

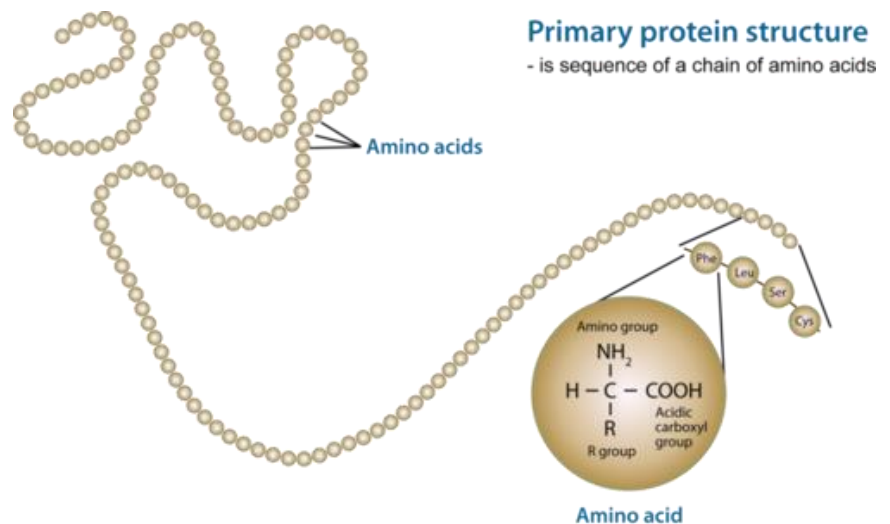
# Characteristics and Origins of Life

## The Origin of Life

- Characteristics of Life: to be considered alive a molecule must...
  - Be organic. The organic molecules needed are amino acids, the building blocks of life
  - Have a metabolism
  - Be capable of replication
- Learning about the origin of life: to look for information regarding the origin of life, scientists...
  - Perform experiments to recreate the environmental conditions found at that time
  - Study the living creatures that make their homes in the types of extreme environments that were typical in Earth's early days
  - Seek traces of life left by ancient microorganisms, also called **microbes**, such as microscopic features or isotopic ratios indicative of life

### Study Tip

The central dogma of biology validates the importance of the Miller-Urey experiment: DNA transcribes into RNA, which translates into amino acids, which combine to form proteins, the building blocks of life.

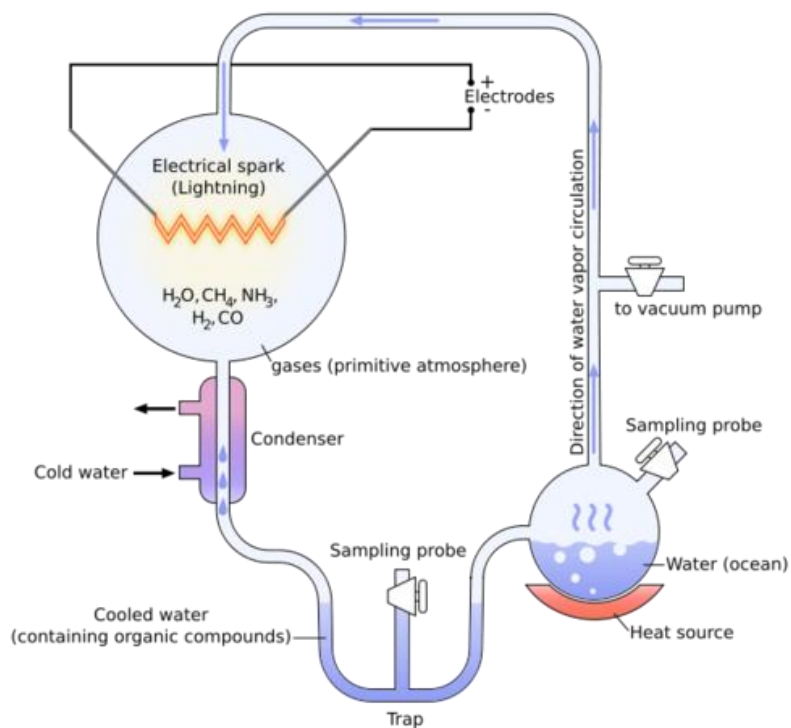


*Amino acids form polypeptide chains*

## Amino Acids

- **Amino acids** are the building blocks of life because they create proteins
  - Linked together by covalent bonds to form polymers called polypeptide chains
- Proteins are the most abundant class of biological molecules
- Miller-Urey Experiment
  - Placed hydrogen, methane, and ammonia in a flask of heated water that created water vapor, which was called primordial soup and simulated the Earth's early atmosphere. Sparks simulated lightning, and the gases combined to form water-soluble organic compounds including amino acids
- Might have also originated at hydrothermal vents or deep in the crust where Earth's internal heat is the energy source

- Meteorites containing amino acids currently enter the Earth system and so meteorites could have delivered amino acids to the planet from elsewhere in the solar system



Setup of the Miller-Urey experiment

## Concept Check

- Why must something that is alive be capable of replication?
- Why do scientists that are interested in the origin of life study extreme environments?
- How do scientists learn about the origins of life?