**Methodological instructions for seminars**

**on** **discipline “Methods on molecular biotechnology”**

**The title of seminars**

**Module 1** Structure, feature and functions of nucleic acids

**Seminar 1.** Main approaches and methods of molecular biotechnology

Whole blood samples are one of the main sources used to obtain DNA, and there are many different protocols available to perform nucleic acid extraction on such samples. These methods vary from very basic manual protocols to more sophisticated methods included in automated DNA extraction protocols.

Solution-based DNA extraction methods using organic solvents

Solution-based DNA extraction methods using salting out

Solid-phase DNA extraction methods

DNA extraction methods using silica and silica matrices

DNA extraction using anion exchange resins

DNA extraction methods using magnetic beads

Main types of DNA extraction methods from human whole blood samples

**Seminar 2** Methods of extraction of nucleic acids from different biological materials

DNA extraction protocols using organic solvents derived originally from a series of related RNA extraction methods. Some of the main steps used in these methods are:

 1) cell lysis undertaken by adding a detergent/chaotropic-containing solution, including SDS or N-Lauroyl sarcosine;

2) inactivation of DNases and RNases, usually through the use of organic solvents;

 3) purification of DNA and removal of RNA, lipids, and proteins;

4) resuspension of extracted nucleic acids.

**DNA extraction methods using silica and silica matrices**

Silica matrices have unique properties for DNA binding. They are positively charged and have high affinity toward the negative charge of the DNA backbone. High salt conditions and pH are achieved using sodium cations, which bind tightly to the negatively charged oxygen in the phosphate backbone of DNA. Contaminants are removed with a series of washing steps, followed by DNA elution under low ionic strength (pH ≥7) using TE buffer or sterile distilled water.A substance that contains high amounts of silica (up to 94%) known as kieselguhr, diatomite, or diatomaceous earth has also been used for DNA purification.

**Seminar 3** Analysis and Characterization of nucleic acids

**Seminar 4.** MicroRNA Cloning from Cells of the Immune System. Use of nucleases, exonuclease, restrictase in molecular biotechnology

**Seminar 5.** Analysis of different types nuclear acids.

**Seminar 6.** DNA Separation Techniques for different types of DNA

**Seminar 7.**  The SDS-PAGE based DNA Separation Techniques

**Seminar 8.** Genome mapping, genetic mapping , physical mapping , mapping distance.

**Seminar 9.** Mass analysis of proteolytic peptides is a popular method of protein characterization, as cheaper instrument designs used for characterization.

**Seminar 10.** Immunodetection of proteins

**Seminar 11.** Strategies for SNP detections strategies for arrays. Applications of microarrays in biotechnology

## Seminar 12. Types of DNA microarrays

The Future of DNA arrays. Data standards and data exchange. DNA microarrays for transcription factor binding analysis.

**Seminar 13.** Preparation of DNA chip and the experiment

**Seminar 14.** Applications of different types of moleculaer markes and PCR in molecular biotechnology

**Seminar 15.** QTL applications in breeding