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(c) Fungi such as *Fusarium venenatum* are grown in huge batch cultures to manufacture protein for food products.

Explain why these cultures are often maintained at the optimum temperature for protein production and not at a temperature above the optimum.

✎ *In your answer you should make clear how the structure and activity of enzymes relates to the effects described.*

....**[8]**

Total: [13]

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4 A group of students carried out some fieldwork to investigate the diversity of insects in three habitats:

- a field of barley
- a field of wheat
- the vegetation under a hedge.

Their results are shown in Table 4.1. Table 4.1 also shows how they used their data to calculate Simpson's Index of Diversity (D) for each habitat.

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

where N = the total number of insects found, and n is the number of individuals of a particular species.

	number of individuals of each species in each habitat		
species	barley field	wheat field	under hedge
a	32	4	0
b	78	0	1
c	0	126	2
d	0	5	12
e	0	0	8
f	0	0	9
g	0	25	3
h	0	10	3
i	0	0	2
j	0	0	5
k	86	56	0
l	0	0	7
species richness	3	6	10
total number of insects (N)	196	226	52
Simpson's Index of Diversity (D)		0.61	0.86

Table 4.1

(a) State what is meant by the term *species richness*.

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

(b) **(i)** Calculate the value for Simpson's Index of Diversity (D) for the barley field.

Show your working and write your answer **in the shaded box in Table 4.1**.

[2]

(ii) Using the data in Table 4.1, suggest why the value of Simpson's Index of Diversity (D) for the vegetation under the hedge is so much higher than that for the wheat field.

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(c) Describe how the students may have determined the numbers of individuals of each species in each habitat.

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(d) Studies of biodiversity are an integral part of an environmental impact assessment (EIA).

(i) Discuss the role of an EIA as part of a local planning decision.

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(ii) Suggest why some conservationists might object to these studies.

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Total: [16]

[Turn over

5 The leopard, *Panthera pardus*, is a large member of the cat family.

(a) Complete the following table to show the full classification of the leopard.

Kingdom	……..
…….	Chordata
Class	Mammalia
……..	Carnivora
Family	Felidae
Genus	……..
…….	*pardus*

[5]

(b) The leopard belongs to a kingdom in which all members are eukaryotic. Plants are also eukaryotic.

Name **two** other kingdoms that contain eukaryotic organisms.

1. .....

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

(c) Historically, all organisms were classified into just two kingdoms. In 1988 a five-kingdom system of classification was accepted. In 1990 a three domain system was proposed.

Discuss, with reference to the **Prokaryotes**, the reasons why classification systems are not universally accepted and why they change over time.

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(d) *Staphylococcus aureus* is a species of bacterium that is found on the skin.

(i) Describe how variation may arise within a species of bacterium such as *S. aureus.*

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

(ii) Suggest why such variation alters the characteristics of the individual organism.

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

(e) Discuss the difficulties that variations arising in *S. aureus* may cause to the medical profession.

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

Total: [18]

6 The Human Immunodeficiency Virus (HIV) is spread by exchange of body fluids between an infected person and an uninfected person. This often occurs as a result of unprotected sexual intercourse.

Fig. 6.1 shows the percentage of people infected with HIV in different parts of the world at the end of 2002.

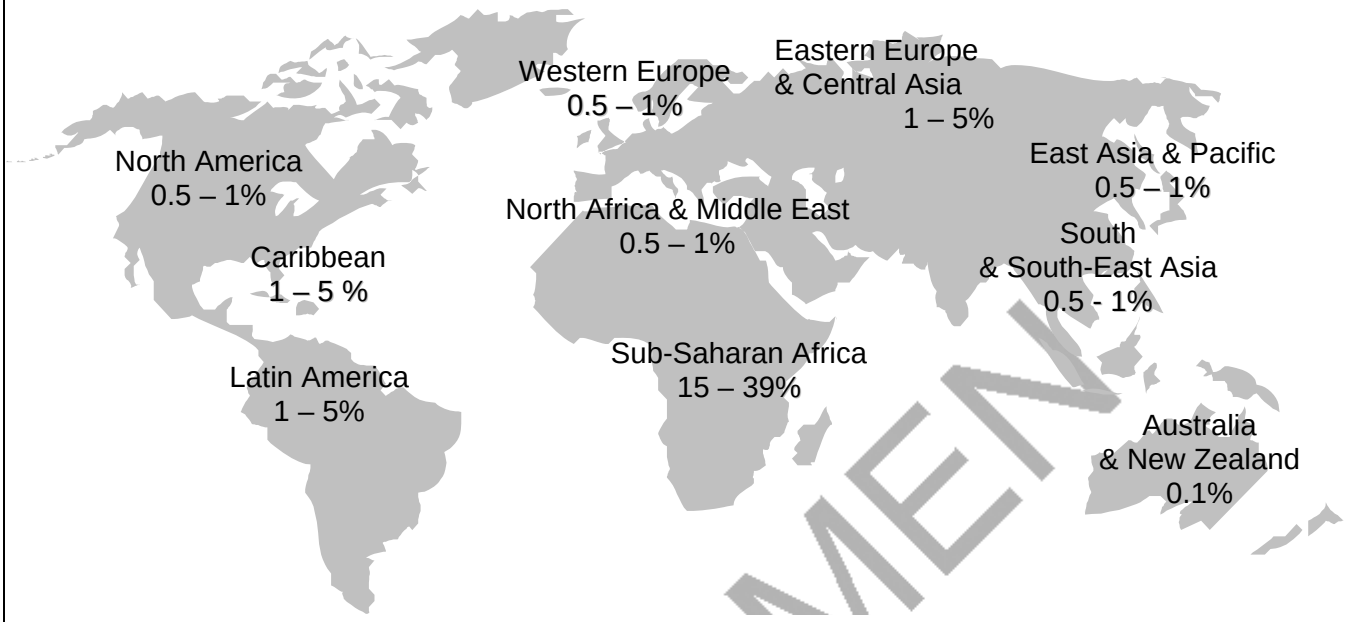

Fig. 6.1

(a) **(i)** The percentage of people infected with HIV is much higher in Sub-Saharan Africa than in much of Europe.

Suggest **three** reasons why the percentages are so much higher in Sub-Saharan Africa.

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(ii) Explain why it is useful to collect information, such as that shown in Fig. 6.1.

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(b) At present there is no cure for HIV / AIDS. Researchers have found that some people in Africa are not infected despite continual exposure to the disease. HIV uses a specific cell surface receptor known as the CD4 receptor to enter a human cell.

Suggest how this information and knowledge of the Human Genome might be used to help reduce the spread of HIV.

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Total: [9]

7 The black rhinoceros, *Diceros bicornis*, is an endangered species whose numbers have fallen to approximately 3000 in the past thirty years. For this reason, the species was placed on Appendix I of the Convention on International Trade in Endangered Species (CITES) agreement. Since the black rhinoceros has been placed on the appendix, numbers have stabilised, or even increased, in several countries.

(a) (i) Explain the term endangered species.

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(ii) Suggest **two** reasons why the black rhinoceros is endangered.

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

(b) State two ways in which the CITES agreement is helping to save endangered species, such as the black rhinoceros.

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2 .....

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

(c) Outline the potential benefits to agriculture of maintaining the biodiversity of wild animals and plants.

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Total: [10]

Paper total [100]

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