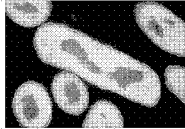
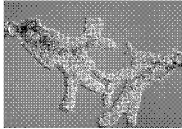


Monday, October 11
Cells: The Building Blocks of Life

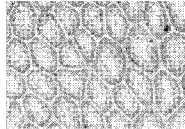


a Bacteria

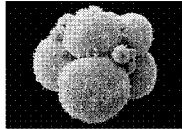


b Amoebas

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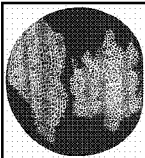
c Plant cells



d Animal cells

Cells: The Building Blocks of Life
Key Concepts

- 1) Cells contain carbohydrates, lipids (fats), proteins, and nucleic acids.
- 2) Prokaryotes are single-celled creatures that lack cell nuclei; eukaryotes have cell nuclei.
- 3) The “tree of life” organizes life by its biochemical and genetic relationships.

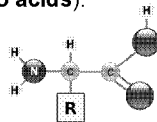


Cell: microscopic “bag” in which living matter is separated from the outside world by a membrane.

All cells use **DNA** to encode hereditary information.

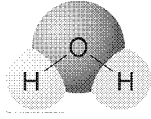
All use a similar mix of a few specific chemical compounds (especially **amino acids**).

Evidence of a common ancestor for all life on Earth.

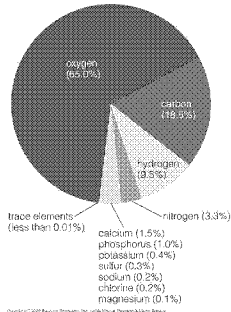


All life on Earth is based on carbon chemistry.

While oxygen is the most abundant element in life, most O is tied up in water.



The molecules responsible for cell structure and function are all based on **carbon**.



Chemical Content of Humans

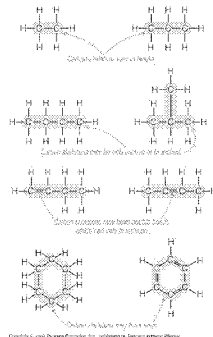
Carbon is able to form a vast variety of organic compounds (organic = containing carbon).

Long linear chains (polymers).

Chains with complex branching.

Close rings or networks of rings.

Millions of possible organic compounds can be formed.



The major molecular components of cells are complex organic molecules.

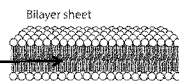
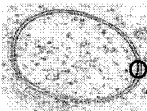


Carbohydrates:

Store and transport energy (sugars).
Provide structure (e.g., cellulose).

Lipids (fats):

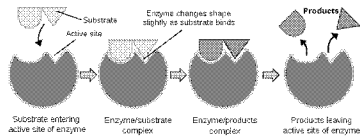
Store and transport energy.
Are built into cell membranes.



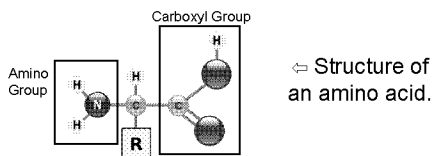
Proteins are long chains of **amino acids**.

Some proteins have structural roles (providing stiffness).

Enzymes are important proteins that act as catalysts for chemical reactions inside cells.



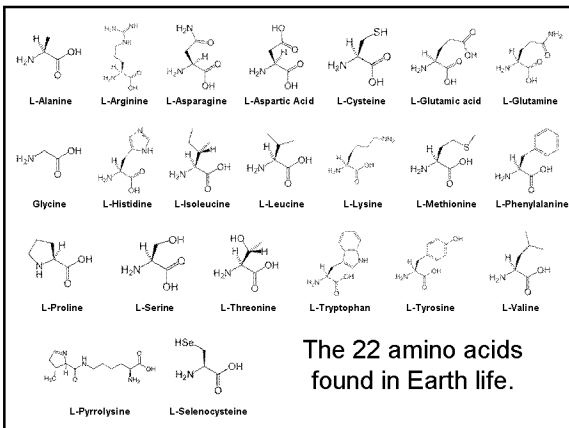
More than 70 amino acids are known.



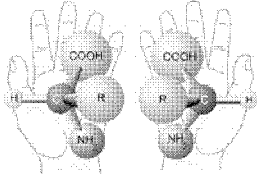
All life on Earth uses only 22 of the 70+ known amino acids.

Of the 22, two are found only in very rare micro-organisms.

All 22 are used only in their left-handed molecular form.



Amino acids come in right-handed and left-handed forms.



Amino acids in non-living systems are a mix of left- and right-handed forms.

Biological systems use **only** the **left-handed** forms.

More evidence of a common ancestor for all life on Earth.

Nucleic acids are the basis for storage and transmission of hereditary information.

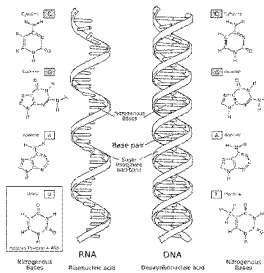
Two main nucleic acids:

RNA = Ribonucleic Acid

Encodes instructions for making proteins & enzymes.

DNA = Deoxyribonucleic Acid

Encodes instructions for making proteins & RNA.

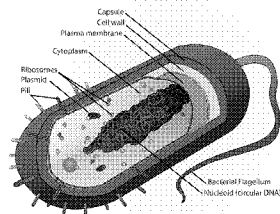


Prokaryotes are single-celled organisms that lack cell nuclei.

Simplest, commonest forms of life on Earth.

Bacteria
Archaea

Prokaryotes can form large colonies.



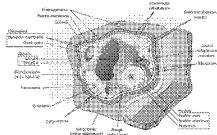
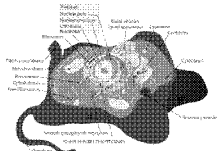
The first forms of life on Earth were prokaryotes.

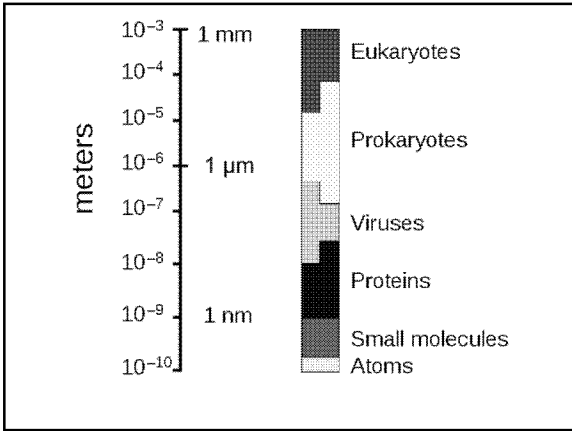
Eukaryotes are single- or multi-celled organisms that have cell nuclei.

The cell nucleus encapsulates the cell's DNA.

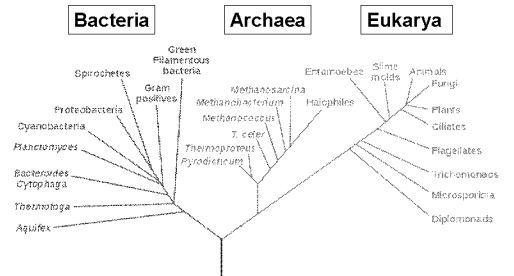
Organelles compartmentalize various cell functions.

Plants and animals are eukaryotes.





The "tree of life" organizes all forms of life by biochemical and genetic relationships.



Branches represent the amount of genetic difference.

Quiz 1: Average score = 37 correct (out of 50)

Number correct (raw score)	Letter grade
44 – 50	A
37 – 43	B
30 – 36	C
23 – 29	D
0 – 22	E
