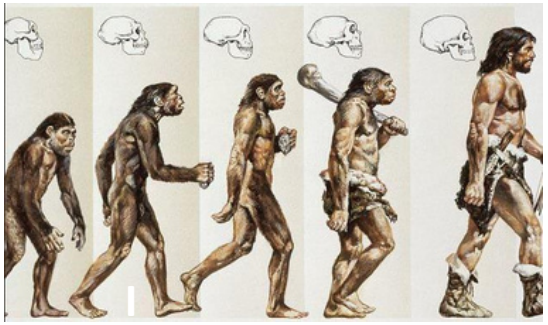
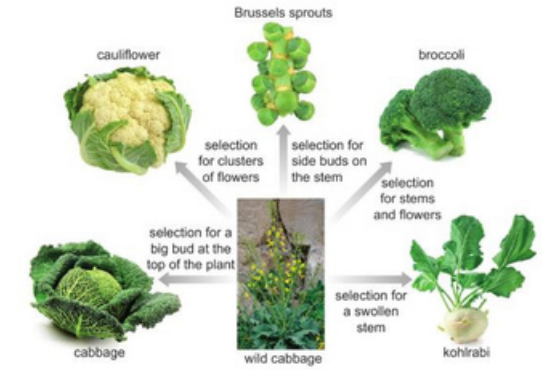
Knowledge Organiser: Biology, SB4

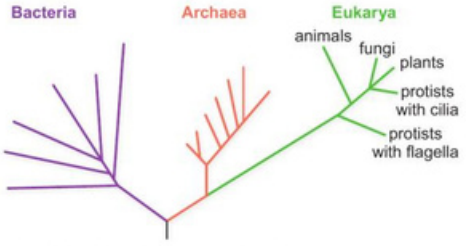
1	**Charles Darwin** published the **theory of evolution by natural selection**in 1859.
2	This theory states that **individual organisms within a particular species show a wide range of variation for a characteristic.** **Individuals most suited to the environment are more likely to breed successfully.** **Characteristics which help individuals to survive and are then passed on to the next generation**
3	The theory was **slowly accepted** as it challenged the theory of creation and there was insufficient evidence at the time
4	E**vidence**for human evolution comes from **fossils**and **stone tools**
5	Fossils-Ardipithecus ramidus **(Ardi**) from 4.4 million years ago Australopithecusafarensis (**Lucy**) from 3.2 million years ago, Leakey's discovery of **Homo habilis** from 1.6 million years ago
6	**Stone tools** from different ages have been found in layers of **rock**. The **age**of different layers of rock can be dated.
7	Evolution is widely accepted. **Evidence**is now available to show that **characteristics**are passed on to offspring in **genes**.
8	**Carl Linnaeus** classified living things, there are 5 kingdoms **animals, plants, fungi, protista, prokaryotes**
9	Linnaeus classification is **Kingdom, Phylum, Class, Order, Family, Genus, Species**
10	**Carl Woese**developed a system where there were 3 domains based on **genetic analysis**
11	Woeseclassification has three domains-**Archae, Bacteria and Eukarya**

12	**Selective breeding** is choosing parents with the **desired characteristics** froma mixed population
13	Desired characteristics are chosen for **usefulness or appearance-**disease resistance in food crops, animals which produce more meat or milk, domestic dogs with a gentle nature.
14	**Genetic engineering**involves the **modification**of the **genome**of an organism to introduce desirable characteristics
15	**Cloning**of plant and animal cells or tissue can be used to preserve rare plants or match tissue that is not rejected by the body's immune system





B Selective breeding of wild cabbage has produced many vegetables – all varieties of the same species.



D the three-domain system of classification

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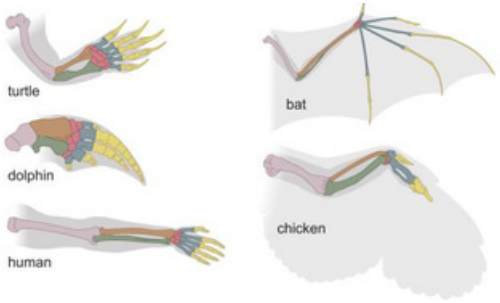
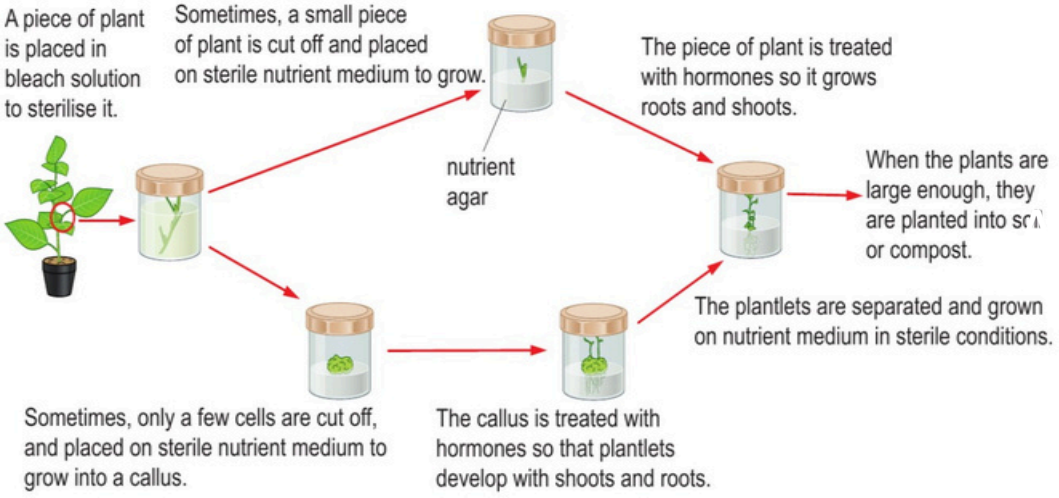
1	**Alfred Russel Wallace** Independently proposed the theory of evolution by Natural selection
2	**Alfred Wallace** published joint writings with Darwin in 1858.Worked worldwide gathering evidence. Best know for work on **warning colouration in animals** and **his theory of speciation**.
3	The **anatomy of the pentadactyl limb** provides scientists with evidence for evolution
4	**Tissue culture** is the growing of cells or tissue. This is a useful way to grow many identical cells
5	**Solutions**to growing human populations include using **fertilisers and biological control**





Risks and benefits (practical and ethical)	
Genetic engineering	**Risks:** Seeds from GM plants can be very expensive. Some people think eating GM plants is bad for health although there is no evidence to support this view.
	Benefits: decreased use of herbicide with increase in yield from food crops. Medicines tailored for individuals.
Selective breeding	**Risks:** alleles that may be useful in future may be bred out. Populations with low variation can be vulnerable to genetic diseases.
	Benefits: Increased growth and yield of plants and animals for food.

Advantages and disadvantages of genetic engineering	
Advantages	Modification of crop plants e.g. insect resistance from Bacillus thuringiensis. Modification of bacteria to produce human hormones e.g. human insulin made by bacteria.
Disadvantages	Resistant crops could pass on genes to wild plants affecting food chains. Insulin produced using GM bacteria is not identical to human insulin and not everyone can use it.

Fertilisers	**Advantages:** Increases the growth and yield of crop plants.
	Disadvantages: Excess fertiliser can run off into lakes and rivers and cause pollution leading to the death of other plants and animals.
Biological control	**Advantages:** Insects can be used to control weed populations. No herbicides are necessary.
	Disadvantages: Introduced insects can complete for non weed plants and disrupt other species food chains.