THE INSTITUTE OF EDUCATION

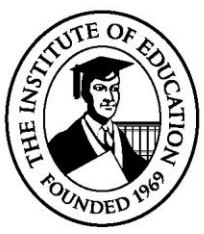
Biology

Wesley Hammond

Higher Level

2020-21

Ecology



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What do you need to know about UNIT 1?

- Unit 1 is worth at least 25% of the Biology paper (can be worth up to 32.5%).
- Two short questions (10%) in Section A will be asked from scientific method, food and ecology.
- One long question (15%) in Section C will be asked from scientific method, food and ecology.
- An experiment question (7.5%) can also be sometimes asked in Section B of paper.

Ecology

This topic has been asked **every year since 2004**. It is worth between **15% to 27.5%** in your Leaving Certificate.

History of topic	
2004	80 marks
2005	60 marks
2006	110 marks
2007	80 marks
2008	95 marks
2009	80 marks
2010	80marks
2011	80 marks
2012	80 marks
2013	110 marks
2014	80 marks
2015	80 marks
2016	86 marks
2017	110 marks
2018	80 marks
2019	60 marks

Ecology

Ecology is the study of **interactions** between living things and their environment.

Biosphere:

- Part of the planet containing living organisms

  Example: Deep in the oceans and high in the mountains.

Ecosystem:

- Group of organisms that **interact** with their environment.

  Example: Woodlands, **grasslands**, bogs, lakes, hedgerows, desert.

(You will need to know one ecosystem in detail)

Habitat:

- A place where a plant or animal lives.

Population:

- All the members of the same species living in an area

  Example: population of rabbits in a field.

Community:

- All the different populations living in an area

  Example: population of bacteria, fungi, plants and animals in a field.

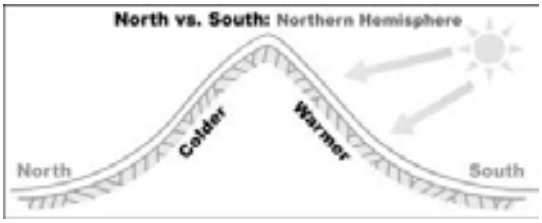
Environmental factors affecting organisms:

- **Abiotic factors** relate to **non living** factors
- **Biotic factors** relate to **living** factors
- **Climatic factors** refer to weather over a long period of time (rainfall, temperature)
- **Edaphic factors** relate to the soil (soil pH, soil type, soil temperature and soil moisture).

Effects of abiotic factors (non- living factors)

- **Altitude** = High altitudes are cooler and plants and animals cannot survive.

- **Aspect** = South facing slopes are warmer and receive more light which allows more plants to grow.



- **Steepness** = Steep slopes cannot hold water which makes it harder for plants and animals to exist.
- **Light intensity** = the more light available the more plants will grow.
- **Air temperature** = in warmer climates with higher temperatures, more plants will be present.
- **Wind speed** = plants exposed to high winds will not grow well and may eventually die.
- **Soil pH**: plants will grow better at certain pH values. If the soil is too acidic or basic the plant may die.

Effects of biotic factors (living factors)

Competition: Competition occurs when **organisms struggle and fight for a resource** that is in **short supply**.

Predation: Predation is the **catching, killing and eating** of another organism.

Food: the more food that is available to a plant or animal, the larger the number of organisms that will survive.

Parasitism: parasites cause harm to an organism and can kill the host.

Humans: humans can cause a lot of damage to natural environments.

Energy flow

NOTE: The sun is the primary source of energy flow.

- Feeding allows energy to flow from one organism to another in a habitat.

Producers:

Producers are organisms that carry out photosynthesis to make their own food.

Examples: sycamore trees, ivy

Primary producer → Primary consumer → Secondary consumer → Tertiary consumer

Consumers:

Consumers are organisms that **take in food from other organisms**.

- **Primary consumer**: feed on producers

Example: Herbivores feed nly on plants (deer)
Decomposers – feed on dead matter (bacteria and fungi)
Detritus feeders (mussels, earthworms)

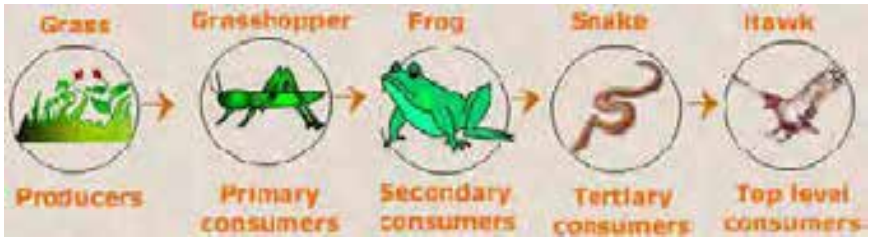
- **Secondary consumer**: animals that feed on primary consumers

Example: Carnivores (only eat meat)

Scavengers (feed on animals killed by other)

- **Tertiary consumers:** feed on secondary consumers

NOTE: These are normally the top consumers.



What are omnivores?

- Organisms that feed on **both** plants and animals.

Example: Badgers, humans, bear.

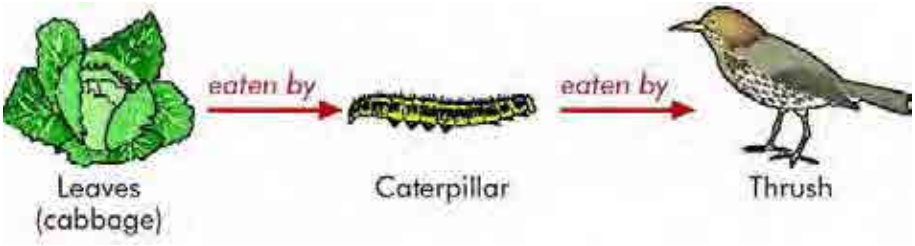
Food chain

A food chain is a **sequence of organisms** in which each **one is eaten by the next** organism in the food chain.

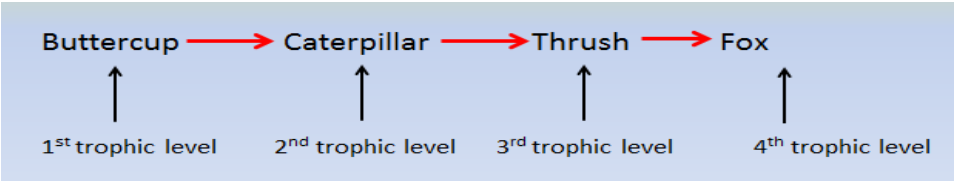
A trophic level is a feeding stage in the food chain.

Examples of a grazing food chain:

Grass → Rabbit → Fox



Dandelion → Butterfly → Thrush → Hawk

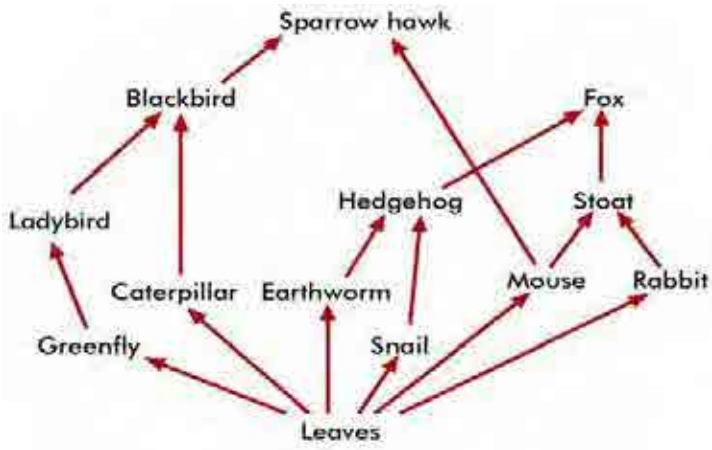


What affects the length of a food chain?

- The amount of energy passing from one trophic level to the next trophic level decreases which **limits the length of a food chain**.
- Only 10 % of energy from each stage is passed onto next trophic level.
- Other 90% is used by organisms for energy or lost by heat.

Food web:

Food web consists of **two or more food chains** that are interlinked.



Examples:

Producer: Leaves

Primary consumer: Snail, earthworm, greenfly, rabbit, mouse, caterpillar

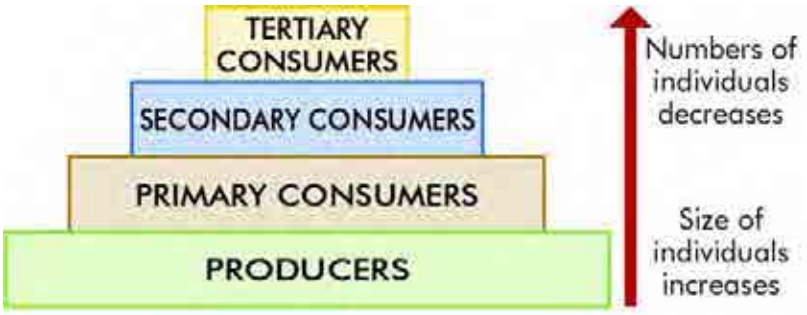
Secondary consumer: Stoat, ladybird, hedgehog

Tertiary consumer: fox.

Pyramid of numbers

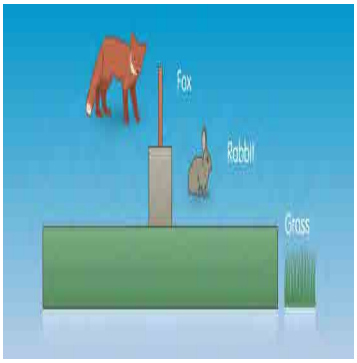
- A pyramid of numbers represents the **organism number** at each **trophic level** in a food chain.

- **Number** of organisms at each trophic level **decreases** as you move up the food chain, and the **size** of the individual **increases**.

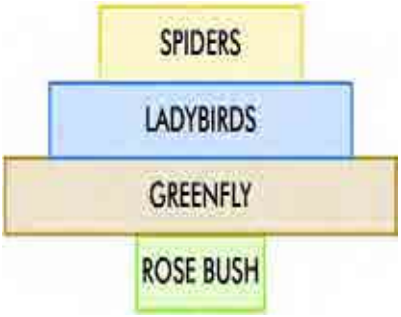


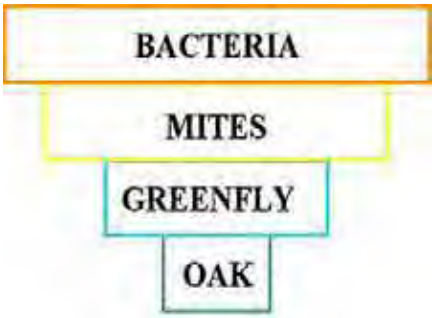
Note: Body size of organisms tend to increase as you move up pyramid because larger animals tend to eat smaller ones.

Example of normal pyramid:

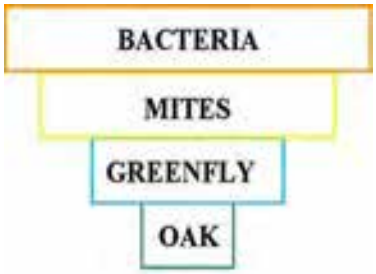


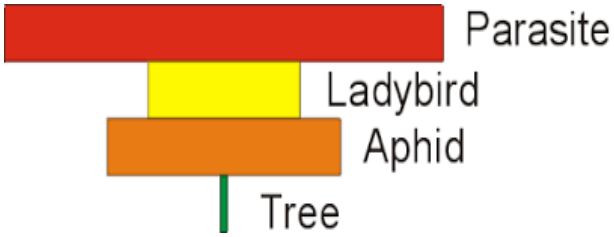
Example of inverted pyramid:





Example of parasitic pyramids:





Limitations of pyramid of numbers:

- They do not take into account the size of the organisms.

- Sometimes the pyramid cannot be drawn to scale due to the numbers being so big (millions of bacteria may live on one ash tree).

What is a niche?

- The niche is the **role an organism plays** in its community.

Example: what it eats and how it interacts with different organisms in the surrounding environment.

If more than one species has the same niche they cannot survive for long due to competition (for space, food, mates).

NOTE: swallows and thrushes prevent competition by having different niches.

Swallow: feeds on aerial insects

Thrushes: feeds on ground insects

.

Note:

If an organism is introduced into a vacant niche it has a better chance of survival as there is less competition.

Why might an organism still not survive when introduced into a vacant niche?

- It may not be able to adapt to new habitat.

Pollution/Conservation/ Waste management

Impacts of humans on ecosystems:

Humans affect ecosystems in three ways:

- Pollution
- Conservation
- Waste management

Pollution:
Pollution is **a harmful addition** to the environment.

Sources of pollution:

- Electricity generation
- Transport
- Farm wastes

What are pollutants?

- Pollutants are **substances** that cause pollution.

Three types of pollution: (only need to know one type)

- **Agricultural/ domestic/ industrial pollution.**
- **Agricultural pollution** (**slurry**, fertilisers, pesticides, silage run-off).

Effects of agricultural pollution:

- Slurry (animals waste material) enters rivers or lakes during heavy rainfall which causes algal to grow.
- When algae die and breakdown, oxygen is absorbed and therefore the level in oxygen in water falls.
- Water plants and animals die due to lack of oxygen.

NOTE: The addition of nutrients to fresh water is called **eutrophication.**

Solving these problems:

- Storing slurry in **leak proof tanks**.
- **Spread the slurry in the dry summer** time as there is less chance of it being washed into streams.

Conservation:

Conservation is the **management of our environment**, which will **prevent the death and extinction** of organisms.

NOTE: The present rate of extinction is faster now than ever before.

Benefits of conservation:

- Prevents organisms becoming extinct
- Maintains a wide range of living things.
- Organisms may be useful in nature.
- Maintains a balance in nature.

NOTE: **Nature reserves and Zoos** are used to prevent extinctions and protect organisms.

Example of conservation in Fisheries

Problems with the fishing industry:

- **Overfishing** has reduced the number in fish stocks.
- The use of **small fish mesh in nets** results in small fish being caught and killed.

Solutions to these problems:

- **Size of mesh in the nets should be made larger** so small fish can escape. This allows small fish to escape and maintain the numbers of the population.
- Use fish **quotas** to ensure only certain amount of fish are caught.

Waste Management

Agriculture:

- Slurry (animals waste material) enters rivers or lakes during heavy rainfall which causes algal to grow.
- When algae die and breakdown, oxygen is absorbed and therefore the level in oxygen in water falls.
- Water plants and animals die due to lack of oxygen.

Solving these problems:

- Storing slurry in **leak proof tanks**.
- **Spread the slurry in the dry summer** time as there is less chance of it being washed into streams.

Waste management in fish:

- Waste materials such as fish heads, tails, and intestines are diluted by water.
- These substances are highly alkaline and are **neutralised** by adding acid. Used to create fertiliser.

Waste management in forestry:

- Waste materials from tops of trees, small branches, roots and saw dust

  are processed to form wood products (MDF)

Problems with waste disposal

- Wastes may contain micro organisms that cause **diseases.**
- Nutrients from agricultural waste released into water can cause plants and animals to die.
- Waste in landfill sites can be **unslightly** and **smell** (attract rats)
- Incinerators can cause **poisonous gases** to be released.

NOTE: Heat from incinerators can be used to produce electricity.

Control of waste production:

- Reduce
- Reuse
- Recycle

Role of micro-organisms in waste management:

- **Landfill sites** should be covered in soil as bacteria and fungi are present which will **break down some of the material.**
- In secondary stage of **sewage treatment** bacteria and fungi are used to break down organic matter.

Factors affecting Populations

A **population** is all the **organisms of same species** living in an area.

How are Populations controlled?

- Predation
- Competition
- Parasitism
- Symbiosis

Competition

Competition occurs when **organisms struggle and fight for a resource** that is in **short supply**.

Examples: Two male blackbirds competing for a female.

What resources might animals compete for?

- Food
- Shelter
- Mates
- Space

What resources might plants compete for?

- Food
- Space
- Water
- Light

Intra-specific competition

Takes place between the **same** species

Example: two robins fighting for territory

Inter-specific competition

Takes place between **different** species

Example: blackbird and thrush competing for food.

Types of competition

Contest competition

- This is where there is a **physical contest** between two individual organisms and only one benefits (**only one gets the resource**).

  Examples: Two male deer fighting for territory and female mates.

Scramble competition

- All of the competing individuals get some of the resource but none of the organisms get enough resource to survive.

Examples: plant seedlings competing for light and space. If some are not removed they will not get enough light, water and space and may die.

NOTE:

How to avoid competition?

- The butterfly and caterpillar which are the same species avoid competition as they have different mouth parts. Butterfly feed on nectar while caterpillars feed on leaves.

Predation

Predation is the **catching, killing and eating** of another organism.

A predator is an organism is an organism that catches, kills and eats another organism (foxes)

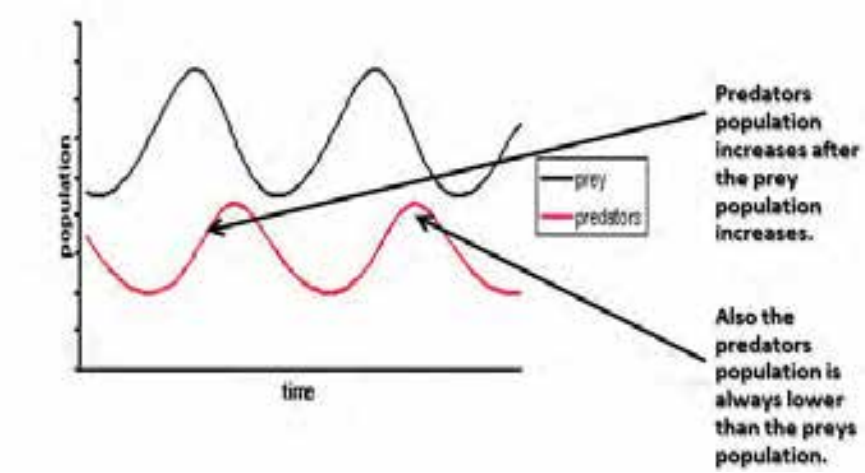
The **prey** is the organism that is eaten by the predator **(rabbits).**

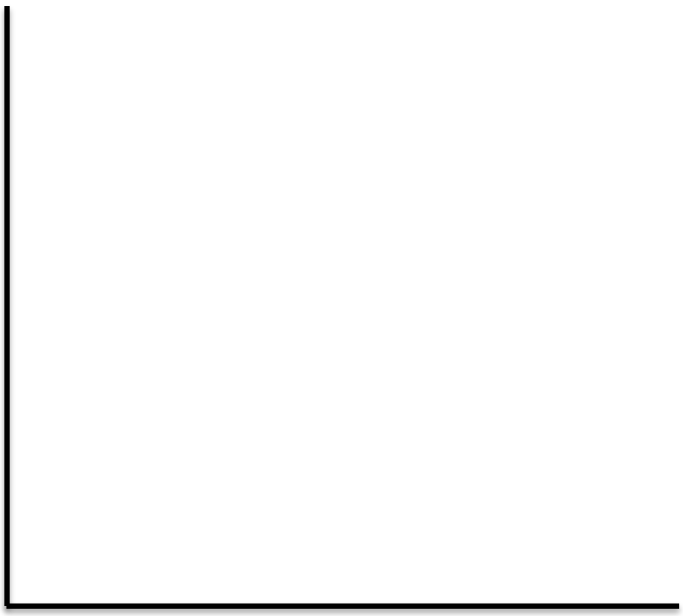
Predator – Prey relationships:

Example: **Predator**: Fox **Prey:** rabbit

- As the population of prey increases, the number of predators will rise (more food available).

- As predators population begins to increase, the population of prey decrease.





Factors that affect predator - prey populations:

- **Availability of food**: if prey numbers are large, this can cause an increase in the numbers of predators.

- **Disease**: can cause population numbers decrease dramatically.

- **Migration of predators:** predators may have to move area if the preys population is really small which makes it easier for the prey populations to increase.

What is an adaption?

- Is a feature that **helps an organism to survive** and reproduce.

Adaptations of predators and prey

Predators:

- **Foxes** can run fast and have good sense of smell to catch prey.
- Owls have great eyesight to catch their prey at night **(nocturnal)** which allows them to avoid other competition.
- Hawks have excellent eye sight to locate prey.
- Ladybirds have a strong jaw to kill and eat aphids.

Prey

- Mice can run fast and hide to avoid being eaten.
- Frogs are camouflaged to avoid attack by its predators.
- Ladybirds have a bright red colour, indicating that they taste very bad.

Adaptions of plants:

- Nettles have a sting to protect them from predators.
- Bright colour flowers is used to attract insects for pollination.

Factors that affect human populations:

- **War** – increase the death rate
- **Famine** – increase the death rate
- **Contraception -** reduces the birth rate
- **Disease** – increases the death rate.

Parasitism:

- Occurs when one organism obtains its food from a live host **causing it harm**.

Types of parasites:

1) **Endoparasites**: live on the **inside** of the host's body causing harm (liver fluke in sheep, tapeworm in the human small intestines).

2) **Exoparasites**: live on the **outside** of the host's body (fleas on a dog, green fly on a rosebush).

What is the role of parasites in nature?

- They control populations of the organism that they feed on.

How do parasites differ from other predators?

- They are smaller than normal predators.
- They can attack the host inside the body.

Symbiosis:

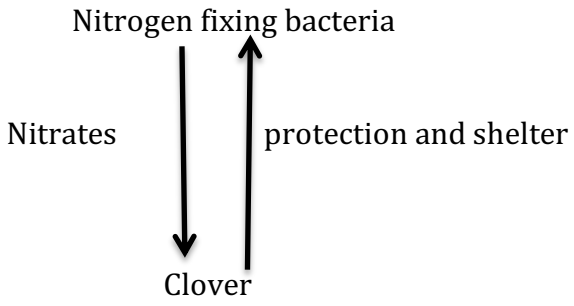
- When two different organisms live in close association with each other and at least one benefits.

- **Mutualism** is another form of symbiosis where both benefits.

Examples of symbiosis:

- Symbiotic bacteria in the human large intestines. They **produce vitamin B and K** for the human (host) and they get food and shelter from the host.

- **Nitrogen fixing bacteria** convert nitrogen gas into nitrates for the plant in the soil. The bacteria get food and shelter living in roots.



Aquatic environments

Factors that affect aquatic environments:

- Light: Plants are only found towards surface of water.
- Currents: Plants can be carried away unless attached to rocks.
- Salt content: salt concentration affects what organisms live in water.
- Wave action: Can cause damage to plants or animals.

The Nutrient Cycles

Nutrient recycling

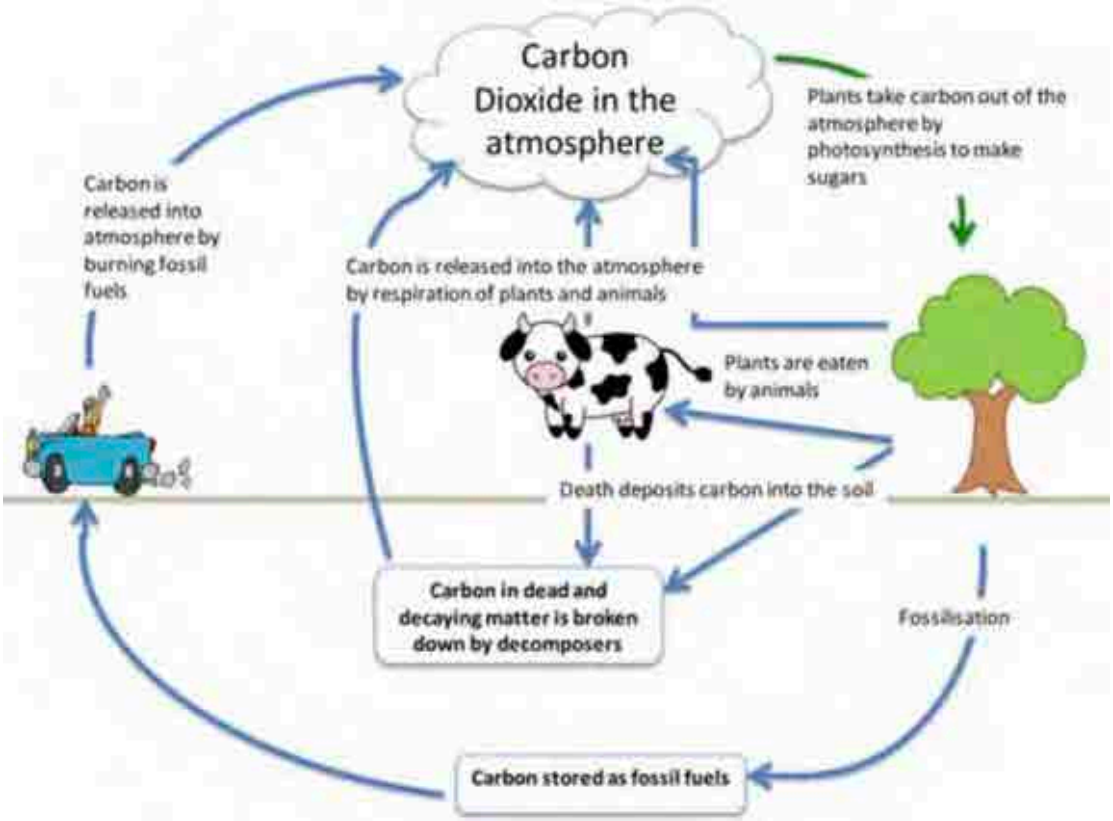
- Nutrient recycling allows elements like **carbon and nitrogen** to be **exchanged** between living and non-living parts of an ecosystem

- Also accepted in marking scheme (**allows nutrients to be reused**)

The Carbon Cycle

What is the function of the carbon cycle?

- So carbon can be converted to carbon in living things (carbohydrates)



Processes involved in the carbon cycle:

- Photosynthesis
- Respiration
- Decomposition
- Combustion

Function of living organisms in the carbon cycle:

Bacteria and fungi: their role as **decomposers** help return carbon back into the atmosphere.

Animals: return carbon back into the atmosphere by the process of **respiration**.

Plants: absorb carbon from the atmosphere by a process called **photosynthesis.**

The Nitrogen Cycle

What is the function of the nitrogen cycle?

- It converts nitrogen into forms that living things can use.
- Living things use nitrogen for the **formation of protein**, RNA, DNA .

Bacteria involved in the nitrogen cycle:

- Bacteria of decay
- Nitrogen fixing bacteria
- Nitrifying bacteria
- Denitrifying bacteria

What bacteria are involved in the nitrogen cycle?

Nitrogen fixation:

- Using **nitrogen fixing bacteria** (anaerobic bacteria who live on roots of legumes of clover), they **convert nitrogen gas into nitrates**.

Decomposition:

- **Bacteria of decay** break down dead organisms and release nitrogen in the form of ammonia into the soil.

Nitrification:

- Using **nitrifying bacteria** ammonia is converted into nitrites and nitrates (these bacteria are chemosynthetic in that they make their own food using chemical reactions)

Denitrification:

- Using **denitrifying bacteria** (anaerobic bacteria) the nitrates are converted back into nitrogen gas.

NOTE:
What is common to both Carbon and Nitrogen cycle?

- Bacteria involved/ excretion/ death and decay/ nutrition.

Experiment

Section

Study of a Grassland ecosystem

A habitat survey should include the following key parts:

1) Map of habitat
2) Abiotic and biotic factors affecting the living organisms.
3) Calculate the populations of both plants and animals in that habitat.
4) Present the information gathered using charts and tables.

What do you use to identify plants and animals?

- An identification key.

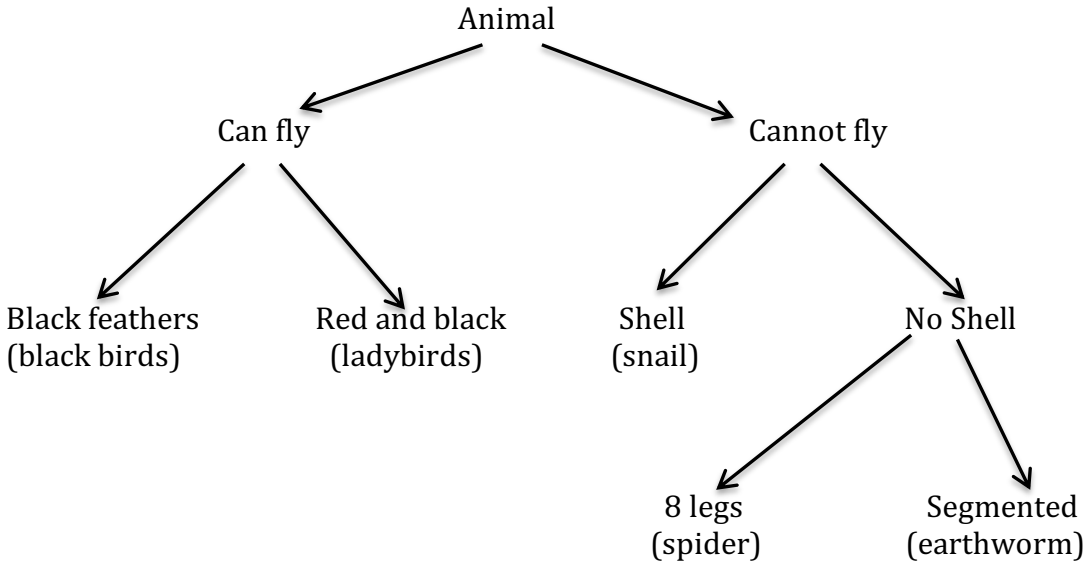
You must identify five animals in your survey:

- Snail
- Ladybird
- Spider
- Blackbird
- Earthworm

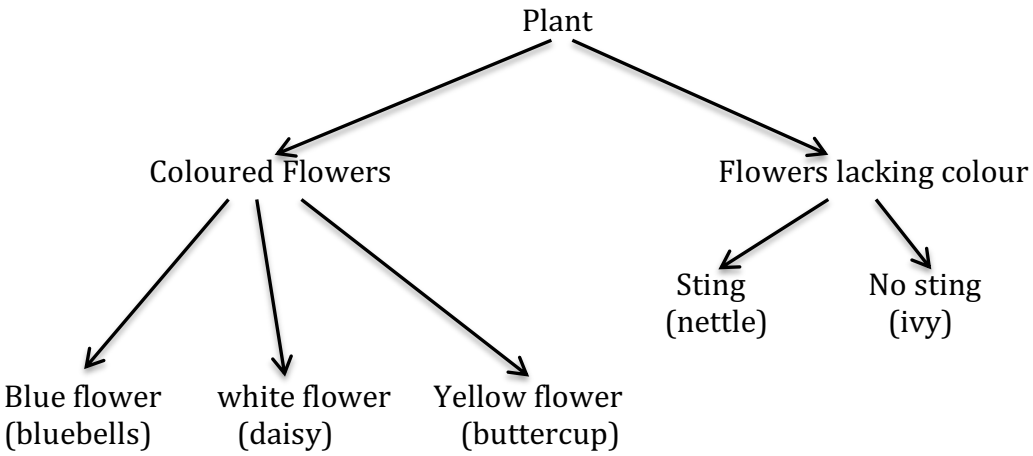
You must identify five plants in your survey:

- Ivy
- Nettles
- Buttercup
- Daisy
- Blue bells

To create a simple key to identify five fauna (type of animals)



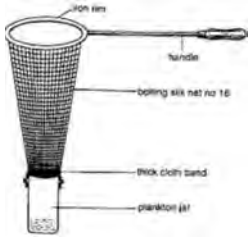
To create a simple key to identify five flora (type of plants)



Equipment used to collect animals:

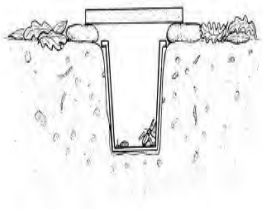
Pooter --- Suck the organism into jar (collects insects and spiders)

Sweep net: Sweep over long grass (collects insects)

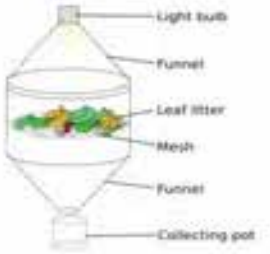


Plankton net: pulled through water with a jar attached to collect plankton.

Beating tray:
Placed under a bush which is shaken (collects insects, beetles, worms)

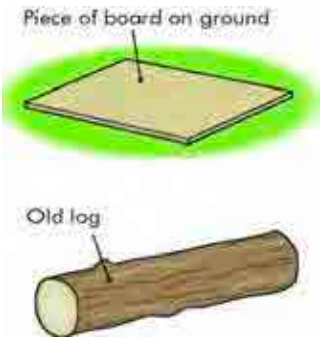


Pitfall trap:
Placed in soil for 24 hours (collects snails, slugs and worms)



Tullgren funnel:
Heat from the light cause the insects to move down from the soil and litter and into the pot (collects insects)

Mammal trap:
Small animals enter and become trapped (collects mice)



Cryptozoic trap:
Placed on top of soil and returned to a few days later. Animals that like moist and dark conditions will gather on the cryptozoic traps.

What is the difference between a quantitative survey and a qualitative survey?

- A quantitative survey tells you the **numbers of organisms** present.
- A qualitative survey tells you if an organism is **absent or present**.

NOTE: quantitative surveys provide more information.

Quantitative survey for plants:

To calculate Percentage Cover of plants in a grassland area: (amount of ground covered by any species)

1) A quadrat is a square made of metal or wood and has sides of 0.5 metre.
2) A quadrat is placed **randomly** in your habitat. This is carried out by **throwing a pencil over your shoulder** and placing the quadrat where the object lands.

3) This was repeated **10 times**.
4) In each quadrat, we **counted** the times each plant touches an **intersection point** of each small square and **recorded** our results on a **table**.
5) We then used the formula:

$$\frac{\text{Number of touches}}{\text{Number of squares}} \times \frac{100}{1}$$

6) A graph was drawn with the results.

NOTE:

- This survey uses an objective estimate as a person's individual judgements are not used.

Quantitative Survey for plants:

To calculate Percentage frequency of plants in a grassland area: (chance of finding a named species with one throw)

1) A quadrat is a square made of metal or wood and has sides of 0.5 metre.

2) A quadrat is placed **randomly** in your habitat. This is carried out by **throwing a pencil over your shoulder** and placing the quadrat where the object lands.

3) A quadrat was thrown **10 times**.

4) The presence or absence of a species is **recorded** for each quadrat and were presented in a **table**.

5) **Graph** your results.

6) If a species is present in three quadrats out of ten, their frequency is 3/10 X 100/1 = 30%

Quantitative survey for plants – Transects

- Used to survey changes along a gradient (e.g from edge of field to its centre)
- Non random

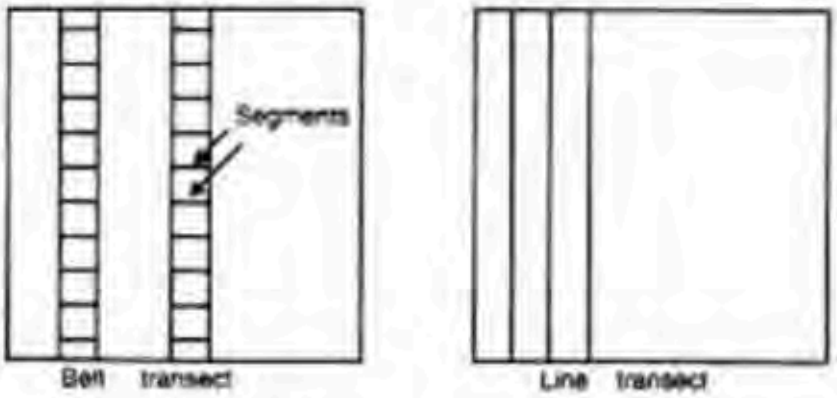
Line Transects:

- A string that is marked at regular intervals.
- Names of organisms that touch the string are recorded.

Note: Limited as they sample narrow piece of habitat.

Belt Transect:

- Two strings running parallel to each other that is divided up into 1m² squares.



To carry out a Quantitative survey of animals using the Capture – recapture method

(estimate the number of mice)

1) In a habitat, **capture** a number of mice (used a **mammal trap**).

2) **Mark** each organism using a marker making sure **not to harm** the animals (e.g making them more visible to predators).

3) **Release** each organism in the **area it was captured.**

4) On a second visit (some days later) a similar number of animals were **caught** and the mice that were marked were **recorded.**

5) The total of number of animals were calculated using the formula:

$$\text{Number} = \frac{C\ 1^{st} \times C\ 2^{nd}}{M\ 2^{nd}}$$

C 1^{st} = number caught and marked on 1^{st} visit
C 2^{nd} = number caught on 2^{nd} visit
M 2^{nd} = number marked on 2^{nd} visit from first visit

6) **Graph** your results.

NOTE: marked animals must be given time to mix with the unmarked animals.

Example: Estimate the number of wild hares in a grassland area. 50 hares were trapped. A tag was placed on its fur and it was released. A few days later 50 more hares were trapped, of which 20 had already been tagged. A few days later 50 more hares were trapped and 10 had their ears tagged.

i) Calculate the number of hares in this grassland:
ii) Calculate the mean population size of hares in grassland:

i) Compare fiest and second visit:

$$\text{Number of hares} = \frac{50 \times 50}{20} = 125$$

Compare first and third visit:

$$\text{Number of hares: } \frac{50 \times 50}{10} = 250$$

ii) Mean population: $\frac{125 + 250}{2} = 187.5$ hares

To investigate three abiotic factors (non-living) in a hedgerow.

Aspect

- Aspect can be identified using a **compass.**

NOTE: aspect affects light intensity and temperature (both are higher on south facing slopes).

Air temperature

- Air temperature is taken using **a thermometer**.

Wind Speed and direction

- Can be measured using an **anemometer and a wind gauge**.

Soil pH

- Recorded using **a pH meter** or universal indicator.

Light intensity

- Can be measured using a light meter

What possible sources of error may occur in your habitat survey?

Accidental discovery:

- A rare animal may or may not be seen which is not very common to the habitat.

Size of sample area:

- If the sample area is too small there might not be a fair reflection on the organisms that are present in that area.

- The larger the sample size the more accurate the results (e.g throwing 100 quadrats rather than just 10).

Human error:

- Humans may identify an organism incorrectly **(Solution – use a key).**

- If humans are required to give estimation on something, there judgement may not be accurate.

Changing seasons:

- Certain organisms may be present in spring and summer. However, if you are carrying out the habitat survey in the winter many organisms may not be present.

Do you Know	Tick
Define ecology	
Define biosphere	
Define ecosystem and name one example	
Define habitat, population, community	
Define abiotic factor and give three examples	
Define biotic factor and give three examples	
Define climatic factors and give three examples	
Define edaphic factors and give three examples	
List three factors impacting on aquatic environment	
State the primary source of energy	
Define producers, primary consumers, secondary consumers, tertiary consumers and note there tropic level in food chain	
Define herbivore, carnivore and omnivore	
Define flora, fauna and decomposers	
Define food chain, food web and trophic levels	
Draw a food chain with four trophic levels	
Draw a food web with three food chains	
Explain the reason why food chains have only 4 or 5 trophic levels	
Define a niche	
Describe the chances of an organism surviving if introduced into a vacant niche	
Define the term pyramid of numbers	
Draw a normal and inverted pyramid of numbers	
To identify examples of organisms in certain stages in pyramid of numbers	
State a limitation of using pyramid of numbers	
State factors that control population numbers	
Define competition, intra- specific competition, inter specific competition, contest competition and scramble competition giving an example for each	
To know an example of how one organism has an adaptive techniques to survive competition	
Define predation, prey	
State adaptions of two types of predators	
State adaptions of two types of prey	
Define parasitism, endoparasite and exoparasites	
Define symbiosis and know two examples of symbiosis relationships	
Draw a graph to represent how predator-prey relationships affect their populations.	
State three factors that impact predator prey interactions	
List four factors that affect human populations	
Define pollution and pollutant	
Name a type of agricultural pollution	
Define conservation	
State two benefits of conservation	
State two problems with fishing industry	

List two methods of conservation in fishing industry	
For waste management state one effect of slurry on environment	
List two methods of controlling the release of slurry	
State three problems associated with waste disposal	
State the role of micro organisms in landfill sites and sewage treatment	
State three methods of controlling waste production	
Define nutrient recycling	
To draw or describe the carbon cycle	
State the role of organisms (bacteria, fungi, plants and animals) in the carbon cycle	
State the function of the nitrogen cycle	
To draw or describe the nitrogen cycle	
Define nitrogen fixation, nitrification and denitrification	
Name the bacteria involved in the nitrogen cycle	
State the role of organisms (bacteria, fungi, plants and animals) in the nitrogen cycle	
Name one ecosystem	
State the function of a key	
Define a qualitative study and quantitative survey	
Name two possible sources of error in ecosystem study and state how they might be prevented	
To investigate three abiotic factors in ecosystem	
To know influence of three abiotic factors	
Define adaptation	
State one adaption of both an animal and a plant and the benefit of this adaptation	
Name five fauna in a named ecosystem	
To draw a key to help identify these five fauna	
Name five flora in a named ecosystem	
To draw a key to help identify these five flora	
List the equipment used to survey organisms and explain how they work	
To carry out a quantitative survey of plants (Quadrat survey - % cover)	
To carry out a quantitative survey of animals (Capture- recapture method))	
State how you present results from such surveys	

Exam Questions

Exam Paper 2019, Question 10:

10. (a) (i) What is the importance in nature of recycling elements such as carbon and nitrogen?

(ii) Name **two** of the types of bacteria that play a role in the nitrogen cycle.

(9)

(b) Invasive mammals have been shown to have a detrimental impact on island biodiversity. Worldwide, invasive mammal species have led to the decline or extinction of bird and other species through predation and competition.
Under an EU directive, Lough Mask in county Mayo is designated as a candidate Special Protection Area for wild birds. Both common and black-headed gulls have significant nesting colonies on islands in Lough Mask. Both are considered to be species of conservation concern because their national breeding populations have declined by 25 – 50% in the last 25 years. The reasons for the decline in these breeding colonies are not fully known, but it is considered that predation by the American mink is a problem. Mink are known to visit colonies and kill both adults and chicks.
Adapted from www.invasivespeciesireland.com

(i) Explain what is meant by the terms
1. *Predation*
2. *Conservation* (of species).

(ii) Suggest why the mink has become a successful predator of the gulls.

(iii) Mink are omnivores. Why is this an advantage when mink invade an island?

(iv) Other than predation, suggest a way in which the mink could cause a decline in the populations of these gulls.

(v) Suggest another impact on food chains in this ecosystem caused by the presence of mink on these islands.

(vi) Sketch and label a graph to show the typical relationship between the populations of a predator and its prey.

(27)

(c) (i) From your knowledge of ecological surveys, explain the meaning of the terms:
1. *Quantitative*
2. *Qualitative*.

(ii) In the course of your ecological studies you investigated an ecosystem.
Name this ecosystem **and** describe how you conducted a quantitative survey of flora present in it.

(iii) How did you present the results of your survey?

(iv) Suggest a possible source of error in your survey.

(24)

Exam Paper 2018, Question 2:

2. From your knowledge of ecology, explain the following terms:

(a) Biotic factor. _____

(b) Habitat. _____

(c) Community. _____

(d) Population. _____

(e) Niche. _____

(f) Biosphere. _____

(g) Qualitative survey. _____

Exam Paper 2018, Question

10. (a) (i) Draw a pyramid of numbers to represent the information in the food chain below.

Rose bush → Caterpillars → Blackbirds → Hawk

(ii) What term is used to describe the organisms at the top of food chains?

(iii) Explain why pyramids of numbers are usually restricted to three or four levels.

(9)

(b) Write notes on the following.

(i) Factors which influence the size of the human population.

(ii) Organism adaptations.

(iii) Conservation.

(27)

(c) (i) Describe the steps you would take to estimate the size of the population of a particular animal species in the ecosystem you have studied.

(ii) Name a plant from the ecosystem you have studied **and** indicate **two** abiotic conditions which favour its presence.

(iii) How did you measure any **one** of the abiotic conditions mentioned in (ii)?

(24)

Exam Paper 2017, Question 2:

(a) Why is it important that nutrients are recycled in nature?

_____

(b) During the nitrogen cycle, nitrogen from the air is converted to nitrates.
Of what benefit is this?

_____

(c) Nitrates are formed directly from other molecules in the soil.
Name **one** of these molecules.

_____

(d) Mention **one** role of animals, other than as consumers, in the nitrogen cycle.

_____

(e) Name the family of plants which have a symbiotic relationship with nitrogen-fixing bacteria.

_____

(f) The nitrogen in the air is converted to nitrates but the percentage of nitrogen in the air does not change. What process is responsible for this?

_____

(g) What is the role of modern fertilisers in the nitrogen cycle?

_____

Solutions 2017, Question 2:

2.	2(5) + 5(2)
(a)	*Why nutrients recycled:* So can be reused **or** used by other organisms
(b)	*Benefit of N_2 changing to nitrates:* Plants can absorb (or use or avail of) nitrate
(c)	*Nitrate in soil formed directly from:* Nitrite (NO_2^-) [*allow* ammonia]
(d)	*Animal role (not consumer) in N cycle:* Excrete (or egest) nitrogen (compounds) **or** die (or decay or decompose) and release nitrogen (compounds) **or** assimilate nitrogen (compounds) **or** waste contains nitrogen (compounds)
(e)	*Plants in symbiosis with N-fixing bacteria:* Legumes
(f)	*Process keeping N_2 in air constant:* Denitrification **or** described
(g)	*Fertilisers' role in N-cycle:* Supply nitrate (or other valid example) (to the soil) **or** supply fixed (or soluble or usable) nitrogen (to the soil)

Exam Paper 2017, Question 7:

7. (a) Answer the following questions by reference to a **named** ecosystem which you have investigated.

Name of ecosystem: _____

(i) Give **one** example of a possible error in ecological surveying.

_____

(ii) Suggest how this error might be minimised or eliminated.

_____

(b) (i) As part of your study you constructed a food web. In the space below or in your answer book, draw a food web from the ecosystem you named above, containing:
1. At least three food chains, **and**
2. At least four trophic levels.

(ii) Many animals must be captured for identification and counting in ecological surveying. Some of these animals have adaptive features that may help them escape capture. Give an example of **one** such adaptive feature.

_____

(iii) Explain how this adaptation helps the animal escape capture.

_____

(iv) Suggest why ecological surveying is important.

_____

(v) Describe how you carried out a quantitative survey of a plant species named in your food web above.

_____

_____

_____

Solutions 2017, Question 7:

7. (a) **2(3)**

Name of ecosystem:

(i) *One possible ecological surveying error:*

Non-random (or biased) **or** misidentification **or** miscounting **or** sample size too small **or** quadrat size unsuitable

(ii) *How might this error be minimised:*

Method of minimisation must be described and match possible error given above

7. (b) **4(4) + 8(1)**

(i) *Food web diagram: (can be in answer book)*

1. Three interlinked valid food chains
2. Four valid trophic levels in at least one of the food chains

(ii) *Animal adaptive feature:*

Appropriate adaptive feature named

(iii) *How adaptive feature helps animal escape capture:*

Matching benefit

(iv) *Why ecological surveying important:*

Monitors biodiversity **or** detects changes **or** pollution monitoring **or** to provide baseline (for comparison) **or** example described

(v) *Plant quantitative survey description:*

Quadrat/ random/ how random/ count (or estimate cover)/ repeat/ several times/ record or tabulate/ scale up (or described)/ how results expressed (or calculate % frequency (or % cover)) ***Any seven***

Exam Paper 2017, Question 10:

10. (a) Explain the following terms as used in ecology.

(i) Scramble competition.

(ii) Ecosystem.

(iii) Conservation. **(9)**

(b) A new waste-to-energy incinerator is currently being built in Poolbeg, Dublin. The facility will generate energy from domestic waste that cannot be reused or recycled.

(i) Suggest **two** reasons why this new incinerator is located in Dublin.

(ii) Give **one** advantage **and one** disadvantage of incineration in waste disposal.

(iii) What is the main role of microorganisms in waste disposal?

(iv) What is meant by the term *pollutant*?

(v) Give an account of the effect of a **named** pollutant from one of the following areas: domestic, agriculture, industry.

(vi) Describe how the pollutant referred to in (v) is controlled. **(27)**

(c) (i) List **two** species from an ecosystem you have studied, which are involved in a predator-prey relationship.

(ii) Draw a graph, appropriately labelling axes and curves, to show how population numbers fluctuate in a predator-prey relationship.

(iii) Explain the fluctuations shown in the graph.

(iv) Outline a role in nature of such a predator-prey relationship. **(24)**

Solutions 2017, Question 10:

10. (a) (i) *Scramble competition:*
A struggle for a (scarce) resource and all get some — 3

(ii) *Ecosystem:*
Organisms (or plants and animals) and (their interactions with) their environment — 3

(iii) *Conservation:*
Management of the environment **or** maintenance of biodiversity — 3

(b) **3(4) + 3(3) + 3(2)**

(i) *Why incinerator in Dublin:*
Large population so a lot of waste/ large population so high energy demand/ no space for landfill/ energy produced can power nearby buildings/ extensive transport links for waste **Any two**

(ii) *Advantage of incineration:*
Amount of waste reduced **or** useable heat (or energy) **or** reduced landfill **or** quick waste disposal

Disadvantage of incineration:
Harmful products **or** named example

(iii) *Main role of microorganisms:*
Decomposers (or described)

(iv) *Pollutant:*
Any harmful addition to the environment

(v) *Effect of particular pollutant:*
Any relevant pollutant

Effect (must match)

(vi) *How pollutant controlled:*
Matching control measure for pollutant named in (v)

(c) **3(4) + 2(3) + 3(2)**

(i) *A predator and its prey:*
Any named predator **and** matching prey

(ii) *Axes:*
X-axis = Time **and** Y-axis = Number **or** population

Predator-prey graph:
Most prey peaks higher than predator peaks (at least one labelled and at least 2 peaks for each curve)

Predator and prey curves out of sync

(iii) *Fluctuation explanations:*
Increased prey (population) allows increased predator (population)

As prey (numbers) decline, predator (numbers) decline

Time lag for predator (numbers) to respond (to lower or higher prey numbers) (or described)

(iv) *Role in nature of predator-prey relationship:*
Population control (or described) **or** natural selection in action

Exam Paper 2016, Question 1:

1. Explain **five** of the following terms.

   (a) Ecology. _____

   _____

   (b) Symbiosis. _____

   _____

   (c) Nutrient recycling. _____

   _____

   (d) Contest competition. _____

   _____

   (e) Edaphic. _____

   (f) Biotic. _____

Solutions 2016, Question 1:

1.	**2(7) + 3(2) i.e. best five answers from (a) – (f)**
(a)	*Ecology:* The study of (the various interactions between) organisms and their environment
(b)	*Symbiosis:* (A relationship) between species in which at least one benefits
(c)	*Nutrient recycling:* Reuse (of nutrients)
(d)	*Contest competition:* A struggle for a resource in which only one wins
(e)	*Edaphic:* (Relating to) soil
(f)	*Biotic:* (Relating to) living (organisms)

Exam Paper 2016, Queestion 10:

10. (a) (i) What is the precise meaning of the term *niche* as used by ecologists?

(ii) From your investigations of a **named** ecosystem, give **one** example **each** of:
1. A safety hazard.
2. A source of error. (9)

(b) In the course of your studies you carried out an investigation of an ecosystem.

(i) In the case of this **named** ecosystem, explain how you carried out **each** of the following:

1. Collection of fauna using a named method.

2. Identification of the collected fauna.

3. A quantitative study of a **named** plant species.
In your answer explain how you ensured that the sample was random.

(ii) Why is it essential to use a random sampling technique?

(iii) Suggest **two** abiotic factors that could affect the distribution of the named plant species.

(iv) State **one** way in which human activity can have an impact on your named ecosystem. (27)

(c) A typical grazing food chain, consisting of four trophic levels, is shown below.
Each letter represents a different species.

A → B → C → D

(i) What is meant by the term *trophic level*?

(ii) Explain why food chains are generally short.

(iii) Which letter represents the secondary consumer?

(iv) Give a possible reason why the population of C may decline naturally.

(v) Suggest a possible consequence for the population of A if the population of C was significantly reduced. Explain your answer.

(vi) Suggest how members of species D might respond, if the population of C was significantly reduced.

(vii) A food web is a series of interconnected food chains. Suggest how it may be possible for the secondary consumer, in the food chain above, to be a primary consumer in another food chain. (24)

Solutions 2016, Question 2:

_____
_____
_____
_____
_____
_____

Solutions 2016, Question 10:

10.	(a)	(i)	*Niche:* An organism's role or an organism's function (in the ecosystem).	3
		(ii)	*If answers do not match named ecosystem, maximum of 3 marks*	
			1. *Safety hazard:* Any valid hazard (e.g. wet grass or broken glass)	3
			2. *Source of error:* Any valid error (e.g. miscounting or misidentification)	3
	(b)	(i)	1. *Animal collection method:* Pitfall trap or mammal trap or beating tray or pooter or picked up or any named suitable method	3
			2. *Identification:* (Identification) key or photograph(s) or picture(s)	3
			3. *Quantitative method details:* (place) quadrat/ count named plant or note presence of named plant/ repeat/ tabulate or record/ how result expressed	2(3)
			How random	3
		(ii)	*Why random:* To prevent bias	3
		(iii)	*Abiotic factors:* pH/ temperature/ light intensity/ water current/ air current (or wind)/ dissolved oxygen/ mineral content/ % air in soil/ % water in soil/ % humus/ salinity/ (degree of) exposure/ slope/ aspect/ altitude/ soil type	2(3)
		(iv)	*Human activity:* Pollution or conservation or waste management or any valid example	3

(c)	(i)	*Trophic level:*	Position on the food chain or feeding level or energy level or feeding stage	3
	(ii)	*Why chains short:*	Little (10%) energy passed on to next level or large amount (90%) of energy lost at each level	3
	(iii)	*Secondary consumer:*	*C	3
	(iv)	*Why C might decline:*	Predation or increase in D or disease or lack of food or lack of B or migration	3
	(v)	*Consequence:*	(Population A) falls	3
		Explanation:	Population of primary consumers increases or population of B increases (which eat large amount of producer A)	3
	(vi)	*How D might respond:*	Migrate or switch prey	3
	(vii)	*How possible primary consumer in other food chain:*	It may be an omnivore or explained	3

Exam Paper 2015, Question 2:

2. (a) What do ecologists mean by the term *scramble competition*? _____

_____

(b) Give **one** example of a factor, other than light, which may be a source of competition among plants.

_____

(c) Give **one** example of a factor, other than food, which may be a source of competition among animals.

_____

(d) Caterpillars have mouth parts that are suitable for chewing on leaves, whereas the adult form, the butterfly, has long sucking mouth parts. Suggest how having different types of mouth parts reduces competition between the adults and the young of such species.

_____

_____

(e) Answer the following questions in relation to a quantitative survey of a species of small herbaceous plant.

(i) Name the method that you would employ. _____

(ii) How would you ensure that your sampling was random? _____

_____

(iii) Name **one** edaphic factor that could affect the distribution of this plant in the ecosystem.

_____

2.			8 + 7 + 5(1)
(a)	All (individuals) get some of a (scarce) resource		
(b)	Water **or** minerals **or** space		
(c)	Water **or** mate(s) **or** shelter **or** territory (or space)		
(d)	Different food **or** feed on different parts of the plant		
(e)	(i)	Frequency **or** cover **or** transect **or** quadrat	
	(ii)	Throw (object) over shoulder (and place quadrat) **or** random numbers matched to a Grid	
	(iii)	pH **or** temperature **or** air content **or** water content **or** mineral content **or** humus content **or** soil type **or** particle size **or** soil texture **or** soil microorganisms	

Exam Paper 2015, Question 13:

13. (a) Explain the following words as used in ecology:

(i) Ecosystem.
(ii) Community.
(iii) Fauna. **(9)**

(b) Answer the following questions in relation to the ecosystem you have studied.

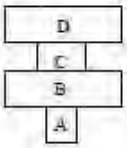
(i) All organisms have adaptations that help them survive and thrive. Some adaptations are structural, other adaptations are behavioural.
Behavioural adaptations are the **techniques** by which organisms enhance their survival.

Name **one** predator from a **named** ecosystem that you have studied **and** give **one** adaptive **technique** of the predator.

(ii) 1. What is meant by the term *variation*?

2. Give a reason why there might be variation in the height of a mature plant species in the ecosystem.

(iii) In relation to this diagram of a pyramid of numbers,
1. name appropriate organisms at A, B, C and D.
2. indicate which organism is most likely to be a herbivore.



(iv) What is the significance of energy loss at each stage in a food chain in relation to:
1. the length of the food chain?
2. the number of organisms at the final trophic level?

(v) If a niche becomes vacant in an ecosystem for a decomposer species, suggest why some other decomposer species may not be able to occupy the vacant niche.

(27)

(c) Using your knowledge of ecology, suggest why caution is advised regarding each of the following practices.

(i) The release of non-native animals into the Irish countryside.

(ii) Using fishing nets of very small mesh size.

(iii) Hedgerow cutting in spring and summer.

(iv) Spreading slurry on farmland. **(24)**

Solutions 2015, Question 13:

13.	(a)	(i)	*Ecosystem:* Organisms (interacting) with their environment	3
		(ii)	*Community:* All (or groups) of organisms found in an ecosystem	3
		(iii)	*Fauna:* *Animals	3
	(b)	(i)	Named predator **and** matching ecosystem	3
			Matching (behavioural) adaptive technique	3
		(ii)	1. Differences within a population (or within a species or between individuals)	3
			2. Differences in a named factor	3
		(iii)	1. D = Parasite C = Named larger carnivore B = Named smaller herbivore A = Named (large) producer	3, 2, 0
			2. B **or** herbivore named in (iii) B. above	3
		(iv)	1. Limits the length (or described)	3
			2. Limits the number (or described)	3
		(v)	May not be suitably adapted (or described)	3

(c)	(i)	Can become pests **or** can spread disease **or** native organisms have reduced or no immunity to their parasites **or** eat native plants **or** eat native animals **or** eat crops **or** compete with native species or extinction of native species	6
	(ii)	Young (or small) fish trapped **or** reduced reproduction rates (or depletes fish stocks) **or** extinction of species	6
	(iii)	Disrupts (bird) nesting **or** endangering animals **or** disrupts food chains (or described)	6
	(iv)	Toxic **or** risk of infection **or** pollution of waterways (or described)	6

Exam Paper 2014, Question 1:

1. From your knowledge of ecology explain **any five** of the following terms:

(a) Biosphere. _____

(b) Niche. _____

(c) Biotic factor. _____

(d) Trophic level. _____

(e) Competition. _____

(f) Symbiosis. _____

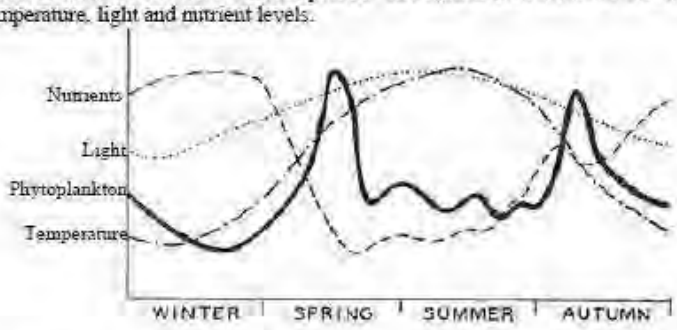
Solutions 2014, Question 1:

1.		**2(7) + 3(2) i.e. best five answers from (a) – (f)**
(a)	*Biosphere*	Parts of the earth where life (or organisms) exists
(b)	*Niche*	The (functional) role of an organism **or** a role explained
(c)	*Biotic factor*	A living factor (in an ecosystem)
(d)	*Trophic level*	Feeding level **or** energy level **or** position in food chain
(e)	*Competition*	The struggle for a resource (or named resource)
(f)	*Symbiosis*	Relationship between two species involving benefit.

Exam Paper 2014, Question 15:

15. Answer any two of (a), (b), (c). (30, 30)

(a) *Phytoplankton* is the collective term covering the small photosynthetic organisms which are part of aquatic ecosystems. The solid line in the graph below shows the fluctuation in phytoplankton numbers in a lake over a twelve month period. The broken lines show the variations over that period in temperature, light and nutrient levels.



(i) What does the graph tell you about the phytoplankton population?

(ii) Why do you think that **nutrient** levels are high in winter **and** then drop sharply in spring?

(iii) Give an example of an inorganic nutrient, necessary for phytoplankton growth, that you would expect to find in lake water.

(iv) *Zooplankton* is the collective term for the small animals present in the lake. **Copy the graph for phytoplankton into your answer book** and then, on the same axes and using a dashed (---) line, show how the numbers of zooplankton would vary over the twelve month period. Briefly explain the graph that you have drawn.

(v) Other than the effect of the zooplankton, suggest why the phytoplankton population drops in late autumn.

(b) Read the passage below and answer the questions that follow.

European rabbits were introduced by settlers into Australia in 1859. Within 70 years the rabbit population grew enormously across most of the continent. The rapid spread of the rabbit led to the destruction of large areas of vegetation, leading to the extinction of many plant species. Loss of vegetation leads to soil erosion as the exposed soil is washed or blown away, removing valuable soil nutrients required for new plants to develop. This soil is typically deposited in waterways, causing siltation and destroying aquatic ecosystems. Farmers battled the problem, fencing their properties with special netting, using poisons, digging out warrens and finally introducing the *Myxoma* virus as a form of biological control. This virus, a benign parasite of the Brazilian forest rabbit, was lethal for European rabbits. It quickly reduced Australia's rabbits to a mere 5% of former numbers. However, this solution was not long-lasting and rabbit numbers recovered.

(i) Describe a procedure for estimating rabbit numbers in an ecosystem.

(ii) Suggest **one** reason for the initial rapid increase of the rabbit population.

(iii) Give **two** possible effects on an ecosystem of the extinction of a plant species.

(iv) Suggest **one** advantage **and one** disadvantage of biological control of a pest organism.

(v) Suggest **one** reason why the rabbit numbers recovered.

(c) The graph shows the growth in human population from 1 AD to present times.

(i) Name **three** factors can that affect human population.

(ii) Suggest **two** reasons why the human population increased so rapidly from the mid-1800s.

(iii) Suggest what could happen to biological diversity as the human population continues to increase.

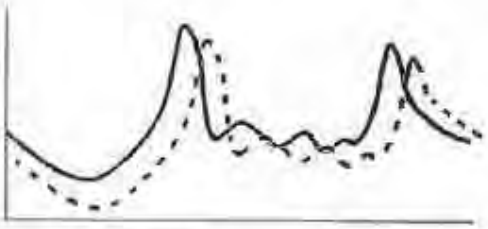
(iv) The vast amount of waste generated is one of the consequences of this huge increase.
Mention the **three** main ways in which waste can be minimised.

(v) What is pollution?

(vi) What is the role of microorganisms in pollution control?

(vii) Describe the role of
1. Plants
2. Animals
in the Nitrogen Cycle **and** in the Carbon Cycle.

Solutions 2014, Question 15:

15.	(a)	(i)	Decreases (or low) in winter / increases (or high) in spring **or** decreases (or low) in spring / fluctuating (or low) in summer / increases (or high) in autumn **or** decreases (or low) in autumn	3(2)
		(ii)	Plankton absorb (or use) (nutrients) / low plankton numbers (in winter) / increasing (or high) plankton numbers (in spring) / (extra) nutrients from dead organisms *Any three*	3(2)
		(iii)	e.g. Nitrate [*accept* nitrogen]	2
		(iv)	*Graph:*  *Features to look for in Graph:* Zooplankton numbers lower than phytoplankton / curve more or less matches the phytoplankton curve / speak shifted to the right / autumn peak shifted to the right	4(2)
			Explanation: Zooplankton eat phytoplankton / (in a food chain) predator numbers are smaller than prey numbers **or** explained / time lag required for numbers to change	2(2)
		(v)	Low temperature **or** low light (intensity)	4

15.	(b)	(i)	*e.g. Capture-recapture*: how captured / how marked / animal welfare comment / release same place / recapture / count / formula **or** calculation described	6(2)
		(ii)	No predator **or** plenty of food **or** warm climate	3
		(iii)	Soil erosion / less nutrients / siltation / destroying aquatic ecosystems / decrease in consumer numbers / increase in numbers of other plant(s) / change of animal species	2(3)
		(iv)	*Advantage*: No (harmful) chemicals **or** specific (target pest)	3
			Disadvantage: Possible extinction (of a species) **or** may not be specific (or explained) **or** immunity develops **or** balance of nature disturbed (or explained)	3
		(v)	Immunity (to the virus evolved)	3

15.	(c)	(i)	War / famine / contraception / birth rate **or** death rate **or** longevity / natural disaster (or example) / disease **or** health care	3(2)
		(ii)	Better nutrition **or** better food distribution **or** better farming **or** improved food preservation techniques / new technology **or** improved living conditions **or** improved medicine or improved hygiene	2(2)
		(iii)	Decrease **or** increase **or** stays the same	1
		(iv)	Reduce / reuse / recycle	3 (1)
		(v)	Any harmful addition to the environment	2
		(vi)	Decomposition (or explained)	2
		(vii)	1. *Plants:* absorb nitrates / synthesise protein / absorb CO_2 / synthesise carbohydrate (or photsynthesise) / respire / die	3(2)
			2. *Animals:* consume plants / assimilate protein / assimilate carbohydrate / produce nitrogenous waste / respire / die	3(2)

Exam Paper 2013 Question2:

Answer the following questions in relation to food chains.

(a) Where in a food chain are primary producers found?

_____

(b) What term is used to describe organisms that feed on primary producers?

_____

(c) Why are most food chains short (i.e. only consist of a few trophic levels)?

_____

(d) What deduction may be made if the organisms at the start of the chain are less numerous than those that feed upon them?

_____

(e) (i) Can a parasite be the first member of a food chain? _____

(ii) Explain your answer. _____

(f) Energy enters food chains in the form of light. In which form do you think most energy is lost from food chains?

_____

Solutions 2013 Question 2:

2.	6(3) + 2
(a)	First (level)
(b)	Primary consumer(s) **or** herbivore(s)
(c)	(Large) energy loss (from one level to next) **or** small energy transfer
(d)	Producers are large **or** primary consumers are parasites
(e) (i)	No
(ii)	(Parasites) are not producers **or** (parasites) are consumers (or explained)
(f)	Heat

Exam Paper 2013 Question 15

(a) Read the article below and answer the questions that follow:

Cigarettes are bad for your health. But that's only if you smoke them. If you use them to line your nest, they might actually do some good. Scientists have recently found that birds that decorate their nests with discarded cigarette butts full of nicotine are less bothered by parasites.* When building a nest, birds tend to make do with the materials at hand. Twigs and leaves are popular choices. Some fresh green leaves give off strong smells. So how can city birds manage? Apparently, some reach for the fibres found in used cigarette filters.

Scientists got to wondering whether this habit might provide the birds with benefits other than bedding. So they investigated the nests of finches and sparrows that were living on the campus of the National University of Mexico, which is in the heart of Mexico City. The scientists used heat traps to lure the parasites and then counted them. Most of the nests contained cellulose fibres from broken cigarette filters. They found that nests with the most used cigarette filter fibres had the lowest number of parasites, in this case, blood sucking mites. For these birds, a butt a day might keep the mites away!

*[Biology Letters: M. Suarez-Rodriguez, I. Lopez-Rull, C. Macias Garcia '*Incorporation of cigarette butts into nests reduces nest ectoparasite load in urban birds: new ingredients for an old recipe.*']

Adapted from Scientific American 60-second podcast by Karen Hopkin 05/12/2012.

i) Name one bird from the study and name its parasite:

_____

_____

ii) Explain the term ectoparasite:

_____

_____

iii) Suggest one negative effect on birds or chicks of living in parasite infested nests:

_____

_____

iv) Apart from an effect on parasite numbers, suggest a reason for the use of the filter fibres in nest building:

_____

_____

v) State one benefit to a plant of giving off strong smells:

_____

_____

vi) Suggest what might be trapped in used cigarettes:

_____

_____

vii) Suggest how the scientists might have measured the amount of cigarette filter fibres in one nest:

_____

_____

viii) The scientists put unused cigarette filters beside bird's nests. Suggest a reason for this:

_____

_____

ix) The nests containing unused filters showed a normal parasite load. Suggest one reason for this observation:

_____

_____

b)

i) Draw a large diagram to illustrate the main features of the nitrogen cycle:

ii) Outline two biological similarities between the nitrogen cycle and the carbon cycle:

_____

_____

iii) Suggest why continual monitoring of the environment is valuable:

_____

_____

iv) In the case of each of the following pairs of terms, distinguish between the members of each pair by writing a sentence about each term:

1) Contest competition and scramble competition:

_____

_____

_____

_____

2) Edaphic and aquatic:

_____

_____

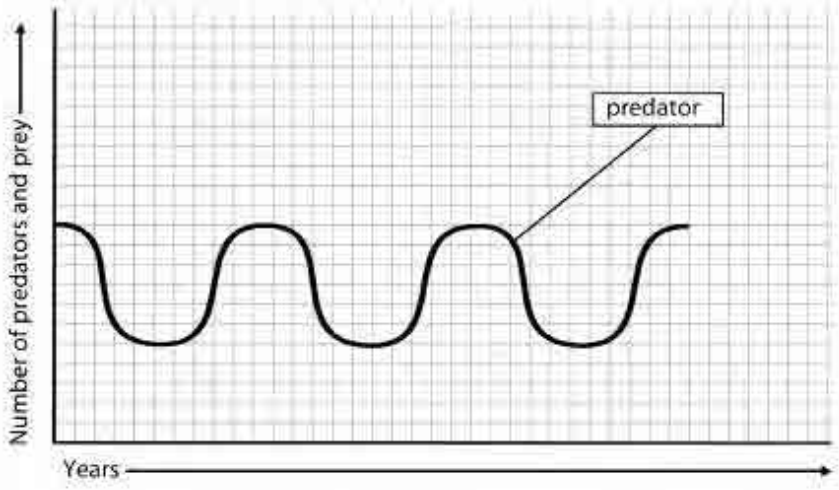
3) Climate and weather:

_____

_____

c)

The graph below shows the fluctuations in the population of a predatory species over many years.



(i) **Copy the graph into your answer book.**
Then, on the same axes and using a dashed line (- - - -), show how you think the population of the predator's main prey species might vary over the same timespan.

ii)Give an explanation of the graph that you have drawn for the prey species:

_____
_____
_____

iii)Do you think that population graphs for a host species and its main parasite would show similar fluctuations. Explain your answer:

_____
_____
_____
_____

iv)Suggest a role for parasites in the overall scheme of nature:

_____
_____

v)

1) Name two predators:
   _____
2) Give one adaptive technique in the case of each predator:
   _____
   _____

Solutions 2013 Question 15:

15.	(a)	(i)	Finch (or sparrow) + (blood sucking) mites	3
		(ii)	(Organism living on) host (or explained) / causing damage	2(3)
		(iii)	Disease **or** death or weakened (birds)	3
		(iv)	Readily available **or** shortage of normal material **or** similar to normal building material **or** suitable material **or** insulator	3
		(v)	Repulsion (or described) **or** attraction (or described)	3
		(vi)	Tar **or** nicotine (or other named substance) **or** bacteria	3
		(vii)	By weighing it	3
		(viii)	Control (or explained)	3
		(ix)	No (mite)-repelling (or mite-killing) chemicals **or** absence of named chemical	3

15.	(b)	(i)	• Nitrogen gas to usable compounds / • Plant protein to animal protein / • Excretion releasing N compounds / • Death and decomposition / • Dead organic matter to ammonium • Ammonium to nitrite / • Nitrite to nitrate / • Nitrates to plant protein / • Nitrogen compounds to nitrogen gas / • One example of bacterial involvement / • Role of lightning *Any six*	6(2)
		(ii)	Fixation (or explained) / bacteria (or micro-organisms) involved / death and decay / nutrition (or described) / excretion	2(2)
		(iii)	To be able to detect change(s) **or** to remedy effect of change **or** to detect levels of pollutants (or example)	2
		(iv)	1. *Contest:* one gets all (of the resource)	2
			Scramble: all get some (of the resource)	2
			2. *Edaphic:* to do with soil	2
			Aquatic: to do with water	2
			3. *Climate:* long-term (prevailing) conditions	2
			Weather: short-term (atmospheric) conditions	2

15.	(c)	(i)	*Graph:*	Out of sync.	3
				Most prey peaks higher than predator peaks	3
		(ii)	Explanation of time lag		3
			Explanation of bigger prey numbers		3
		(iii)	Yes (or No) + explanation		3
		(iv)	Population control		3
		(v)	Name predator 1		3
			Adaptative technique		3
			Name predator 2		3
			Adaptative technique		3

Exam Paper 2012 Question 4:

(a) (i) What does an ecologist mean by the term *conservation*?

_____

(ii) Suggest a reason why nature reserves are important for conservation.

_____

(b) (i) Explain the term *pollution*. _____

(ii) Pollution may result from domestic, agricultural or industrial sources.
Select **one** of these areas **and** state an effect that may be produced by a **named** pollutant.

Pollutant: _____

Effect: _____

(iii) How may the pollution referred to in (ii) be controlled?

_____

(c) In relation to the incineration of domestic waste, suggest:

(i) an advantage of the process. _____

(ii) a disadvantage of the process. _____

Solutions 2012 Question 4:

4.		2(7) + 6(1)
(a)	(i)	Management of environment or management of species (or organism(s))
	(ii)	To allow species to develop or (maintaining) biodiversity or prevent extinction or protection
(b)	(i)	Harmful addition to the environment (or named part of environment)
	(ii)	*Pollutant:* Any relevant pollutant
		Effect: Must match pollutant
	(iii)	Matching control measure for pollutant from (ii)
(c)	(i)	*Advantage:* Amount of waste greatly reduced or useable heat or reduced landfill
	(ii)	*Disadvantage:* Harmful products

Exam Paper 2012 Question 11:

a)

i) Distinguish between a food chain and a food web:
Include a clear reference to each in your answer:

_____
_____
_____
_____
_____

ii) What do ecologists mean by a pyramid of numbers:

_____
_____
_____

b)

Organisms that are introduced into new environments outside their natural ranges are referred to as exotic species. In some cases these introductions have been deliberate and in other cases accidental e.g. when a species kept in captivity in a new country escapes and gives rise to a wild population. Worldwide, the great majority of deliberate attempted introductions have been unsuccessful.

i) Suggest a reason for attempting to establish an exotic species in a new country:

_____
_____

ii) Suggest two reasons why the great majority of attempted introductions have been unsuccessful:

_____
_____
_____
_____

iii) Use your knowledge of the life cycle of flowering plants to suggest how an exotic plant may escape from capacity:

_____
_____
_____

iv) Use your knowledge that you have gained in your studies of ecology to suggest how the introduction of an exotic species may:

1) impact negatively on an existing community:

_____
_____

2) impact positively on an existing community:

_____
_____

v) It has been stated that an exotic species has a good chance of becoming established in a new environment if there is a vacant niche.

1) Explain the term niche in this context:

_____
_____

2) Do you agree with the above answer:

_____
_____

3) Explain your answer:

_____
_____
_____

c) Name the ecosystem which you investigated during your study of ecology:

_____

i) Explain the terms:

1) Flora:

_____

2) Fauna:

_____

ii) Name one animal from your ecosystem and describe how you carried out a quantitative study of that animal:

_____
_____
_____
_____
_____
_____
_____

iii) Suggest one way in which marking an animal might endanger it:

_____

_____

iv) Ecosystems are subject to changes, both natural and artificial. Mention one of each type of change as it applies to your named ecosystem:

_____

_____

_____

Solutions 2012 Question 11:

11.	(a)	(i)	Chain: One species at each trophic (or feeding) level or described or diagram	3
			Web: Interconnected food chains or described or diagram or more than one species at each trophic (or feeding) level	3
		(ii)	(Diagram) that shows the number of organisms at each trophic level	3
	(b)	(i)	Food source or biological control or aesthetic or sporting or other	3
		(ii)	Failure to adapt / example of failure to adapt / preyed upon / insufficient numbers / dispersal / competition *Any two*	2(3)
		(iii)	Seed dispersal or fruit	3
		(iv)	1. Increased competition or (increased) predation or example of increased competition or example of increased predation	3
			2. Control of nuisance species or food or shelter or other	3
		(v)	1. Role of organism (in an ecosystem) or explained e.g. 'how it fits'	3
			2+3. Yes, because it is adapted (or is suited) or explained OR No, because it is not adapted (or is not suited) or explained	6, 0

(c)	Name of investigated ecosystem:	
(i)	1. *Plants	**2**
	2. *Animals	**2**
(ii)	Named animal (must match named ecosystem and method if given)	**2**
	Details of method:	**6(2)**
(iii)	More conspicuous (to predators) **or** social outcast **or** toxic marker	**2**
(iv)	*Natural:* relevant matching example	**2**
	Artificial: relevant matching example	**2**

Exam Paper 2011 Question 3:

Choose suitable terms from the list below that most closely match each of the following descriptions:

population; producers; competition; predation; community; symbiosis; decomposers; parasitism

(a) A situation in which one organism lives on or in a second species, feeding on it and causing it harm.

_____

(b) Organisms capable of making their own food.

_____

(c) All the members of a species living in an area.

_____

(d) Micro-organisms and other organisms that return nutrients to the environment by decay.

_____

(e) A situation in which two organisms of different species live together and at least one benefits.

_____

(f) A struggle between organisms for a scarce resource.

_____

(g) One organism killing and eating another organism.

_____

Solutions 2011 Question 3:

3.		6(3) + 2	
	(a)	Parasitism	
	(b)	Producers	
	(c)	Population	
	(d)	Decomposers	
	(e)	Symbiosis	
	(f)	Competition	
	(g)	Predation	

Exam Paper 2010 Question 5:

Explain each of the following terms from your study of ecology.

(a) Biosphere .....

(b) Ecosystem .....

(c) Habitat .....

(d) Symbiosis .....

(e) Biotic factor .....

(f) Food Web .....

(g) Fauna .....

Solutions 2010 Question 5:

5.		6 (3) + 2	
	(a)	Part(s) of earth that supports life	
	(b)	Organisms and their (interactions with) environment	
	(c)	(Place) where a species (or an organism) lives	
	(d)	Relationship between (different) species in which at least one benefits	
	(e)	Living (organism's influence on another organism)	
	(f)	Interconnected food chains **or** more than one species at each trophic level	
	(g)	Animals	

Exam Paper 2009 Question 3:

(a) Define *predation*. _____

_____

(b) Give an example of predation by naming a predator and its prey.

Predator: _____

Its prey: _____

(c) Explain the term *niche*. _____

_____

(d) Name an anabolic process carried out by plants.

(e) Explain the term *edaphic*. _____

_____

(f) Give an example of an edaphic factor.

Solutions 2009 Question 3:

3.		6(3) + 2	
	(a)	Killing (or catching) and eating another animal	
	(b)	Predator named	
		Its prey named	
	(c)	Organism's role in ecosystem **or** explained	
	(d)	Photosynthesis **or** protein synthesis	
	(e)	(To do with) soil	
	(f)	Particle size **or** soil type **or** pH **or** air content **or** water content **or** mineral content **or** temperature **or** humus content	

Exam paper 2008 Question 7:

(a) (i) What is a habitat? .....

(ii) What is an ecosystem?.....

(b) Answer the following questions by reference to a named ecosystem that you have investigated.

Name of ecosystem.....

(i) List **three** abiotic factors that you investigated.

1. ..... 2. ..... 3. .....

(ii) For each of the three abiotic factors that you have listed describe how you carried out the investigation.

Factor 1 .....

.....

.....

.....

.....

Factor 2 .....

.....

.....

.....

.....

Factor 3.....

.....

.....

.....

.....

(iii) In the case of a named organism give an adaptation feature that you noted.

Name of organism .....

Adaptation feature .....

.....

.....

(iv) Briefly explain how the adaptation feature that you have given in (iii) is of benefit to the organism .....

.....

.....

Solutions 2008 Question 7

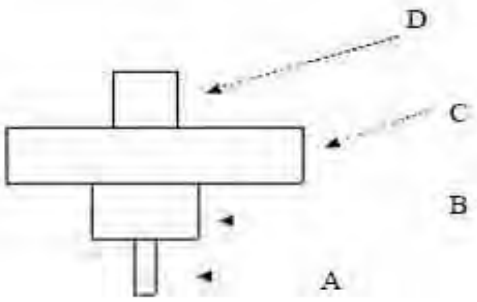
7.	(a)	(i)	(place) where organism (or species) lives	3
		(ii)	organisms and their environment	3
	(b)	name of ecosystem:		3
		(i)	any three abiotic factors	3(1)
		(ii)	how investigated (what used or how)	3(3)
		(iii)	organism name matching ecosystem adaptation feature matching organism	3 3
		(iv)	benefit	3

Exam paper 2007 Question 2:

(a) In ecology what is meant by a trophic level? .....

.....

(b) Complete the pyramid of numbers by naming an organism in each case of A, B, C and D.



A ..... B .....

C ..... D .....

(c) Which letter represents the producer in the pyramid? .....

(d) Comment on the relative sizes of an individual producer and an individual primary consumer in the pyramid.

.....

.....

.....

Solutions 2007 Question 2:

2.			
	(a)	feeding level or energy level or position in food chain	5
	(b)	name A + B C = parasite or scavenger or decomposer or correctly named	3 2
	(c)	A	5
	(d)	(producer) larger or consumer smaller	5

Exam Paper 2006 Question 2:

Answer the following questions in relation to your study of ecology.

(a) What is the biosphere?

.....

.....

(b) What is meant by a qualitative survey? .....

.....

(c) Construct a grazing food chain containing at least four trophic levels in the space below.

(d) In your food chain in (c) identify each of the following.

1. A predator .....
2. A producer .....
3. A secondary (second order) consumer .....
4. A primary (first order) consumer .....

Solutions 2006 Question 2:

2.			
	(a)	where life can exist or all the ecosystems of the earth [*must not define habitat]*	4
	(b)	descriptive (survey) / species, or organisms, or types, present or implied	4
	(c)	food chain with four organisms	4
	(d)	predator / producer / secondary consumer / primary consumer	4(2)

Exam Paper 2006 Question 9:

(a) (i) What is meant by the term 'fauna'? .....

(ii) In ecological studies what is a key? .....

.....

(b) (i) Name five plants in the ecosystem that you have studied.

1. .....
2. .....
3. .....
4. .....
5. .....

(ii) In the space below draw up a simple key which could be used to identify each of these plants.

(iii) Name five animals in the ecosystem that you have studied.

1. .....
2. .....
3. .....
4. .....
5. .....

(iv) In the space below draw up a simple key which could be used to identify each of these animals.

Solutions 2006 Question 9:

9.				
	(a)	(i)	animals	3
		(ii)	a guide to identification or explained	3
	(b)	(i)	five plants	2(2)+3(1)
		(ii)	reasonable attempt at key design [or distinguishing features shown or stated 5(1)]	5
		(iii)	five animals	2(2)+3(1)
		(iv)	reasonable attempt at key design [or distinguishing features shown or stated 5(1)]	5

Exam paper 2004 Question 5:

(a) What is meant by pollution? .....

....

Give an example of a human activity that results in the pollution of air or water.....

.....

Suggest a means of counteracting this pollution. .....

.....

(b) Explain conservation in relation to wild plants and animals.

.....

.....

Suggest **two** reasons for conserving wild species.

(i) .....

(ii) .....

State **one** conservation practice from agriculture **or** fisheries **or** forestry.....

.....

Solutions 2004 Question 5:

(a)	Any harmful (undesirable) (addition to) the environment (or named ecosystem)
	Any correct example of human activity
	Counteracting method (must relate to example given above) [*allow "clean up"*]
(b)	***Explain conservation:*** Retention of viable populations (e.g. stopping extinction) **or** their habitats **or** comment on management **or** any one explained [allow *'wise use of environment]* **(i)** and **(ii)** NB ***any two reasons for conservation*** aesthetic / recreational / food supplies / possible sources of drugs /source of other materials / species right to existence / prevent extinction / biodiversity **or** balance / **or** any 2 correct examples *[Note: group term + example = 1 point; 2 examples = 2 points]*
	One conservation practice: Control of fertiliser usage **or** control of mesh size **or** plant trees **or** any valid example explained