Origins of life

**What is the origin of life?**

Even though scientifically the origin is

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, scientist do know that the earliest life form had to have had:

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – cloudy atmosphere, too much radiation for photosynthesis or chemosynthesis
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – live without oxygen in the atmosphere (Earth was acidic/plate disruptions)
3. Others? Single-celled, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, asexual binary fission

**Louis Pasteur**

Pasteur discovered the role of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in fermentation. His experiments with bacteria conclusively

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the theory of

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ generation and led to the theory that infection is caused by germs.

**Alexander Oparin**

Developed a theory that life on Earth

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ through gradual chemical evolution of carbon-based molecules in

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ soup - the mix of gases in the

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and the energy from lightning strikes, amino acids could

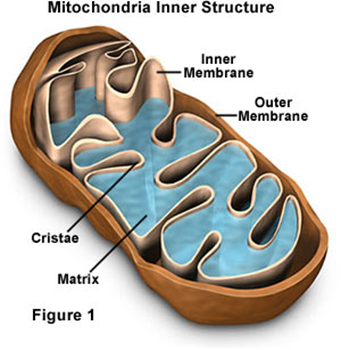
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ form in the oceans.

**Lynn Margulis**

Best known for her theory on the origin of

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ organelles, and her contributions to the

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ theory, which is now generally accepted for how certain organelles were formed.

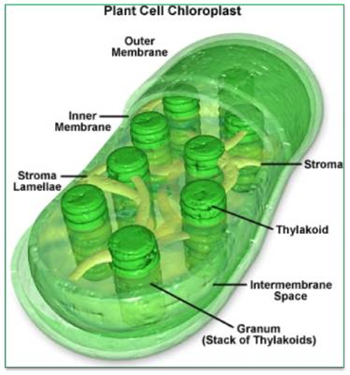
**Evidence of endosymbiosis**

Chloroplast and Mitochondria

* Double membranes
  + Outer membrane is of

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ origin

* + Inner membrane is of

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ origin

* Single loop of DNA
* Reproduce by binary fission
* Have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of prokaryotic origin
* About the same size as

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Miller – Urey**

Stanley Miller and Harold Urey, conducted an experiment which

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that several organic compounds could be

formed \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ by simulating the conditions of Earth's early atmosphere. They designed an apparatus which held

a mix of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ similar to those found in Earth's early

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ over a pool of water, representing Earth's early ocean. Electrodes delivered an electric current, simulating lightning, into the gas-filled chamber.

**Sidney Fox**

The production of \_\_\_\_\_\_\_\_\_\_\_\_\_\_ acids from inorganic molecules.

Fox based his experiments off of the information found in the \_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_ experiment. He demonstrated that amino acids could

spontaneously form small \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. These amino acids and small peptides could be encouraged to form closed spherical

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, which

show many of the basic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of 'life.

**Three scenarios have been proposed for the origin of life:**

* **organic molecules :**
  + were \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from inorganic compounds in the atmosphere
  + rained down on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from outer space;
  + were synthesized at \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ vents on the ocean floor.

**Chemical evolution**

* The formation (synthesis) of complex \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ molecules from simpler inorganic molecules through chemical reactions in the oceans during the early history of the Earth

**Endosymbiotic theory**

* A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is an organism whose cells contain complex structures enclosed within membranes, which takes a big part in the building blocks of life. This

**\_\_\_\_\_\_\_\_\_\_\_\_\_** postulates that several key organelles of eukaryotes originated as symbioses between separate single-celled organisms. According to this theory,

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, plastids and possibly w that were taken inside another cell as an endosymbiont.