Introduction to Biology. Lecture 7

Alexey Shipunov

Minot State University

September 15, 2014

Outline

Outline

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Questions and answers

Exam 1

Results of Exam 1: statistic summary

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Summary:
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
  19.00   41.00   45.00   44.51   49.00   58.00      13
Grades:
  F   D   C   B max
 35  41  46  52  58
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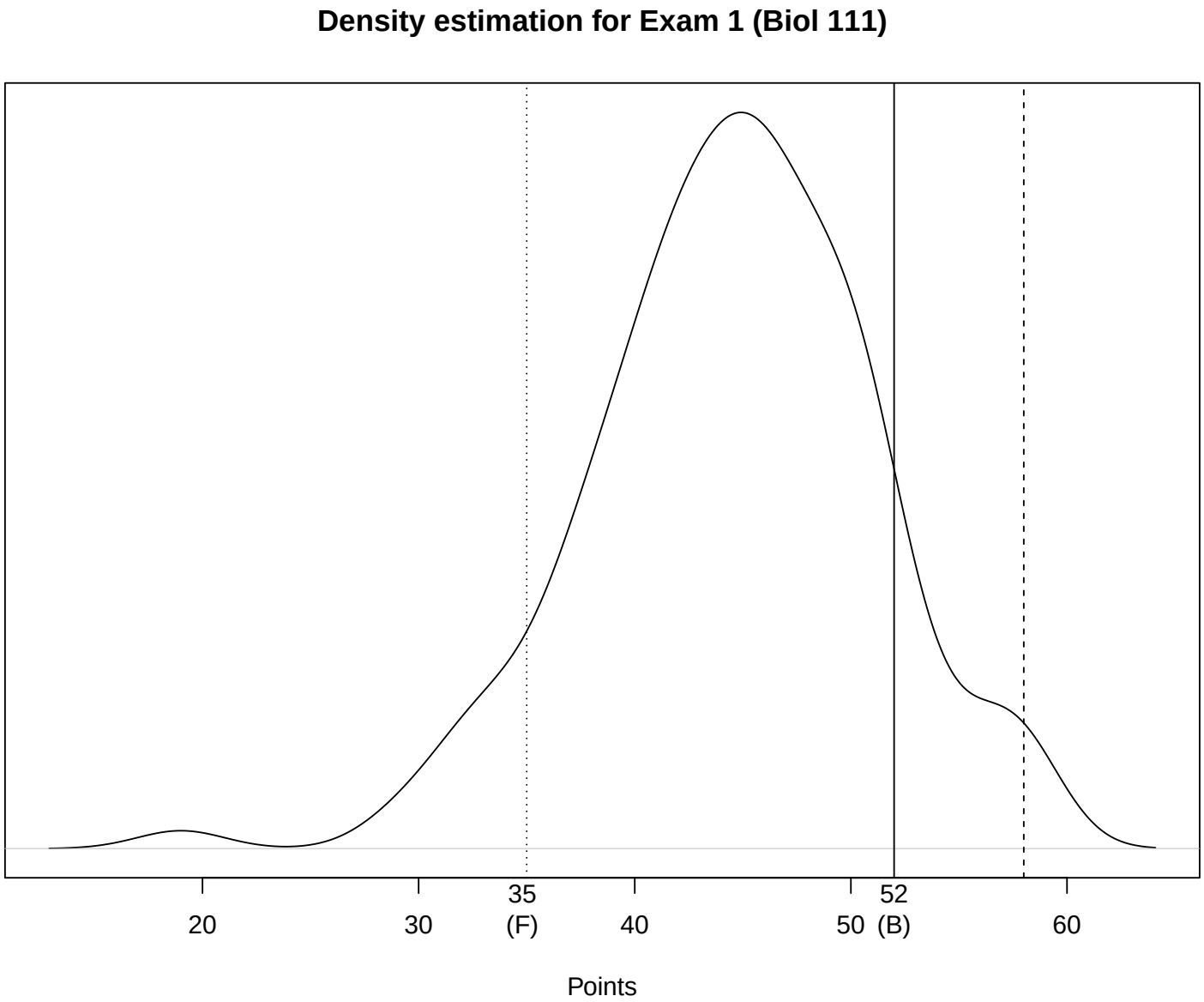
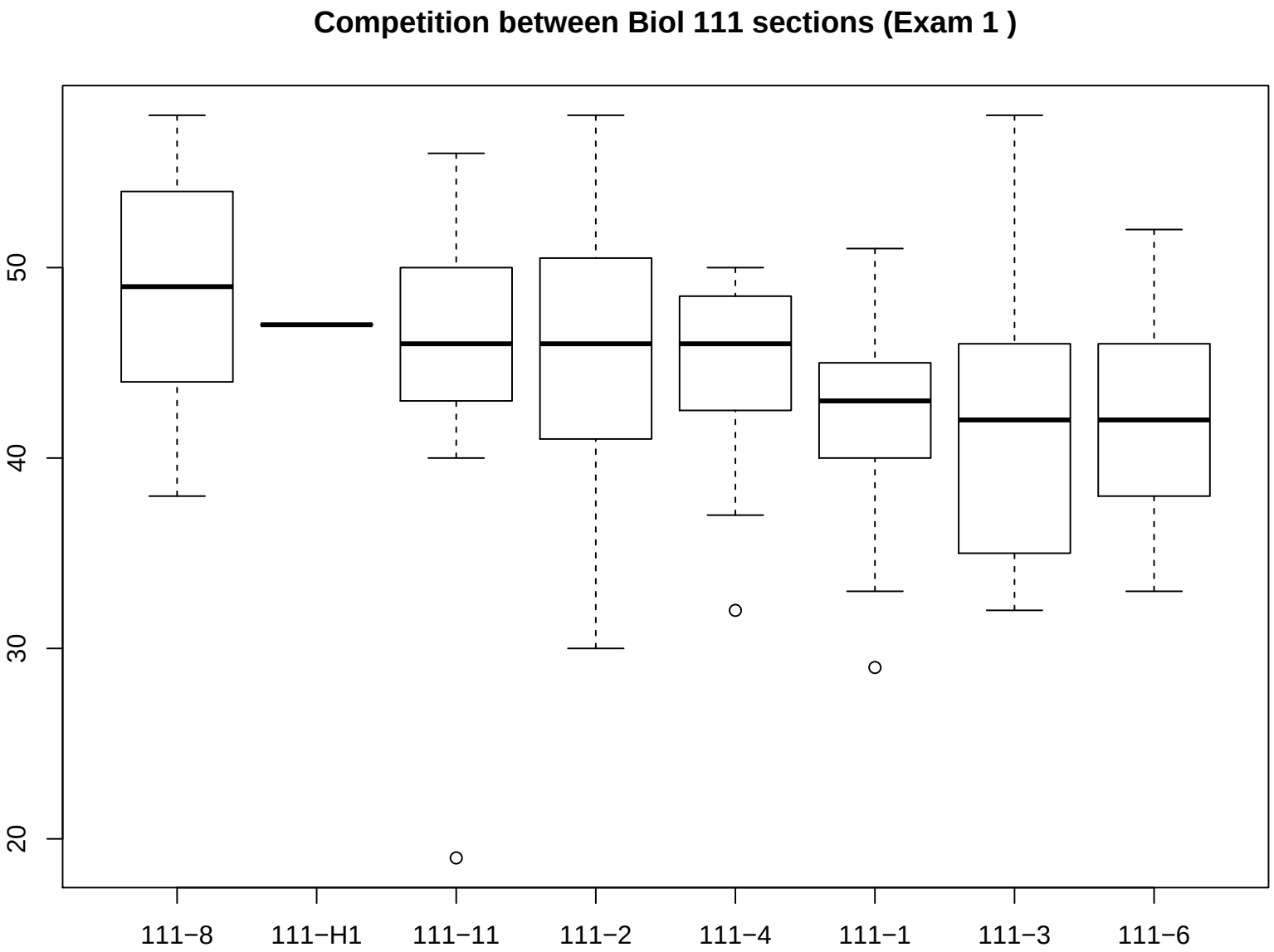
Results of Exam 1: the curve



Results of Exam 1: sections



Results of Exam 1: some questions

32. Radioactivity was discovered:
    - A In XVII century
    - B **In XIX century**
    - C In XXI century
56. What is the difference between reversal and vestigial organs?
    - A **Reversal organs are mutations, vestigial organs are normal**
    - B Vestigial organs are mutations, reversal organs are normal
    - C Reversal organs are are results of the convergent evolution, vestigial organs are not
57. Homological structures:
    - A **Are descendants of the same ancestral structure**
    - B Are results of parallel evolution
    - C Are mutations
58. What are silenced genes (pseudogenes)?
    - A Non-functional genes which are similar to genes working in other organisms
    - B Malicious genes which may kill its own cell
    - C **“Fossil” viruses**

Evolution is the fact and research program

- Given the amount of evidence presented, evolution is a fact
- Evolution is also an extremely useful, working research program, both in biology and medicine

Origin of life

Molecules of life

Organic chemistry: chemistry of carbon

- Carbon skeleton
- And H, O, N, P, S

Four types of biomolecules

- Lipids: hydrophobic
- Carbohydrates (sugars): multiple $-$OH groups
- Amino acids: N + C + O and hydrogen
- Nucleotides: cycle with nitrogen (heterocycle), sugar and phosphoric acid

Organic polymers

- Polymeric carbohydrates: polysaccharides (like cellulose and starch)
- Polymeric amino acids: proteins
- Polymeric nucleotides: nucleic acids (DNA and RNA)

The very basic features of life

- Semi-permeable (proteins + lipids) membrane
- DNA $\rightarrow$ RNA $\rightarrow$ proteins sequence

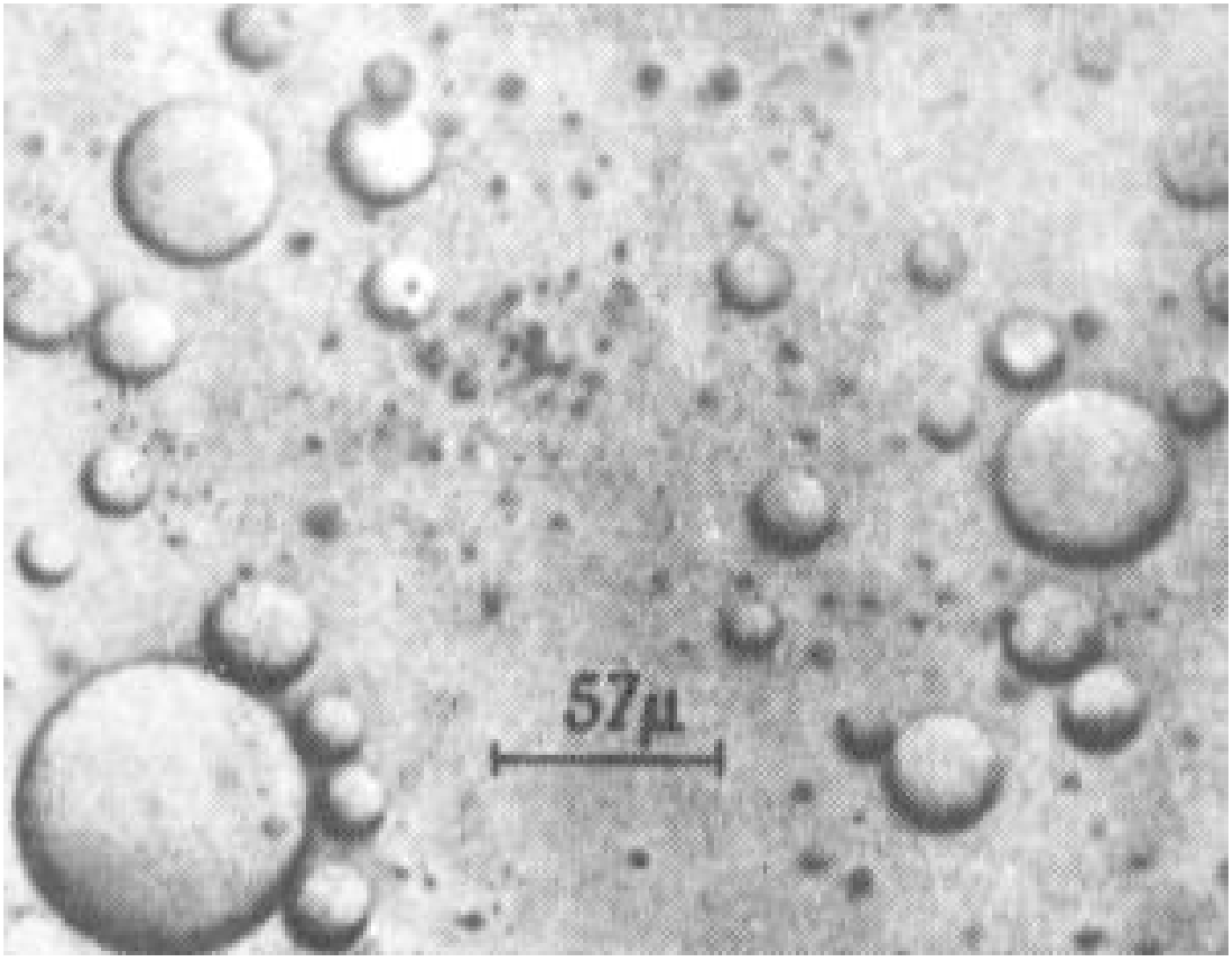
Origin of life

Primordial living structures

Coacervates

- Lipid globules capable to chemical exchange with environment
- Discovered by 1930s, used as an important proof of **abiogenesis** (Oparin's theory)

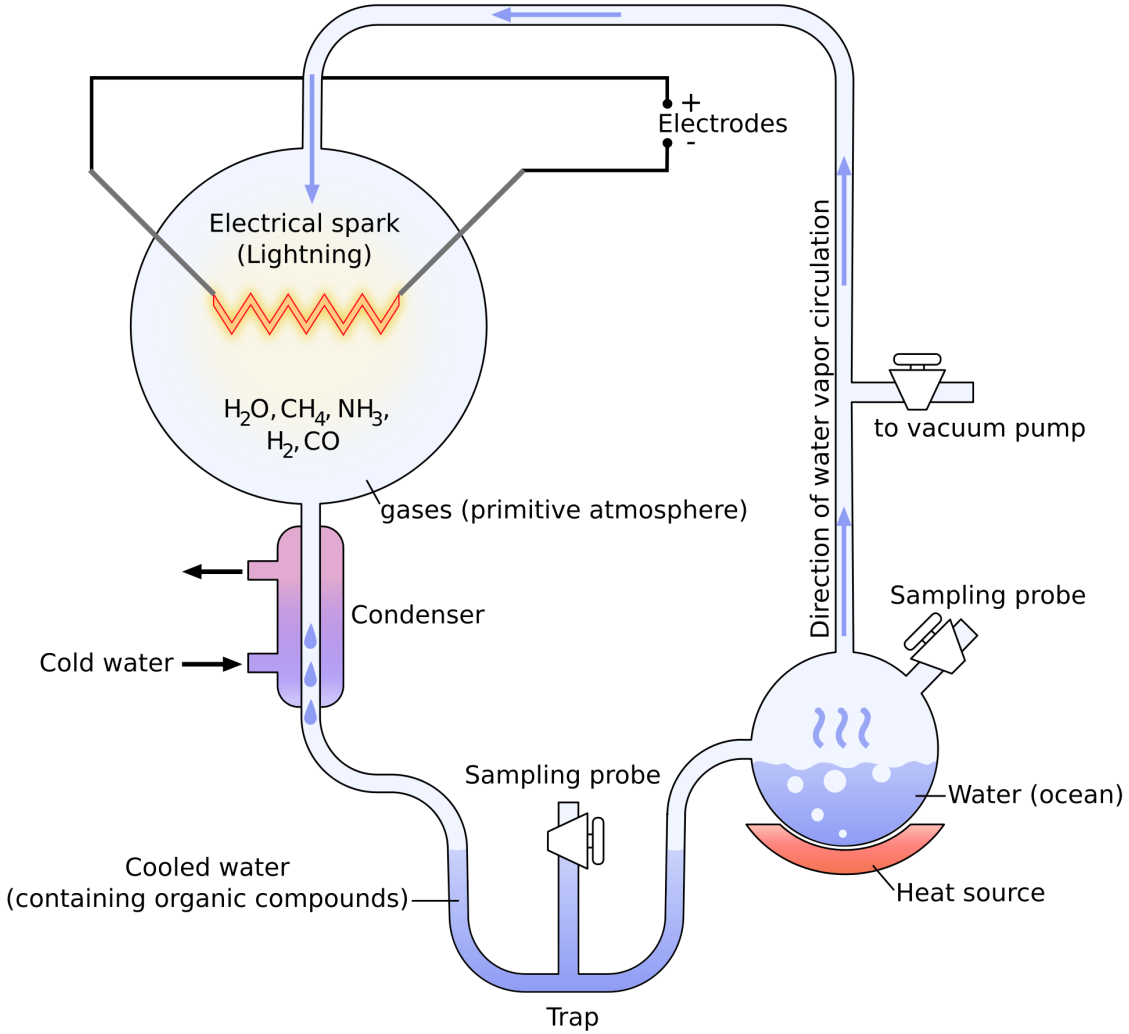
Coacervates



Abiogenesis of proteins

- In 1952, Miller-Urey experiment showed that formation of simple organic molecules is possible when Earth ancient atmosphere and temperature were imitated in lab
- In 1958, Fox and Harada found that “proteinoids” (short peptides) may be synthesized in similar conditions

Miller-Urey experiment



First steps, according to abiogenesis

- Primordial soup
- RNA world
- Proteins
- Cells: last universal common ancestor (LUCA)

Summary

- Four types of biomolecules form biological polymers
- Abiogenesis is the most feasible theory of life origin

For Further Reading

Organic chemistry.

`http://en.wikipedia.org/wiki/Organic_chemistry`

Origin of Life.

`http://en.wikipedia.org/wiki/Abiogenesis`