THIS IS A NEW SPECIFICATION

OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE

BIOLOGY

F212

Molecules, Biodiversity, Food and Health

OCE/13969

Candidates answer on the question paper

OCR Supplied Materials:
None

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

Monday 1 June 2009
Afternoon

Duration: 1 hour 45 minutes

F212

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

MODIFIED LANGUAGE

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, however additional paper may be used if necessary.

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 **20** pages. Any blank pages are indicated.

FOR EXAMINER'S USE		
Qu.	**Max.**	**Mark**
1	**14**	
2	**16**	
3	**18**	
4	**16**	
5	**17**	
6	**19**	
TOTAL	**100**	

Answer **all** the questions.

1 **(a)** Complete the following passage by using the most appropriate terms from the list to fill the gaps. Each term should not be used more than once.

anti-parallel	**β-pleated sheet**	**covalent**
double helix	**hydrogen**	**parallel**
polypeptide	**ribose**	**sugar-phosphate**

DNA is found in the nucleus. The molecule is twisted into a .... in which each of the strands are ..... . It has two ..... backbones attached to one another by complementary bases. These bases pair in the centre of the molecule by means of ..... bonds. **[4]**

(b) Table 1.1 shows the relative proportions of different DNA bases in four different organisms.

Table 1.1

	relative proportions of bases in DNA as a percentage			
organism	A	C	G	T
human	30.9	19.8	19.9	29.4
grasshopper	29.3	20.7	20.5	29.3
wheat	27.3	22.8	22.7	27.1
E. coli	24.7	25.7	26.0	23.6

(i) Describe the patterns shown by the data given in Table 1.1.

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

(ii) Suggest how the data given in Table 1.1 might have been helpful to scientists in working out the structure of DNA.

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

(c) DNA in the nucleus acts as a template for the production of RNA.

Complete the table below to show **three** ways in which the structure of DNA differs from that of RNA.

feature	DNA	RNA
number of strands		
bases present		
sugar present		

[3]

(d) DNA codes for the structure of polypeptides.

State the role of messenger RNA (mRNA).

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

[Total: 14]

2 Malaria kills over one million people every year. The vast majority are under the age of ten.

Adults who have survived malaria in childhood and then continue to live in an area where malaria is found, develop a limited form of immunity.

(a) (i) Name the parasite that causes malaria.

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

(ii) Name the vector for the malarial parasite.

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

(iii) Name a human cell in which the malarial parasite reproduces.

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

(b) Scientists are developing a vaccine using an attenuated (inactive) form of the malarial parasite.

The aim is to trigger an immune response without the development of the disease.

Describe the actions of the **B lymphocytes** in the immune response.

In your answer you should make clear how the steps in this part of the immune response are sequenced.

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(c) Suggest why adults who have survived malaria may lose their immunity when they **leave** a malarial area.

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

(d) State **three biological** reasons why it has not been possible to produce an effective vaccine for malaria.

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

[Total: 16]

3 In the search for new biofuels, research has been done into the digestion of wood waste by fungi.

The fungi produce cellulase enzymes that break cellulose into sugars. These sugars can then be converted into ethanol, a biofuel.

Fig. 3.1 shows the stages in this digestion process.

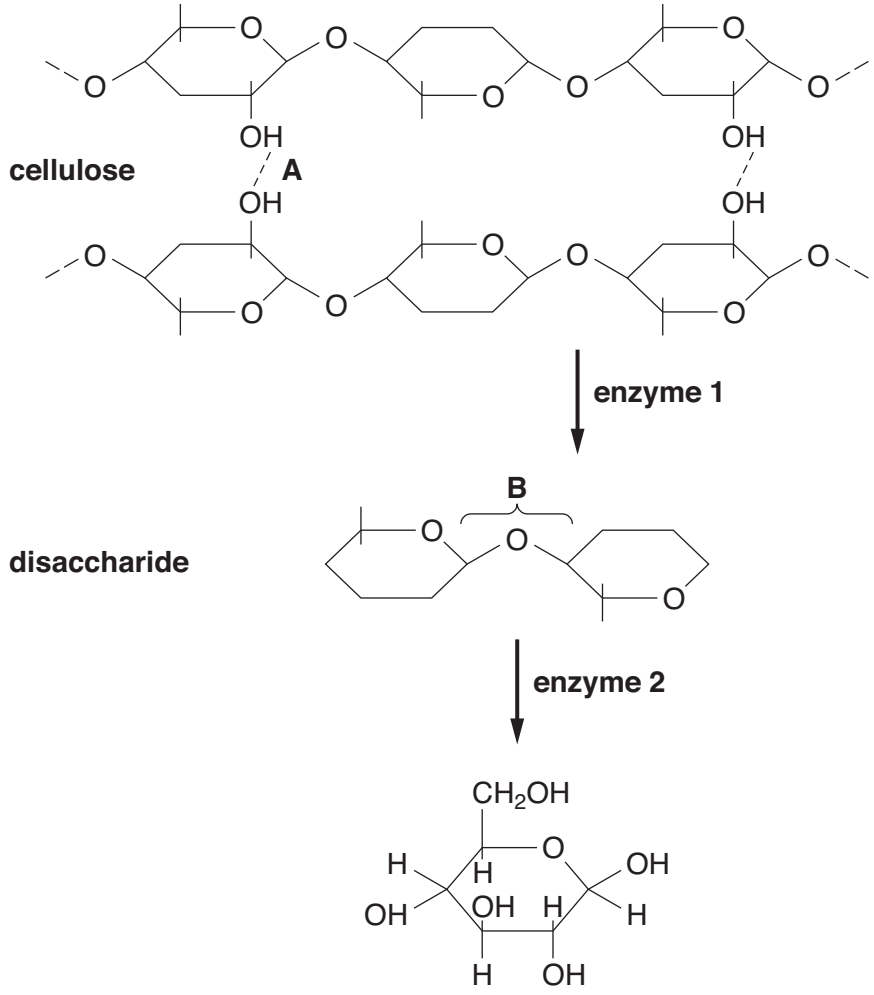

Fig. 3.1

(a) (i) Name bonds **A** and **B** shown in Fig. 3.1.

A .....

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

(ii) State how bond **B** is broken in the digestion of the disaccharide.

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

(iii) Name the sugar that is the **final** product of this digestion process.

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

(b) Explain why **different** enzymes are involved in each stage of the digestion process.

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

QUESTION 3 CONTINUES ON PAGE 8

(c) Fig. 3.2 shows the effect of changing pH on the rate of activity of **enzyme 2**.

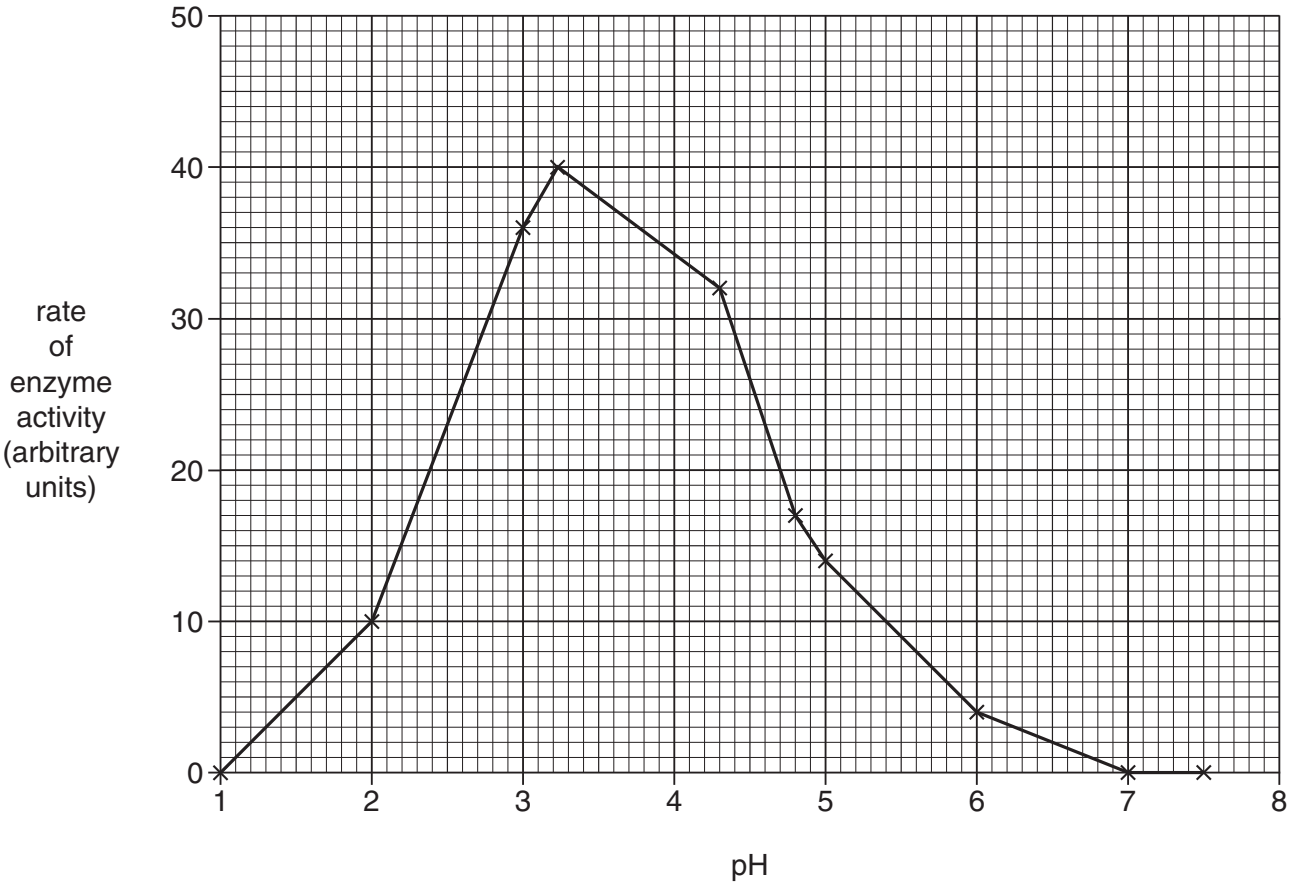

Fig. 3.2

(i) Explain why the activity of **enzyme 2** falls to zero at pH 7.

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

(ii) State **two** factors that should have been controlled when investigating the effect of pH on the activity of **enzyme 2**.

1 .....

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

(d) The activity of an enzyme can be measured by testing for the concentration of its product at regular intervals.

Describe how the concentration of a reducing sugar can be measured using a colorimeter.

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

[Total: 18]

4 The population of the white-backed vulture, *Gyps bengalensis*, in India has fallen by 97% to an estimated 4 000 vultures. This vulture is now considered to be 'critically endangered'. Reasons for the decline in numbers include:

- vultures feed on carcasses including those from farm animals.
- these farm animals may have been treated with a pain killer. This particular pain killer causes kidney failure in the vultures.
- the use of this pain killer is being phased out. However, many farmers continue to use up their stocks of the drug.
- this pain killer is not easily biodegradable and will remain in the environment for many years.

(a) (i) Suggest what is meant by *critically endangered*.

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

(ii) Calculate the **original** population of the white-backed vulture.

Show your working.

Answer = ... **[2]**

(b) A captive breeding programme has been set up in an effort to save the white-backed vulture.

Three centres in India have been built, each housing up to 40 individuals. These vultures have been collected from different areas of the Indian subcontinent.

(i) Explain why the decision was made to conserve the species in captivity (*ex situ*) rather than in the wild (*in situ*).

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

(ii) Explain why the white-backed vultures in the captive breeding programme were,

- collected from several different areas
- housed in three separate centres.

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

(c) Outline **three** reasons why the conservation of the white-backed vulture is important.

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

(d) Once the captive bred individuals have been released into the wild, suggest **three** measures that could be taken **in the long term** to preserve the numbers of white-backed vultures.

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[Total: 16]

5 **(a)** Fig. 5.1 shows a section of a leaf from a pear tree that is infected by the mildew fungus.

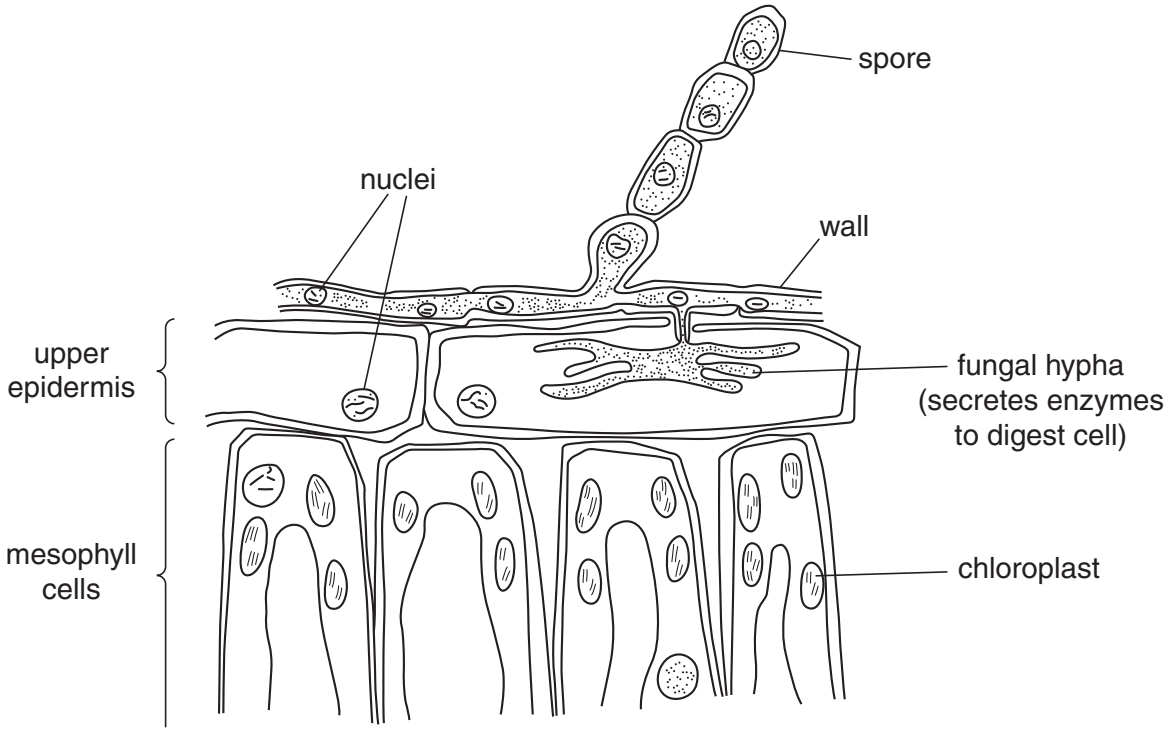

Fig. 5.1

(i) State **one** feature, **shown in Fig. 5.1**, that excludes **both** the pear tree and mildew from the kingdom Prokaryotae.

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

(ii) State **two** reasons why mildew should be placed in the kingdom Fungi.

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

(iii) State **two** reasons why the pear tree should be placed in the kingdom Plantae.

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

(iv) Name **two** kingdoms other than Prokaryotae, Fungi and Plantae.

1 .....

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

(b) The mildew fungus also infects wheat plants, causing disease.

- Most wheat plants in the UK show little resistance to this disease.
- Some Iranian wheat plants are resistant.
- The yield from these resistant wheat plants is very low.

(i) An investigation into the resistance of the Iranian wheat plants to mildew produced the results shown in Fig. 5.2.

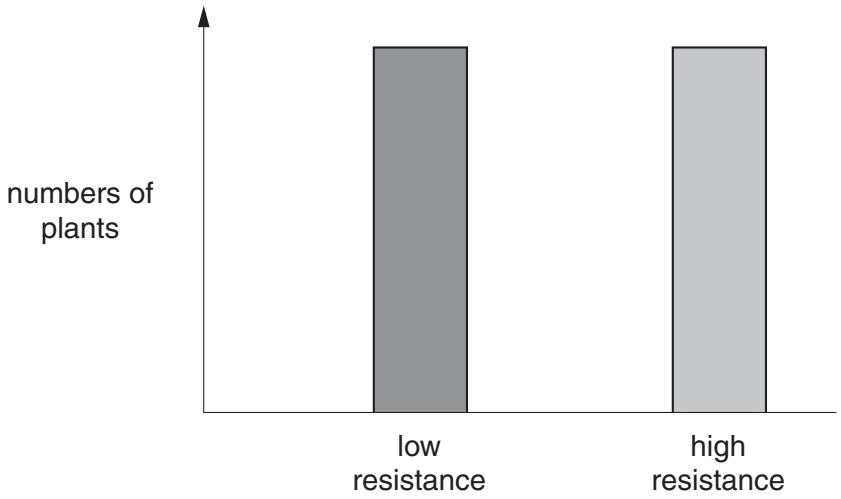

Fig. 5.2

State the type of variation that is shown in Fig. 5.2 **and** describe its characteristics.

type of variation .....

characteristics of this type of variation

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

(ii) Outline how a breeding programme could be carried out to produce wheat plants which have both high yield **and** resistance to mildew.

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(c) Over a period of time, mildew can overcome the resistance bred into the wheat.

Use the theory of natural selection to explain how the mildew fungus adapts to overcome this resistance.

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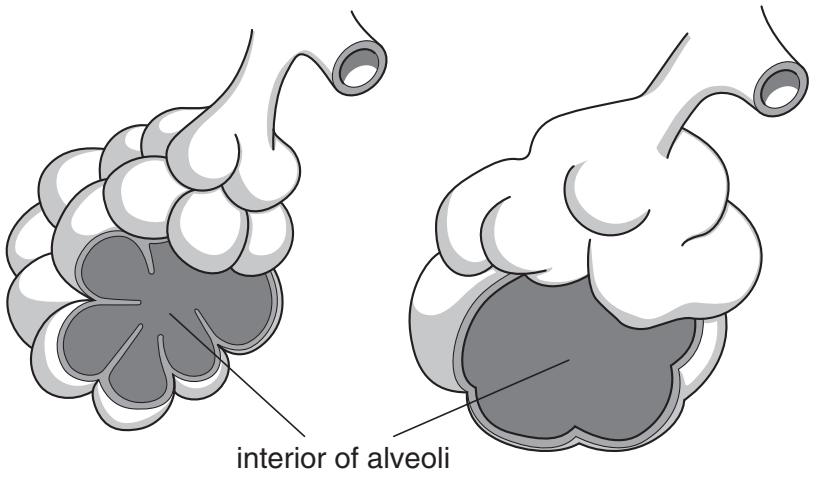
[Total: 17]

6 **(a)** Fig. 6.1 shows a diagram of alveoli in a healthy lung and alveoli in a lung from a person with advanced emphysema.



alveoli in a healthy lung alveoli from a person with advanced emphysema

Fig. 6.1

(i) Describe how smoking could cause changes in alveoli, such as those shown in Fig. 6.1.

In your answer you should make the links between the changes and their causes clear.

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(ii) Emphysema is a form of chronic obstructive pulmonary disease (COPD).

Describe **two** signs or symptoms of emphysema.

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

(iii) Emphysema is described as a chronic disease.

Suggest the meaning of the term *chronic*.

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

(b) An investigation was conducted into the effect of smoking on lung function. One measure of lung function is peak flow rate.

The peak flow rate is the maximum volume of air expelled from the lungs in one minute ($dm^3\ min^{-1}$).

Two male volunteers, one a smoker and one a non-smoker, had their peak flow measured once a year for seven years.

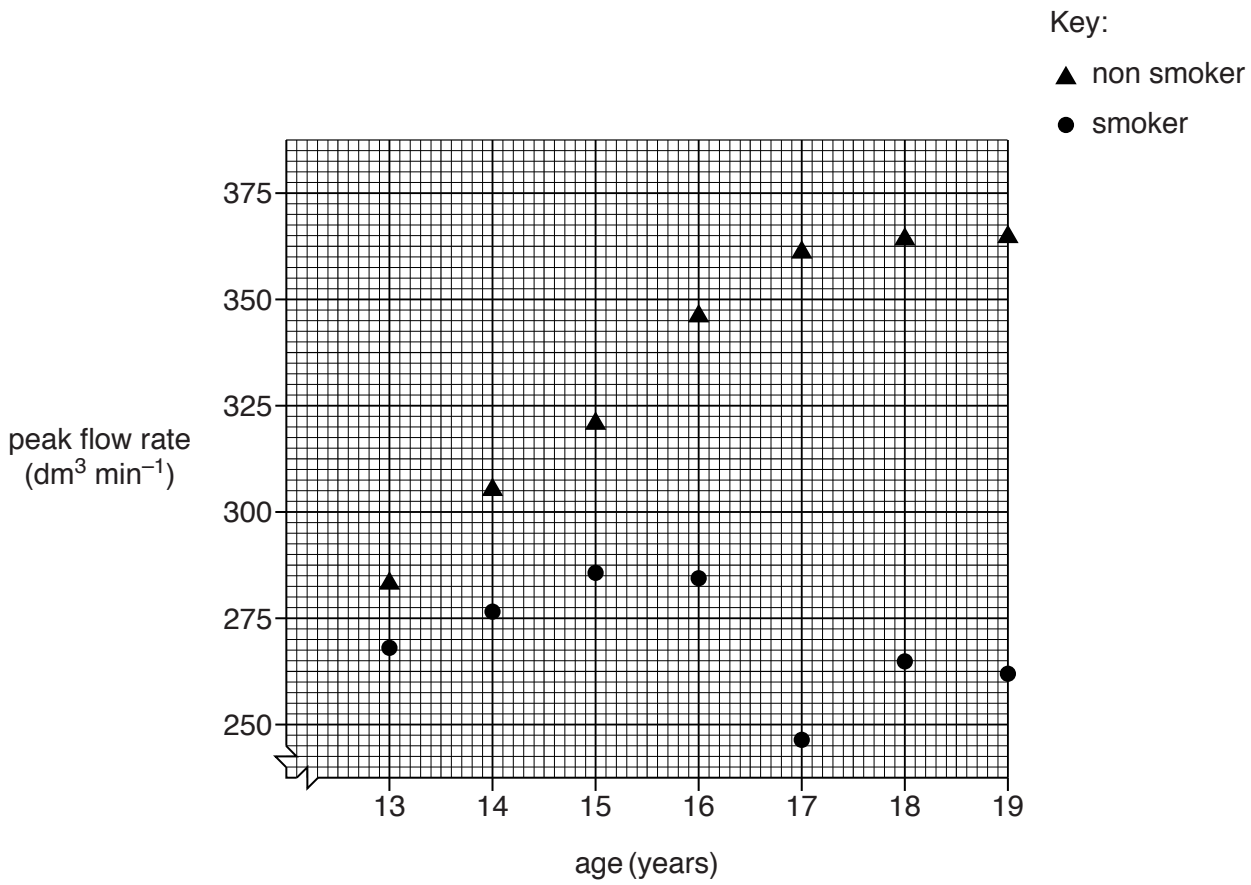

Fig. 6.2

(i) **Describe** the data shown in Fig. 6.2.

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(ii) **Explain** the results obtained for the smoker.

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(iii) Suggest **three** ways of improving the reliability of this investigation.

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[Total: 19]

END OF QUESTION PAPER

PLEASE DO NOT WRITE ON THIS PAGE