Key Area 2—Distribution of organisms

Biotic factors which can affect the distribution of an organism include:

Competition for resources
Disease
Food availability
Grazing
Predation

Biotic factors are factors associated with **living things**.

Abiotic factors which can affect the distribution of an organism include:

Light Intensity
Moisture
pH
Temperature

These are **'non- living'** factors.

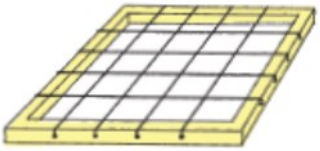
Measuring abiotic factors.

Examples:

Abiotic Factor:	**Light Intensity**
How to measure:	Use a **light meter**
Possible source of error:	Shadow cast on meter
How to minimise error:	Make sure observers stand clear of light meter.

Abiotic Factor:	**Moisture**
How to measure:	Stick a **moisture probe** into soil.
Possible source of error:	Soil left on probe from previous reading.
How to minimise error:	Wipe probe between readings to remove soil.

Sampling Plants and Animals

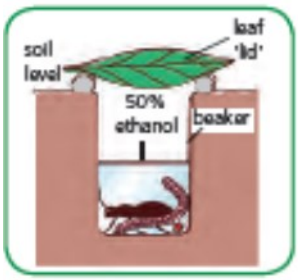


Plants can be sampled using a **Quadrat**.

Source of Error : Sample size is too small and not representative of the entire area.

How to minimise error: Take several replicate quadrat measurements/readings.

Animals can be sampled using a **Pitfall Trap.**



Source of Error: Predators may eat trapped animals.

How to minimise error: Camouflage entrance of pitfall trap to prevent predators seeing trap.

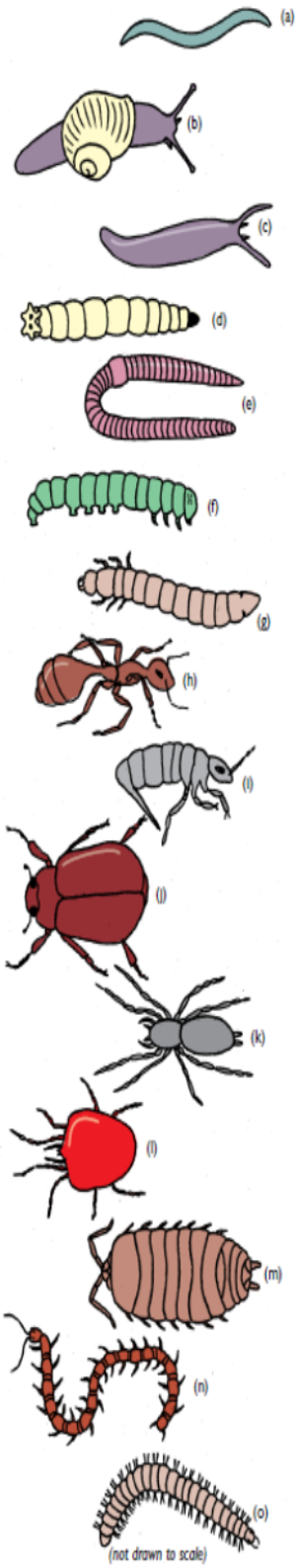
Source of Error: Some of the trapped animals eat other animals in trap with them.

How to minimise error: Preserve trapped animals in ethanol (not eco-friendly!)

Check traps regularly.

(d) Using and constructing **Paired-statement Keys.**

1	body has no legs	go to 2
	body has legs	go to 6
2	body not divided into sections (segments)	go to 3
	body divided into segments	go to 5
3	body worm-like	nematode worm (a)
	body not worm-like	go to 4
4	shell present	snail (b)
	no shell present	slug (c)
5	no more than 13 segments present	fly maggot (d)
	more than 13 segments present	earthworm (e)
6	6 jointed legs present	go to 7
	more than 6 jointed legs present	go to 11
7	grub-like insect	go to 8
	adult insect	go to 9
8	non jointed legs present on abdomen	caterpillar (f)
	non jointed legs absent from abdomen	beetle larva (g)
9	thin waist between thorax and abdomen	ant (h)
	no thin waist between thorax and abdomen	go to 10
10	spring attached to abdomen	springtail (i)
	no spring attached to abdomen	beetle (j)
11	8 legs present	go to 12
	more than 8 legs present	go to 13
12	body divided into 2 parts	spider (k)
	body not divided into 2 parts	mite (l)
13	14 legs present	woodlouse (m)
	more than 14 legs present	go to 14
14	each body segment has 1 pair of legs	centipede (n)
	each body segment has 2 pairs of legs	millipede (o)



In the example shown, each

Organism can be identified using the paired statement key.

For organism (a)

Start at statement 1: it does not have legs so follow the instruction ‘go to 2’.

Statement 2: its body is not divided into sections so follow the instruction ‘go to 3’

Statement 3: its body is ‘worm-like’ so (a) is a Nematode worm.

To construct a 'paired statement key' it's a little trickier.

Example:

Plant	*Height range (cm)*	*Flower colour*	*Flowering period (months)*
Pink Campion	30–90	pink	6
Ragwort	30–200	yellow	6
Meadow Grass	30–70	green	3
Buttercup	5–90	yellow	5

In this example, the information in the table must be used to complete the paired statement key.

Statement 1 should have 2 'go to…' statements.

Using the information in the table, complete the three boxes in the paired statement key below.

1. Flower colour is yellow — go to 2

   Flower colour is not yellow — [ ]

Flower colour is not yellow must have the instruction **'go to 3'** since Ragwort is in statement 2 and Ragwort is yellow (seen in table).

2. Height of plant can be over 100 cm — Ragwort

   Height of plant is under 100 cm — [ ]

3. Flowering period lasts only 3 months — Meadow Grass

   Flowering period is longer than 3 months — [ ]

Since we have worked out statement 2 is for identifying Yellow flowers and Ragwort is already given, it is easy to work out the remaining yellow flower must be **'Buttercup'.** We can check this is correct by making sure its height is under 100cm (which it is : 5 – 90cm).

Statement 3 identifies the 'non yellow' flowers. Meadow Grass is already given so the only other non-yellow flower is **'Pink Campion'.**

(e)Effect of Biotic and Abiotic factors on biodiversity and the distribution of organisms.

Low Light Intensity
Low Carbon Dioxide Concentration
Low/Very High Temperatures
Low moisture/rainfall
Low Oxygen concentration

These **abiotic factors** can **reduce biodiversity** since they will lead to a reduced rate of photosynthesis and/or aerobic respiration.

Low temperatures **reduce enzyme activity** and **high temperatures denature enzymes**. Since **enzymes control both photosynthesis and aerobic respiration**, the rate of these processes decrease (or stop) and this leads to the death of plants and/or animals and so **reduces biodiversity**.

Explanations are required for 2 mark questions.

Disease
Increased Competition
Availability of food

These **biotic factors** can reduce biodiversity.
Disease leads to **increased death rate.**
Weaker species/individuals lose out on vital resources as a result of competition.

(f) Indicator Species

These are species that by their presence or absence **indicate environmental quality/levels of pollution**.

Levels of air pollution can be estimated by the presence or absence of organisms called lichens.

Air pollution level	*Most common type of lichen present*
Low	Shrubby
Medium	Leafy
High	Crusty

Environmental scientists carried out a study on lichen species at four different sites and obtained the results shown in the table below.

	Number of lichen species present		
Site	*Shrubby*	*Leafy*	*Crusty*
A	0	5	19
B	3	2	0
C	16	3	0
D	7	14	2

(a) (i) Site A had the highest levels of air pollution.

Using information from both tables, describe the evidence supporting this statement. 1

_____

_____

(ii) Calculate the average number of leafy lichen species present at the four sites. 1

Space for calculation

_____

(b) State the name given to species, such as lichen, which are used to estimate levels of pollution. 1

_____

In this example, Site A contains the greatest number of 'Crusty' lichens (using lower table) **and** this species of lichen indicates high levels of air pollution (using upper table).

Use information from BOTH tables as instructed.

Indicator species estimate levels of pollution.