Research methods.

Examination questions.

1. Classification of research methods.
2. Experiment as a research method. Features and specificity.
3. Research objects: types of the objects, their advantages and disadvantages. Randomization, blinding, control and experimental groups.
4. Rodents as the objects of experimental research. “Pure lines” of rodents and their types.
5. Ethical implications of laboratory animals research.
6. The basic rules of animal management (care, husbandry, feeding) at the example of the rodents.
7. The basic rules of surgical manipulations with experimental animals. Techniques of blood sampling, injections to animals.
8. Using anesthesia during manipulations with animals.
10. Sample taking rules for morphological and other examinations.
12. Fluorescence microscopy in biomedical researches: principle, requirements to study objects, natural and artificial fluorochromes; confocal laser scanning microscopy (CLSM).
18. The main rules of fixation in the clinic and laboratory. Cutting of the tissue for sample preparation.
19. Tissue processing and embedding. Embedding specificity and storage in the celloidine.
20. Decalcification: purposes. Objects which have to be decalcificated before studying. Methods of decalcification. Quick decalcification.


23. Advantages and disadvantages of cryosections and sections for paraffin blocks. Role of these methods in clinical morphological diagnostic.

24. Staining: the preparatory steps. Deparaffinization, rehydration, staining, cover slip application. Main types of mounting mediums and their characteristics.

25. Fundamental theoretical positions about staining. Classification of the stains, features of their chemical structure.

26. The main types of the histological stains (Hematoxylin and eosin staining, van Gieson staining, Masson trichrome staining, Mallory staining).

27. Histochemical methods of tissue study: main principles and conditions, features of material preparing for the analysis. Structures that may be identified by use of histochemistry (with reactions examples). Enzyme histochemistry, its principles.


29. Methods of diagnostic antibodies obtaining for immunohistological analysis. Advantages and disadvantages of the different types of the diagnostic antibodies.


32. Rules of the histological preparations microphotographing.

33. Quantitative analysis of the histological preparations, features. Morphometry.

34. The main rules of the statistical analysis after morphometric research.

35. Hybridome method in biology: principle, meaning and field of application.


38. Genealogical method of research and diagnostic: principle, meaning for clinical
diagnostic, fields of application in biology and medicine. Genealogical symbols. Give
an example of genealogic tree of autosomal dominant diseases.
39. Genealogical method of research and diagnostic: principle, meaning for clinical
diagnostic, fields of application in biology and medicine. Genealogical symbols. Give
an example of genealogic tree of sex-linked diseases.
41. Methods of nucleic acids research: polymerase chain reaction (PCR) and DNA
sequencing: principles, technical capabilities, meaning in clinical diagnostic. Whole-
exome sequencing (WES) of DNA; new generation sequencing.
42. PCR and DNA sequencings for pathogens identification in the eukaryotic cells:
principle of realization, meaning for researches and in clinic (give a particular detailed
case / concrete detailed example).
43. DNA testing / Molecular genetic testing in criminal investigations, particularly, for
parentage testing.
44. DNA testing / Molecular genetic testing for hereditary human diseases diagnostic:
PCR, Sanger sequencing, whole-exome sequencing (WES), searching of specific
metabolites with biochemical methods (give a detailed examples).
45. Genetic transformation of bacteria: types and fields of application in biological
researches and pharmaceutical production.
46. Genetic transformation of plants: types and fields of application in biological
researches and plant production.
47. Genetic transformation of animal and human cells: types and fields of application in
biological researches and pharmaceutical production.
Classification of vectors; advantages and disadvantages of different vectors.
49. Gene therapy: definition, mail principles. Characteristic of viral vectors: integrated and
unintegrated vectors, their advantages and disadvantages.
50. Genome correction methods: Zinc finger nuclease, TALEN, CRISPER/Cas9; potential
fields of application in medicine.
51. Genome correction and posttranscriptional modifications methods: exon skipping and
trans-skipping, potential fields of application in medicine.
52. Enzyme multiplied immunoassay. Western blotting: principle of the method. Meaning
for researches in biology, medicine and diseases diagnostics.
researches in biology, medicine and diseases diagnostics.
56. In vitro fertilization (IVF) and preimplantation genetic diagnosis (PIGD). Purposes of methods, indications for genetically controlled IVF.
60. Electrophysiological information registration. Electrical processes on the area of electroskin contact. Electrocutaneous resistance – impedance. Reasons of the skin electrical conductance changes.
61. Main types of bioelectrical potentials research methods: ECG, EMG, EEG, GSR (galvanic skin response) and their assignment in clinic.
62. Electrodes. Specified requirements to the electrodes. Classification of cutaneous and transcutaneous electrodes depending on their assignment, electrical properties, specificity.
63. Standard constructions of electrodes foe electrophysiological assays: blade electrodes, suction electrode, subtrodes - needle electrodes.
64. Biopotential reference system. Electrodes application rules.
65. Diagnostic indicators registered with electrophysiological methods: simple, relative, complex and composite. Methods and signal processing algorithm.
66. Electrocardiography. History of method’s development, foreign and Russian researchers’ contribution in its formation. (здесь я не стала переводить ‘отечественных’, иностранцы могут не понять)
70. Electrodes application for electrical brain activity registration. International standard
system. Bipolar and monopolar leads: lead scheme selection.


73. Autopsy. Purposes, procedure, rules; legislative regulation.

74. Different techniques of autopsy. Order of the autopsy by G. V. Shor method.


76. Principle of GCP – Good clinical practice. Main positions
