

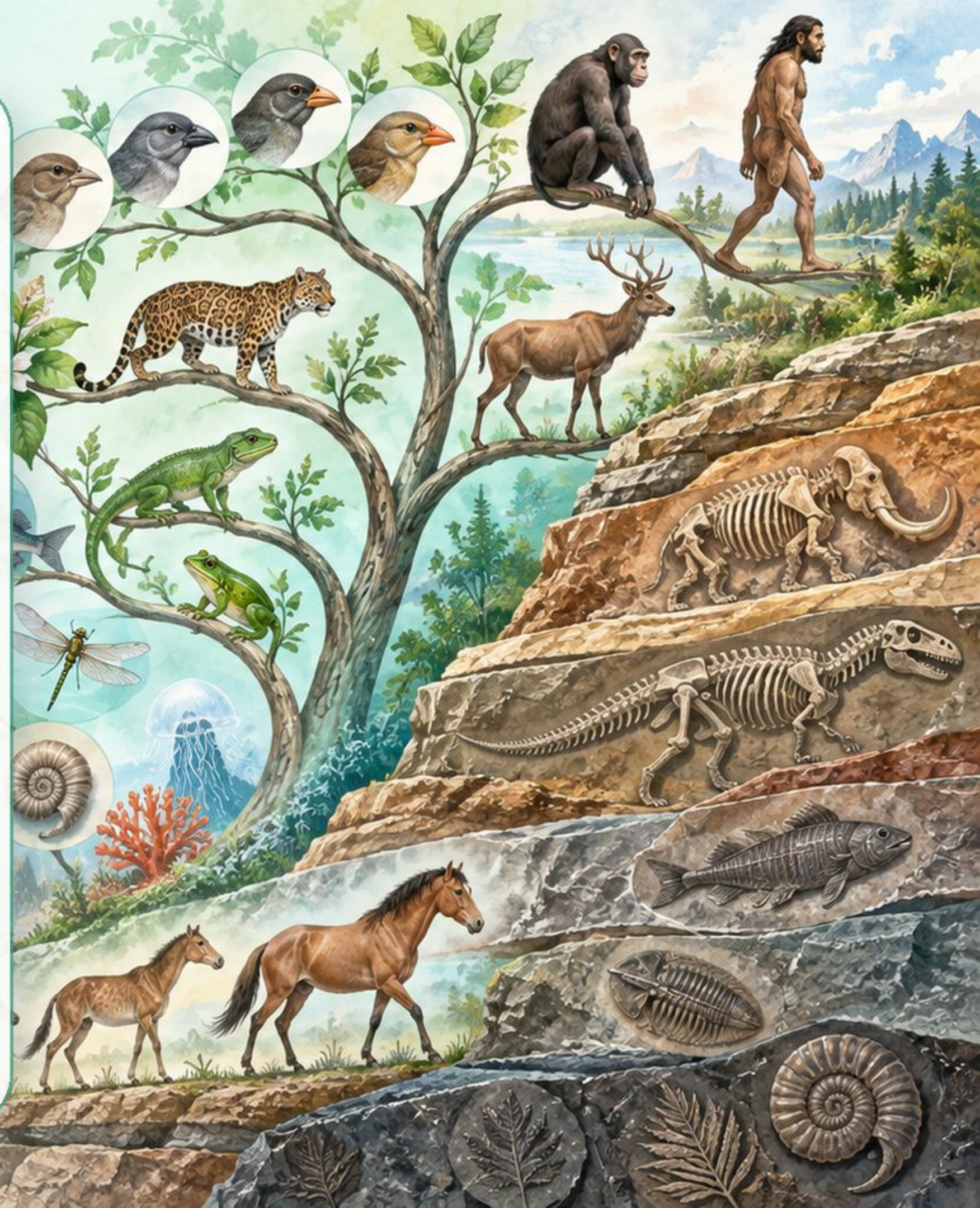
BIOLOGY • CLASS 12

6

CHAPTER

Evolution

CHAPTER NOTES



Evolutionary biology studies the history of life and changes in life forms through time.

ORIGIN OF LIFE

Evolution, the universe and early Earth

A light-year is a unit of distance. Distant starlight shows us the past.



- Early Earth was hot. Volcanic gases formed an atmosphere with little free oxygen.
- Chemical evolution preceded cellular life.
- The exact origin of life remains uncertain.
- Atmospheric oxygen and a protective ozone layer built up later, after oxygen-producing photosynthesis evolved.

ORIGIN OF LIFE

Panspermia, biogenesis and chemical evolution



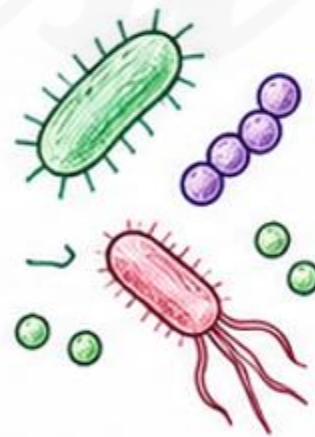
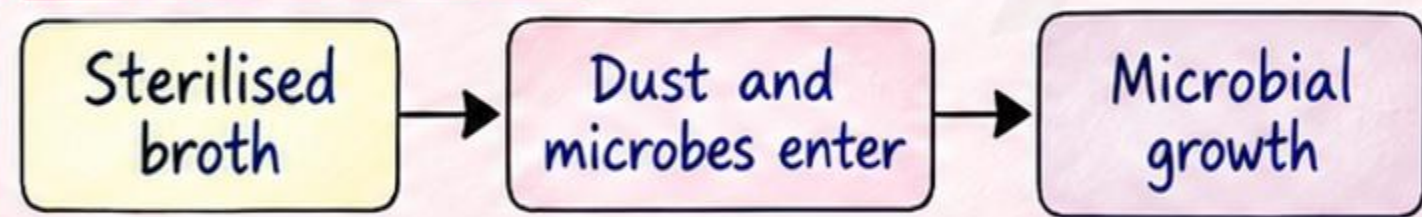
Louis Pasteur

Sterilised broth stayed free of microbial growth when airborne dust and microbes could not reach it. Growth occurred after contamination.

Swan-neck flask



Broken-neck flask



Biogenesis

Living organisms arise from pre-existing life under the tested conditions.

Panspermia

The proposal that life or its seeds reached Earth from space. It does not explain the ultimate origin of life.

Spontaneous generation

The old belief that living organisms arise routinely from decaying matter.

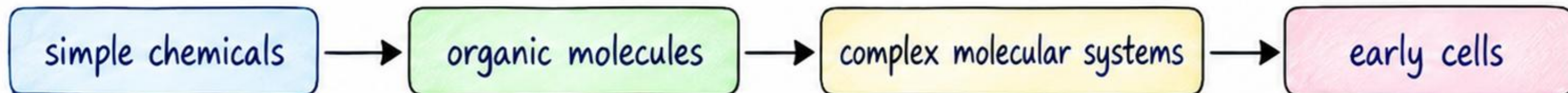
Oparin and Haldane

Simple non-living chemicals could gradually form organic molecules before cells appeared. This is chemical evolution.

Abiogenesis

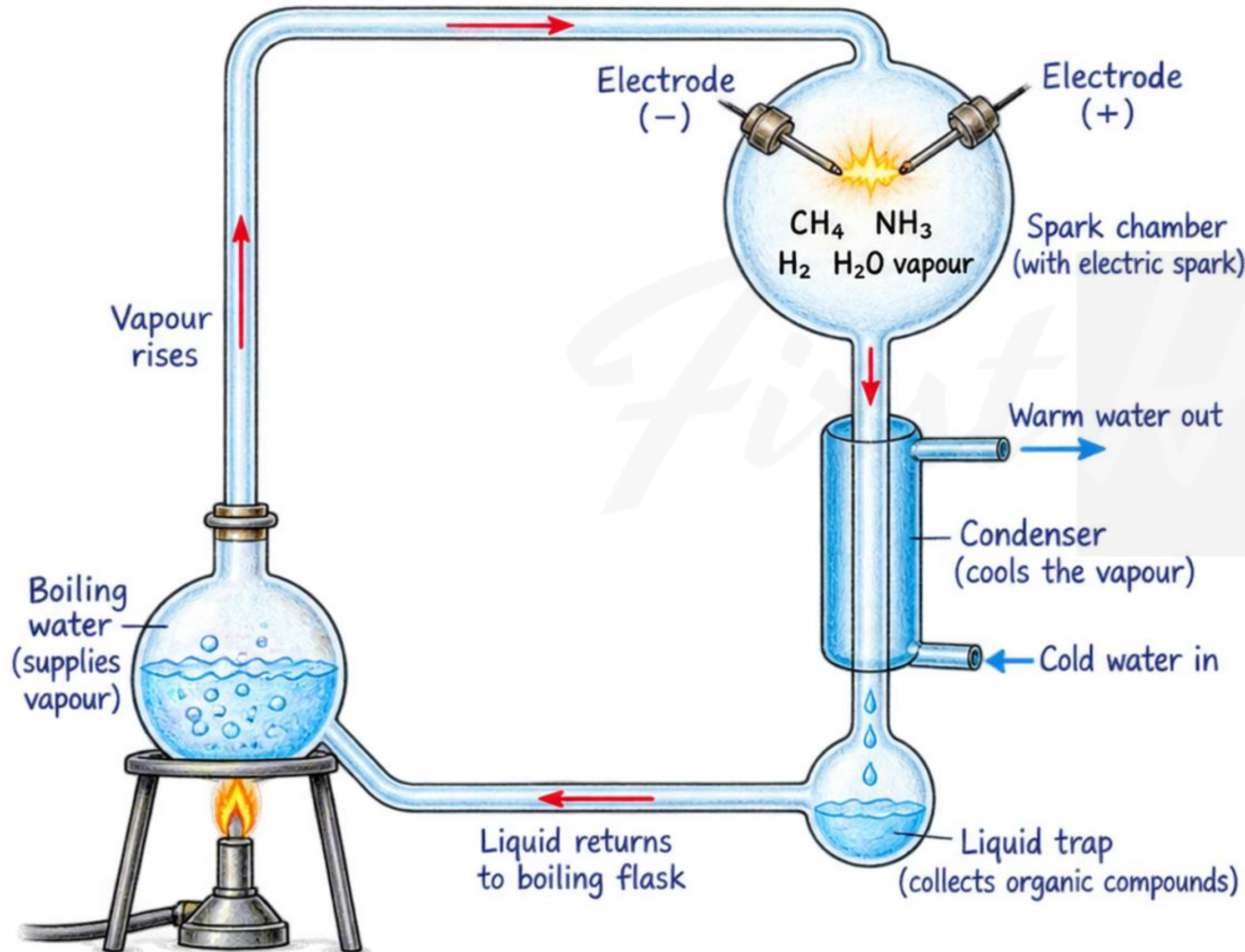
Abiogenesis concerns the first origin of life from non-living matter. The exact steps are still under study.

Possible sequence:



ORIGIN OF LIFE

Miller's experiment



Experiment

- S. L. Miller, 1953, tested chemical evolution using a model of early Earth conditions.
- Gas mixture in the spark chamber: CH_4 , NH_3 , H_2 and H_2O vapour. No free O_2 was added.
- Boiling water supplied vapour.
- The electric spark supplied energy, like lightning.
- A condenser cooled the vapour.
- The liquid trap collected organic compounds and liquid returned to the boiling flask.

Result

- Amino acids formed from non-living starting materials.

Conclusion

- Organic building blocks can form abiotically under suitable conditions.
- The experiment did not create living cells.

Further evidence

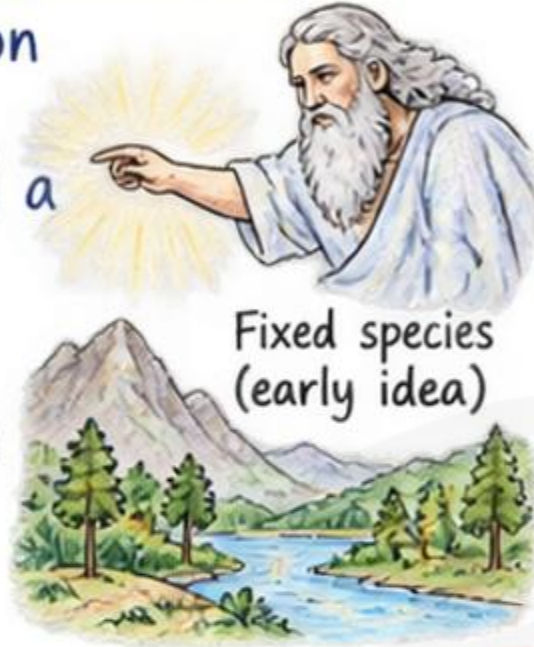
- Other experiments produced sugars, nitrogenous bases, pigments and fats.
- Organic compounds in meteorites also show that such compounds can form outside living organisms.

EVOLUTION OF LIFE FORMS - A THEORY

Darwin, Wallace and descent with modification

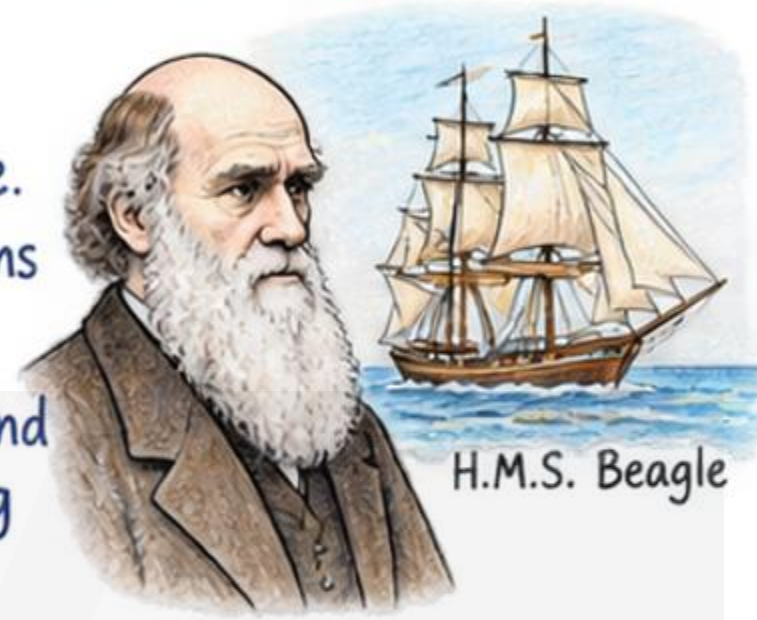
Early ideas: Special creation

- Historical special creation proposed fixed species, unchanged diversity and a very young Earth.
- Geological and biological evidence challenged these claims.



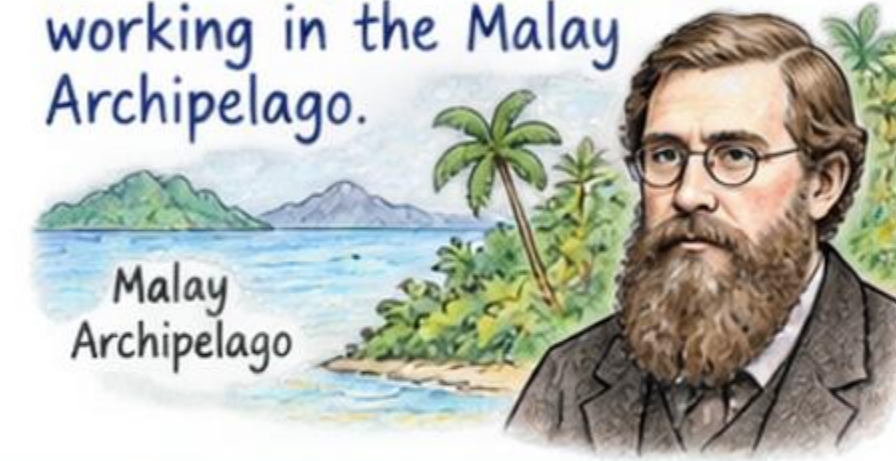
Charles Darwin and H.M.S. Beagle

- Charles Darwin studied organisms during the voyage of H.M.S. Beagle.
- Living and extinct organisms share features.
- Species appear, change and become extinct over long periods.



Alfred Russel Wallace

- Alfred Russel Wallace independently developed a similar explanation while working in the Malay Archipelago.



Natural selection

- Natural selection: inherited differences affect survival and reproduction in a particular environment.

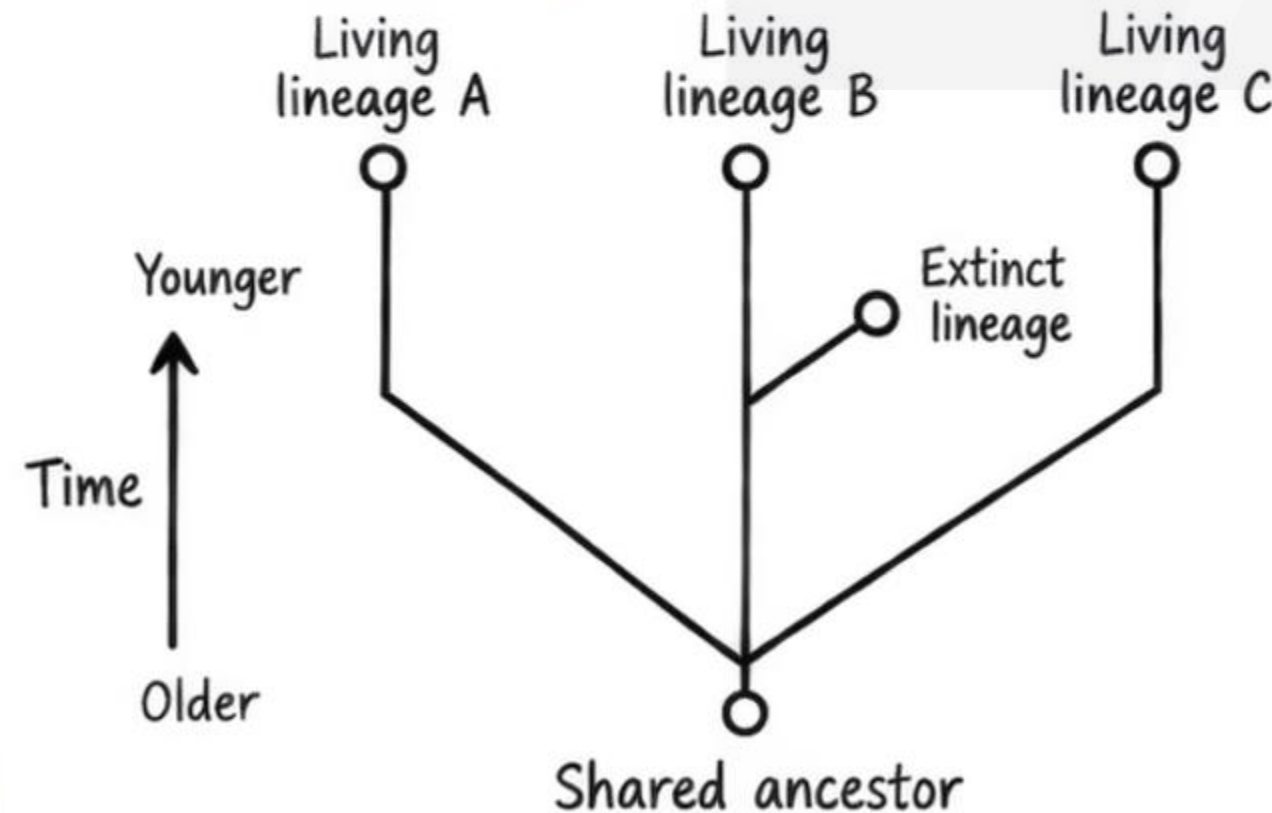
Fitness

- Fitness means reproductive success: leaving more surviving offspring.



Branching descent

- Different lineages arise from shared ancestors.



Age of Earth and no fixed goal

- Earth is billions of years old.
- Evolution has no fixed goal, and living species are not arranged in a ladder of progress.



A very old Earth

Evolution is a branching tree, not a ladder.



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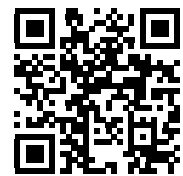


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