Test/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.
9. Animal euthanasia: reasons, basic principles, methods. Cardial perfusion.
10. Sample taking rules for morphological and other examinations.
11. Optical microscopy in biomedical researches: principle, physical limitations, main methods (bright field, dark field, polarization microscopy.
12. Fluorescence microscopy in biomedical researches: principle, requirements to study objects, natural and artificial fluorochromes; confocal laser scanning microscopy (CLSM).
13. X-ray and ultraviolet microscopy in biomedical researches: principle, advantages and disadvantages.
14. Electron microscopy in biomedical researches: classification. Transmission electron microscopy: principle, resolving power, main stages of sample preparation.
15. Electron microscopy in biomedical researches: classification. Raster (scanning) electron microscopy: principle, resolving power, main stages of sample preparation. Scanning microprobe analysis.
16. AFM: atomic force microscopy in biomedical researches: principle, resolving power, main stages of sample preparation.
17. Fixation as a step of preparation of histological sections: purposes, types. Choice of the type. Classification of chemical fixatives.
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.
21. Sectioning from paraffin blocks. Microtome types. Microtome construction. Rules and possible mistakes during sample preparation.
22. Sectioning from frozen blocks (cryosectioning). Cryomicrotomes – construction and principle of work.
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, rehydrataion, 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.
28. Immunohistochemistry: principle, main definitions: antigen, antibodies. Classes of the

antibodies.
29. Methods of diagnostic antibodies obtaining for immunohistological analysis. Advantages and disadvantages of the different types of the diagnostic antibodies.
30. Antibody labeling methods. Detection of the immune complexes after immunohistochemical reactions (direct and indirect methods).
31. Antigen retrieval for immunohistochemical staining. Purposes, types. Control of immunohistochemical staining.
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.
36. Cytogenetic method of research and diagnostic: principle, meaning for clinical diagnostic, fields of application in biology and medicine.
37. 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 recessive diseases.
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.
40. Genetic counselling. Chromosome banding methods.
41. Methods of nucleic acids research: polymerase chain reaction (PCR) and DNA sequencing: principles, technical capabilities, meaning in clinical diagnostic. Wholeexome 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.
48. Gene therapy: definition, mail principles. Structure of gene therapy constructions. 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.
53. Chromatography. Types of chromatography. Principle of the method. Meaning for

researches in biology, medicine and diseases diagnostics.
54. Spectroscopy and spectrometry. Principle of the method. Meaning for researches in biology, medicine and diseases diagnostics.
55. Mass spectrometry. Principle of the method. Meaning for 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.
57. Complex study of body functions. Definitions “Functional diagnostics”, “Functional status”.
58. Technical approaches for the body bioelectrical activity study. Devices for stimulation.
59. Vivisection. Methods of brain extirpation and transection. Cerebral localization of body functions: phrenology of F. Gall, cytoarchitectonic areas by K. Brodmann. Stereotaxic device and its using in neurosurgery.
60. Electrophysiological information registration. Electrical processes on the area of electroskin contact. Electrocutaneuos 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)
67. Bioelectrical processes in cardiac muscle. Cardiac conducting system (CCS). Electrocardiographic waves, their origin.
68. Biopotential reference system in ECG: standard leads, augment limb leads, chest leads. Electrodes arrangement.
69. Electroencephalography (EEG). Founders of the method. Phenomenon of electrical brain activity. EEG rhythms and their characteristics.
70. Electrodes application for electrical brain activity registration. International standard system. Bipolar and monopolar leads: lead scheme selection.
71. Interferential electromyogram registration. Motor unit. Background for EMG understanding. Applicability of the method in functional diagnostics.
72. Galvanic skin response (GSR). History of method. Recording methods. Application of technique in functional diagnostic.
73. Autopsy. Purposes, procedure, rules; legislative regulation.
74. Different techniques of autopsy. Order of the autopsy by G. V. Shor method.
75. Biopsy. Definition. Types of biopsy. Emergency biopsy. Rules of biopsic material (biopsy specimen) marking in clinical practice.
76. Principle of GCP – Good clinical practice. Main positions
77. Phases of clinical research. Purposes.
78. Human as an object of research. Basic principles of Declaration of Helsinki (1964).