



National 5

Unit 3

Life on earth

Ink exercise 3

Sampling techniques and
measurement of abiotic and
biotic factors

Once completed and marked-

Think about and list below the areas I need to work on:

Multiple choice

Tick one answer from each question.

1. Which piece of equipment can be used for estimating the number of plants in an area?
 - a) Quadrat
 - b) Pitfall trap
 - c) Light meter

2. Which of the following is a piece of equipment that can be used to sample the ground invertebrates in a habitat?
 - a) Light meter
 - b) Pitfall trap
 - c) Quadrat

3. Which of these pieces of equipment can be used to measure an abiotic factor?
 - a) Pitfall trap
 - b) Quadrat
 - c) Light meter

4. Which of the following reasons explains why grass grows abundantly in a field but not in a wood?
 - a) The woodland animals have eaten all the grass
 - b) The wood will be too sheltered from the wind
 - c) There is a higher light intensity in a field for photosynthesis

5. How can a representative sample of the plant species growing in a field be obtained?
 - a) By placing one quadrat at a random location in the field
 - b) By randomly placing a quadrat at many different locations around the field
 - c) By randomly placing many quadrats in one corner of the field

6. How can errors be minimized when using a moisture meter?

- a) Use the probe several times in a row
- b) Wave the probe around in the air between samples
- c) Wipe the probe between samples

7. How can the reliability of light meter readings be checked?

- a) Take one reading
- b) Take one reading and then another later in the day
- c) Take several readings and obtain an average

8. A sample of fresh soil from woodland was weighed, dried at 60°C and reweighed. This procedure was repeated until there was no further loss in mass.

Results

Original mass of fresh soil = 50g

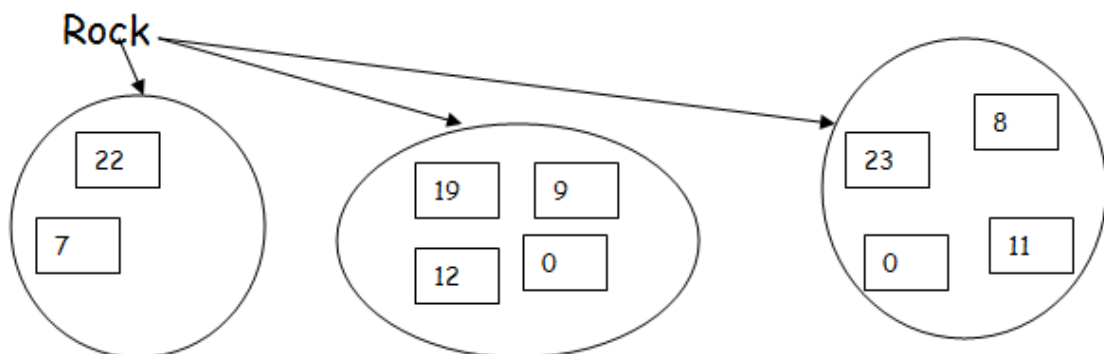
Final mass of dried soil = 32g

What percentage of the original soil sample was water?

- a) 36
- b) 18
- c) 64

9. A survey was carried out to investigate the number of mussels attached to rocks on a sea shore. Quadrats measuring 10cm X 10cm were used in the survey.

The positions of the quadrats and the number of mussels in each quadrat are shown below.



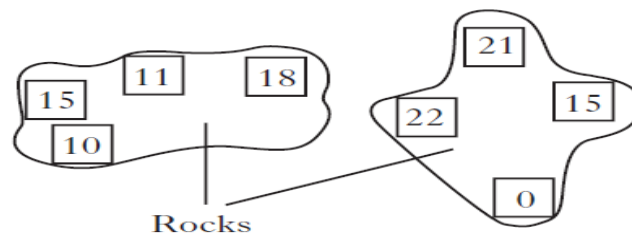
How could the results have been made more reliable?

- a) Sample one rock only
- b) Use larger quadrats
- c) Record a wider variety of species

10.

A survey was carried out on the number of mussels attached to rocks on a seashore.

The positions of the mussels are shown by squares in the diagram below. The numbers of mussels at each position are shown in the squares.



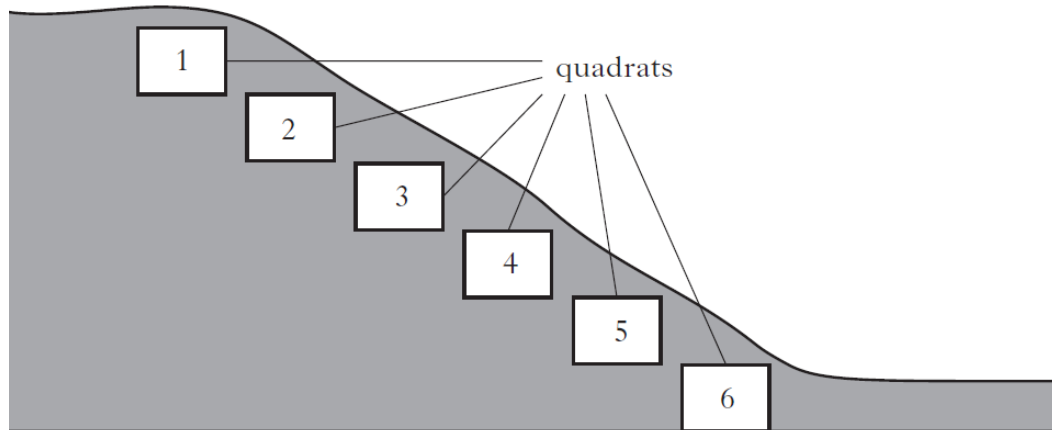
What is the average number of mussels found per square?

- A 14
- B 16
- C 56

11.

- (a) In an investigation into the distribution of heather plants, six quadrats were placed in a line from the top to the bottom of a hill.

Soil moisture, pH, surface light intensity and heather abundance score were recorded for each quadrat.



The following table shows the results.

<i>Quadrat</i>	<i>Soil moisture (%)</i>	<i>Surface light intensity (lux)</i>	<i>pH</i>	<i>Heather abundance score</i>
1	10	10 000	5.5	25
2	15	11 000	5.4	22
3	40	10 000	5.5	15
4	63	10 500	5.5	9
5	71	12 000	5.6	6
6	81	11 000	5.4	0

- (i) Describe the distribution of heather on the slope of the hill.

- (ii) Which of the abiotic factors recorded has the greatest effect on the distribution of the heather plants?

1

- (iii) Which quadrat would be most likely to contain a species of plant which grows best in wet soil with a low pH?

Quadrat _____

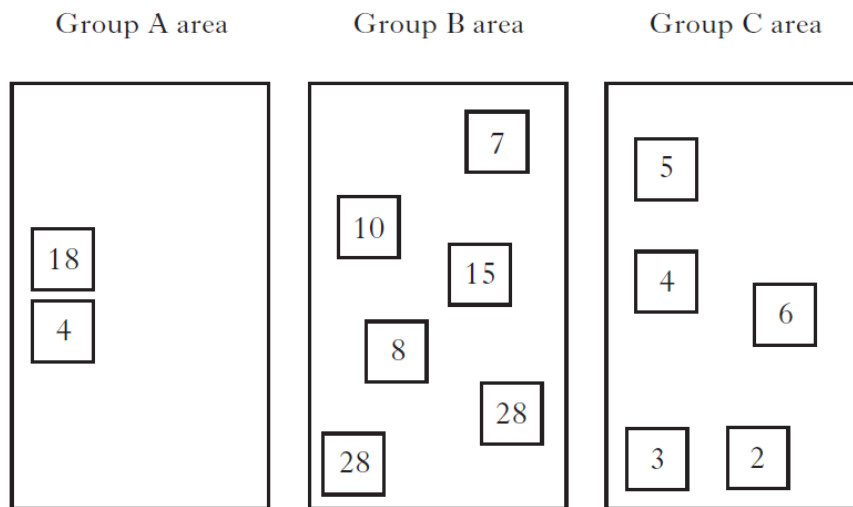
1

12.

- (a) Three groups of students used quadrats to carry out a survey on the distribution of mussels on different areas of a shore.

Each quadrat measured 50 cm × 50 cm. (Four quadrats = 1 m²).

The positions of the quadrats and the number of mussels found is shown below for each group.



- (i) Complete the following table with the results from the area of Group C.

Space for calculation

<i>Group</i>	<i>Average number of mussels per quadrat</i>	<i>Estimated number of mussels per m²</i>
A	11	44
B	16	64
C		

1

- (ii) Which group has made an error in their sampling technique which makes their results less reliable than the other groups?

State the error this group has made and describe an improvement which would increase the reliability of their results.

Group _____

Error _____

1

Improvement _____

1

13.

- (a) Two groups of pupils set pitfall traps in the school gardens to sample invertebrates living there. All traps were left for the same length of time. The results are shown in the following tables.

Group A	Pitfall trap number	Number of each type of invertebrate caught				
		spider	beetle	snail	earthworm	woodlouse
	1	2	1	2	0	1
	2	3	2	1	0	0

Group B	Pitfall trap number	Number of each type of invertebrate caught				
		spider	beetle	snail	earthworm	woodlouse
	1	2	3	2	1	1
	2	2	0	3	1	2
	3	0	2	1	1	1
	4	3	2	1	0	1
	5	3	1	1	2	1

- (i) How many types of invertebrate did Group A find?

_____ types

1

- (ii) Calculate the average number of spiders found in Group B's traps.

Space for calculation

_____ spiders

1

- (iii) Explain why conclusions made by Group B from their results would be more reliable than conclusions made by Group A.

1

- (iv) Give **one** precaution which must be taken when setting up a pitfall trap, or other named sampling technique, and explain the reason for it.

Sampling technique _____

Precaution _____

_____ **1**

Reason _____

_____ **1**

(b) The diagrams below show the invertebrates collected by the pupils.
They are not drawn to scale.



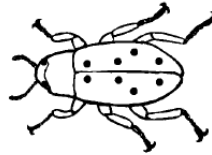
Earthworm



Snail



Spider



Beetle



Woodlouse

(i) Complete the following key using information from the diagrams.

1	Legs	Go to 2	<input type="checkbox"/>	1
	No legs	Go to	<input type="checkbox"/>	
2	12 legs or more	<i>Woodlouse</i>		
	Fewer than 12 legs	Go to 3		
3	Spots on body	<i>Beetle</i>		
	No spots on body	<input type="checkbox"/>		1
4	Shell	<i>Snail</i>		
	<input type="checkbox"/>	<input type="checkbox"/>		1

(ii) Give **three** features of the beetle mentioned in the key.

- 1 _____
- 2 _____
- 3 _____

1

25 marks