



AQA GCSE INHERITANCE VARIATION AND EVOLUTION PART 4

Charles Darwin

Theory of evolution by natural selection.

Individual organisms within a particular species show a wide range of variation for a characteristic.

Individual most suited to the environment are more likely to breed successfully.

Characteristics enable individuals to survive are then passed on to the next generation.

Developed since its proposal from information gathered by other scientists.

Did much pioneering work on speciation but more evidence over time has lead to our current understanding.

Allows biologists to understand the diversity of species on the planet.

Evidence from around the world, experimentation, geology, fossils, discussion with other scientists (Alfred Wallace) lead to:

Charles Darwin 'On the Origin of the Species' (1859)

Published the theory of evolution by natural selection

Slowly accepted; challenged creation theory (God), insufficient evidence at time, mechanism of inheritance not yet known.

Theory of evolution (Biology only)

Speciation (Biology only)

Alfred Wallace

Independently proposed the theory of evolution by natural selection

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.

Speciation

Due to isolation of a population of a species e.g. species are split across far apart islands.

Environmental conditions differ for populations e.g. types of food available, habitat.

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Individuals in each population most suited to their environments are more likely to breed successfully.

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Over long periods of time each population will have greater differences in their genotype.

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If two populations of one species become so different in phenotype that they can no longer interbreed to produce fertile offspring they have formed two new species.

Other theories e.g. Lamarckism are based on the idea that changes occur in an organism during its lifetime which can be inherited. We now know that in the vast majority of cases this cannot occur.

The full human classification

Classification of living organisms

Carl Linnaeus classified living things	Kingdom	Animalia
	Phylum	Chordata
	Class	Mammalia
	Order	Primates
	Family	Hominidae
	Genus	<i>Homo</i>
	Species	<i>sapiens</i>

Due to improvements in microscopes, and the understanding of biochemical processes, new models of classification were proposed.

Carl Woese

3 domain based on chemical analysis.

Archaea (primitive bacteria), true bacteria, eukaryota.

Organisms are named by the binomial system of genus and species. Humans are *Homo sapiens*

Evidence for evolution

The understanding of genetics (biology only)

Gregor Mendel

In the mid 19th century carried out breeding experiments on plants

Inheritance of each characteristic is determined by units that are passed on to descendants unchanged.

Fossils and antibiotic resistance in bacteria provide evidence for evolution.

Antibiotic resistant bacteria

Mutations produce antibiotic resistant strains which can spread

Resistant strains are not killed.

Strain survives and reproduces.

People have no immunity to strain and treatment is ineffective.

Extinction

When no members of a species survive

Due to extreme geological events, disease, climate change, habitat destruction, hunting by humans.



Fossils tell scientists how much or how little different organisms have changed over time.

Fossils

'remains' of ancient organisms which are found in rocks

Parts of organism that have not decayed as necessary conditions are absent.

Parts of the organism replaced by minerals as they decay.

Preserved traces of organisms such as footprints, burrows and rootlet traces.

Early forms of life were soft bodied and few traces are left behind and have been destroyed by geological activity, cannot be certain about how life began.

Led to gene theory being developed but not until long after Mendel died.

Further understanding of genetics

Improving technology allowed new observations.

Late 19th century: behaviour of chromosomes in cell division.

Early 20th century: chromosomes and Mendel's 'units' behave in similar ways. 'units' now called genes must be located on chromosomes.

Mid 20th century: structure of DNA determined. Mechanism of gene function worked out.

Evolution is widely accepted. Evidence is now available as it has been shown that characteristics are passed on to offspring in genes.