GCSE 9-1 Biology Revision Topic 4: Natural Selection and Genetic Modification

Great video to watch, google Amoeba sisters 'natural selection'

Natural selection leading to evolution

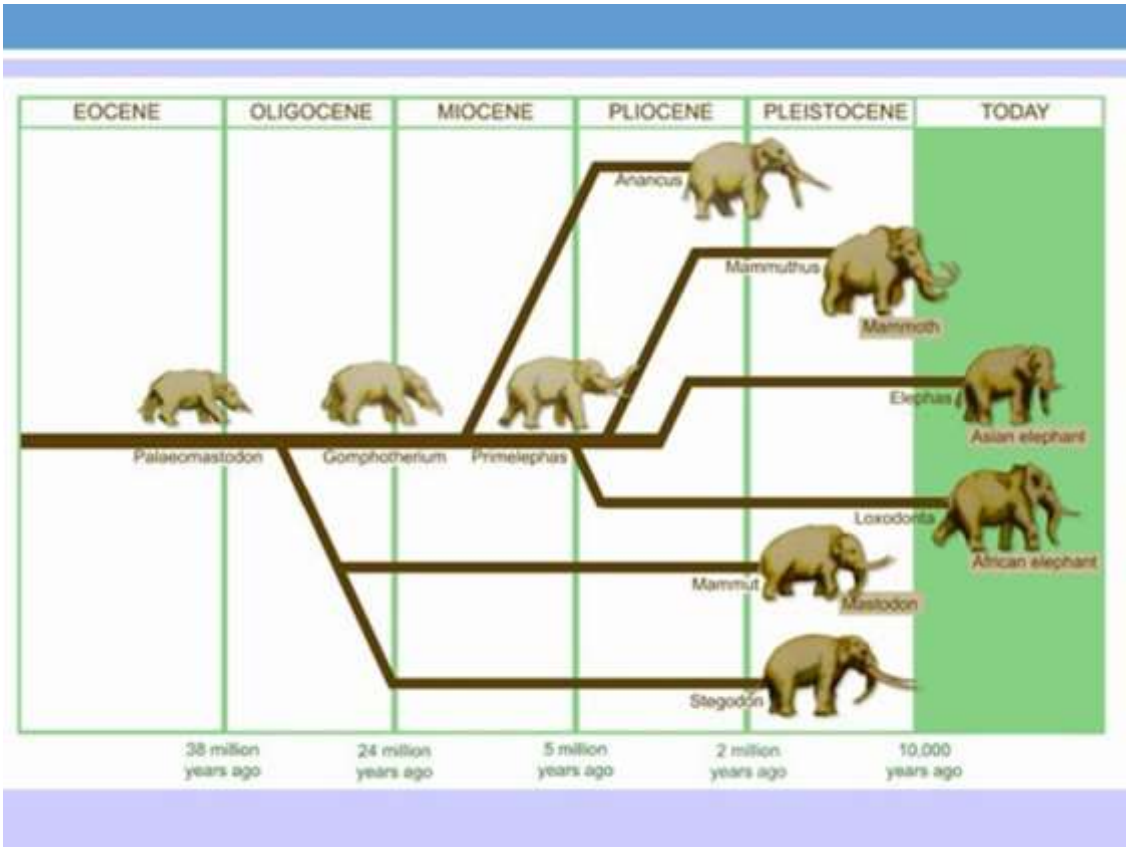
Charles Darwin and Alfred Wallace – 18th century scientists separately came up with the theory of evolution and how it happens at roughly the same time. Darwin published his book first in 1858.

Key points to include on any natural selection causing evolution question:

- In a group of individuals of the same species there is _____ _____ due to differences in DNA
- Organisms over produce offspring, so there is _____ between the organisms for resources eg space, food, light, prey
- The best adapted _____ and _____
- They _____ and pass on their advantageous _____ to their offspring, over time increasing the number of organisms with the favoured characteristic, the least well adapted decrease in number or may die out (survival of the fittest)

Now give a named example of your choice (plant or animal), giving the adaption and competition:

Question: use the diagram below to answer the evolution of elephants and woolly mammoths



What is the common ancestor of elephants and woolly mammoths?

How did African elephants evolve large ears? (hint: think climate, surface area to volume ratios)

How have elephants evolved to have no tusks?

Woolly mammoths had much more body hair than elephants, how does evolution explain this?

What evidence is there for evolution? *Video link, google 'fuse school fossils and evidence for evolution'*

1. Emergence of bacteria resistant to antibiotics. Explain how antibiotic resistance in bacteria provides evidence to support Darwin, use keywords of: antibiotics, mutation, sensitive, resistant, random, reproduction

2. **DNA** similarity between organisms with a common ancestor, DNA only changes gradually
3. **Fossils** – they give details of body structure, age. However, the fossil record is incomplete due to:

4. **The time line for evolution of humans**.

6 million years ago there was a common ancestor through which hominids and chimps evolved.

	Ardi	**Lucy**	**Homo habilis**	**Homo erectus**	**Homo sapiens**
Time	4.4 million yrs	3.2 million yrs	2.4 million yrs	1.6 million yrs	200,000 yrs
Arm length					
Leg length					
Walking					
Brain size					
Features (more human or ape like)					

Homo habilis and Homo erectus fossils were found by the archaeologist Richard Leakey

5. **Stone tools** have become more developed over time with the evolution of humans. The stone tools have been found in rock layers, fossils can be dated surrounding/in the tools and carbon-14 dating can be done if they contain carbon, this allows us to put a time line on stone tool development.

   This is the order of evolution of Homo species of hominids from oldest to youngest over the last 2.5 million years, each becoming more developed, the stone tool use development needs matching to the right homo species :

Homo habilis	Rock shaped, simple axe formation
Homo erectus	Flint tool, wooden spears
Homo neanderthalis	Pointed tool eg arrow heads
Homo sapiens	Pebble tools from hitting rocks together

6. **Pentadactyl limb** = ____ digits on limbs are found in many animals – fish, mammals, amphibians, reptiles. There is a very similar bone structure, but are not necessarily used for the same function:

- a human or monkey's hand is used for _____,
- a dolphin's fin is adapted for _____
- a mole's feet are adapted for _____,

- a bat's 'hands and feet' supports the wings for _____

This suggests that all species exhibiting a pentadactyl limb, evolved from some common ancestor. It is highly unlikely that so many different species could have independently evolved to have the same specific anatomical characteristic of the pentadactyl limb.

Classification – kingdoms and Domains

Scientists classify organisms based on how closely related they are and put them into groups, based on what they look like. This was originally developed by Linnaeus

Largest group Smallest group

(Fill in the groups):

Kingdom _____ _____ _____ _____ _____ _____

Every organism has a unique name with the **Binomial system.** This uses the _____ and _____ eg Homo sapiens, *Mus musculus (a mouse!).*

A **species** is a group of organisms that can breed with each other and produce fertile offspring. Problems arise when organisms breed asexually and some species interbreed to produce fertile hybrids e.g. ruddy duck species

Fill in this table on the 5 kingdoms

Kingdom	Unicellular or multicellular	Nucleus or no nucleus	Autotroph or heterotroph	Cell wall and type or no cell wall

3 Domain system was developed in the 1970s by looking at the DNA of organisms. DNA sequencing (to determine the order of the _____ in DNA) is widely available and is used to classify organisms rather than looking at observable characteristics that the kingdom system uses. All organisms can be placed into 1 of 3 domains

Link the domain to its description

Archaea	Cells have a nucleus, unused sections in genes. Include fungi, plants, animals and protoctista.
Bacteria	Cells have no nucleus, have unused sections in genes
Eukaryotes	Cells have no nucleus. Have no unused sections of DNA in genes. Very old organisms

Achaea are more similar to organisms in the domain_____ than _____ . The more DNA 2 organisms have in common the more _____ _____ they are and therefore evolved from a common _____. DNA changes _____ over time.

Past paper questions – all answers are on sharepoint (science, biology, year 11, revision session folder)

B3 june 2016 Q5

*(c) Many fossils of early humans have been discovered in Africa, including Lucy from 3.2 million years ago.

Leakey found many early human fossils in Africa from 1.6 million years ago.

Describe how Leakey used the fossils and surrounding environment to reach the conclusion that his fossils were from a species more recent than Lucy.

(6)

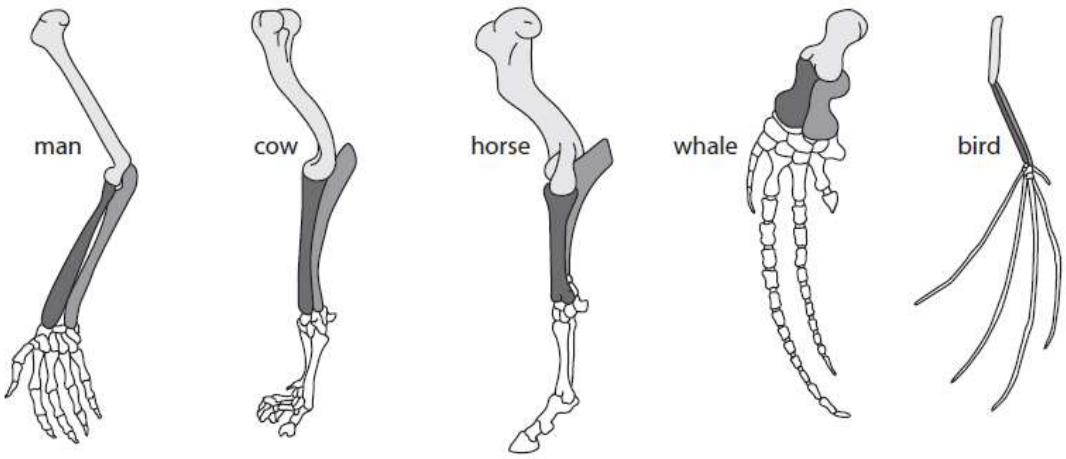
B1 june 2016 Q6

*(b) Explain Darwin's theory of evolution by natural selection.

(6)

B2 june 2015 q5

*(c) The diagram shows some limbs of modern-day animals.



Explain how the study of the limbs of different species of vertebrates provides evidence for evolution.

(6)