Candidate forename		Candidate surname	

Centre number						Candidate number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

ADVANCED SUBSIDIARY GCE

F212

BIOLOGY

Molecules, Biodiversity, Food and Health

THURSDAY 26 MAY 2011: Afternoon
DURATION: 1 hour 45 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the question paper.

OCR SUPPLIED MATERIALS:

Loose Sheet for question 5

OTHER MATERIALS REQUIRED:

Electronic calculator
Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

DC (NF/JG) 11MEP06354 48183

INSTRUCTIONS TO CANDIDATES

- **Write your name, centre number and candidate number in the boxes on the first page. 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.**

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.**

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.

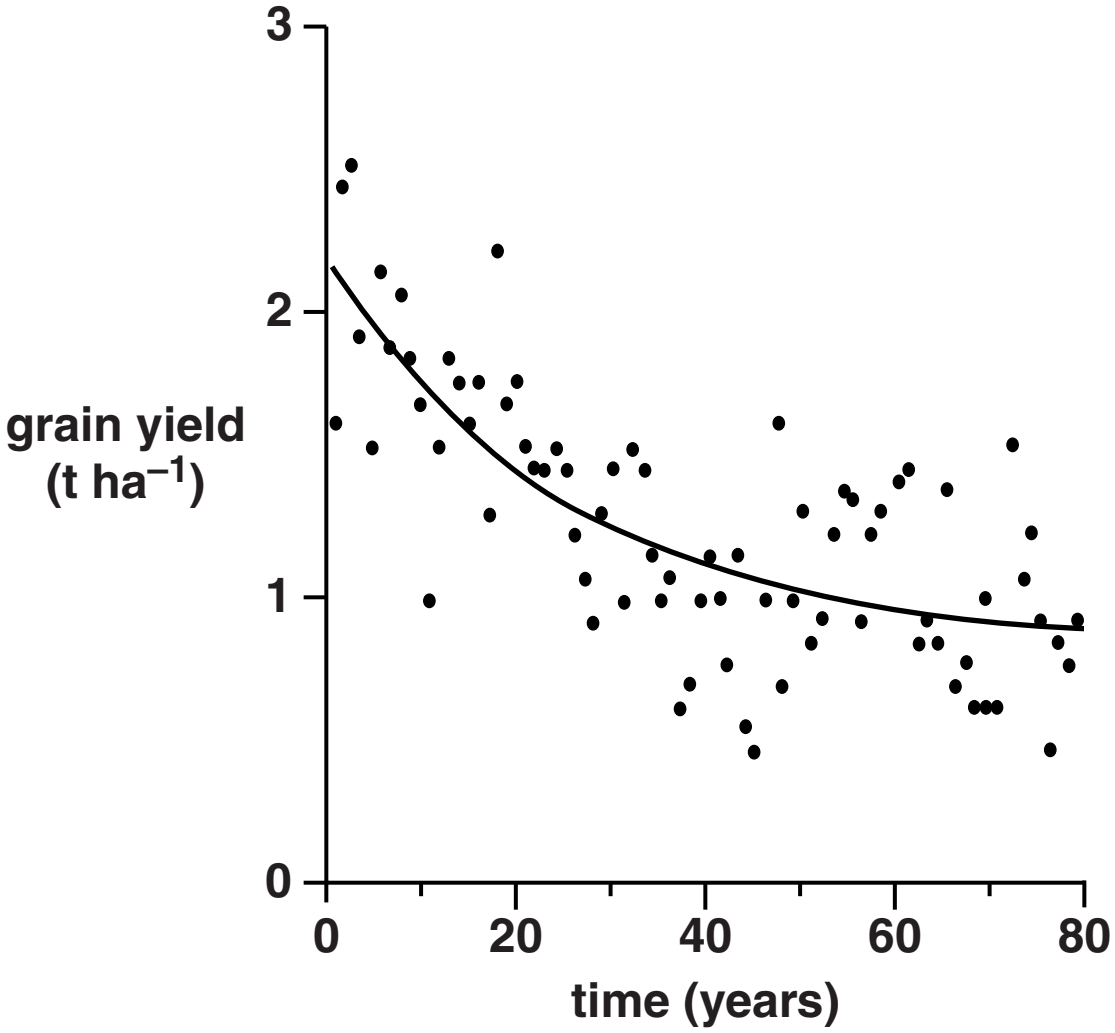

Fig. 1.1

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

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

QUESTION 1(c) STARTS ON PAGE 6

(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.

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[4]**

[Total: 12]

2 (a) Enzymes are biological catalysts.

Explain the term biological catalyst.

_____

_____

_____

_____

_____ **[2]**

QUESTION 2(b) STARTS ON PAGE 8

(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.

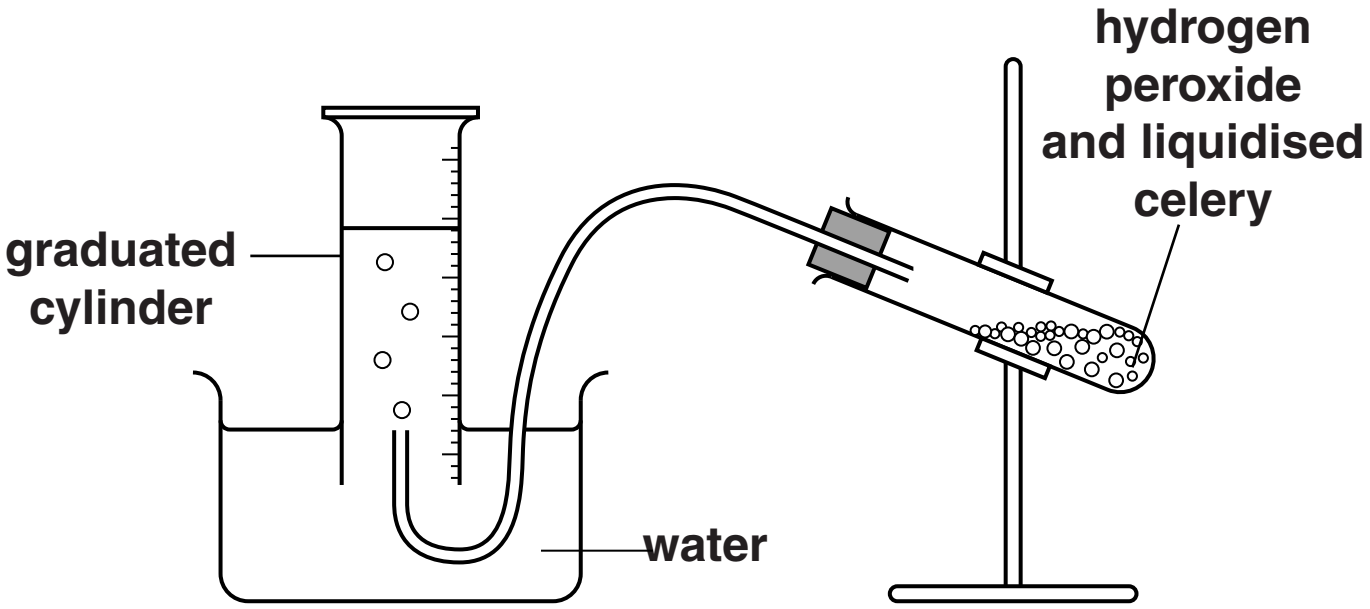

Fig. 2.1

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]**

(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.

_____

_____

_____

_____

_____

_____ **[2]**

QUESTION 2(b)(iii) STARTS ON PAGE 10

(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.

_____

_____

_____

_____

_____

_____ **[2]**

(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.

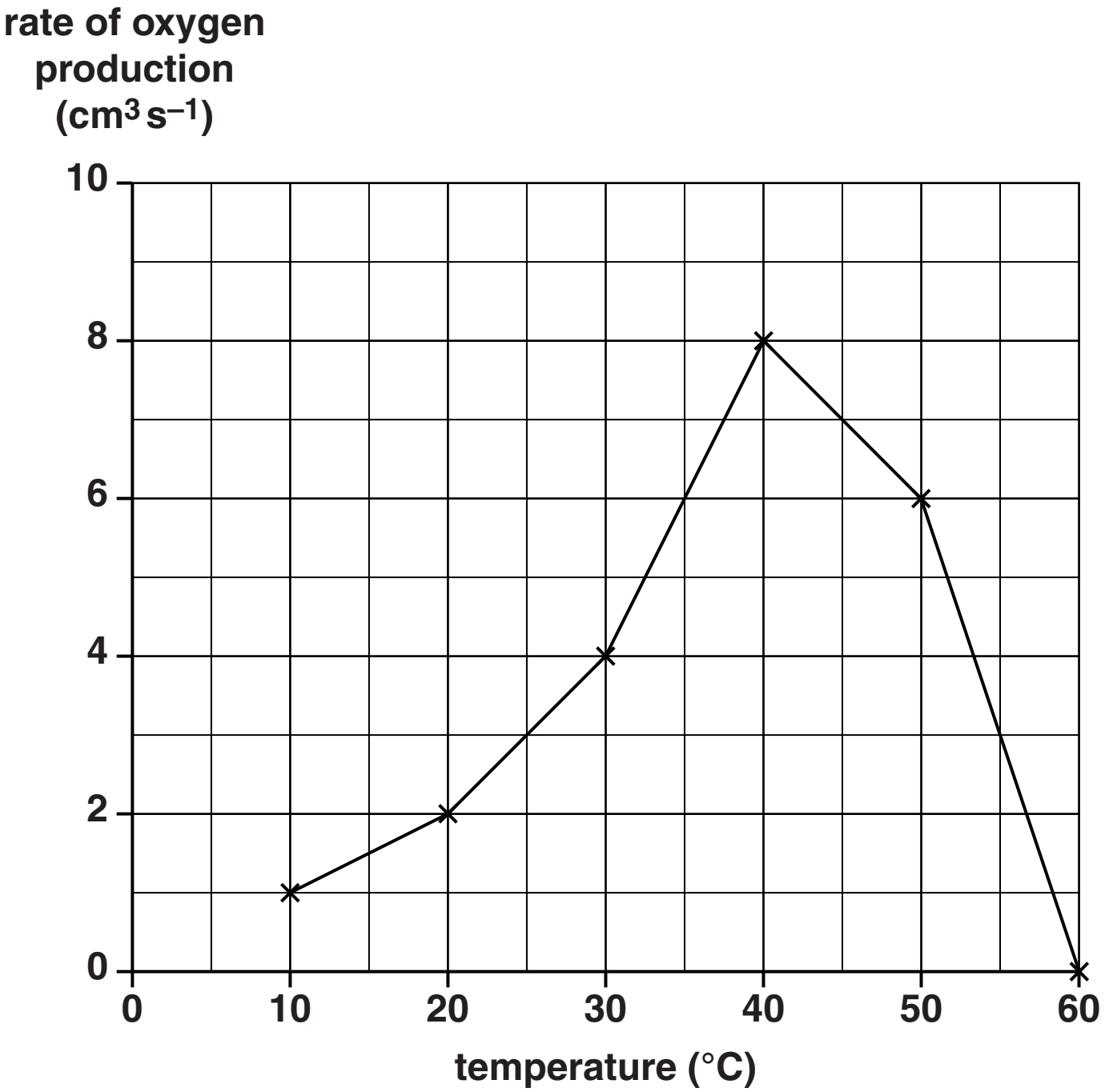

Fig. 2.2

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

_____

_____

_____

_____

_____

_____

_____

_____ **[4]**

(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]

QUESTION 2(c)(iii) STARTS ON PAGE 14

(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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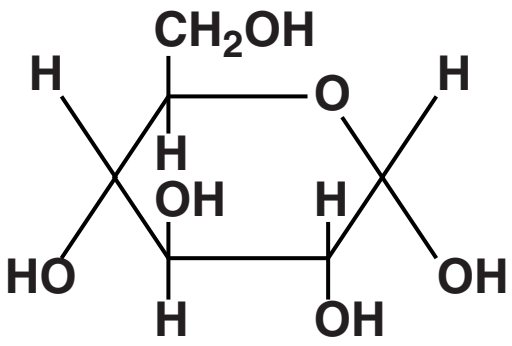
QUESTION 3 STARTS ON PAGE 16

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

A



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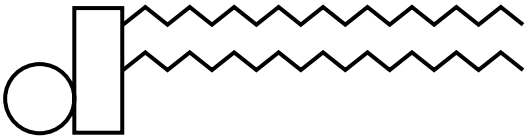

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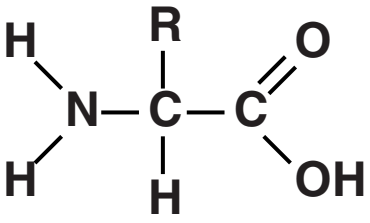

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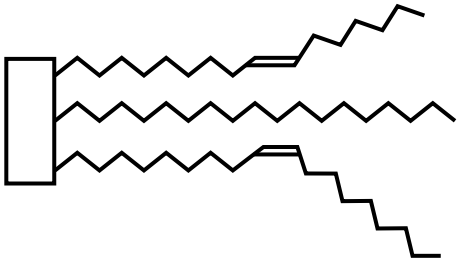
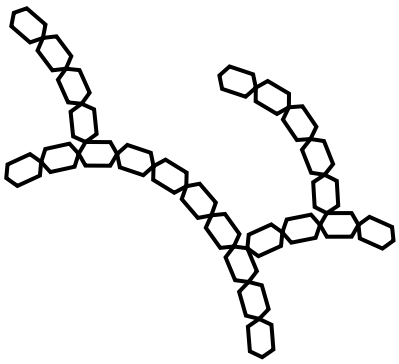


E



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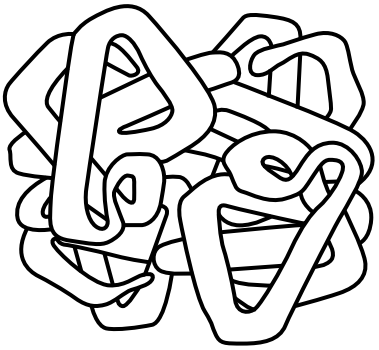

Fig. 3.1

(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]**

QUESTION 3(b) STARTS ON PAGE 18

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

Explain why glycogen makes a good storage molecule.

_____

_____

_____

_____

_____

_____

_____

_____ **[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]

(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]

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 _____

_____

2 _____

_____ **[2]**

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

_____

_____

_____

_____

_____

_____ **[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.

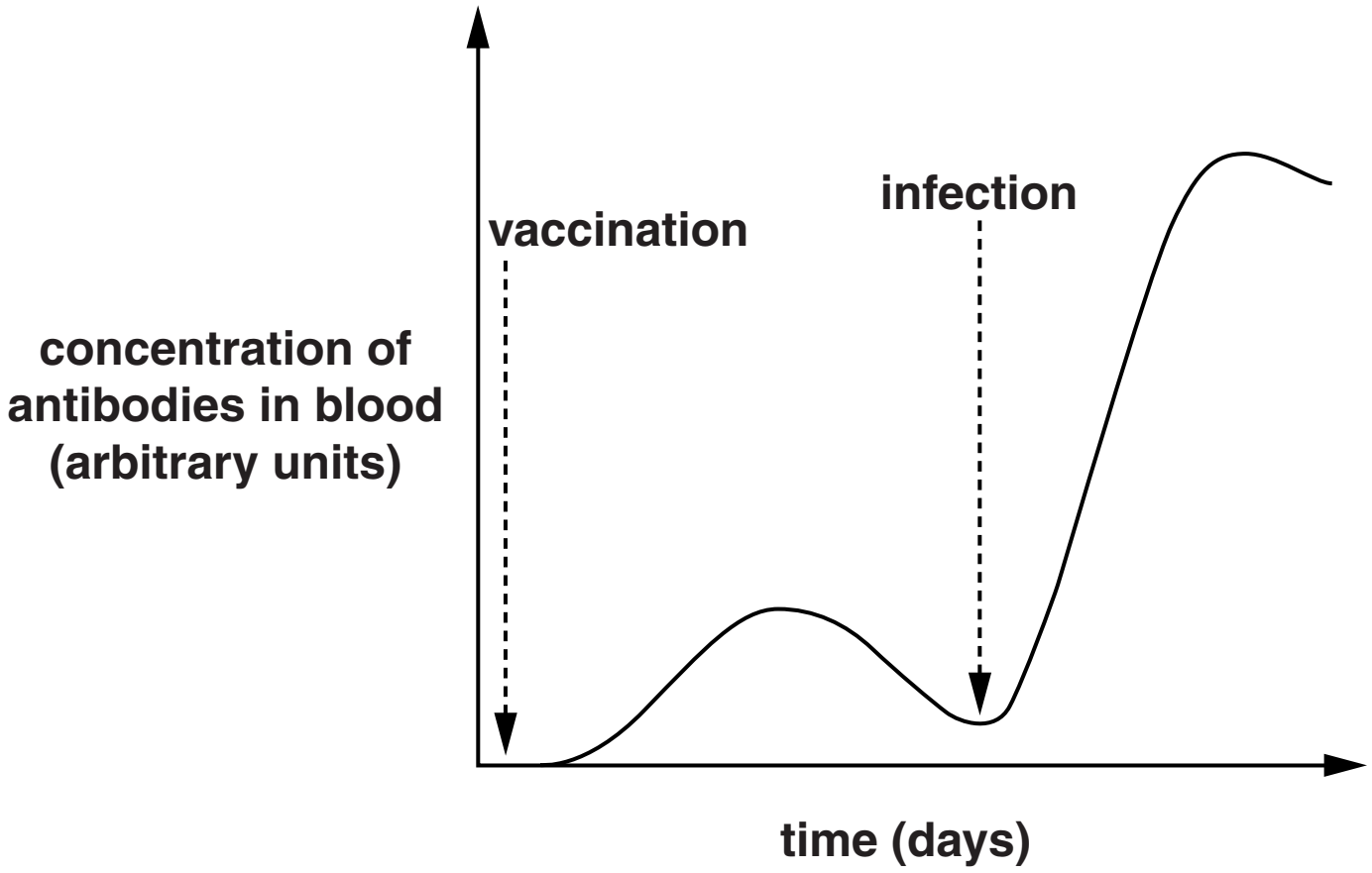

Fig. 4.1

QUESTION 4(a)(iii) STARTS ON PAGE 22

(iii) Using the information from Fig. 4.1, state TWO DIFFERENCES between the primary and secondary immune responses.

_____

_____

_____

_____

_____

_____ **[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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_____

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_____

_____ **[3]**

(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.

_____

_____

_____

_____

_____

_____ **[2]**

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

_____

_____

_____

_____

_____

_____ **[2]**

(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.

_____

_____

_____

_____

_____ **[2]**

[Total: 16]

5 (a) Fig. 5.1 on the loose A3 sheet 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.

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

_____

_____

_____

_____

_____

_____ **[2]**

QUESTION 5(a)(ii) STARTS ON PAGE 26

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

_____

_____

_____

_____

_____

_____ **[2]**

(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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_____ **[6]**

(c) Name THREE OTHER diseases associated with smoking.

1 _____

2 _____

3 _____ **[3]**

[Total: 13]

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.

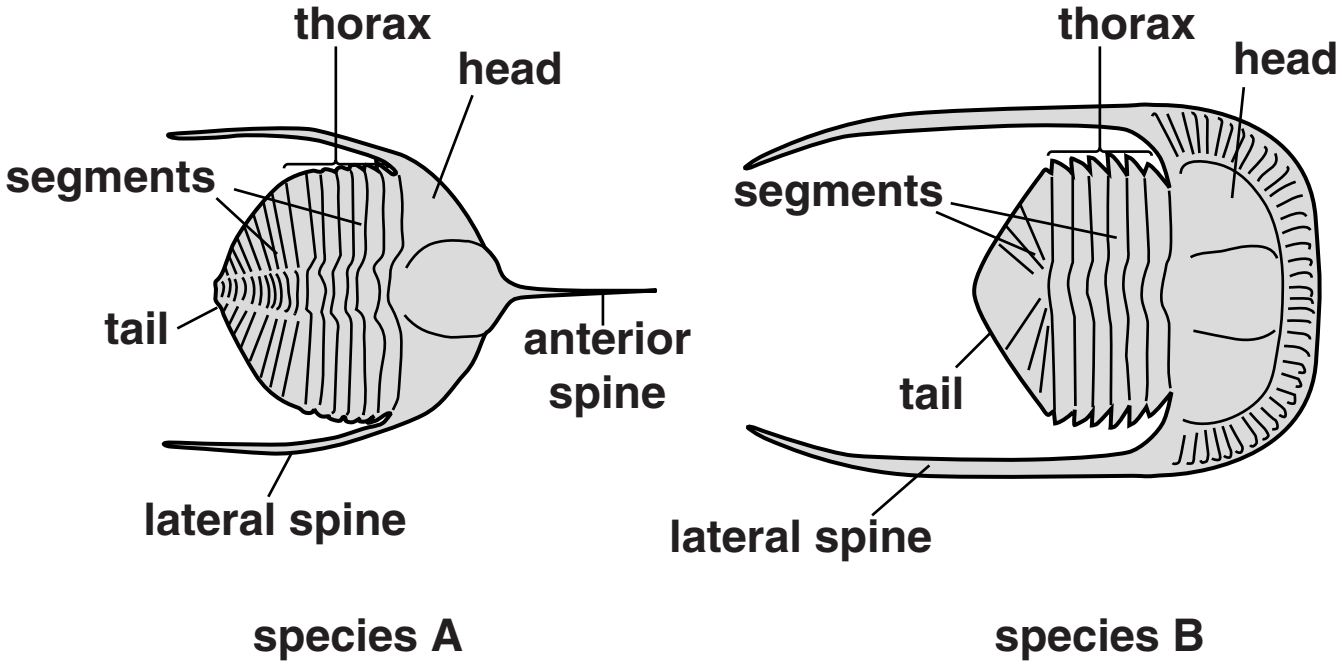

Fig. 6.1

(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.

_____

_____

_____

_____

_____

_____ **[2]**

[Total: 7]

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

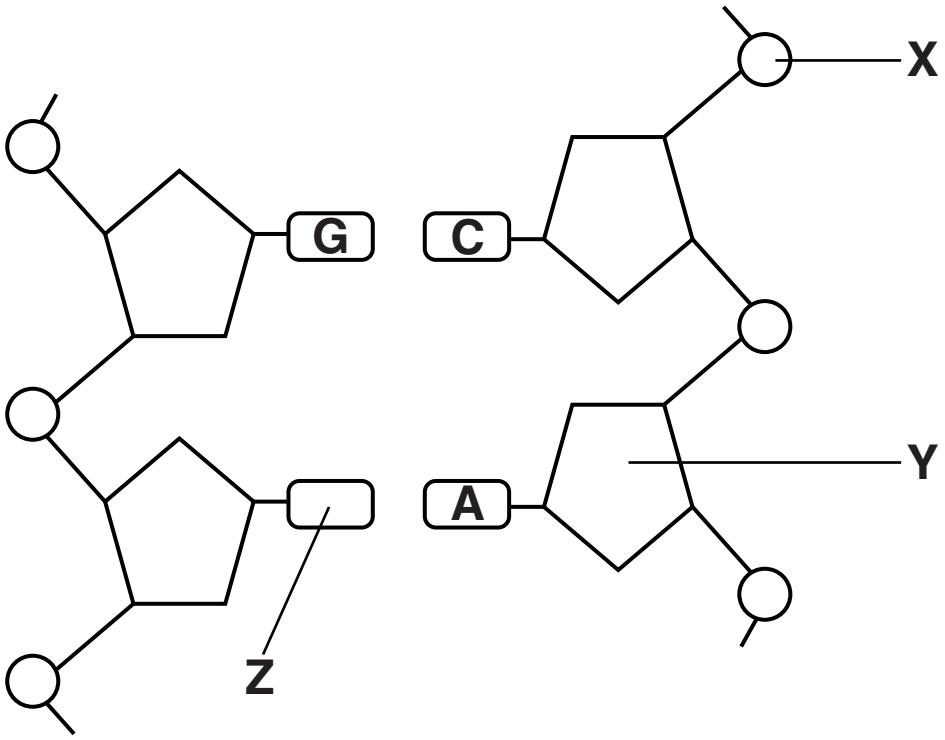

Fig. 7.1

State the PRECISE NAME of each of the parts of the DNA molecule labelled X, Y and Z.

X _____

Y _____

Z _____ [3]

QUESTION 7(b) STARTS ON PAGE 32

(b) Describe how the DNA molecule replicates.

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

_____

_____

_____

_____

_____

_____

_____

_____ **[7]**

[Total: 10]

QUESTION 8 STARTS ON PAGE 34

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.

_____

_____

_____

_____

_____

_____ **[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.

_____

_____ **[1]**

(ii) State TWO of the aims of the CITES agreement.

1 _____

_____

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.

_____

_____

_____

_____

_____

_____ **[2]**

QUESTION 8(d) STARTS ON PAGE 36

(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?

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

[Total: 10]

END OF QUESTION PAPER

ADDITIONAL PAGE

IF ADDITIONAL SPACE IS REQUIRED, YOU SHOULD USE THE LINED PAGES BELOW. THE QUESTION NUMBER(S) MUST BE CLEARLY SHOWN.