

Historical milestones of nanobiotechnology

Provide some examples of nano-scaling effects

Carbon-based nanomaterials

Graphene, preparation and applications

Examples of metal-based nanoparticles

Magnetic particles – preparation, applications

Preparation, characterization and modification of Au nanoparticles

Surface plasmon resonance for bioanalysis

What are typical applications of nanoparticle bioconjugates?

Surface groups for bioconjugations

Principles of click-chemistry

Electrophoresis of nanoparticles

Which interactions are important for stability of nanomaterial dispersions?

How can be estimated the molar concentration of nanoparticle dispersion?

Which methods can be used for size characterization of nanoparticles and their bioconjugates?

Which methods can be used for purification of nanoparticles and their bioconjugates?

Light scattering and nanotracking analysis

Electron microscopies

Single-particle based techniques

Quantum dots – principles, preparation, properties

Photon up-conversion luminescent nanoparticles

Electrochemical techniques useful for nanomaterials

Field effect transistors and applications

Principles of biofuel cells

Nanopores – structure and applications

Examples of point-of-care testing

Describe photolithographic process

Examples of nanofabrication techniques

Microfluidic systems and their applications

What is Lab-on-Chip and Point-of-care? Describe fundamental principles and aims.

What are the approaches to cell sorting?

What are the main approaches to deposition of biomolecules at nanoscale?

Describe main biosensing schemes and principles of nanosensors with electrochemical detection.

Principles of DNA assays, biochips

Types of scanning probe microscopy techniques

Microcantilevers, preparation, materials, principal parameters

What is the effect of AFM tip sharpness on resolution of atomic force microscopy?

Can be microscopy glass used for imaging of individual molecules, such as protein, DNA, etc.?

Describe the procedure for immobilization of protein molecules on the mica surface for AFM microscopy.

Describe the procedure for immobilization of DNA molecules on the mica surface for AFM microscopy.

Make an easy sketch of force-distance curve and describe its basic properties.

Describe basic modes of AFM microscope operation

Principles of SNOM

Principles of STM

Piezoelectric actuators in AFM systems

Nanobiotechnologies in biomedicine

Delivery of drugs to tumors

Materials suitable for implants