

Name: _____

Date: _____

Chapter 28

Section 28-4 The origins of Life- Early Hypotheses

28-5 The Origins of life- Modern Hypotheses

The idea of spontaneous generation: (abiogenesis)

Living things come from non-living materials

Egyptians, Greeks and the active principle:

Believed the air contained a Life force.

Helmont and the 1600's supports spontaneous generation ☹

Non-living + time = living
 dirty clothes/rag + wheat + 2 days = mice

Redi in the mid 1600's opposes spontaneous generation!!

Describe his experiment below (discuss first with neighbor... Write/diagram at the end)



Leeuwenhoek in the 1700's and microorganisms: Support or refute spontaneous generation

Invented the microscope. Looked at microbes in a drop of water for the first time. The water was "sterile" but in reality was mixed with soil.

Needham in 1745: support or reject spontaneous generation

He attempted to boil a sterile bottle of gravy. The heat he proposed would kill all life. Several days later he found life in the sealed container which he claimed came from the gravy.

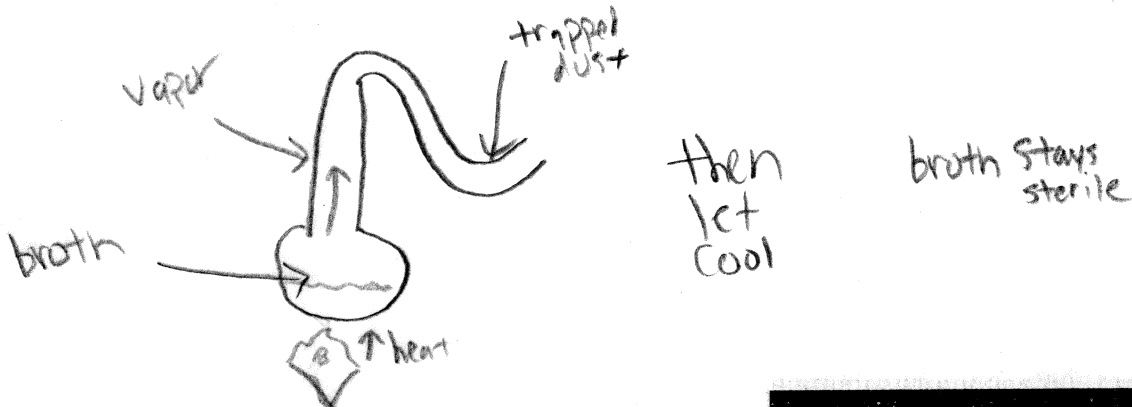
Flaw: Container was not fully sealed

Spallazani in 1765: support or reject spontaneous generation

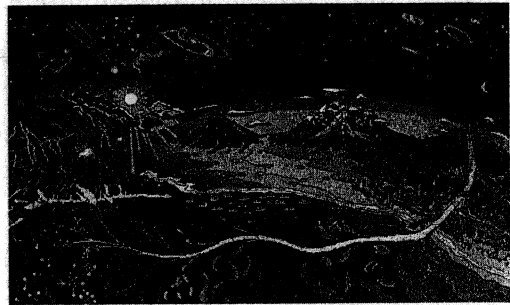
- Challenges Needham, boiled 2 _____, one is covered the other is not.
Life is found in both containers.

Flaw: did not heat enough

Pasteur to the rescue in 1860!!!! Draw his set up... and label



The origins of Life Modern Hypothesis chapter 28-5



Biogenesis: Living things originate from other living things

Oparin's Hypothesis or The Heterotroph Hypothesis in the 1920's and 1930's

Heterotroph Hypothesis: How origin of life on earth developed

About 4 Billion years ago Primitive earth conditions:

Chemicals

- CH₄
- NH₃
- H₂O
- H₂

Natural phenomenon

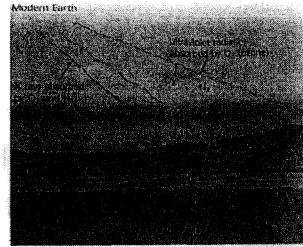
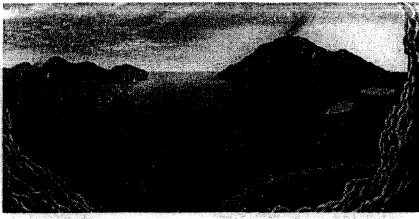
- X-ray
- UV radiation
- Lightning
- Volcanos
- Heat

Lacked

- Ozone layer

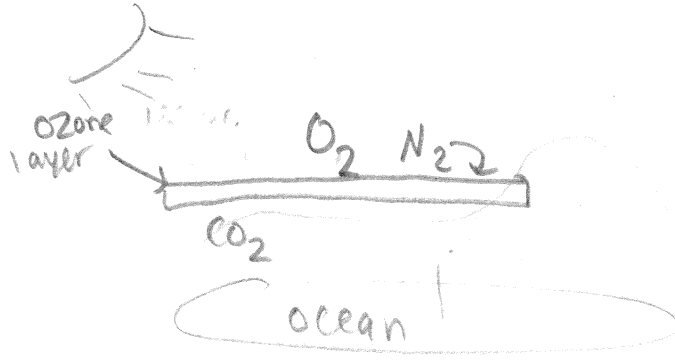
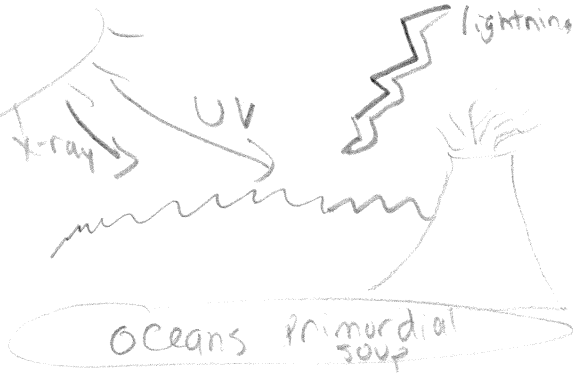
*Not present or much lower amount in modern earth

**Present in modern earth



Draw the conditions of primitive earth
PRIMAL EARTH

Modern Earth



Inorganic → organic molecules

Overarching concept – Heat and other break sources needed to break and form Chemical bonds. Energy

Energy sources in primordial earth:

- Radioactive elements in earth crust
- Electrical energy → Lightning ****
- X-ray and ultraviolet radiation

**** used in Miller's experiment

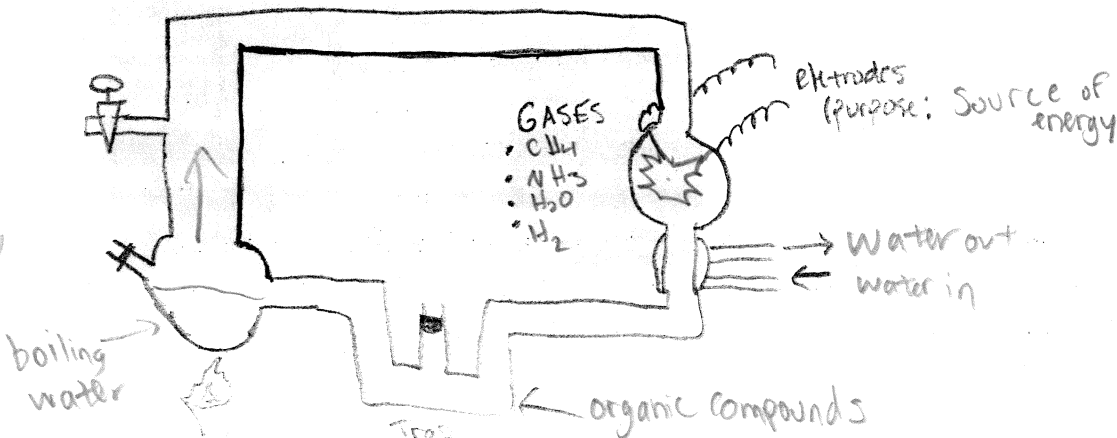
Miller's hypothesis in 1953 and the experiment at the University of Chicago.

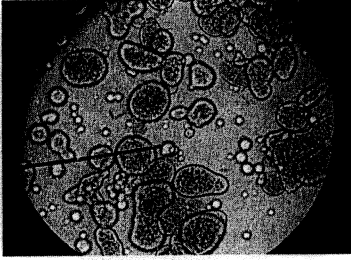
- Simulates the formation of organic compounds from the gases found on primitive earth. (gases= methane CH₄, Ammonia NH₃, Water H₂O, and Hydrogen H₂)

Basis for organic molecules include combination of CHON

Also need a source of energy → heat or a spark → Lightning

Fill in the setup below:





Coacervates (the first heterotroph)

circle WERE THEY AEROBIC OR ANEROBIC?

- Found in the primal Soup of oceans
- Form clusters of large organic molecules (amino acids, sugars, proteins, nucleotides)

- Water molecules form a "shell" or bubble like membrane → internal contents can be chemically different from external environment.

Stable internal environment = homeostasis

Leads to build up of CO₂ in the atmosphere

First autotrophs (first photosynthetic organisms)

Equation for photosynthesis and circle what is gas is produced by photosynthesis



Leads to aerobic respiration uses O₂ and produces CO₂

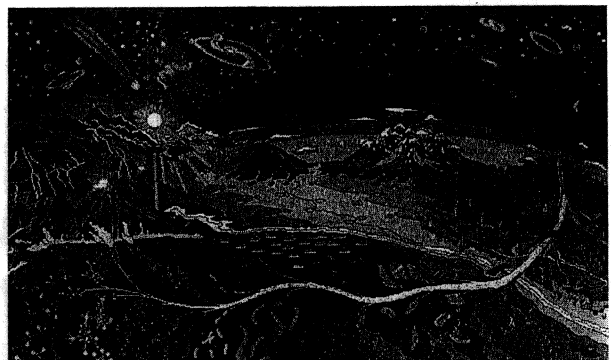
Aerobic respiration and autotrophic organisms lead to a balance in the amount of O₂ and CO₂ in the atmosphere.

Development of an Atmosphere

Lightning = converts O₂ in atmosphere into O₃ (ozone)
Ozone → atmosphere

What does an atmosphere do for us organisms?

Protect from harmful X-rays
and radiation



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Use pages 585-593 and your notes to answer the questions below. Make sure to number the responses.

28-4 Early Hypothesis

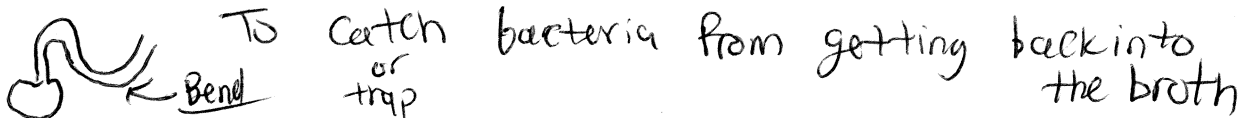
1. What is spontaneous generation?

Living things come from non-living things

2. What did Leeuwenhoek discover?

The microscope

3. Why did Pasteur alter the shape of his flasks in his experiment with spontaneous generation?

 To catch bacteria from getting back into the broth

28-5 Modern Hypothesis

1. What is biogenesis?

Living things come from other living things

2. What is the name of Oparin's hypothesis of the origin of life?

Heterotroph hypothesis

3. Name the components of the atmosphere thought to have been present on the primitive earth.

What important photosynthesis product was missing? \rightarrow CO_2 missing

Present

NH_3 H_2O

CH_4 H_2

4. What are the steps to how life was formed? (ie autotrophs, anaerobic and aerobic heterotrophs)

① inorganic molecules $\xrightarrow{\text{Energy}}$ organic molecules

Anaerobic heterotroph ② First heterotroph ~~used~~ use organic molecules as food and produce CO_2

Autotroph ③ First ~~heterotrophs~~ autotrophs use $\text{CO}_2 + \text{H}_2\text{O}$ produce O_2 (photosynthesis)

Aerobic heterotroph ④ Aerobic heterotrophs use $\text{O}_2 + \text{glucose}$ (food) to produce CO_2

⑤ $\text{CO}_2 + \text{O}_2$ are balanced in the atmosphere due to photosynthesis + Aerobic respiration

⑥ O_2 is converted to O_3 by lightning \rightarrow Ozone production

