OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE

BIOLOGY

F212

Molecules, Biodiversity, Food and Health

Candidates answer on the question paper.

OCR supplied materials:
None

Other materials required:
- Electronic calculator
- Ruler (cm/mm)

Thursday 26 May 2011
Afternoon

Duration: 1 hour 45 minutes

F 2 1 2

F2157306111

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined pages at the end of this booklet. The question number(s) must be clearly shown.
- Answer **all** the questions.
- Do **not** write in the bar codes.

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**.
- Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **28** pages. Any blank pages are indicated.

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Answer **all** the questions.

1 **(a)** Plants are the producers in most food chains.

Complete the following passage by using the most appropriate terms from the list to fill the gaps.

A term should **not** be used more than once.

cellulose	**nucleic acids**	**respiration**
lipids	**photosynthesis**	**starch**
monomers	**proteins**	**sucrose**

Plants carry out the process of ..... in which energy from the sun is used to produce a storage carbohydrate such as ..... .

Plants also absorb phosphates which are used to produce ..... . When humans eat the plants, the various polymers are hydrolysed to ..... and absorbed, but molecules such as ..... cannot be digested by humans and are egested. **[5]**

(b) Fig. 1.1 shows the yield of rye plants (in tonnes per hectare) grown on the same soil for 80 years. These plants were grown without the addition of nitrogen fertiliser.

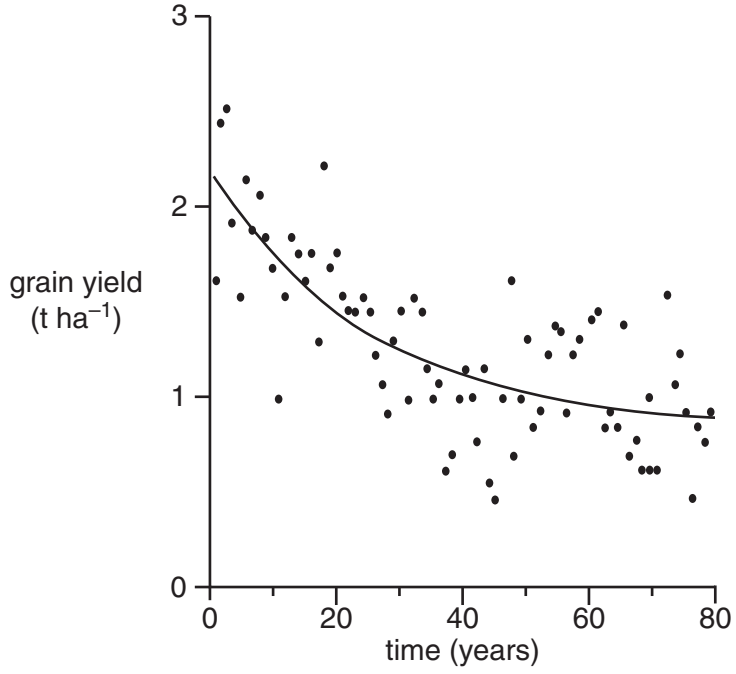


Fig. 1.1

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Using Fig. 1.1 and your own knowledge, explain why nitrogen fertiliser needs to be applied to farmland.

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

(c) Insect pests, such as aphids, can reduce yield in rye plants by piercing the phloem and removing materials.

Aphids can be killed using an insecticide. However, over a period of time, an increasing concentration of insecticide is required to control the aphid population.

Explain why this is the case.

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

[Total: 12]

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2 **(a)** Enzymes are biological catalysts.

Explain the term *biological catalyst*.

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

(b) When the enzyme catalase is added to hydrogen peroxide, the following reaction occurs:

$$\underset{\text{hydrogen peroxide}}{H_2O_{2(l)}} \xrightarrow{\text{catalase}} 2\,H_2O_{(l)} + O_{2(g)}$$

In an investigation into the effect of temperature on the rate of this reaction, a student set up apparatus as shown in Fig. 2.1, using liquidised celery as a source of catalase.

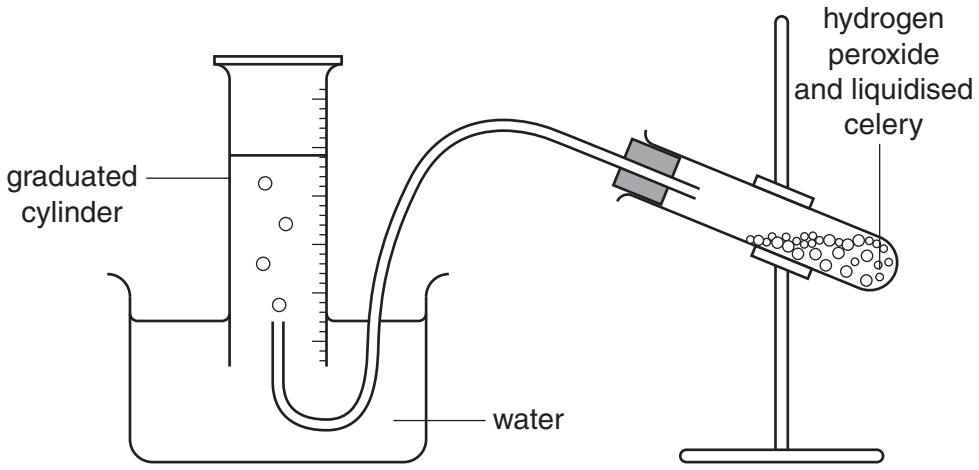


Fig. 2.1

The student measured the volume of oxygen produced at five different temperatures using samples of the liquidised celery.

(i) State the other variable that needs to be measured in order to calculate the **rate** of reaction.

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

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(ii) Identify **one** potential problem with using samples of liquidised celery as a source of catalase in this investigation **and** suggest a way to minimise this problem.

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

(iii) The student collected the data shown in Table 2.1.

Table 2.1

temperature (°C)	volume of oxygen (cm^3)
5	4
10	7
12	10
25	28
28	32

Suggest how the student could check the reliability of the data.

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

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(c) Another student carried out a similar procedure and presented his results as a graph. The graph that he drew is shown in Fig. 2.2.

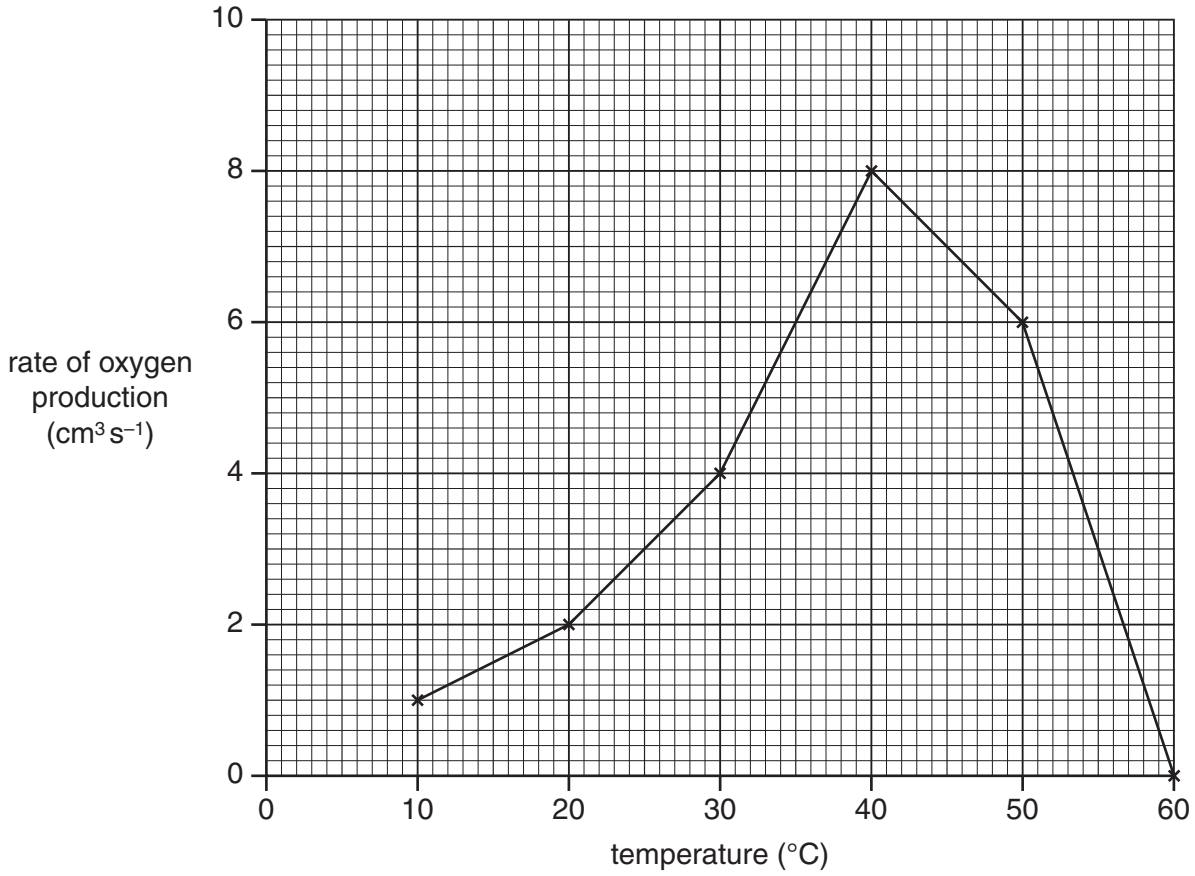


Fig. 2.2

(i) Describe the data shown in Fig. 2.2.

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

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(ii) Q_{10} is a measure of the increase in the rate of reaction for a 10 °C rise in temperature.

It is calculated using the following formula:

$$Q_{10} = \frac{\text{rate at } (t + 10\,°C)}{\text{rate at } t\,°C}$$

where $t + 10$ °C = rate at the higher temperature
t = rate at the lower temperature

Using the information in Fig. 2.2, calculate Q_{10} between 15 °C and 25 °C.

Show your working.

Answer = ... **[1]**

(iii) In the conclusion to this experiment, the student wrote the following:

> ***As the heat increased, the reaction went faster until it got to its highest. After this, the rate of reaction fell. This happened because the enzyme was killed and the hydrogen peroxide could not fit into the enzyme's key site.***

Suggest a more appropriate word to replace each of the underlined words.

heat should be replaced with .....

highest should be replaced with .....

killed should be replaced with .....

key should be replaced with ..... **[4]**

[Total: 16]

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3 A number of different biological molecules are represented in Fig. 3.1.

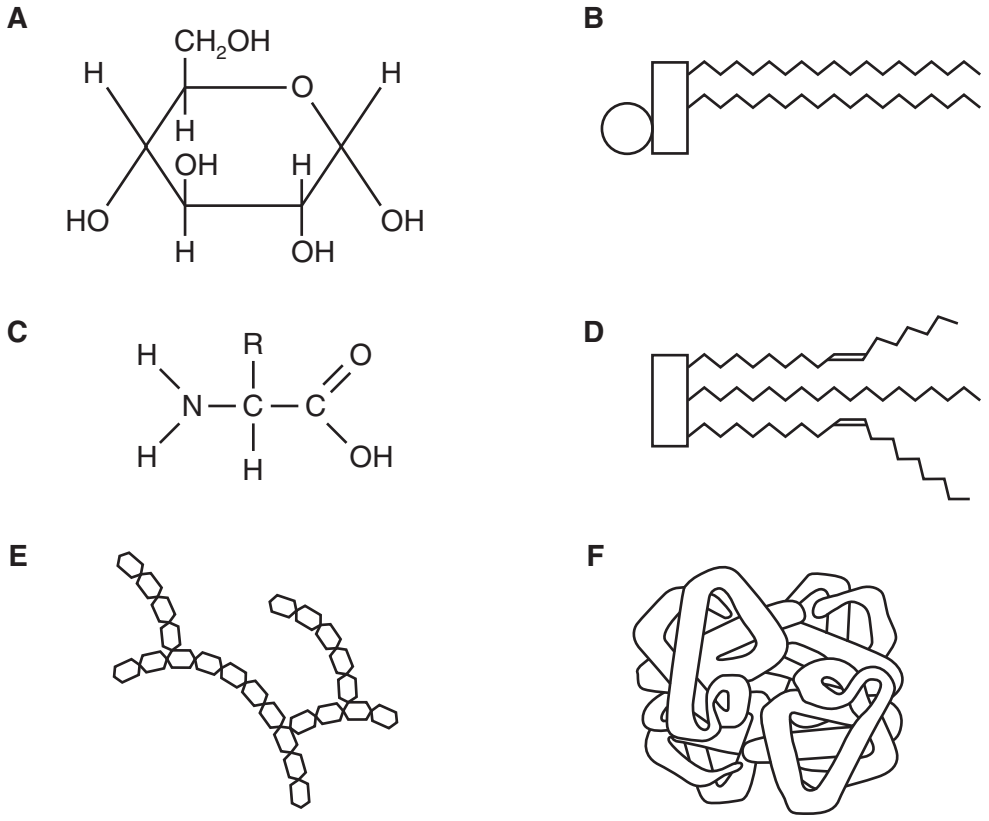


Fig. 3.1

(a) (i) State the letter of the molecule shown in Fig. 3.1 that represents:

a triglyceride .....

a monosaccharide .....

a protein ..... **[3]**

(ii) State the letter of the molecule shown in Fig. 3.1 that contains:

phosphate .....

glycosidic bonds .....

peptide bonds .....

disulfide bonds ..... **[4]**

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(b) Molecule **E** shown in Fig. 3.1 is part of the carbohydrate molecule glycogen.

Explain why glycogen makes a good storage molecule.

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

(c) **(i)** When glycogen is hydrolysed, molecule **A** shown in Fig. 3.1 is produced.

State the **precise name** of molecule **A** ..... **[1]**

(ii) State **one** function of molecule **A.**

.....

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

(iii) State the letter of a molecule shown in Fig. 3.1, other than molecule **E**, that is used as a storage molecule.

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

QUESTION 3(d) STARTS ON PAGE 10

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(d) Cellulose is a carbohydrate molecule found in plants.

Complete the table below to give three **differences** in the **structures** of glycogen and cellulose.

One difference has been done for you.

glycogen	cellulose
no hydrogen bonding	*hydrogen bonding*

[3]

[Total: 16]

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QUESTION 4 STARTS ON PAGE 12

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4 **(a)** Each winter, the UK government recommends that vulnerable members of the public are vaccinated against the influenza (flu) virus.

(i) State **two** groups of people that the government would consider as being vulnerable.

1 .....

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2 .....

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

(ii) Suggest why the influenza vaccine has to be changed each year.

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

Fig. 4.1 shows the concentration of antibodies in a patient's bloodstream following an influenza vaccination and then infection with the influenza virus.

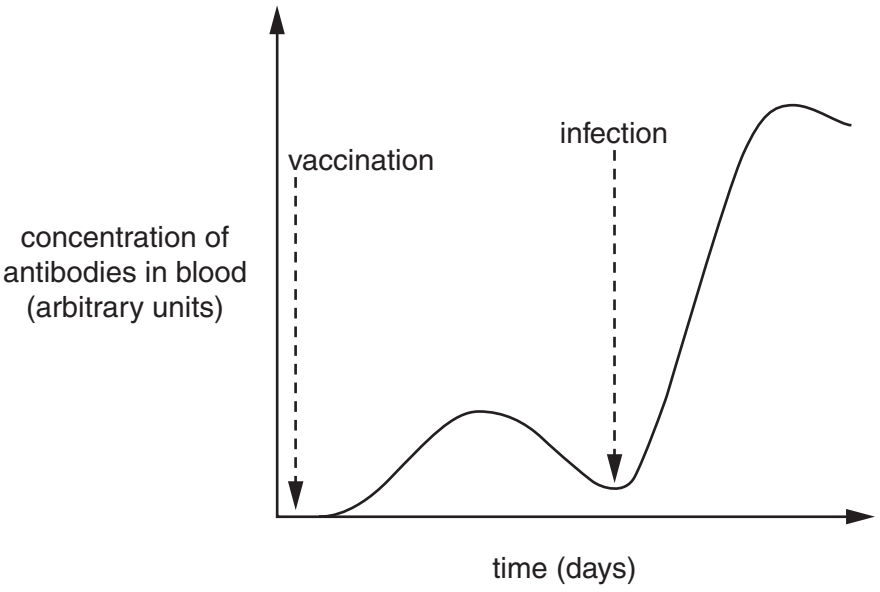


Fig. 4.1

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(iii) Using the information from Fig. 4.1, state **two differences** between the primary and secondary immune responses.

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

(iv) Memory cells are produced when a patient is vaccinated against influenza.

Describe the role of these memory cells when the influenza virus enters the body.

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

QUESTION 4(b) STARTS ON PAGE 14

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(b) Tamiflu® is an antiviral drug that can be used to treat influenza patients.

(i) State why a doctor would **not** prescribe antibiotics to treat influenza.

.....

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

(ii) Neuraminidase is an enzyme which is present on the protein coat of the influenza virus.

This enzyme is used to break down the host cell membrane and allow the influenza viruses to leave the infected cell. Tamiflu® is a neuraminidase inhibitor.

Suggest how Tamiflu® could inhibit neuraminidase.

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

(iii) Suggest how Tamiflu® could help to reduce the spread of influenza.

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

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(c) In an effort to find new drugs to combat a possible new influenza pandemic, researchers have investigated plants used in traditional medicine in Nepal. Two plants, an onion, *Allium oreoprasum*, and an asparagus, *Asparagus filicinus*, have been found to show antiviral properties.

Suggest why researchers in Nepal concentrated their research on plants that had been used in traditional medicine.

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

[Total: 16]

QUESTION 5 STARTS ON PAGE 16

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5 **(a)** Fig. 5.1 shows the relationship between the mean number of cigarettes smoked per person per year and the incidence of lung cancer for both men and women between 1900 and 1990.

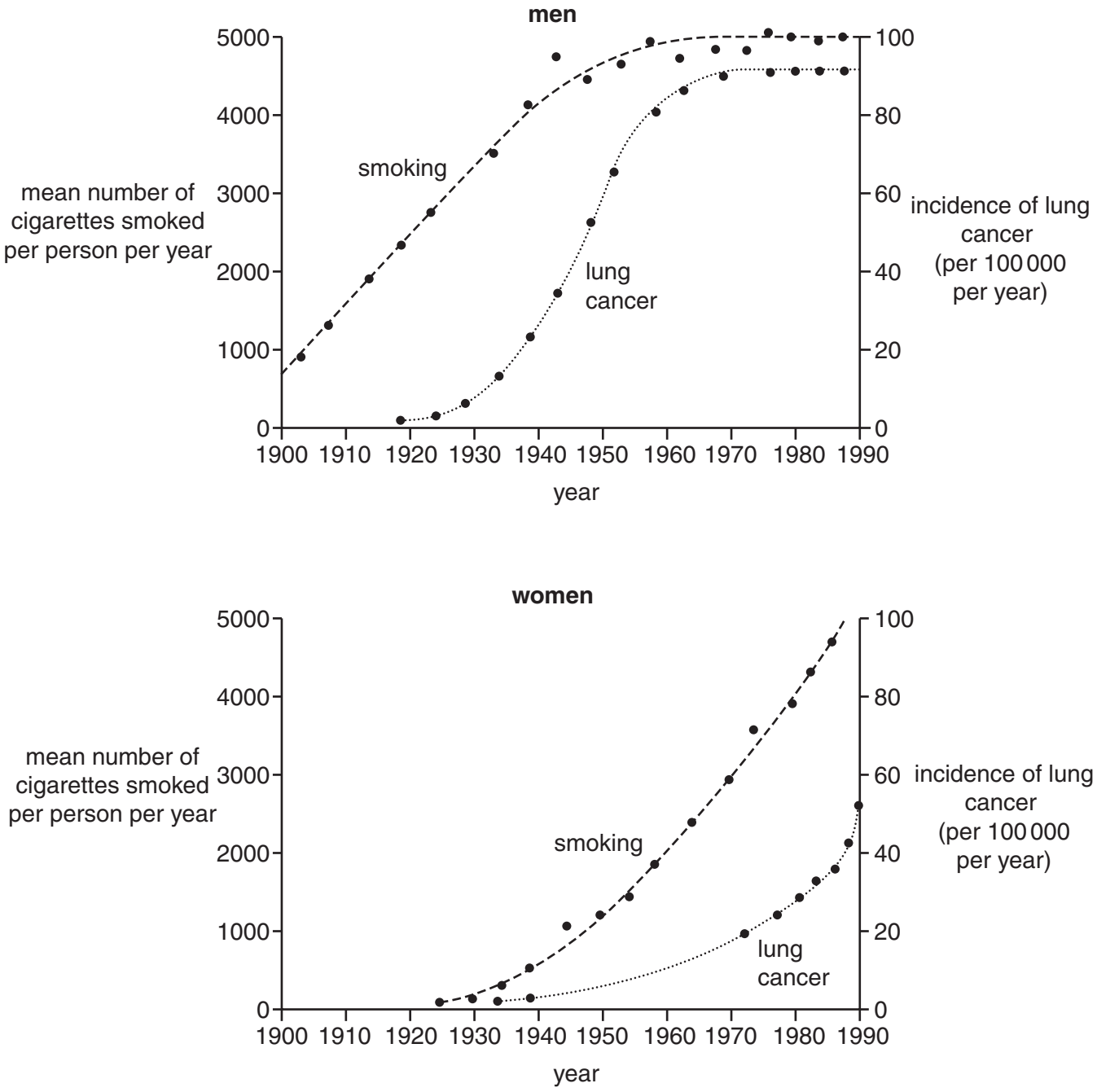


Fig. 5.1

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(i) Compare the changes in the patterns of **smoking** in men and women from 1900 to 1990.

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

(ii) What evidence from Fig. 5.1 suggests that smoking causes lung cancer?

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

QUESTION 5(b) STARTS ON PAGE 18

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(b) Describe how smoking contributes to the development of lung cancer.

In your answer, you should make clear the links between smoking and the development of lung cancer.

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(c) Name **three other** diseases associated with smoking.

1 .....

2 .....

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

[Total: 13]

QUESTION 6 STARTS ON PAGE 20

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6 **(a)** Fig. 6.1 shows two species of trilobites, a group of arthropods that became extinct about 240 million years ago. Species **A** is 20 million years older than species **B**.

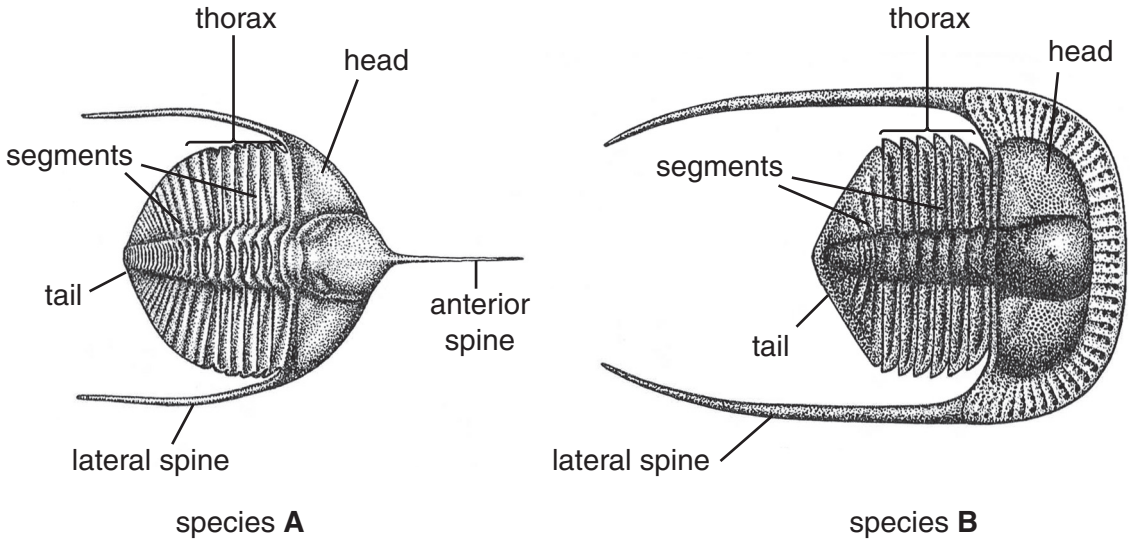


Fig. 6.1

(i) List **three** observable features from Fig. 6.1 that suggest the two species are related.

1 .....

2 .....

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

(ii) List **two** observable features from Fig. 6.1, **other than size**, that could suggest they are **different** species.

1 .....

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

(b) Explain how fossils provide evidence for the theory of evolution.

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

[Total: 7]

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QUESTION 7 STARTS ON PAGE 22

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7 **(a)** Fig. 7.1 represents part of a DNA molecule.

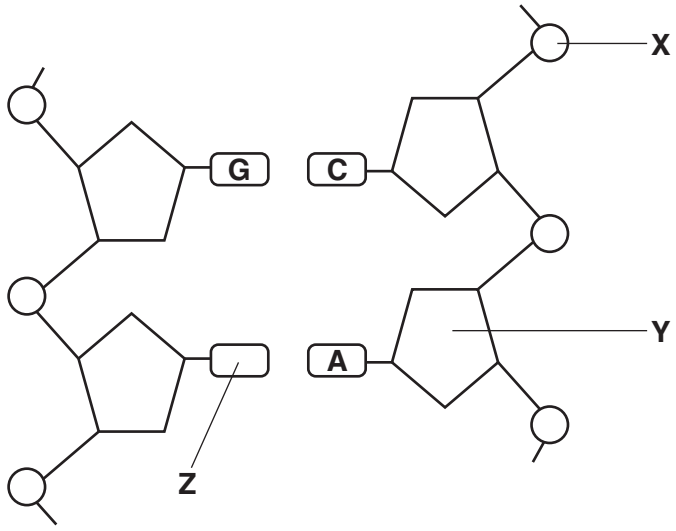


Fig. 7.1

State the **precise name** of each of the parts of the DNA molecule labelled **X**, **Y** and **Z**.

X .....

Y .....

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

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(b) Describe how the DNA molecule replicates.



In your answer, you should make clear the sequence of events.

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8 On Christmas Eve 1987, the last female Spix's Macaw, *Cyanopsitta spixii*, was removed from the wild in Brazil. The last remaining male bird continued to live in the wild for a further six years. This male bird, having lost its partner, mated with a Blue-winged Macaw, *Propyrrhura maracana*.

(a) Explain why eggs produced by this mating did not hatch.

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

(b) Spix's Macaws became endangered because the birds were illegally trafficked to collectors in other parts of the world. This is against the CITES agreement.

(i) State what the abbreviation CITES stands for.

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

(ii) State **two** of the aims of the CITES agreement.

1 .....

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2 .....

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

(c) Once it was realised that the Spix's Macaws were in danger of becoming extinct, the collectors were "invited" to allow their macaws to take part in a breeding programme.

Suggest **two** factors to be taken into consideration when selecting individuals for this breeding programme.

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

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(d) Finally, a captive bred female Spix's Macaw was released into the original male's territory.

What could be done to try to ensure the success of this release programme?

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

[Total: 10]

END OF QUESTION PAPER

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ADDITIONAL PAGE

If additional space is required, you should use the lined pages below. The question number(s) must be clearly shown.

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