

Kirkcaldy High School
Biology Department
National 4/5 Biology
Unit 3 Life on Earth
Section 2 - Survival of the Fittest



Name: _____

Class: _____

#	Level	I can.....	Tracking
1.	4	State the word equation for photosynthesis	
2.	4	Carry out the test for starch using iodine	
3.	4	Describe the conditions needed for photosynthesis to occur	
4.	4	Understand, giving examples, the term 'limiting factor'	
5.	5	State the names of the two stages involved in photosynthesis	
6.	5	Describe what happens in both stages of photosynthesis	
7.	5	State reasons for energy being lost in food chains	
8.	5	Explain and draw pyramids of energy and numbers and identify these from food chains	
9.	4&5	State why plants and animals need nutrients and describe the effect of lacking these nutrients on plant growth	
10.	4	State the microorganisms involved in the nitrogen cycle	
11.	4	Make up a simple nitrogen cycle diagram	
12.	4	State the three nutrients found in fertilisers	
13.	4	Describe why fertilisers may be used on crops	
14.	4	State the effects of fertilisers washing into fresh water	
15.	5	Explain the cause of algal blooms	
16.	5	Describe the changes in levels of oxygen, bacteria and fish as a result of algal blooms	
17.	5	Explain the term indicator species	
18.	4	Describe why beaches would be awarded Blue Flag status	
19.	5	State why pesticides would be used by farmers	
20.	5	Explain the build-up of pesticides along food chains	
21.	5	State how biological control may be an alternative to using pesticides	
22.	5	Explain the benefits of GM crops to farmers	
23.	5	Explain the term mutation and give examples of factors which can increase the rate of mutations	
24.	4&5	State why adaptations are useful to organisms	
25.	4&5	Give examples of structural and physiological adaptations	
26.	4	Explain the difference between innate and learned behaviour adaptations and give examples of both	
27.	5	Describe the forms of variation found in Darwin's finches and peppered moths	
28.	5	State the five steps involved in natural selection	
29.	5	State the meaning of the term speciation	
30.	5	Describe the possible three isolation barriers found in speciation	
31.	5	Explain the steps involved in speciation	

Biodiversity and the distribution of life
Photosynthesis

Word equation for photosynthesis...

_____ reactions are controlled by enzymes and happen in _____ stages:

1. _____: the light energy from the sun is trapped by chlorophyll in the green chloroplasts and is converted into chemical energy in the form of ATP. Some of the energy is used to split water into hydrogen and oxygen. Oxygen diffuses from the cell.
2. _____: a series of enzyme controlled reactions, which use hydrogen and ATP (carried from stage 1) with carbon dioxide to produce glucose (sugar).

Draw a diagram of the two stages of photosynthesis

Uses of Glucose

The chemical energy in glucose (sugar) produced from photosynthesis can be used immediately in _____ to make ATP. It can also be turned into other substances:

1. Used to make _____, a part of cell walls.
2. Built up and _____.

Rate of Photosynthesis

Rate of photosynthesis can be measured in _____ plants by measuring how much the water levels in the tube _____ over a set period of time e.g. 1 minute.

The quicker oxygen is given off, the _____ the rate of the plant's photosynthesis and the faster the water level in the test tube _____.

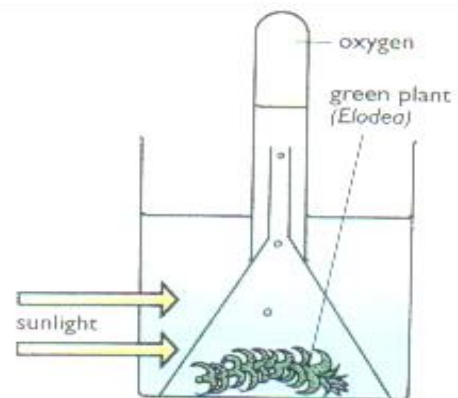


Figure 11.20 Oxygen release

Virtual Lab - Measuring the Rate of Photosynthesis

Use the following website to investigate the effect of light intensity on the rate of photosynthesis.

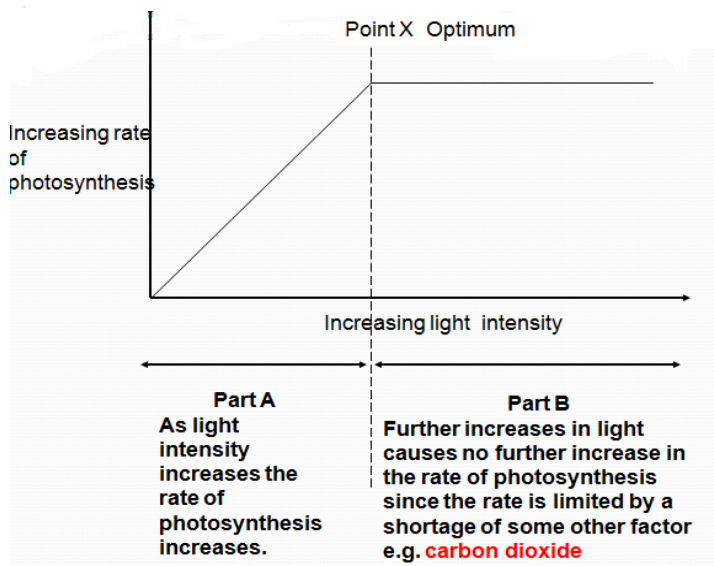
<http://www.kscience.co.uk/animations/photolab.htm>

In your jotter, write a scientific report detailing your findings. You must include...

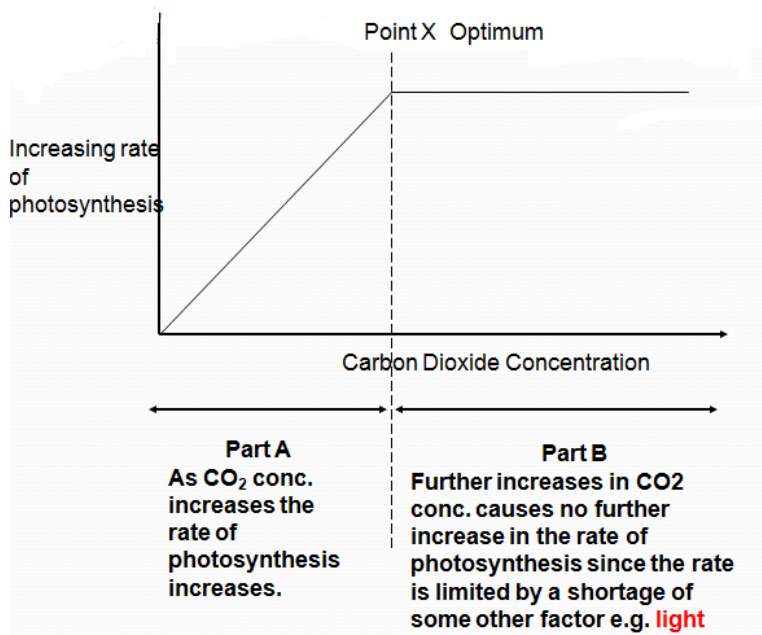
- Title
- Aim
- Hypothesis
- Method
- Results (a table and graph)
- Conclusion
- Evaluation

Limiting Factors of Photosynthesis

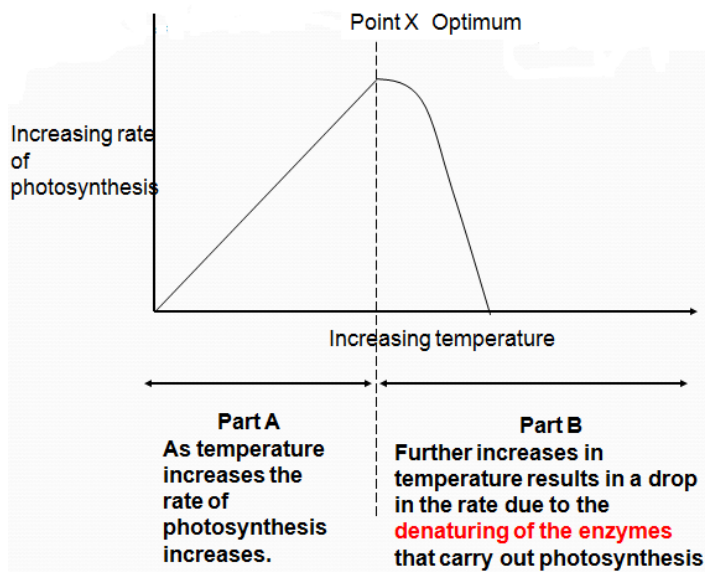
Anything which limits the rate of photosynthesis is called a limiting factor. E.g. not having enough sunlight, warmth or carbon dioxide. A limiting factor will slow down a plant's growth.



The limiting factor at part A is light intensity because as the light intensity increases, the rate of photosynthesis increases. In part B, another factor must be a limiting factor as increasing light intensity is no longer causing an increase in rate of photosynthesis.

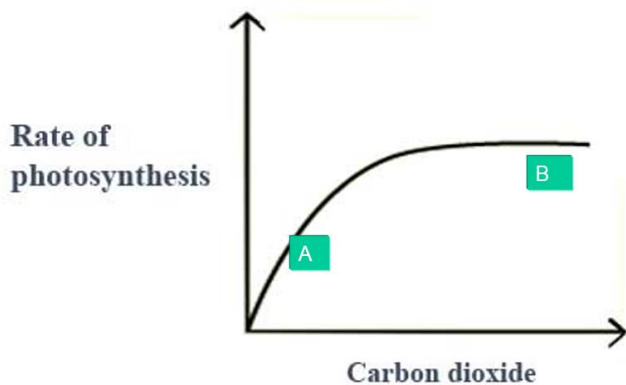


The limiting factor at part A is carbon dioxide concentration because as the carbon dioxide concentration increases, the rate of photosynthesis increases. In part B, another factor must be a limiting factor as increasing carbon dioxide concentration is no longer causing an increase in rate of photosynthesis.



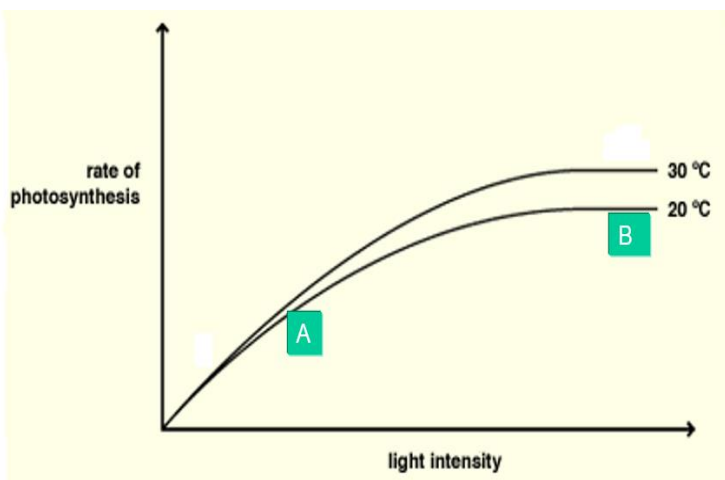
The limiting factor at part A is temperature because as the temperature increases, the rate of photosynthesis increases. In part B, the further increase in temperature has caused enzymes to denature and so the reaction rate drops.

Analyse the two following graphs and decide what the limiting factor is at point A and point B.



Limiting factor at point A =

Limiting factor at point B =

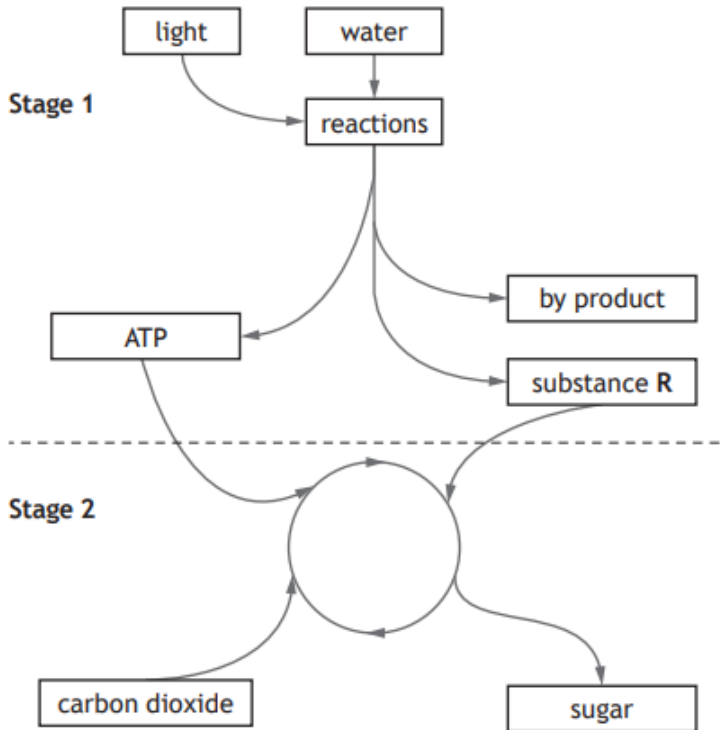


Limiting factor at point A =

Limiting factor at point B =

Practice Question - National 5 Specimen Paper

Photosynthesis is the process by which plants produce sugar using light.
The flow diagram represents some stages of photosynthesis in a leaf.



(i) Identify substance R. 1

(ii) Describe the transfer of energy in stage 1 from light arriving at the leaf, and how the sugar produced in stage 2 can be used by the plant. 3

Energy in ecosystems

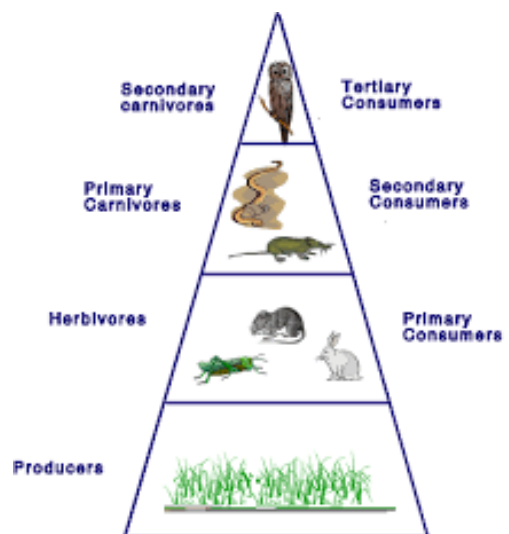
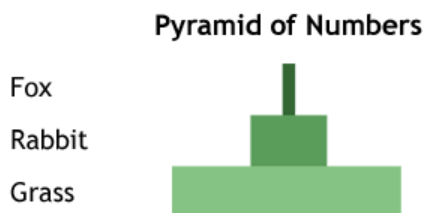
Arrange the organisms on the smart-board into a food chain. Draw pictures and include arrows to show the flow of energy.

Food _____ show the transfer of energy between organisms in an ecosystem. The arrows show the _____ of _____ transfer (meaning where the energy is travelling to).

At each step in a food chain, the majority of the energy is lost as _____, _____ or _____. Only a very small quantity is used for _____ and is therefore available at the next level in a food chain.

Pyramid of Numbers

A _____ of numbers shows the total _____ of organisms at each step in a food _____.





Woodpecker
(Secondary consumer)



Insects
(Primary consumer)



Oak tree
(Producer)



A pyramid of numbers _____ looks a pyramid shape, but not always. For example, if there is a _____ as the producer, it is always _____ at the base.

Draw the pyramids of numbers on the smart-board and write their description next to them.

A

Description:

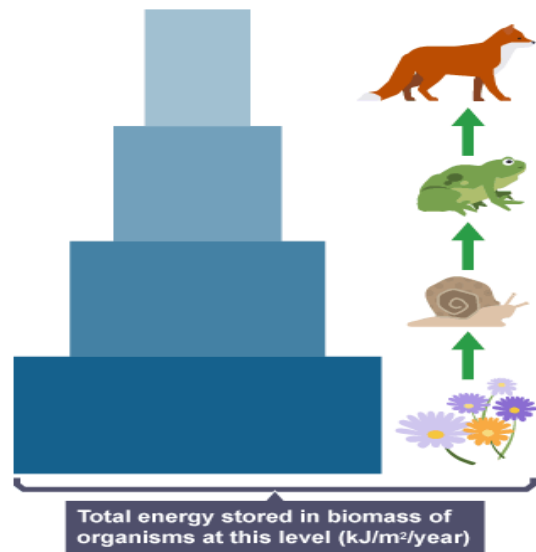
B

Description:

C

Description:

A pyramid of _____ shows the total energy in all _____ at each stage of a _____ chain.



Producing food: Growing Crops

Use www.kscience.co.uk/animations/minerals.htm to carry out an experiment on the effect of missing nutrients on plant growth. Fill in your results below.

Nutrient missing	Length of root (cm)	Length of shoot (cm)	Colour of leaves
None			

Plants take nutrients such as _____, _____ and _____ from the soil to grow _____.
With nutrients such as nitrogen, plants grow much _____ and _____.

Nutrients in Ecosystems

_____ are chemicals which _____ and animals need to survive. Nutrients must be _____ in ecosystems otherwise they would eventually _____ out.

The Nitrogen Cycle (N4)

Plants and animals need nitrogen to make _____.

Plants get their nitrogen from chemicals called _____ in the _____. Animals get their nitrogen by _____ plants and other animals.

Use the BBC Bitesize page below to produce a poster showing the recycling of nitrogen.

<https://www.bbc.com/bitesize/guides/z637hyc/revision/1>

Nitrogen (N5)

_____ dissolved in soil water are _____ into plants. Nitrates are used to produce _____ which are synthesised into plant proteins. Animals consume plants or other animals to obtain amino acids for protein _____. Fertilisers can be added to soil to increase the nitrate content of the soil.

Fertilisers

When plants grow, they take up nutrients like nitrogen from the _____. When they naturally die, the nitrogen is returned to the soil by _____, however _____ crops by cutting and taking them away _____ the nutrients from the soil.

_____ can be added to the soil to replace these nutrients.

Fertilisers contain three main nutrients: _____
(N), _____ (P) and _____
(K).



Fertilisers cause crops to grow _____ and _____.
Fertilisers increase the _____ of food a farmer can produce.

Problem Solving Practice

Task 1 - Draw a link graph on graph paper using the data on the board.

Task 2 - Calculate the percentage increase of yield between crop A and crop B at the following concentrations of fertiliser.

a) 0kg/ ha

b) 20kg/ha

c) 40kg/ha

REMEMBER!

To calculate a percentage change we use the following formula:

$$(\text{change/original}) \times 100$$

Task 3 -

a) Draw two conclusions from the information.

Conclusion 1 -

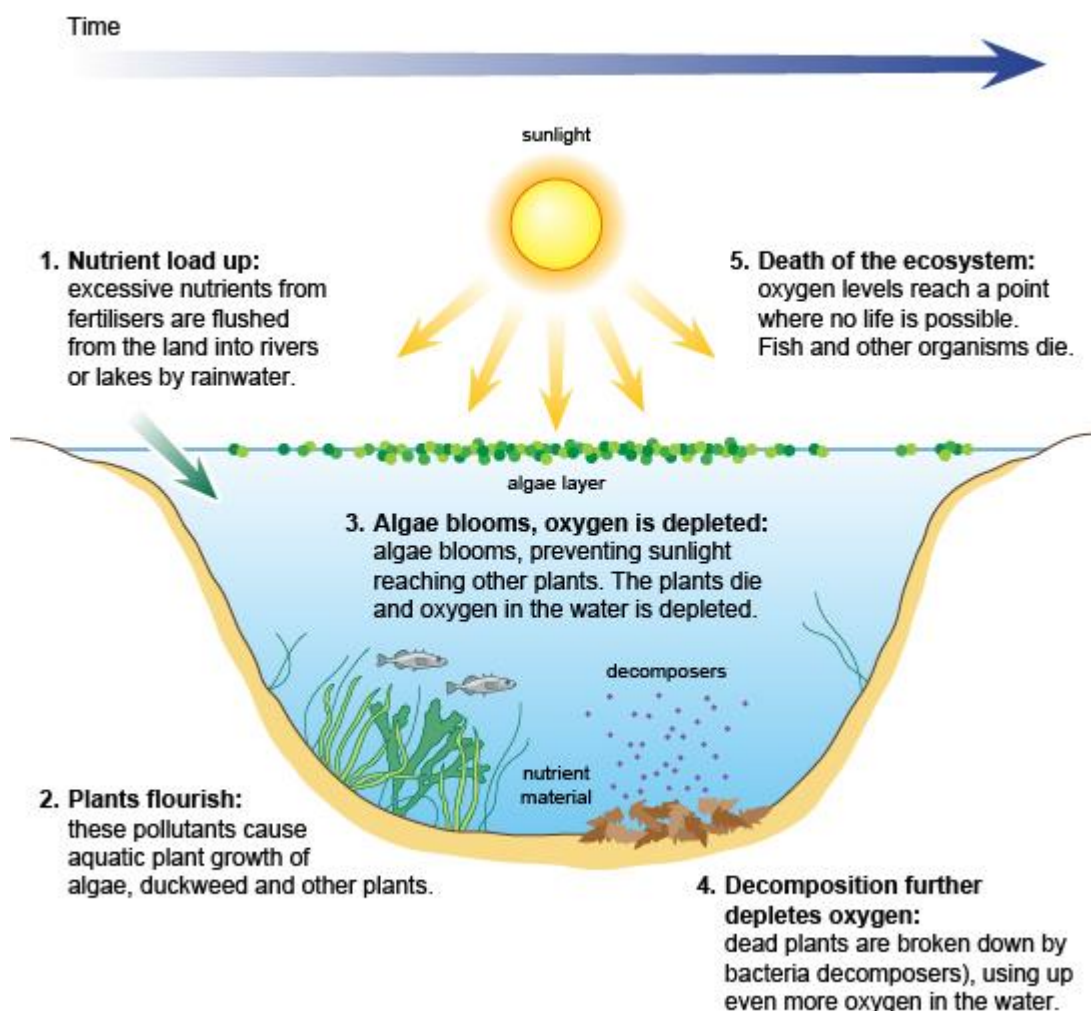
Conclusion 2 -

b) Predict the yield of crop A when the concentration of fertiliser is 180kg/Ha.

Effects of fertilisers

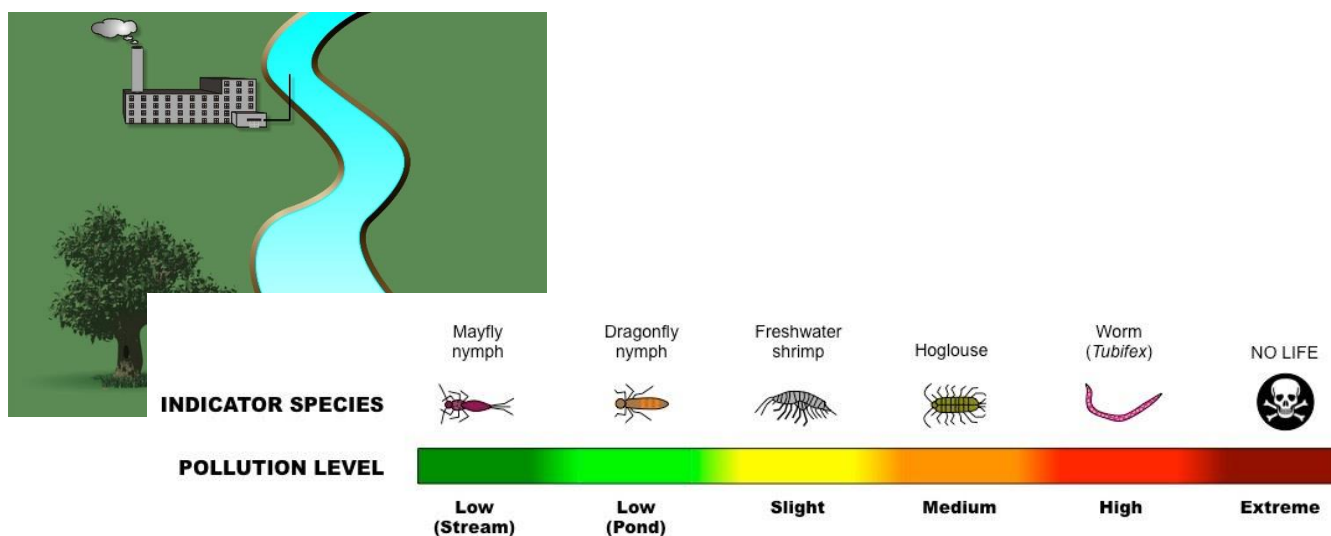
1. Fertilisers can wash into _____, called _____. This adds extra, unwanted nitrates. If this happens, algae in the river will feed on them then grow quickly, forming an algal _____. This blocks _____ so kills aquatic plants below the surface.
2. Algae eventually _____ as they run out of _____. The dead plants along with dead algae provide _____ for bacteria which increase in number
3. Bacteria use up all the _____ in the river
4. _____ and other living things _____.

_____ (GM) crops can be used to reduce the use of fertilisers.



Indicator species

_____ species are species that by their _____ or absence, indicate the level of _____ in a certain area.



Blue flag beaches

_____ Flags are awarded to very clean beaches who meet certain criteria:

Criteria	Example
Environmental education and information	
Water quality	
Environmental management	
Safety and services	

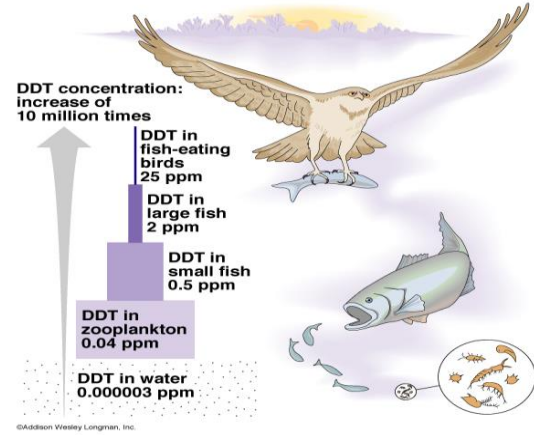
Growing Crops

To provide more food, we can use:

Chemical pesticides sprayed onto crops to kill pests

When the _____ eats the crop sprayed with pesticide, the _____ enters the pest's body. The pesticide remains in the pest's body and if another organism in the food chain _____ it, the pesticide passes into it.

As they are passed on, they can _____ at each level of a _____ to lethal levels in organisms at the _____ of the chain. E.g. DDT.



Biological control

_____ control means introducing natural _____ to eat the _____ e.g. introducing ladybirds to eat _____.



3. Genetically modified (GM) crops

These have _____ from other organisms inserted into their _____. This can allow them to use nutrients _____, so reduce the need for fertilisers.

Adaptation, Natural Selection and Evolution of a Species

Mutations

Random changes to genetic material (DNA) are called _____. Mutations can be neutral (have no effect), pass on an advantage or a disadvantage to survival

Mutations are spontaneous. Some factors can _____ the rate of mutations, e.g _____ temperatures, _____ and x ray radiation and certain chemicals.

Adaptations

Mutations produce new _____ (forms of a _____)

These new alleles can change an organism's _____ or _____ and may help it _____ to its environment.

Adaptations are features which an organisms possesses to help its species survive. They may be:

- a) _____ -physical features
- b) _____ - bodily functions
- c) _____ - learned or instinctive actions

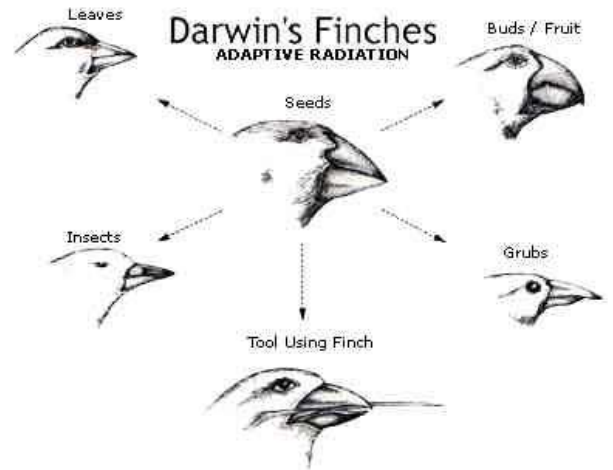
Some organisms possess _____ adaptations which help them to survive. These are either _____ (present at _____) or _____ (developed throughout life).

Organism -	Adaptation -	How it helps survival -

Darwin's finches

New _____ produced by _____ allow plants and animals to _____ to their environment.

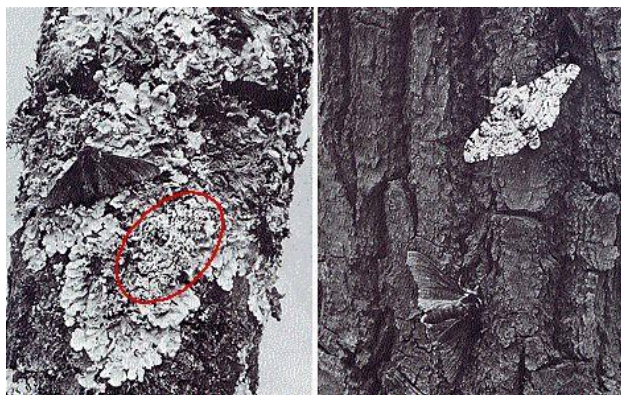
For example, different mutations caused Darwin's finches to develop differently shaped _____. This made each one slightly better adapted to eating a certain type of _____.



Moths

In _____ areas, _____ forms of the moth were more common. They were better adapted as they had better _____ to hide them from predators.

In areas where _____ were polluted by black soot, _____ forms of the moth were more common. Dark moths _____ to _____ because they are camouflaged and are therefore not eaten by birds.



Natural selection

Darwin believed in '_____ selection':

1. Species produce _____ offspring than the environment can _____.
2. _____ (differences) exists in all species due to different _____.

3. Survival of the _____ occurs. This means that only individuals in the population which are _____ adapted are able to _____ in their environment.
4. The best adapted _____ and pass on the alleles which give the best adaptations to their _____.
5. The species gradually _____ in response to changing environmental _____ because these alleles increase in frequency within the population.

Speciation

Forming a brand _____ species is called _____. This is how it happens:

1. Part of a population becomes _____ by what is called an _____ barrier. This barrier can be:
 - a) _____ (e.g. by river / mountain)
 - b) _____ (e.g. different mating rituals)
 - c) _____ (e.g. living in different habitats)
2. Different _____ occur in each _____ population.
3. Natural selection selects different _____ in each sub population, leading to different adaptations. This is because each group will have to _____ in a slightly different environment.
4. Each population gradually becomes more and more _____ over time.
5. Eventually they are so genetically different that they become _____ different species.

