Centre Number	Candidate Number	Name

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education
General Certificate of Education Ordinary Level

ENVIRONMENTAL MANAGEMENT **0680/04**
5014/02

Alternative to Coursework

October/November 2005

1 hour 30 minutes

Candidates answer on the Question Paper.
Additional Materials: Ruler (cm/mm)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces provided at the top of this page.
Write in dark blue or black pen on both sides of the paper.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.
Study the appropriate Source materials before you start to write your answers.
Credit will be given for appropriate selection and use of data in your answers and for relevant interpretation of these data. Suggestions for data sources are given in some questions.
You may use the source data to draw diagrams and graphs or to do calculations to illustrate your answers.
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

This document consists of **15** printed pages and **1** blank page.

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Fig. 1 Map of the World

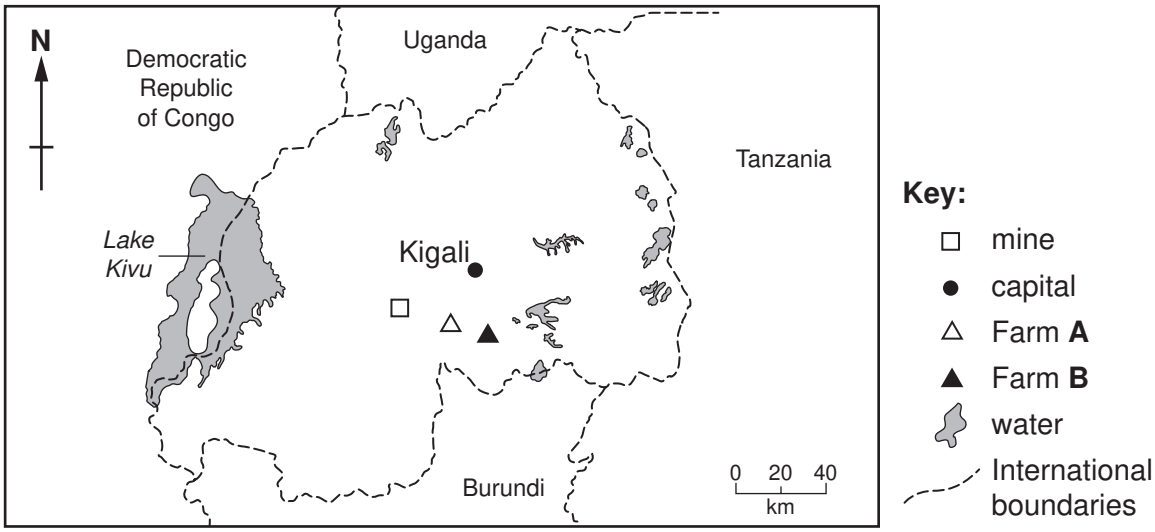


Fig. 2 Map of Rwanda

Rwanda is the most densely populated and one of the smallest countries in Africa. About 90% of the population are farmers. Only 13% of the original wildlife habitat remains.

- Area: land 24 948 sq km water 1 390 sq km
- Population: 8.2 million
- Currency: Rwandan Franc 475 francs = 1 US Dollar
- Languages: Kinyarwanda, French, English
- Altitude: 1000 to 4500 m
- Climate: tropical, modified by height
- Main Exports: coffee, tea, hides, tin ore
- Population growth rate: 1.84% per year
- Average number of children born to each woman: 5.6
- Life expectancy: male 38 years, female 40 years
- Population below poverty line: 60%

1 Climate is a very important factor in successful farming. The annual temperature and
were recorded on two farms over one year.

Months	Rainfall mm	
	Farm **A**	Farm **B**
January	111	46
February	156	61
March	140	130
April	183	175
May	164	147
June	23	74
July	7	48
August	27	86
September	63	91
October	102	97
November	110	122
December	93	99
Recorded temperature range	14 – 27 °C	16 – 28 °C

Fig. 3

(a) How many months had rainfall greater than 100 mm

on farm **A** .....

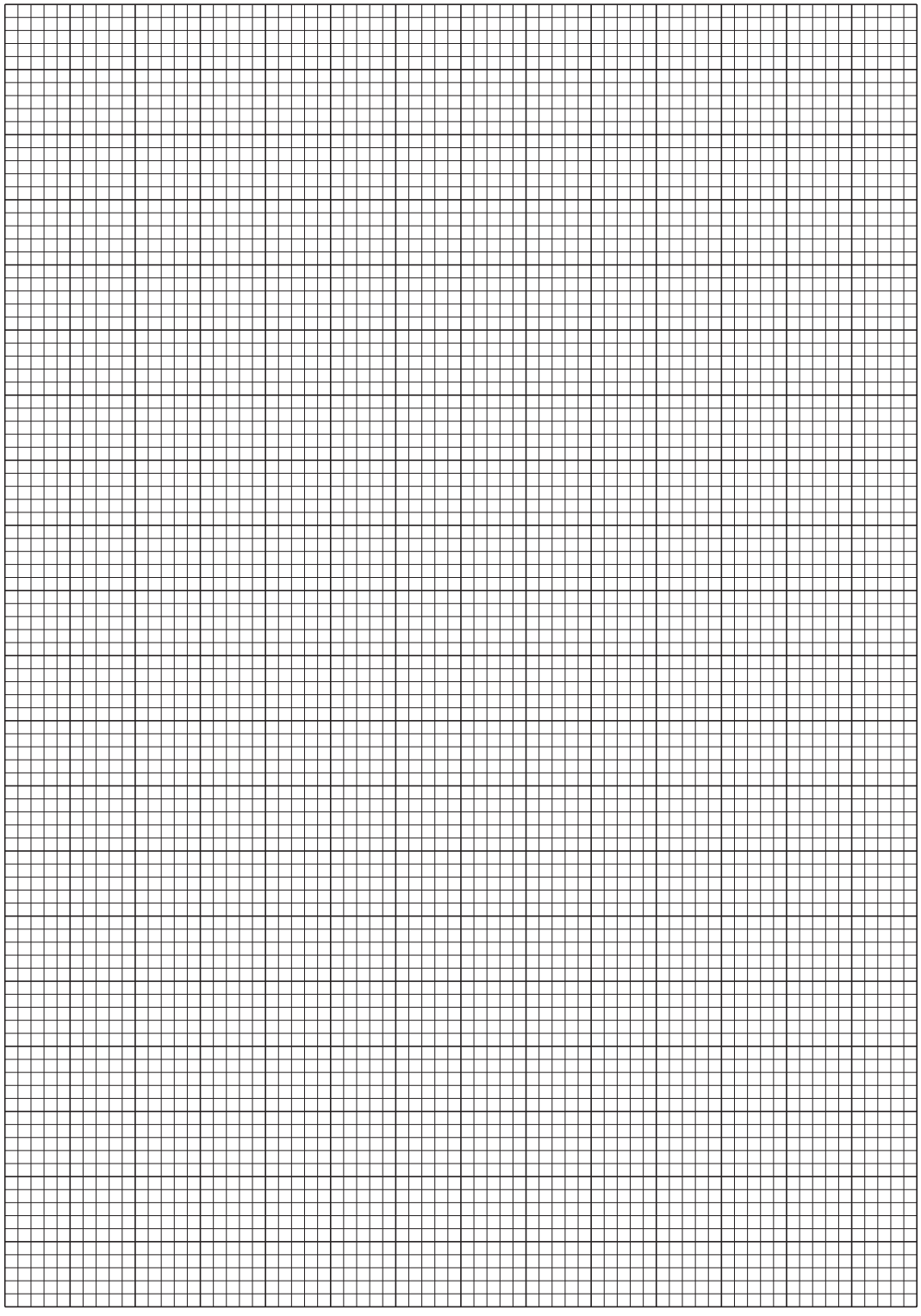
on farm **B**? ..... [1]

(b) Which was the driest month

on farm **A** .....

on farm **B**? ..... [1]

(c) Plot the rainfall data on a suitable graph.



[4]

(d) The crops harvested on farms **A** and **B** were recorded for one year.

Crops harvested	Farm **A**	Farm **B**	Total
Finger millet	1500 kg	1050 kg	2550 kg
Sorghum	1000 kg	850 kg	1850 kg
Maize	1500 kg	2350 kg	3850 kg
Beans	500 kg	1500 kg	2000 kg
Total	4500 kg	5750 kg	10250 kg

Fig. 4

(i) Calculate the **total** yield of sorghum as a % of **total** yield of all crops.

.....[2]

(ii) Porridge is a staple food eaten once a day by farming families. It can be made from the grain of finger millet, sorghum or maize. The porridge is cooked on small open fires.

Fig. 5

Sorghum stalks can be used as a fuel for cooking instead of wood.
Some students wanted to find out how many sorghum stalks were used for cooking. They each wrote a plan.

Plan A
Watch one family cooking for a day. Write down how long the cooking takes and how many stalks are used.

Plan B
Watch one family for three days. Weigh the pile of sorghum stalks on day one and again at the end of day three. The difference is the weight of stalks used.

Plan C
Watch one family for three days and write down how long the cooking takes. Weigh the pile of sorghum stalks at the start of day one and again at the end of day three. The difference is the weight of stalks used.

Draw a table to show how you would record the data from plan C.

[3]

(iii) Which plan is **least** likely to give reliable data? Give a reason for your answer.

.....

.....[2]

(e) An average family uses 3 kg of cooking fuel each day. If they run out of sorghum stalks they have to walk 10 km to collect wood.

- The students calculated that 3 kg x 365 days = 1095 kg of sorghum stalks are needed to cook for one year.
- An average harvest of one hectare gives 1950 kg sorghum stalks.
- After a new sorghum crop is planted intensive labour is needed to carry out weeding to stop sorghum plants dying.

What advice would you give farmers?

.....

.....

.....[2]

(f) The farmers told the students that some of their seeds started growing and the... the soil became waterlogged due to heavy rainfall. The students decided to carry ... trial using seedlings. They planted finger millet seedlings in five pots with free drain... soil and another five seedlings in pots with waterlogged soil. They carried out the same procedure for sorghum and maize.

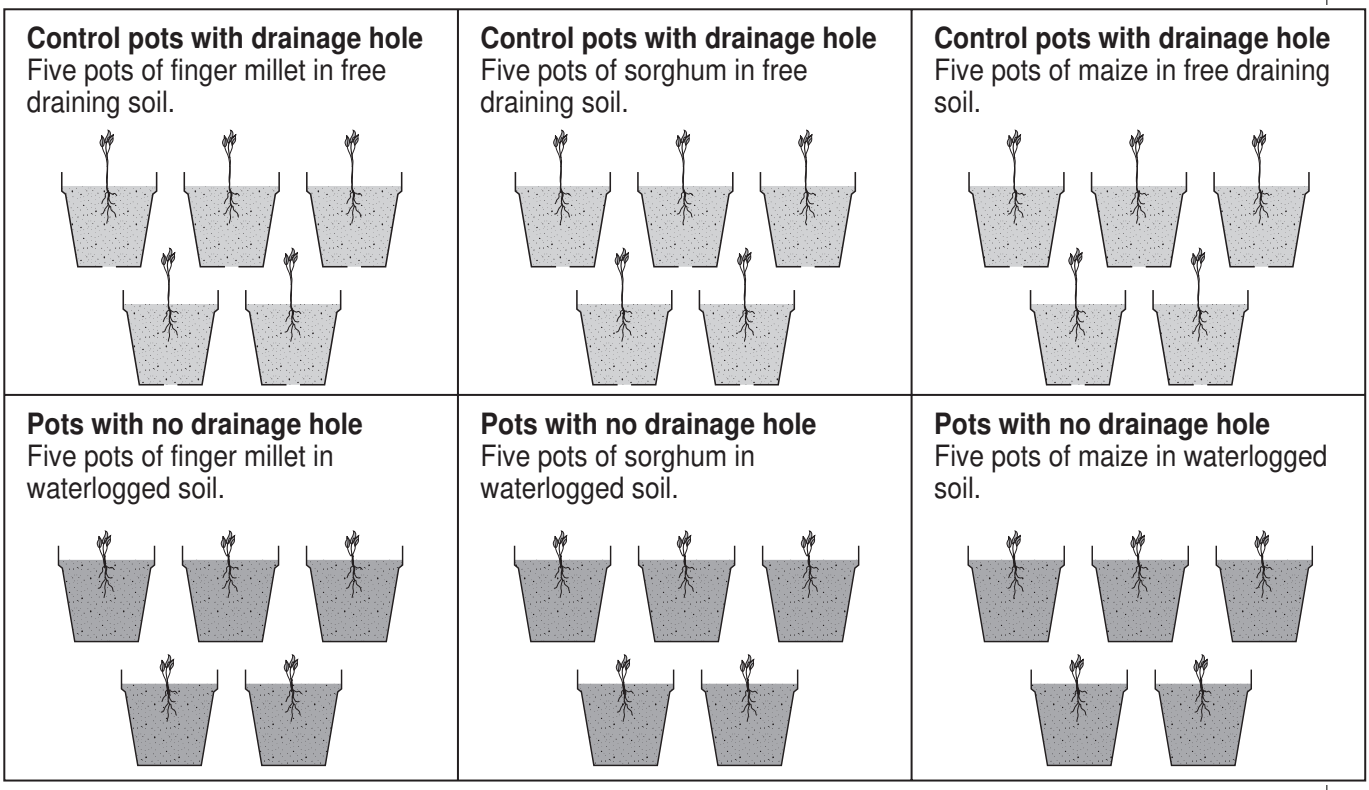


Fig. 6

The students measured the height in cm of all the seedlings after one week. The results are shown below.

Pot	Finger millet	Sorghum	Maize
1	10	6	2
2	8	5	3
3	7	6	2
4	11	4	4
5	9	4	4
Average in waterlogged soil	9	5	3
Average in free draining soil	12	9	10

(i) Which type of crop showed the least growth in waterlogged conditions?

.....[1]

(ii) Why did the students plant five pots for each type of crop?

.....

.....[1]

(iii) The farmer wanted to plant crops in February. Using information in the table and Fig. 3 suggest, with a reason, which crops should be planted. (Give at least **two** types of crop for each farm.)

on farm **A** .....

.....

.....

on farm **B** .....

.....

.....[4]

(iv) One student wanted to repeat the trial before suggesting any changes on farms **A** and **B**.
State **three** pieces of information you would need to carry out exactly the same trial.

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.....

.....

.....[3]

2 The students wanted to find out how the farmers carried out crop rotation. A farmer [illegible] the students to make a plan of his fields.

Field plan of farm 2005

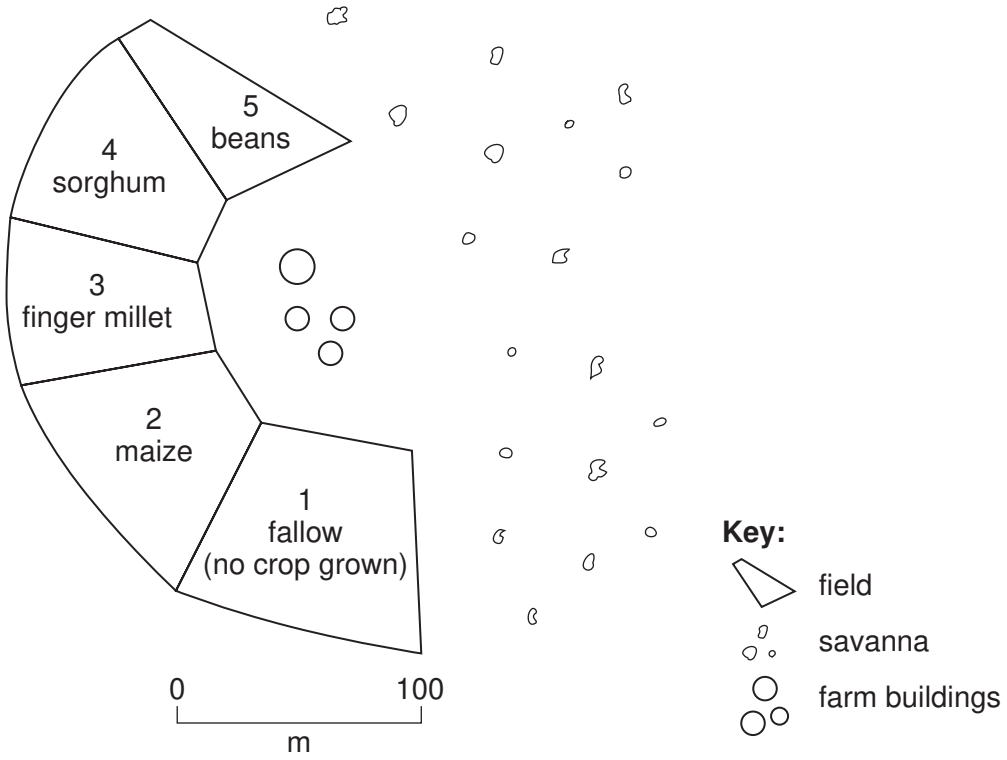

Fig. 7

(a) Which field should the farmer make bigger? Why would this help the farmer?

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.....

.....[2]

(b) Suggest a field management plan for the farmer by completing the table below to show which crops should be grown in each field.

Year	Field				
	1	2	3	4	5
2006					
2007					
2008					

[3]

(c) The farmer complained that some parts of his fields and grazing land were affe soil erosion due to heavy rainstorms. The students made rain collectors from pl sheets and stones. The water collects in the centre and can be measured in containe of known volume.

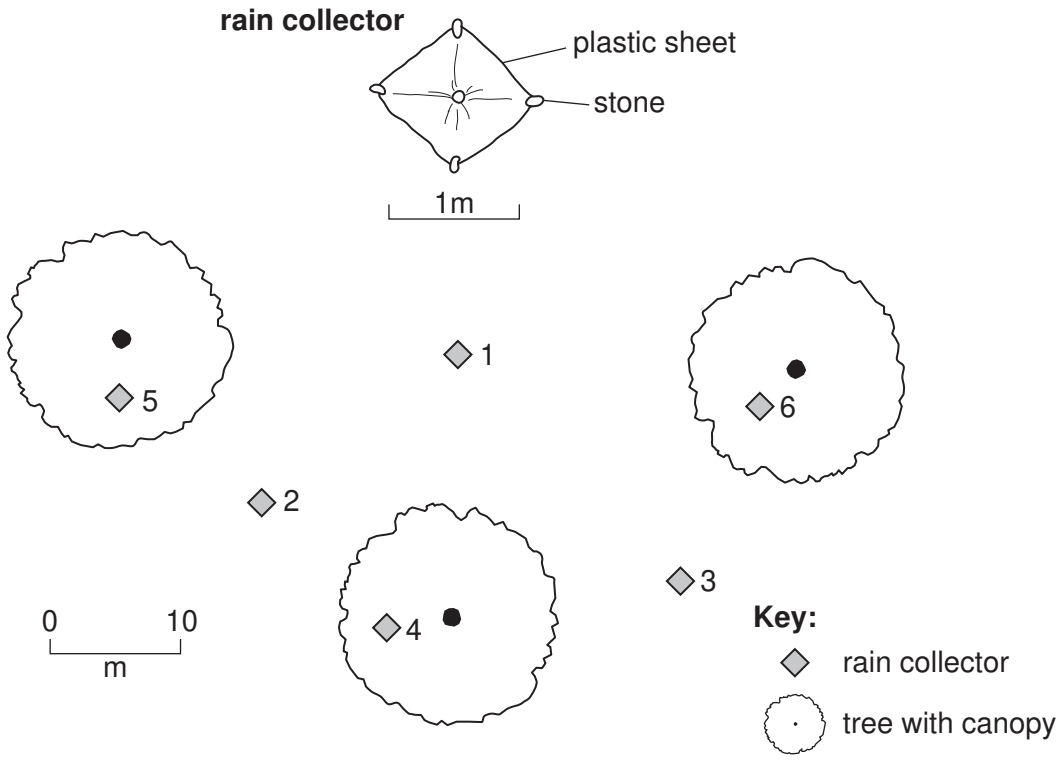

Fig. 8

The students placed the collectors on the ground as shown and measured the volume of water collected after one rain storm.

	Collector in the open			Collector under the trees		
	1	2	3	4	5	6
Volume of water cm^3	7500	6900	7200	5000	5400	5500
Average						

(i) Complete the table. [2]

(ii) Suggest an explanation for the differences between the two groups of collection sites.

.....

.....

.....[2]

(iii) Describe **three** ways the students could make sure they collected the d accurately and reliably as possible.

.....

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.....

.....[3]

(d) One of the students noticed that the grasses growing under the trees looked taller and healthier than those in the open. They decided to dig six soil pits and draw a diagram of the profile of each pit.

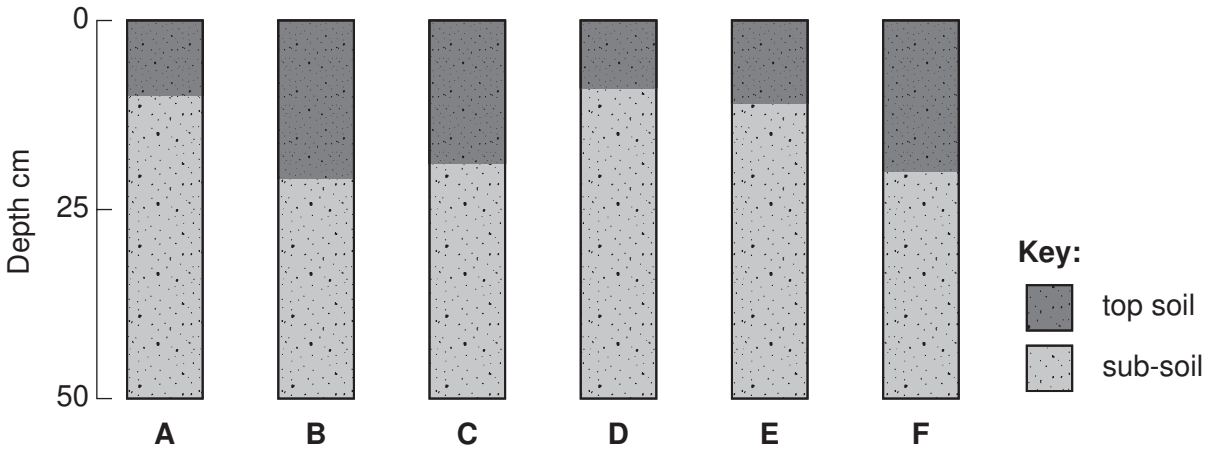

Fig. 10

(i) Write the letters A – F on Fig. 8 to show where you think the soil pits were dug. [2]

(ii) Choose **two** different soil profiles and suggest reasons for the differences between them.

.....

.....

.....

.....[2]

3 You are a local agricultural advisor. Your task is to help each family use their plot of la sustainable way and to reduce malnutrition.

A farmer has had four ideas to try and improve his situation next year.

First idea
Replace maize with new genetically modified (GM) maize.

Second idea
Clear more marginal land on a hillside to produce more crops.

Third idea
Grow only sorghum and finger millet.

Fourth idea
Try to grow three crops in one year instead of two.

(a) Give the farmer **one** reason why each idea may make his situation worse.

First idea

.....

.....

Second idea

.....

.....

Third idea

.....

.....

Fourth idea

.....

.....[4]

(b) Another farmer thinks that the students have gathered helpful information which use to carry out sustainable farming in future and prevent malnutrition in his family.

Suggest methods the farmer could use to farm sustainably and provide enough food for his family.

.....

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.....[5]

4 Some people have left the land to look for other types of work. A mine has been st... the centre of Rwanda to extract tantalum and coltran (used in cellphones). There ... already been many fatal accidents and the local environment is beginning to suffer.

(a) Dust from the spoil heaps can be carried over a large area by wind.
A student applied clear sticky tape to some plant leaves near a spoil heap. The tape was then removed and fixed onto microscope slides.
Four samples were seen as shown below.

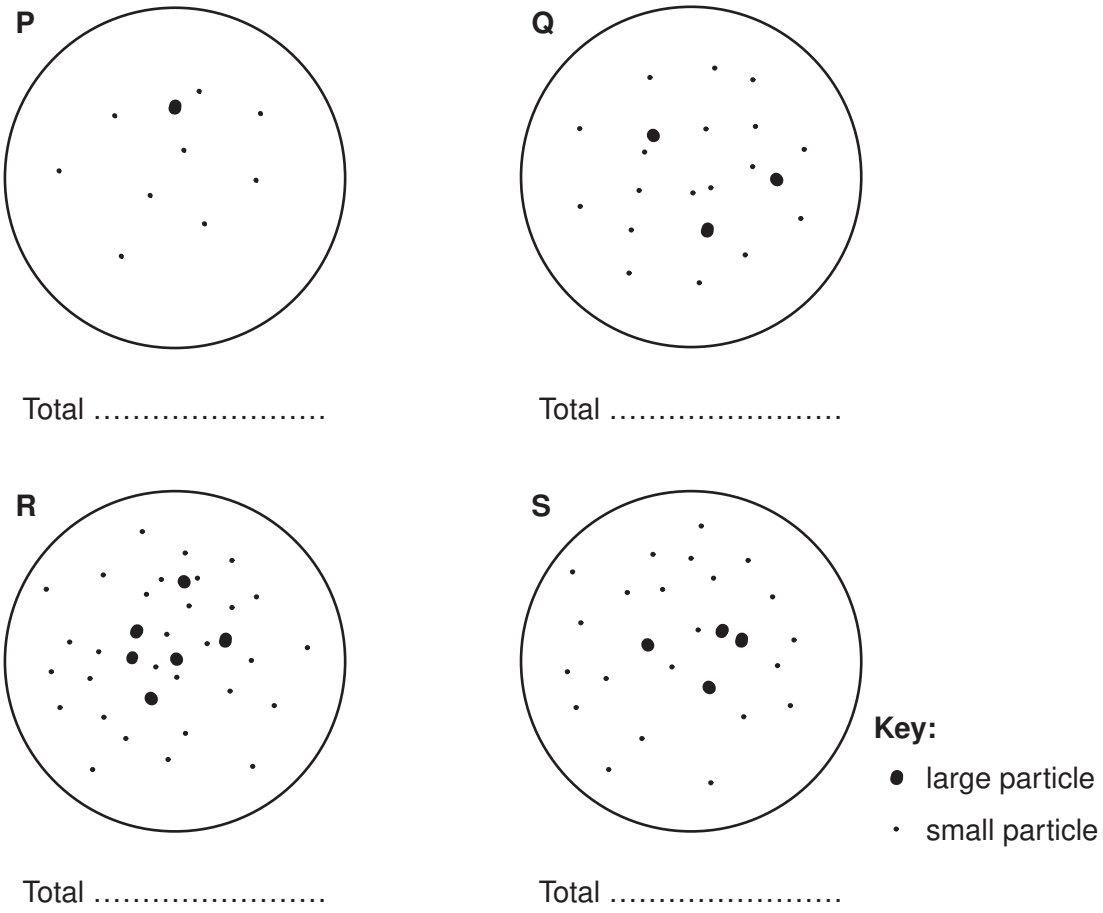

Fig. 11

(i) Count all the particles on each slide and write in the totals. [1]

(ii) Which samples are likely to be the nearest and the furthest from the spoil heap? Give a reason for your answer.

Nearest .....

Furthest .....

Reason .....

.....[2]

(iii) Why is dust from spoil heaps a hazard to humans and plants?

Humans

.....

.....

Plants

.....

.....[3]

(b) (i) Suggest **one** reason why the government wants the mining to continue.

.....

.....[1]

(ii) You have been asked to find out why people became miners using a questionnaire. Complete the questionnaire which has been started for you, with three further questions.

Questionnaire for miners

Q1 How long have you been working at the mine?

Less than one week ☐ 1-4 weeks ☐

5-8 weeks ☐ more than 8 weeks ☐

Q2 .....

.....

.....

Q3 .....

.....

.....

Q4 .....

.....

.....[4]