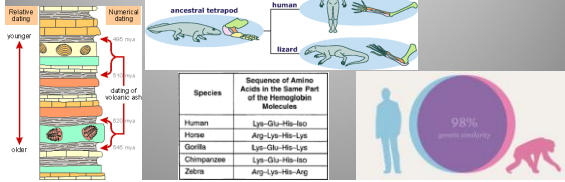


## 7.6 Evidence of Evolution



## ENDURING UNDERSTANDING

### EVO-1 Evolution is characterized by a change in the genetic makeup of a population over time and is supported by multiple lines of evidence.

### EVO-1.M Describe the types of data that provide evidence for evolution.

Evolution is supported by scientific evidence from many disciplines (geographical, geological, physical, biochemical, and mathematical data).

### EVO-1.N Explain how morphological, biochemical, and geological data provide evidence that organisms have changed over time.

Molecular, morphological and genetic information of existing and extinct organisms add to our understanding of evolution.

### EVO-1.N Explain how morphological, biochemical, and geological data provide evidence that organisms have changed over time.

Fossils can be dated by a variety of methods.

- Age of the rocks where a fossil is found (relative/absolute)
- Rate of decay of isotopes including carbon-14
- Geographical data

Isotope	Half-life
Carbon <sup>14</sup> C	5700 years
Iodine <sup>131</sup> I	8 days
Polonium <sup>214</sup> Po	1.6 · 10 <sup>-6</sup> seconds
Radium <sup>226</sup> Ra	1620 years
Strontium <sup>90</sup> Sr	4.5 · 10 <sup>10</sup> years

### EVO-1.N Explain how morphological, biochemical, and geological data provide evidence that organisms have changed over time.

Morphological Homologies

- Represent features shared by common ancestry.
- May show functional differences.
- Vestigial structures are remnants of functional structures, which can be compared to fossils and provide evidence for evolution.

**EVO-1.N Explain how morphological, biochemical, and geological data provide evidence that organisms have changed over time.**

☐ A comparison of DNA nucleotide sequences and/or protein amino acid sequences provides evidence for evolution and common ancestry.

Species	Sequence of Amino Acids in the Same Part of the Hemoglobin Molecules
Human	Lys-Glu-His-Iso
Rhesus	Arg-Lys-His-Lys
Gorilla	Lys-Glu-His-Lys
Chimpanzee	Lys-Glu-His-Iso
Zebra	Arg-Lys-His-Arg

Group Member	Name of Organism	DNA Sequence
1	Human	A-G-G-C-A-T-A-A-C-C-A-A-C-C-G-A-T-T-A
2	Chimpanzee	A-G-G-C-C-C-T-T-C-C-A-A-C-C-G-A-T-T-A
3	Gorilla	A-G-G-C-C-C-T-T-C-C-A-A-C-C-A-G-G-C-C
4	Common Ancestor*	A-G-G-C-C-G-G-T-C-C-A-A-C-A-G-G-G-C-C

**EVO-2.B Describe the fundamental molecular and cellular features shared across all domains of life, which provide evidence of common ancestry.**

☐ Many fundamental molecular and cellular features and processes are conserved across organisms.

- Enzymes and structures for important biological pathways are universal (respiration, photosynthesis)
- Universal genetic code

Base of Letter	Second Letter			
	A	U	G	C
U	UUU UUU	UUA UUA	UUG UUG	UUC UUC
C	CUU CUU	CUA CUA	CUG CUG	CUA CUA
A	AUU AUU	AUA AUA	AUG AUG	AUA AUA
G	GUU GUU	GUA GUA	GUG GUG	GUA GUA
U	UUU UUU	UUA UUA	UUG UUG	UUC UUC
C	CUU CUU	CUA CUA	CUG CUG	CUA CUA
A	AUU AUU	AUA AUA	AUG AUG	AUA AUA
G	GUU GUU	GUA GUA	GUG GUG	GUA GUA

**EVO-2.B Describe the fundamental molecular and cellular features shared across all domains of life, which provide evidence of common ancestry.**

☐ Structural and functional evidence supports the relatedness of organisms in all domains.

**Phylogenetic Tree of Life**

The tree is divided into three main domains: **Bacteria**, **Archaea**, and **Eucarya**.

- Bacteria** includes: Green nonsulfur bacteria, Purple bacteria, Gram positives, Cyanobacteria, Bacteroides, and Thermotoga.
- Archaea** includes: Methanobacteriales, extreme Halophiles, Methanococcales, and Thermoproteota pyrodictica.
- Eucarya** includes: Animalia, Fungi, Plantae, Ciliates, Flagellates, and Microsporidia.