5.1 Evidence for Evolution

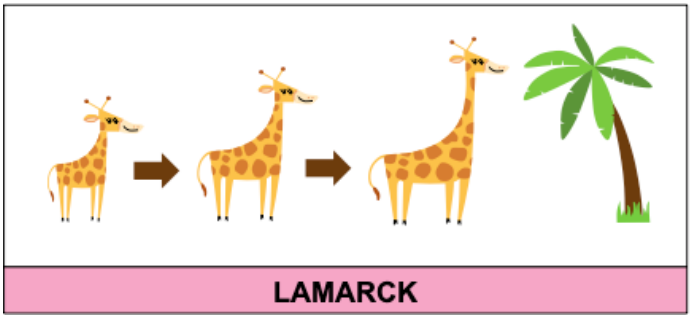
Evolutionary Theory

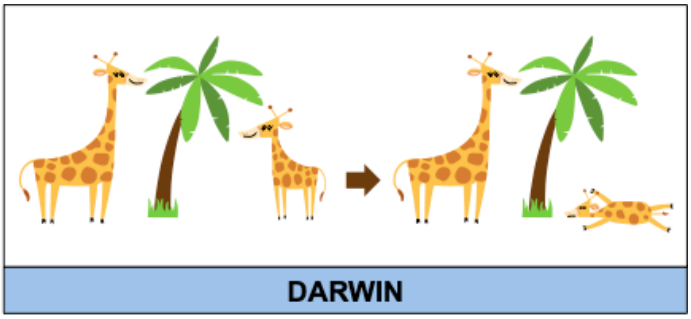
Define evolution

Evolution is the cumulative change in the heritable characteristics of a population

It is a change in the allele frequency of a gene pool across successive generations

With the aid of the diagram, compare the evolutionary theories of Lamarck and Darwin





Lamarck proposed that organisms evolved new characteristics as a consequence of habitual use or disuse

(e.g. giraffes evolved long necks via stretching to reach higher leaves)

Darwin proposed that organisms randomly developed new characteristics that were passed on for being beneficial

(e.g. long neck giraffes survived over short neck giraffes because they could reach more leaves)

Distinguish between natural selection and artificial selection

Natural selection occurs when the environment determines which adaptations are beneficial or detrimental

Artificial selection occurs when humans make this determination (via genetic modification or selective breeding)

Evolutionary Evidence

Outline the evidence for evolution provided by the fossil record

A fossil is the preserved remain or trace of an organism from the remote past (totality of fossils = fossil record)

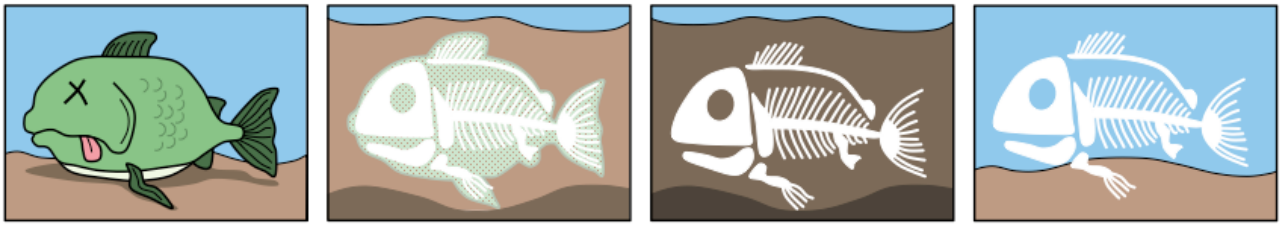
The fossil record shows that changes have occurred in organisms over time (evolution)

The law of fossil succession shows that certain organisms appear in the fossil record in a consistent order

(this indicates an evolutionary sequence of development from ancestral forms)

Transitional fossils represent intermediary forms within the evolution of a genus (e.g. archaeopteryx)

With the aid of the diagram, describe the process of fossilisation



Fossilisation preserves hard body parts (although soft parts may leave trace remains - such as imprints)

Fossilisation is a rare process that requires the preservation of remains (i.e. no scavenging), anoxic conditions

(i.e. no oxygen for decomposition) and high pressure (to turn the hard body parts into fossilised minerals)

These conditions are most likely to occur (on land) as a result of rapid burial

Outline, with examples, the evidence for evolution provided by selective breeding

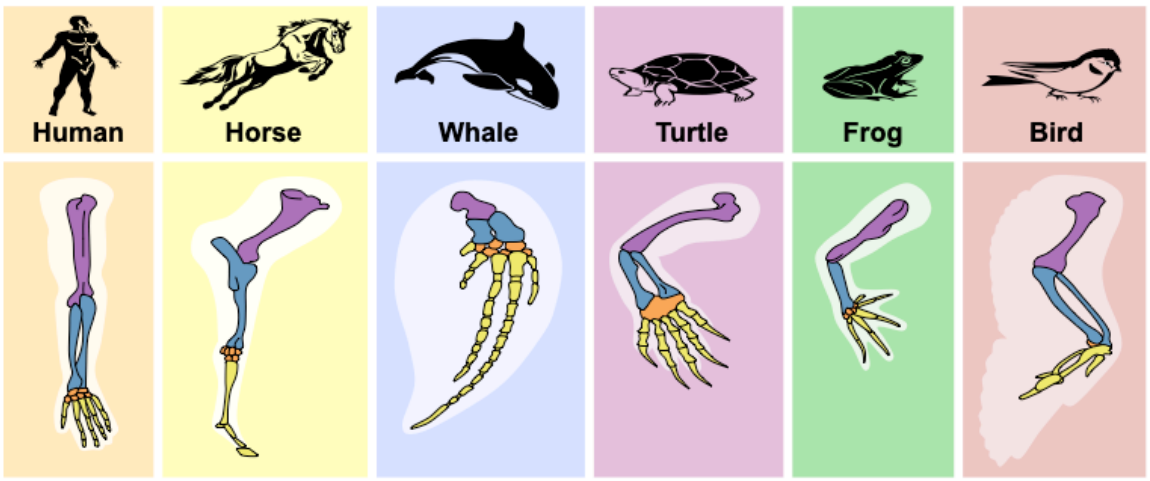
Selective breeding involves the intentional mating of animals with desired characteristics (artificial selection)

As human intervention drives the selection process, changes will occur over fewer generations and will promote

the evolution of phenotypic extremes (hence, easier to identify the evolutionary pathway)

Examples: Horses (bred for speed vs power), cows (Belgian blue = muscle mass), large variations in dog breeds

Explain, using the diagram, how the pentadactyl limbs of vertebrates provides evidence of evolution



Homologous structures are anatomical features that share a common underlying structure despite having distinct

functions - the pentadactyl limb of mammals is an example of a homologous structure

The rapid diversification of the anatomical feature is a result of adaptive radiation

Closely related species will have more similarities in their homologous structures