# TRAINING MATERIALS FOR PRACTICAL WORKS. Problems of modern biology.

**Almaty**

# Practical work №1.

**Biology as a science. Scientific Research Methods.**

**Aim of the work:** Acquaintance students with the Scientific Research Methods of Biology science.

Research methodology in biology and life science. Life science is one of the major branches of natural science, the other counterpart being the physical science.

Life science or biological science is the scientific study of life and living organisms. Biology falls under the umbrella of natural science discipline and it encompasses various fields such as molecular biology, cell biology, genetics, organismal biology, behaviour health and medicine, neuroscience ecology and evolution. Thus, the research methodology applies to almost all fields in life science and its sub-disciplines.

The following steps highlight the guideline to a researcher in completing his research without any confusion:

1) Identification of research problem

2) Broad literature survey

3) Hypothesis formulation

4) Preparation of research design

5) Determining sample design

6) Data collection

7) Analysis of data

8) Hypothesis testing

9) Generalizations and interpretation

10) Preparation of the report or presentation of the results.

A clearly stated research question helps the researcher to formulate a good study design and good study design is the backbone of any successful research.

*Control questions:*

1. Science and scientific research methods

2. Methods for collecting data

3. Examples of data collection methods

4. Methods for analyzing data

5. Examples of data analysis methods.

**Literature:**

1.Космин, В. В. Основы научных исследований (Общий курс) [текст] : учеб. пособие . - 2-е изд. - M. : Риор, 2014. - 214 с.

2. Герасимов, Борис Иванович. Основы научных исследований. - Москва ; Москва : Издательство "ФОРУМ" : ООО "Научно-издательский центр ИНФРА-М", 2013. - 272 с.

3. Леонова, О. В. Основы научных исследований. - 1. - Москва : Московская государственная академия водного транспорта (МГАВТ), 2015. - 72 с.

4. Шкляр, М.Ф. Основы научных исследований. - Москва : Издательско-торговая корпорация "Дашков и К", 2018. - 208 с.

5. Shanti Bhushan Mishra and Shashi Alok Handbook of research methodology. – India 2017. – 28 p.

6. В. А. Бакулев, Н. П. Бельская, В. С. Берсенева Основы научного исследования. - Екатеринбург: Изд-во Урал. ун-та, 2014. – 64 c.

# Practical work №2.

**The New Biology’s Great Potential.**

**Aim of the work:** Acquaintance students with the Scientific Research Methods and problems in Biology science.

The New Biology relies on integrating knowledge from many disciplines to derive deeper understanding of biological systems. That deeper understanding both allows the development of biology-based solutions for societal problems and also feeds back to enrich the individual scientific disciplines that contributed to the new insights.

It is critically important to recognize that the New Biology does not replace the research that is going on now; that research is the foundation on which the New Biology rests and on which it will continue to rely.

Nowadays, biologists are faced with many tasks, the solution of which can have a driving influence both on natural science and on the progress of humanity. Among them are questions that are studied by genetics, molecular biology, physiology and biochemistry of muscles, glands, nervous system and sensory organs (processes of memory, excitation and inhibition in the NS); photo- and chemosynthesis, energy and productivity of natural complexes and the biosphere as a whole, the form and content of natural processes, their integrity and expediency, progress, etc.

Taken as a whole, biology as a science is interested in three main problems:

1) mechanisms of the origin of life (there is no single concept);

2) variability (there is no single view of its mechanisms);

3) evolution (the role of the mechanisms of variability in the evolutionary process).

Everything else is covered by these three global problems, and whatever is explored will be the answer to the above questions.

**Control questions:**

What is the New Biology?

Who is the new biologist?

Problems of modern biology.

**Literature:**

1. Леонова, О.В. Основы научных исследований. - 1. - Москва : Московская государственная академия водного транспорта (МГАВТ), 2015. - 72 с.

2. Шкляр, М.Ф. Основы научных исследований. - Москва : Издательско-торговая корпорация "Дашков и К", 2018. - 208 с.

3. Shanti Bhushan Mishra and Shashi Alok Handbook of research methodology. – India 2017. – 28 p.