Kirkcaldy High School
Biology Department
National 4/5 Biology
Unit 3 Life on Earth
Section 1 – Extreme Earth

Name:_____

Class: _____

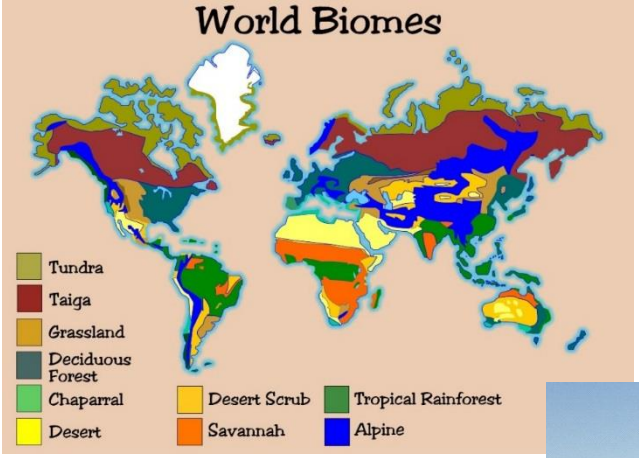
Level	Key Area	Content	S3/4
5	1a	Give the definitions of ecological terms: species, biodiversity, population, producer, consumer, herbivore, carnivore, omnivore, predator, prey, food chain, food web.	3
4	1	Investigate a variety of ecosystems/biomes, eg rainforest, tundra, desert, arctic, temperate, local ecosystems. Animals and plants depend upon each other for a number of things including food, shelter and pollination	3
3	1	Habitat is the place where an organism lives The range of types of organisms, ie the biodiversity, varies greatly between habitats.	3
4	1	The addition/removal of a species will impact upon other species within an ecosystem.	3
5	1b	Describe that an ecosystem consists of all the organisms (the community) living in a particular habitat and the non-living components with which the organisms interact. I can describe the interactions of organisms in food webs.	3
5	1c	A niche is the role that an organism plays within a community. It relates to the resources it requires in its ecosystem, such as light and nutrient availability and its interactions with other organisms in the community. It involves competition and predation and the conditions it can tolerate such as temperature.	3
5	1d	Competition in ecosystems occurs when resources are in short supply. Interspecific competition occurs amongst individuals of different species for one or a few of the resources they require. Intraspecific competition occurs amongst individuals of the same species and is for all resources required. Intraspecific competition is therefore more intense than interspecific competition.	3
5	2a	Competition for resources, disease, food availability, grazing and predation are biotic factors. Light intensity, moisture, pH and temperature are abiotic factors.	3
5	2b	Measuring abiotic factors such as light intensity, soil moisture, pH and temperature. Possible sources of error and how to minimise them.	3
5	2c	Sampling of plants and animals using quadrats and pitfall traps. Evaluation of limitations and sources of error in their use.	3
4	1	Investigate various biotic factors, eg food availability, predators, disease and competition. Use sampling techniques, eg transect and quadrat analysis.	3
3	1	Different sampling techniques are used depending upon the organisms being sampled, eg quadrats — plants, pitfall traps — ground dwelling invertebrates.	3

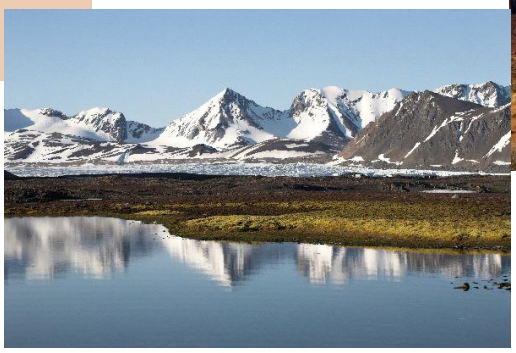
3	1	The conditions in a habitat, eg light intensity, moisture content of the soil and temperature have an effect on distribution of the organisms living there.	3
5	2d	Using and constructing paired-statement keys to identify organisms.	3
3	1	Branching keys are used to identify organisms	3
5	2e	The effect of biotic and abiotic factors on biodiversity and the distribution of organisms.	3
4	2	Human population growth has resulted in habitat destruction, deforestation, overfishing, intensive agriculture, genetic pollution, climate change, acid rain, oil and chemical spills, sewage and litter. These environmental disruptions have had a negative impact on biodiversity.	3
4	2	Natural hazards such as forest fires, earthquakes, tsunamis, floods and volcanic activity will also reduce biodiversity.	3
4	2	Investigate examples of human population growth and how these affect biodiversity. Investigate/research ecological footprints that measure human demands on earth's resources	3

Biodiversity and the distribution of life

Biomes

_____ are regions of our planet that are grouped together by their similar _____ (e.g. rainfall and _____) and distinctive group of plants and animals living there. Examples of biomes include the _____, desert and _____.





<u>Optional Task –</u> Use the internet to research a biome of your choice (either forest, desert, grassland, tundra or aquatic). Write down your research in your jotter.

INCLUDE…

- The name of the biome
- Examples of this type of biome on Earth
- The types of **flora** found in the biome
- The types of **fauna** found in the biome
- The annual temperature changes
- The annual precipitation
- Other interesting facts that you can find.

Two useful websites to use for this are:

- https://earthobservatory.nasa.gov/experiments/biome
- https://animalcorner.co.uk/biomes/grassland/

Key Ecological Terms

In order to describe ecosystems, you need to be able to use some key ecological terms.

Term	**Definition**
Ecosystem	
Biodiversity	
Habitat	
Species	
Population	
Community	
Producer	
Consumer	
Herbivore	
Carnivore	
Omnivore	

Food Chains

One of the most useful ways of showing feeding relationships in an ecosystem is through a food chain.

Food chains always start with producers, then move onto consumers.

In this food chain the _____ is the Grain. It produces its own food from sunlight.

The field mouse is the _____ _____. Since it eats only plant material. It is a _____.

The fox is the _____ _____. It eats only animal material. It is a _____

IMPORTANT

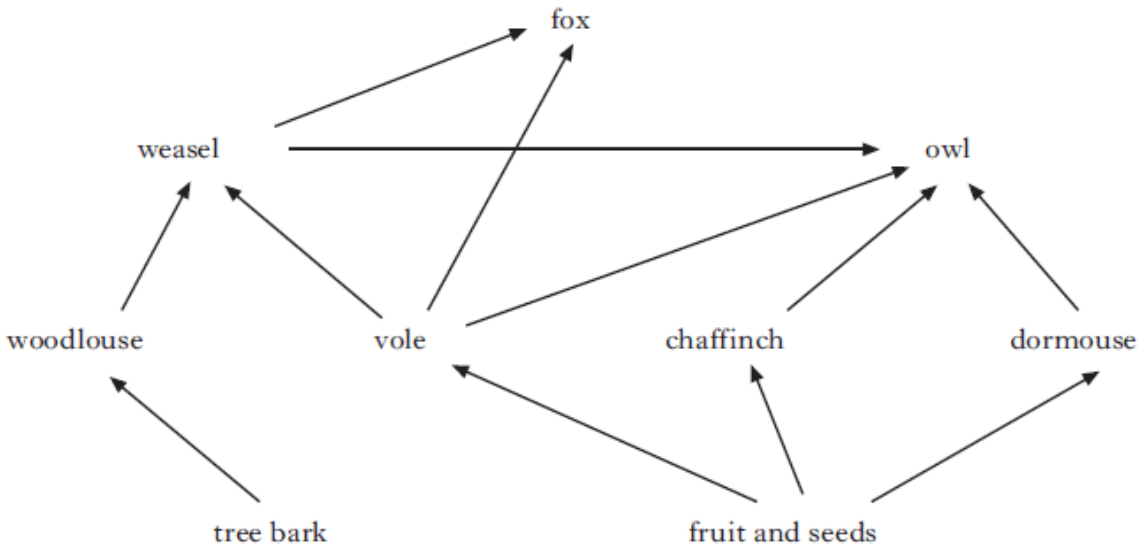
_____.

Food Webs

A food chain does not show what is really going on in an ecosystem. If you take all the food chains and link them up, you get a **food web**

Activity

1. In the food web below:
   - Circle the **producers** in **green.**
   - Circle the **primary consumers** in **yellow.**
   - Circle the **secondary consumers** in **orange.**
   - Circle the **tertiary consumers** in **red.**



2. If the chaffinches were removed from this food web, the populations of **dormouse** would INCREASE/DECREASE/STAY THE SAME. This is because

   _____

   _____

   _____

   _____.

3. Using the same template sentence as in question 2. Predict what would happen to the population of **owls** if the chaffinches were removed.

   _____

   _____

   _____

   _____

EXTENSION ACTIVITY –

From the same food web, try to make as many food chains as you can in your jotter (always starting with a producer and ending in a tertiary consumer).

Niche

Definition of niche –

An organism's niche relates to the resources it requires in its ecosystem, such as light and nutrient availability and its interactions with other organisms in the community. It involves _____ and _____ and the conditions it can tolerate such as _____.

Activity

In Scotland, only around 100 Scottish wildcats are thought to remain in the wild. Create a newspaper article about the effect of feral cats on the population of Scottish Wildcats. Your article must include:

- A headline
- A description of what feral cats are
- An explanation of why and how feral cats are causing wildcat numbers to decrease.
- Some information on the Scottish Wildcat's niche.

http://mattbinstead.blogspot.co.uk/2014/07/scottish-wildcat.html

Competition

Competition in ecosystems occurs when resources are in short supply.

Interspecific competition occurs amongst individuals of _____ species. They compete for one of a small numbers of the resources that they require.

Intraspecific competition occurs amongst individuals of _____ species. They compete for all resources.

Case Study 1

Red squirrel

Grey squirrel

The North American **grey squirrel** was introduced to Britain and has resulted in the decline in population (and almost extinction) of the **native red squirrel.** Both species occupy a similar niche in the woodland ecosystem. The grey squirrel competes aggressively for food and can eat a wider range of foods, so has now become much more highly distributed. Red squirrels are more timid and cannot digest foods with a high tannin content like acorns like the grey squirrels can.

Is this an example of intraspecific competition or interspecific competition? Justify your answer.

_____
_____
_____
_____
_____.

Case Study 2

Red grouse

The **red grouse** is a bird that lives on the moorlands of Scotland. It feeds on heather plants. Young heather plants are more nutritious than older ones. The male grouse claims a territory large enough to provide food for his young, rather than competing directly for food. This is called territorial behaviour.

Is this an example of intraspecific competition or interspecific competition? Justify your answer.

_____
_____
_____
_____
_____.

Factors affecting ecosystems

Living factors which affect biodiversity are called _____ factors. Non living factors are called _____ factors.

Biotic factors include:

1. availability of_____
2. _____ (animals eating plants)
3. _____ (animals eating other animals)
4. _____
5. _____

Impact on Biodiversity of Biotic Factors

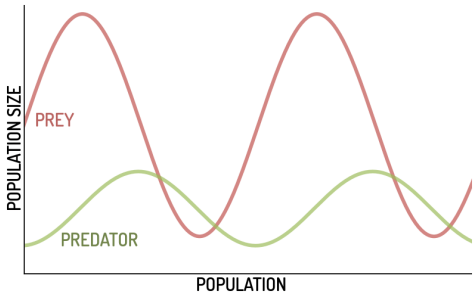
Example 1

A farmer puts too many sheep on an area of land. The sheep are grazing so much on the grass that there is very little left. What impact might this have on the biodiversity of plant species in this ecosystem? What affect might this have on other wildlife in the ecosystem?

_____
_____
_____
_____
_____
_____.

Example 2

Predators are organisms that eat other animals (prey). If the population of predators increases, what will happen to the population of prey? Justify your answer.



_____
_____
_____
_____
_____.

Example 3

A highly contagious disease is spread within a population of rabbits. What will happen to the population of rabbits? What does this mean for organisms that prey on the rabbits?

_____
_____
_____
_____
_____
_____.

Past Paper Example (National 5 biology 2016)

A group of students carried out a five year investigation into plant growth in an area of abandoned farmland.

They sampled the area using quadrats.

The results are shown in the table below.

	Average abundance of each plant		
Year	*Meadow grass*	*Ragwort*	*Pink campion*
2011	8	15	9
2012	16	14	7
2013	24	12	4
2014	25	8	2
2015	25	5	1

(a) (i) Calculate the average decrease per year in the abundance of ragwort over the five-year period. **1**

Space for calculation

_____

(ii) **Use information from the table** to suggest why the ragwort abundance decreased over the five-year period. **1**

_____

_____

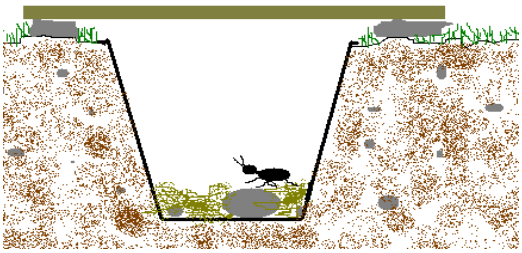
_____

Measuring Biotic Factors

It takes too long to count every living organism in an environment, so we take a sample instead.

The more samples we take, the more reliable our results are!

Technique	Description	Source of Error	How to Avoid
Pitfall trap	Can be used so sample _____. As they walk over the leaf, they fall in and are trapped.		
Quadrat	Quadrats are used to sample _____. The quadrat is placed at _____ and the number of squares containing plants are counted. More samples are taken to increase _____ of results. An average is calculated and multiplied by the area of the field.		



Quadrat Example Question 1

Calculate the estimated number of dandelions in the field.

Field size = 5m x 7m

Space for calculation:

Quadrat	Number of dandelions
1	12
2	0
3	12

Expected number of dandelions = _____

Quadrat Example Question 2

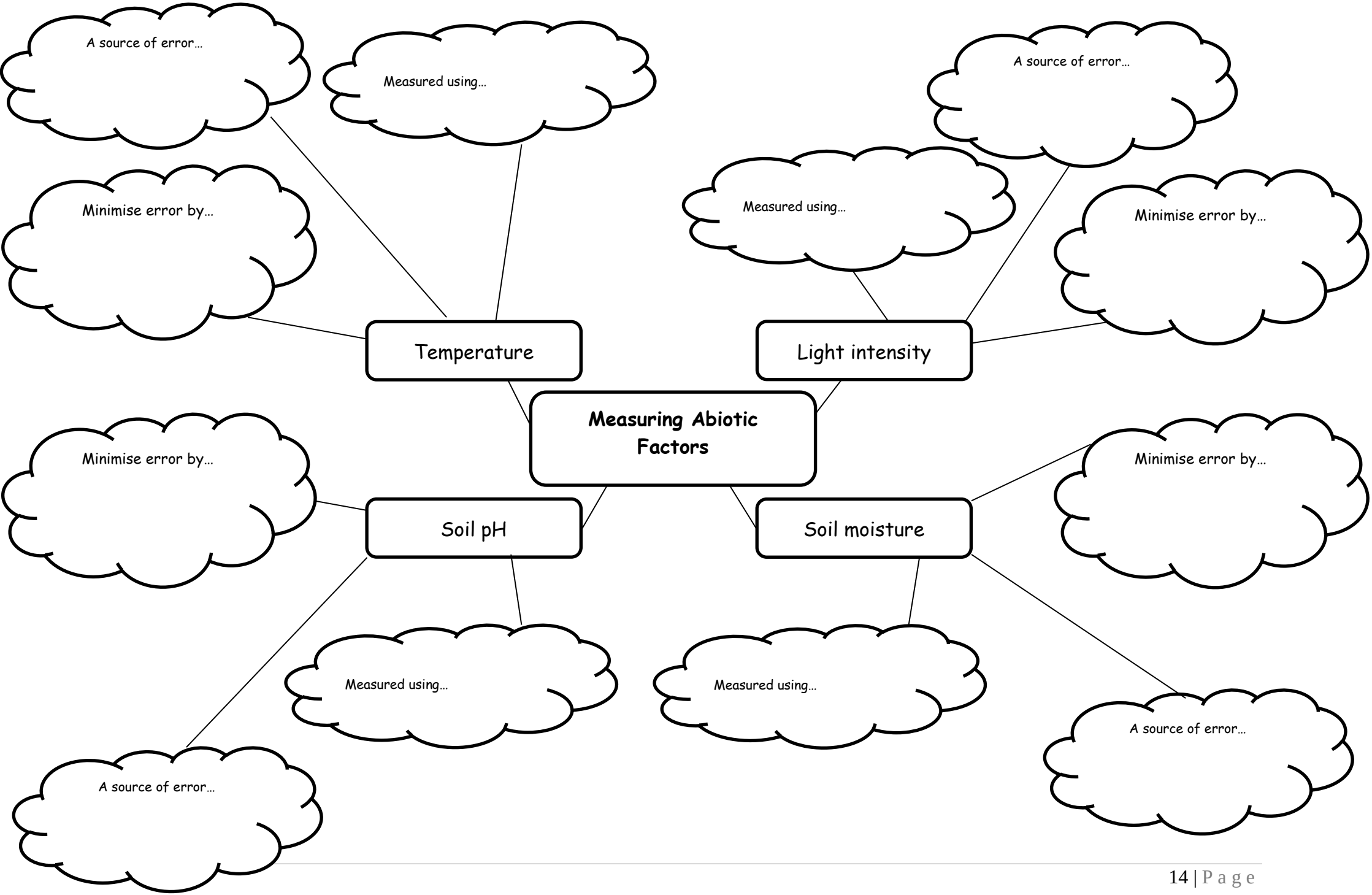
Calculate the estimated number of daisies in the field.

Field size: 26m x 3m

Space for calculation:

Quadrat	Number of plants
1	8
2	1
3	3

Expected number of daisies = _____

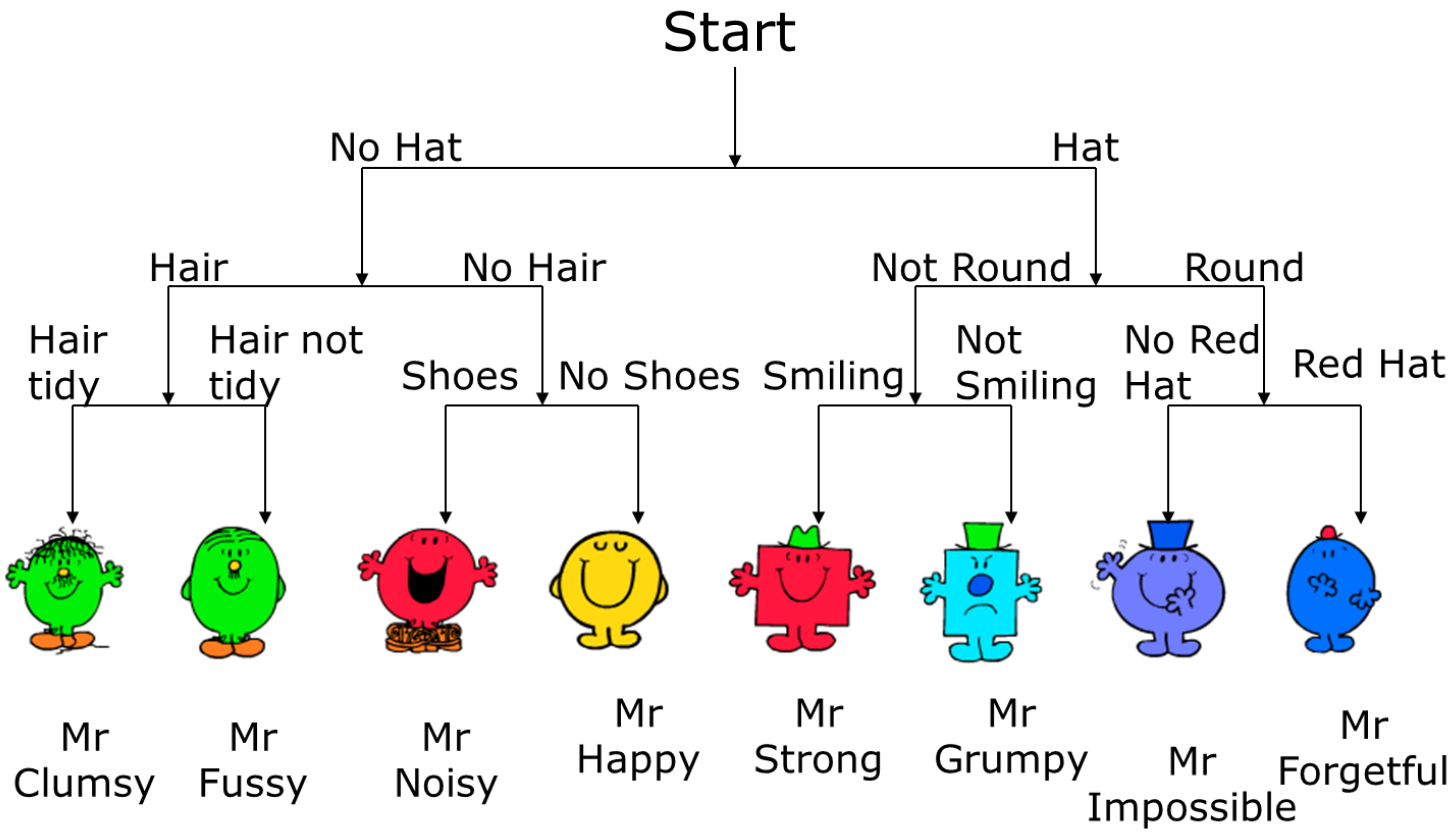

Measuring Abiotic Factors
Temperature
A source of error…
Measured using…
Minimise error by…
Light intensity
A source of error…
Measured using…
Minimise error by…
Soil pH
Minimise error by…
Measured using…
A source of error…
Soil moisture
Minimise error by…
Measured using…
A source of error…

Biological Keys

In order to identify and name a living organism, we use a biological key. There are two types of key:

1. _____
2. _____

The example below is a branching key…



The example below is a paired statement key.

The key gives information about some water plants growing in a pond.

1	Plant is fully submerged in water	Go to 2
	Plant has leaves on or above surface	Go to 3
2	Grows in deep water	*Elodea*
	Grows in shallow water	*Starwort*
3	Plant has roots in soil	Go to 4
	Plant is free floating on water surface	*Water hyacinth*
4	Long and thin leaves	*Water hawthorn*
	Round leaves	Go to 5
5	Resistant to frost	*Water lily*
	Cannot survive frost	*Lotus*

The key can be used to identify the plant below.

Photograph	*Description*
	The plant has its roots in the soil at the bottom of the pond and does not tolerate frost very well.

Past paper example (National 5 Biology 2016)

The following table gives information about some of the flowering plants found in the area.

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

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 — [ ]

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 — [ ]

Factors affecting Biodiversity

Biodiversity is the number of different species of organism living in an ecosystem. _____ biodiversity is good as it is important for healthy ecosystems. The biodiversity of ecosystems can be affected by:

1. _____
2. _____

Research Task

Choose either Goal 14 (Life Below Water) or Goal 15 and produce a poster detailing:

- 3 of the Goal's specific targets and 5 facts/figures http://www.undp.org/content/undp/en/home/sustainable-development-goals.html (click on the goal then click on 'view goal targets')
- An example of an organism that would be affected by this goal and what issues it currently faces.
- How this goal can be implemented in Scotland https://globalgoals.scot/

SPACE FOR NOTES

Human Impact on the Environment

Using the information cards provided, choose 3 ways that humans can impact on the environment and make notes on them below.

Example 1:

Example 2:

Example 3:

Natural Hazards

Draw a mind-map below showing each of the natural hazards using the information that your teacher has given you.

Natural Hazards

Natural hazards generally decrease biodiversity. They can either _____ organisms directly, destroy their _____ or remove their _____ source.