

Federal State Budgetary Educational Institution of Higher Education  
"Privolzhsky Research Medical University"  
Ministry of Health of the Russian Federation

**BANK OF ASSESSMENT TOOLS FOR DISCIPLINE**

**BIOLOGY**

Training program (specialty): **31.05.03 DENTISTRY**

Department: **BIOLOGY**

Mode of study **FULL-TIME**

Nizhniy Novgorod  
2021

## 1. Bank of assessment tools for the current monitoring of academic performance, mid-term assessment of students in the discipline / practice

This Bank of Assessment Tools (BAT) for the discipline "BIOLOGY" is an integral appendix to the working program of the discipline " BIOLOGY ". All the details of the approval submitted in the WPD for this discipline apply to this BAT.

*(Banks of assessment tools allow us to evaluate the achievement of the planned results stated in the educational program.*

*Assessment tools are a bank of control tasks, as well as a description of forms and procedures designed to determine the quality of mastering study material by students.)*

## 2. List of assessment tools

The following assessment tools are used to determine the quality of mastering the academic material by students in the discipline/ practice:

No	Assessment tool	Brief description of the assessment tool	Presentation of the assessment tool in the BAT
1	Test №1	A system of standardized tasks that allows you to automate the procedure of measuring the level of knowledge and skills of a student	Bank of test tasks
2	Case - task	A problem task in which the student is offered to comprehend a real professionally-oriented situation necessary to solve this problem.	Tasks for solving cases
3	Solving sets of tasks	The following tasks are distinguished : a) of reproductive level, allowing to evaluate and diagnose knowledge of factual material (basic concepts, algorithms, facts) and the ability to correctly use special terms and concepts, recognition of objects of study within a certain section of the discipline; b) of reconstructive level, allowing to evaluate and diagnose the ability to synthesize, analyze, summarize factual and theoretical material with the formulation of specific conclusions, the establishment of cause-and-effect relationships; c) of creative level, allowing to evaluate and diagnose skills, integrate knowledge of various fields, argue your own point of view	A set of multi-level tasks

## 3. A list of competencies indicating the stages of their formation in the process of mastering the educational program and the types of evaluation tools

Code and formulation of competence*	Stage of competence formation	Controlled sections of the discipline	Assessment tools
UC-1 (Able to carry out a critical analysis of	Entry, Current, Mid-term	Cell Biology	On-line tests Case-task Multi-level tasks and tasks

problem) GPC-8 (Able to use basic physico-chemical, mathematical and natural science concepts and methods in solving professional problems)  GPC-13 (Able to solve standard tasks of professional activity using information, bibliographic resources, medical and biological terminology, information and communication technologies, taking into account the basic requirements of information security)	Entry, Current, Mid-term	Fundamentals of medical parasitology -Medical protozoology -Medical Helminthology -Arthropoda and human diseases	On-line tests Case-task Multi-level tasks and tasks
	Entry, Current, Mid-term	Molecular bases of heredity	On-line tests Case-task Multi-level tasks and tasks
	Entry, Current, Mid-term	Classical genetics Mendelian Genetics. Morgan's theory. Chromosome theory.	On-line tests Case-task Multi-level tasks and tasks
	Entry, Current, Mid-term	Ontogenesis and phylogenesis	On-line tests Case-task Multi-level tasks and tasks

\* - not provided for postgraduate programs

#### 4. The content of the assessment tools of entry, current control

Entry /current control is carried out by the discipline teacher when conducting classes in the form of: assessment tool 1, assessment tool 2, assessment tool 2,

Assessment tools for current control .

##### Assessment tool 1 for the assessment of competence " UC-1, GPC-8, GPC-13"

1. ACCORDING TO WHICH PRINCIPLES DOES THE REPLICATION PROCESS SYNTHESIS OF NEW CHAINS TAKE PLACE?

**complementarity**

**antiparallelism**

transcriptional principle

parallelism

directional principle

2. ARE AMINO ACIDS BUILDING BLOCKS OF?

lipids

**proteins**

carbohydrates

nucleic acids

endoplasmic reticula

**3. ARE ORGANIC MOLECULES THAT HAVE THE FUNCTION OF STARTING AND REGULATING CHEMICAL REACTIONS?**

carbohydrates  
lipids  
**enzymes**  
endoplasmic reticula  
nucleic acids

**4. BY THE WHICH ORDER AND TYPE IS THE STRUCTURE OF PROTEINS DETERMINED?**

nitrogen bases  
pyrimidines  
**amino acids**  
nucleotides  
peptones

**5. IN THE DNA DOUBLE HELIX, COMPLEMENTARY BASE PAIRS ARE HELD TOGRTHER BY .....**

hydrogen bonds  
N-glycosidic bonds  
ionic bonds  
peptide bonds  
phosphodiester bonds

**6. THE HUMAN BODY IS COMPOSED MOSTLY OF.....**

calcium, iron, phosphorus, and zinc  
oxygen, hydrogen, calcium, and iron  
**oxygen, nitrogen, hydrogen, and carbon**  
sulfur, nitrogen, hydrogen, and carbon  
phosphorus, nitrogen, hydrogen, and carbon

**7. WHAT ARE COMPONENTS OF DNA?**

**nitrogen base**  
ribose sugar  
aminoacid  
**deoxyribose sugar**  
peptide

**8. WHAT ARE PYRIMIDINES IN THE STRUCTURE OF RNA?**

**adenine**  
cytosine  
thymine  
**guanine**  
uracil

**9. WHAT HAPPENS DURING TRANSCRIPTION?**

a new polypeptide is created  
RNA is scanned by a ribosome  
a new copy of DNA is produced  
**a complementary copy of RNA is made**  
a complementary copy of DNA is made

**10. BECAUSE DNA- POLYMERASE III CAN ONLY ACT FROM 5' to 3', CONTINUOUS STRAND GROWTH CAN BE ACHIEVED ONLY ALONG ONE OF THE TEMPLATE STRANDS (LEADING STRAND) AND STRAND GROWTH ALONG THE OTHER STRAND MUST OCCUR DISCONTINUOUSLY RESULTING IN THE PRODUCTION...**

- replicon fragments
- okazaki fragments**
- klenow fragments
- klenow segments
- none of the above

**11. A MAN HAS BLOOD TYPE A. HIS WIFE HAS BLOOD TYPE B. WHAT BLOOD TYPES DO CHILDREN HAVE?**

- AB
- A or B
- A or B or AB
- A or B or AB or O**
- A

**12. A MAN HAS BLOOD TYPE B. HIS WIFE HAS BLOOD TYPE AB. WHAT BLOOD TYPES DO CHILDREN HAVE?**

- AB
- A or B
- A or B or AB**
- A or B or AB or O
- A

**13. AN ORGANISM'S EXPRESSED PHYSICAL TRAIT, SUCH AS SEED COLOR OR POD SHAPE. HOW IS IT CALLED?**

- genotype
- phenotype**
- gamete
- gene
- cytosol

**14. HOW MANY DIFFERENT KINDS OF GAMETES WILL THE INDIVIDUAL WITH GENOTYPE AAbb PRODUCE?**

- 1 (ONE)**
- 2 (TWO)
- 3 (THREE)
- 4 (FOUR)
- 6 (SIX)

**15. HOW MANY DIFFERENT KINDS OF GAMETES WILL THE INDIVIDUAL WITH GENOTYPE Aabb PRODUCE?**

- 1 (ONE)
- 2 (TWO)**

3 (THREE)

4 (FOUR)

6 (SIX)

**16. HUMAN BODY (SOMATIC) CELLS CONTAIN ..... CHROMOSOMES; AND THE GAMETES (SEX CELLS) CONTAIN ..... CHROMOSOMES**

23; 46

**46; 23**

46; 46

23; 23

92; 46

**17. IF THE ALLELE FOR GREEN POD COLOR (G) IS DOMINANT OVER THE ALLELE FOR YELLOW POD COLOR (g), WHICH OF THE FOLLOWING GENOTYPES WOULD A PLANT WITH YELLOW PODS HAVE?**

GG

Gg

gG

**gg**

GGgg

**18. ROUND SEED IS DOMINANT OVER WRINKLED SEED IN PEA. IF HOMOZYGOUS ROUND SEEDED PEAS ARE CROSSED WITH WRINKLED SEEDED PEAS THE OFFSPRING WILL BE?**

**all round**

all wrinkled

50 % round + 50% wrinkled

75 % round + 25% wrinkled

25 % round + 25% wrinkled

**19. WHAT ARE ALLELES?**

homologous chromosomes

chromosomes that have crossed over

**alternate forms of gene**

linked genes

nonhomologous chromosomes

**20. WHAT ARE THREE IMPORTANT LAWS OF HEREDITY PROPOSED BY MENDEL?**

linkage

**segregation**

**independent assortment**

**dominance recessiveness**

crossing over

**21. .... BEGINS WHEN PAIRS OF SISTER CHROMATIDS ALIGN IN THE CENTER OF THE CELL.**

anaphase

interphase

**metaphase**

prophase

telophase

**22. ASEXUAL REPRODUCTION .....**

is limited to plants

leads to a loss of genetic material

produces offspring that are genetically identical to the parent

**produces offspring that always look exactly like the parent**

is limited to single-celled organisms

**23. AT THE END OF TELOPHASE I OF MEIOSIS AND CYTOKINESIS, THERE ARE**

.....

4 haploid cells.

2 diploid cells.

4 diploid cells.

1 haploid ovum and 3 polar bodies.

**2 haploid cells**

**24. CYTOKINESIS IS THE .....**

exchange of homologous regions of nonsister chromatids

formation of tetrads

independent assortment of chromosomes

transfer of genetic material involving sex pili

**division of one cell into two**

**25. DURING WHAT STAGE OF DEVELOPMENT DO THE THREE PRIMARY TISSUE LAYERS FIRST APPEAR?**

cleavage

blastulation

neurulation

fertilization

**gastrulation**

**26. MANY CHROMATIDS DOES A DUPLICATED CHROMOSOME HAVE?**

one

**two**

three

four

six

**27. IN EARLY STAGES OF VERTEBRATE CLEAVAGE, SUCCESSIVE BLASTOMERES .....**

are equal in size to that of the original zygote

**become smaller and smaller**

grow larger and larger

migrate to positions of future development

begin immediate differentiation

**28. IN TELOPHASE OF MITOSIS, THE MITOTIC SPINDLE BREAKS DOWN AND THE CHROMATIN UNCOILS. THIS IS ESSENTIALLY THE OPPOSITE OF WHAT HAPPENS IN .....**

**prophase**  
interphase.  
metaphase  
S phase  
anaphase

**29. WHAT ARE THE PLACENTA FUNCTIONS?**

**excretory organ**  
**respiratory organ**  
**endocrine organ**  
reproductive organ  
none of the above

**30. WHAT DOES THE TERM "HOMOLOGOUS CHROMOSOMES" MEAN?**

refers to replications of the same chromosome  
is another name for sister chromatids  
must be haploid  
**means a pair of chromosomes of the same kind, such as X sex chromosomes**  
must be diploid

**31. FOR WHICH PARASITE IS THE HABITAT THE LARGE INTESTINE?**

Leishmania tropica  
Lambliia intestinalis  
**Entamoeba histolytica**  
Trichomonas vaginalis

**32. ORGANISMS THAT MOVE BY MEANS OF PSEUDOPODIA BELONG TO THE GROUP .....**

algae  
**sarcodina**  
diatoms  
euglenoids  
dinoflagellates

**33. WHICH OF THE FOLLOWING IS NOT A GROUP USED IN THE TEXT TO CLASSIFY PROTISTS?**

Mastigophora  
Sarcodina  
Sporozoa  
Infuzoria  
**Cestoda**

**34. WHICH OF THE FOLLOWING LISTS CONTAINS A LOCOMOTOR MECHANISM NOT POSSESSED BY PROTISTS?**

pseudopodia



flagella  
**tube feet**  
cilia

**35. PARASITES WHICH LIVE INSIDE THE BODY ARE TERMED**

**Endoparasites**  
Ectoparasites  
Autoparasites  
Seudoparasites

**36. HOW IS A LIFE CYCLE STAGE WHERE PARASITE CAN INITIATE AN INFECTION IN A HOST CALLED?**

**invasion stage**  
diagnostic stage  
intermediate stage  
definitive stage  
general stage

**37. MALARIA RESULTS FROM A MOSQUITO INJECTING THE ..... OF PLASMODIUM INTO THE HUMAN BLOOD STREAM.**

sporocyst  
glycoprotein coat  
merozoites  
gametocytes  
**sporozoites**

**38. TO WHICH ONE OF THE FOLLOWING GROUPS DOES THE ORGANISM THAT CAUSES MALARIA BELONG?**

flagellates  
sarcodines  
ciliates  
zoomastigotes  
**none of the above**

**39. WHAT ARE MECHANISMS OF TRANSMISSION OF TOXOPLASMOSIS?**

**blood transfusion or organ transplantation**  
**consuming undercooked, infected meat**  
consuming undercooked, infected fish  
consuming undercooked, infected crabs  
**mother-to-child transmission**

**40. WHAT IS THE SPECIMEN FOR THE DIAGNOSIS OF TRICHOMONAS VAGINALIS INFECTION?**

**prostatic secretions**  
**vaginal discharges**  
**urine**

blood  
sputum

**41. CESTODES OBTAIN NUTRIENTS FROM HOST THROUGH .....**

vacuole  
the digestive tract  
the mouth  
**the whole body**  
the intestine

**42. THE PARASITES THAT INFECTS PEOPLE WHO EAT UNDERCOOKED PORK ARE .....**

Schistosoma species  
Enterobius vermicularis  
**Taenia solium**  
Fasciola hepatica  
Hymenolepis nana

**43. WHAT DO TREMATODES USUALLY HAVE?**

**two suckers**  
head  
scolex  
strobila  
hooks

**44. WHICH PARASITE CAN CAUSE PERIANAL PRURITUS (ITCHING)?**

Ascaris lumbricoides  
**Enterobius vermicularis**  
Trichuris trichiura  
Trichinella spiralis  
Strongyloides stercoralis

**45. .... IS THE CESTODE THAT PARASITIZES HUMANS WITHOUT REQUIRING AN INTERMEDIATE HOST, WHOLE LIFE CYCLE MAY BE ONLY IN THE HUMAN BODY**

**Hymenolepis nana**  
Taenia saginata  
Echinococcus granulosus  
Echinococcus multilocularis  
Diphyllobothium latum

**46. "SCOTCH TEST" IS USED FOR THE DIAGNOSIS OF INFECTION, WHICH IS CAUSED BY .....**

Ascaris lumbricoides  
**Enterobius vermicularis**  
Trichiurus trichura  
Trichinella spiralis  
Loa-loa

**47. CYSTICERCOSIS IS CAUSED BY .....**

- Taenia saginata
- Enterobius vermicularis
- Fasciola hepatica
- Taenia solium**
- Hymenolepis nana

**48. HOW IS HUMAN INFECTED BY FASCIOLA HEPATICA?**

- by eating raw fish
- by eating raw pork
- by eating raw beef
- by eating raw caviar
- by eating raw fresh-water grass**

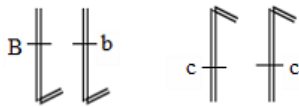
**49. HYDATID DISEASE IS CAUSED BY .....**

- Diphyllobothrium latum
- Echinococcus granulosus**
- Taenia saginata
- Loa-loa

**4.1. Tasks for the assessment of competence " UC-1, GPC-8, GPC-13":**

**Task 1.** Individual genotype is AaBbGG. Genes are in different chromosome pairs. Locate the genes in chromosomes (draw). Observe these chromosomes in the mitotic cycle.

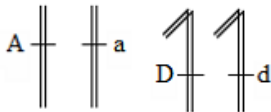
**Task 2.** The primary spermatocyte has:



Write down number of chromosomes and genes in primary, secondary spermatocytes and sperms. Draw the chromosomes and genes in the sperms.

**Task 3.** Individual genotype is BBHhYy. Genes are in different chromosome pairs. Locate the genes in chromosomes (draw). Observe these chromosomes in the mitotic cycle.

**Task 4.** The primary oocyte has:



Write down number of chromosomes and genes in secondary oocytes and ova. Draw the chromosomes and genes in the secondary oocytes.

**Task 5.** The structure of DNA is AAAGCTTTCCGAGTCGGATGCCAA.

What is the length of this segment? What is the structure of protein?

**Task 6.** The base sequence of a segment of single stranded DNA is: A-A-G-T-C-T-A-C-G-T-A-C. Write down the sequence of a segment of double stranded DNA. What is the length of this segment? How many amino acids are coded by this fragment?

**Task 7.** Genes are inherited independently. The crossing given is AaeeFf x AaEeff. Write down the genotypic and phenotypic ratio. How many different genotypes and phenotypes appear in this crossing?

**Task 8.** The hereditary disease is caused by autosomal dominant gene A. The mother is heterozygous, the father is healthy. The first child is sick, the second is healthy. What is the probability of a third healthy child birth?

**Task 9.** A color blind is a recessive sex-linked trait in humans. A normal vision woman marries a man who is color blind. What is the probability that a daughter will be color blind?

**Task 10.** A woman with A (II), Rh<sup>+</sup> blood group is married to a man with AB (IV), Rh<sup>+</sup> blood group. His first child has B (III) and Rh<sup>-</sup> blood group. What is the probability of second child birth with B (III) and Rh<sup>-</sup> blood group?

**Task 11.** Arachnodactyly (spider fingers) is inherited as an autosomal dominant trait with 30% penetrance. Determine the probability of occurrence of anomalies in children in a family where both parents are heterozygous for this gene and they have already given birth to a child with spider fingers.

**Task 12.** The results of crossing of pumpkins are

P: ♀ yellow x ♂ white

F<sub>1</sub>: white

F<sub>2</sub>: 204 white : 53 yellow : 17 green

Explain these results. Determine the type of heredity. Write down the scheme of crossing. Write down the genotypes of all individuals.

**Task 13.** Genes are inherited independently. The crossing given is:

P: ♀ AABb CC Dd x ♂ aa Bb Cc dd

a) Write down the genotypic and phenotypic ratio.

b) How many different genotypes and phenotypes appear in this crossing?

**Task 14.** The individual genotype is AaBb. The crossingover between A and B is 20%. Locate the genes in the chromosomes. Write down the scheme of crossingover, gametes and the ratio of gametes.

### **Tasks for the assessment of competence " UC-1, GPC-8, GPC-13":**

**Task 1.** Which method can identify the Sickle cell anemia? Why?

**Task 2.** Which method can identify the Cat Cry syndrom? Why?

**Task 3.** Imagine that you are a doctor. The analysis has showed that somatic cells of the patient don't contain Barr bodies. Make a conclusion. Write down the formula of the karyotype. What are the main features of this person?

**Task 4.** What is a prenatal diagnosis? Describe the methods of prenatal diagnosis.

**Task 5.** What is a karyogram? Write down formulas of karyotype for syndromes associated with changes in the set of autosomes. What are the main features of these diseases?

**Task 6.** Imagine that you are a doctor. The analysis has shown that 65 out of from 100 somatic cells of the patient contain Barr bodies. Make a conclusion. Write down the formula of the karyotype. What are the main features of this person? What is Barr body? Where is Barr body found?

**Task 7.** What mutations do we study using the cytogenetic method? Explain the steps of preparation of karyogram.

#### 4.2. Control work for the assessment of competence " UC-1, GPC-8, GPC-13":

##### Variant 1

**Task 1.** Who introduced the binominal nomenclature? What does this term mean?

**Task 2.** What organelles of a plant cell surrounded by a double membrane do you know? Name their functions.

**Task 3.** What types of partnership between two organisms do you know? What is parasitism?

**Task 4.** Define the species of Protozoa in the photograph. Write down the classification of the parasite, which is illustrated in the photo.

**Task 5.** Give definitions of a definitive host and an intermediate host. Write down the examples.

**Task 6.** Is *Lamblia intestinalis* a geoprotozoan or a bioprotozoan? Why?

**Task 7.** What species causes African sleeping disease? What is the mechanism and mode of invasion?

**Task 8.** What is the location of the parasite which causes skin leishmaniasis in the human body? What is the laboratory diagnosis of the disease?

**Task 9.** What is the invasion stage of *Toxoplasma gondii* for human? Write down the preventive maintenance for toxoplasmosis.

**Task 10.** Describe the life cycle of *Balantidium coli*.

##### Variant 2

**Task 1.** Write down the Latin name and the classification of a parasite which causes cysticercosis.

**Task 2.** What is a natural focus disease? Give the examples of worms.

**Task 3.** Write down the main morphological features of Nematodes.

**Task 4.** Is *Opistorchis felinus* a geohelminth or a biohelminth? Why?

**Task 5.** What species causes Trichuriasis? Write down the laboratory diagnosis of this disease.

**Task 6.** How is human infected with hydatid disease (write down mechanisms and modes of invasion)? What is the invasion stage for human?

**Task 7.** What is the preventive maintenance of Diphyllbothriasis?

**Task 8.** Compare the morphological features of *Opistorchis felinus* and *Dicrocoelium dendriticum* (adults).

**Task 9.** What is the location of *Schistosoma haematobium* in the human body? Explain the laboratory diagnosis of this disease.

**Task 10.** Describe the life cycle of *Taenia solium*.

### Variant 3

**Task 1.** What species causes scabies? Write down its Latin name and the classification of the species.

**Task 2.** Give the definition of a type of parasitic disease: «invasion». Write down the examples of human diseases of this type.

**Task 3.** Is African sleeping sickness a natural focus disease? If it is correct, write down the components of the natural focus for the disease.

**Task 4.** What is the medical importance of *Pediculus humanus*? How can human be infected with these diseases (the mechanisms and modes of transmission)?

**Task 5.** What are the main features of phylum Arthropoda?

**Task 6.** What are the mechanism and mode of transmission of bubonic plague?

**Task 7.** Describe the life cycle of *Ornithodoros papillipes*. Does the species develop with complete or incomplete metamorphosis?

**Task 8.** Give the definition of an ectoparasite. Give the examples (Latin names of human parasites).

**Task 9.** What is an obligate- vector borne disease? Give examples of human obligate- vector borne diseases.

**Task 10.** Draw the schemes of the mouth part of male *Anopheles* and male *Culex* mosquitoes.

### Variant 4

**Task 1.** Name the experiments demonstrating the genetic role of DNA as the hereditary substance. Explain Griffith's experiment.

**Task 2.** When does the DNA replication occur in the life cycle of cells? Describe the principles of replication.

**Task 3.** What is Okazaki fragment? Why is the Okazaki fragment formed?

**Task 4.** Name the enzymes and its functions involved in dark DNA-repair.

**Task 5.** Explain why the genetic code is specific.

**Task 6.** What is processing? In which cells does post-transcriptional processing take place? Enumerate the stages of this process.

**Task 7.** Describe the processes occurring in the elongation of translation.

**Task 8.** What is a promoter? What is the place and the function of promoter in the operon?

**Task 9.** Enumerate the stages of a recombinant DNA technology or a DNA cloning.

**Task 10.** The base sequence of a segment of single stranded DNA is: A-A-G-T-C-T-A-C-G-T-A-C. Write down the sequence of a segment of double stranded DNA. What is the length of this segment? How many amino acids are coded by this fragment?

## Variant 5

**Task 1.** What are Hox Genes?

**Task 2.** Give a definition of the cell cycle.

**Task 3.** Describe a metaphase and an anaphase of mitosis.

**Task 4.** Describe the process of cleavage. What is formed after cleavage? Draw the structure of this stage.

**Task 5.** The diploid number of chromosomes AaBb (2n2c) is located in different chromosome pairs. Locate the genes in chromosomes for a primary spermatocyte. What is the set of chromosomes and genes?

## Variant 6

**Task 1.** Genes are inherited independently. The crossing given is:

P: ♀ AA bb Cc Dd x ♂ aa Bb Cc dd

a) Write down the genotypic and phenotypic ratio.

b) How many different genotypes and phenotypes appear in this crossing?

**Task 2.** The hereditary disease is caused by autosomal dominant gene D. Brown eyes are dominant to blue eyes. The mother is ill and heterozygous, the father is healthy and brown-eyed. The first child is sick and blue eyed. What is the probability of a healthy blue-eyed child birth?

**Task 3.** The results of crossing of pumpkins are

P: ♀ yellow x ♂ white

F1: white

F2: 204 white: 53 yellow : 17 green

Explain these results. Determine the type of heredity. Write down the scheme of crossing. Write down the genotypes of all individuals.

**Task 4.** A young woman accused a man of being the father of her child. The father had AB blood groups, mother had A blood group, the child had O blood group. What are the possible genotypes of these people? Could this man be the father of this child? Why?

**Task 5.** What is a chromosome mutation? Write down the classification of chromosomal mutation.

**Task 6.** What methods are used to study gene mutations?

**Task 7.** What is the karyotype of a person with Down syndrome? What are the main features of this disease? The formula of a karyotype.

**Task 8.** Which method can identify the Sickle cell anemia? Why?

**Task 9.** What are mutagens? What kind of mutagens types do you know?

### 4.3. Tasks (assessment tools) for the exam

The full package of examination tasks is given (*for the assessment of competence " UC-1, GPC-8, GPC-13"*):

## Exam questions

1. Properties of life. Levels of organization of living things.
2. Hierarchy of life. Bacteria, archaea, eukarya. Prokaryotes and eukaryotes. The Domains of the living organisms.
3. Discovery of DNA genetic role. Griffith's, Macleod, McCarty, Avery, Hershey-Chase experiments.
4. DNA primary structure. Nucleotide structure. Linkage of nucleotides. DNA secondary structure. Complementary base pairing. Main principles of the Watson and Crick's model for DNA structure.
5. Levels of DNA package. Chromosome. Heterochromatin and euchromatin.
6. Nucleic acids. Levels of organization: gene level, chromosomal level, genome level. Types of nucleic acids. DNA genetic role. RNA genetic role.
7. Nucleic acids. RNA structure. Major classes of RNA and its characteristics. Role of RNAs.
8. Central dogma of molecular genetics. Expression of genetic information.
9. The genetic code and its characteristics. Codon and anticodon.
10. Stages of DNA replication. Enzymes which take part in replication. Leading and lagging strand synthesis. Direction of synthesis. Prokaryotic and eukaryotic replication.
11. DNA repair. Direct repair, excision repair: enzymes which take part in repair. Human diseases: result of defect of DNA repair processes.
12. Expression of the genetic information. Central dogma of molecular genetics.
13. Stages of transcription. Posttranscriptional RNA processing.
14. Central dogma of molecular genetics. Translation of mRNA. Components necessary for protein synthesis. Ribosomal structure. Charging t-RNA. Activation of amino acids: formation of aminoacyl-transfer RNA.
15. Translation in Eukaryotes. Translation steps. Polyribosomes. Posttranslational modification.
16. Regulation of gene expression in prokaryotes. Operon model for the regulation of gene expression in prokaryotes: lac-operon, trp-operon.
17. The structure of eukaryotic chromosomes. Morphology of chromosomes.
18. Types of chromosomes. Chromatin and chromosomes. Rules of chromosomes. Characteristics of a normal human karyotype.
19. Biology of development. Types of development. Ontogenesis. Periods of ontogenesis. Stages of embryonic period.
20. Types of reproduction. Asexual reproduction: fission, spore formation, budding, fragmentation. Advantages and disadvantages of asexual reproduction. Parthenogenesis.
21. Biological aspects of human reproduction. Gametogenesis. Stages of spermatogenesis and oogenesis. Differences between spermatogenesis and oogenesis.
22. Sexual reproduction in mammals. Alternation of haploid and diploid stages in the life cycle. The structure of sperm and ovum. External and internal fertilization. Advantages and disadvantages of sexual reproduction.
23. Cell cycle. Phases of the cell cycle. Three types of cell cycle.
24. Meiosis. The main stages. The importance of meiosis in variation.
25. Mitosis. Stages of mitosis. Number of chromosomes and DNAs in mitotic stages. The role of mitosis.
26. Mendel's laws of heredity. Gene, phenotype, genotype, allele, homozygous, heterozygous, monohybrid cross.
27. Sex determination. Types of sex determination. Sex linkage. Inheritance of sex-linked diseases.
28. Gene interaction. Non-allelic gene interaction.
29. Gene interaction. Allelic gene interaction.
30. Mutagens. Classification of mutations. Spontaneous and induced mutations. Gametic and somatic mutations. Gene mutation.
31. Classification of mutations. Chromosomal mutations. The role of chromosomal mutations in the development of human diseases.



32. Genome mutations. Classification of genome mutations. The role of genome mutations in plants and animals. Human diseases as a result of genome mutations.
33. Genetic variation. Types and characteristics of genetic variation. Sources of genetic variation.
34. Methods of human genome investigation. Cytogenetic method. Karyogramm.
35. Methods of human genome investigation. Genealogical method.
36. Methods of human genome investigation. Twin method.
37. Methods of human genome investigation. Biochemical method.
38. Cytogenetic method. Barr body test.
39. Cytogenetic method. Diseases which determined by cytogenetic method.
40. Forms of interactions between organisms. Symbiosis. Commensalism.
41. Mutualism. Parasitism. Adjustment between parasite and host. Parasitic adaptations. Parasites and humans.
42. Parasite and host relations. Adaptations to parasitism. Effect of parasite on the host. Effect of host on the parasite.
43. Kingdom Protista. Latin classification. Characteristic features of Protista. Medical importance.
44. *Entamoeba histolytica*. Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis. Prevention.
45. *Lambliia intestinalis*. Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis. Prevention.
46. *Leishmania tropica*. Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis. Prevention.
47. *Leishmania donovani*. Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis. Prevention.
48. *Trichomonas vaginalis*. Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis. Prevention.
49. *Trypanosoma brucei*. Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis. Prevention.
50. *Trypanosoma cruzi*. Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis. Prevention.
51. *Toxoplasma gondii*. Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis. Prevention.
52. *Plasmodium vivax*. Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis. Prevention of malaria.
53. Classification of helminthes. Characteristic features of Phylum Platyhelminthes. Medical importance.
54. Classification of helminthes. Characteristic features of Phylum Nematelminthes. Medical importance.
55. *Fasciola hepatica*. Classification (kingdom, phylum, class). Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis, prevention.
56. *Opisthorhis felinus*. Classification (kingdom, phylum, class). Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis, prevention.
57. *Paragonimus westermani*. Classification (kingdom, phylum, class). Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis, prevention.
58. *Schistosoma* species (blood flukes). Classification (kingdom, phylum, class). Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis, prevention.
59. *Taenia saginata*. Classification (kingdom, phylum, class). Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis, prevention.

60. *Taenia solium*. Classification (kingdom, phylum, class). Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis, prevention.
61. *Diphyllobothrium latum*. Classification (kingdom, phylum, class). Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis, prevention.
62. *Hymenolepis nana*. Classification (kingdom, phylum, class). Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis, prevention.
63. *Echinococcus granulosus*. Classification (kingdom, phylum, class). Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis, prevention.
64. *Ascaris lumbricoides*. Classification (kingdom, phylum, class). Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis, prevention.
65. *Enterobius vermicularis*. Classification (kingdom, phylum, class). Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis, prevention.
66. *Trichuris trichiura*. Classification (kingdom, phylum, class). Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis, prevention.
67. *Trichinella spiralis*. Classification (kingdom, phylum, class). Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis, prevention.
68. *Strongyloides stercoralis*. Classification (kingdom, phylum, class). Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis, prevention.
69. *Ancylostoma duodenale*. Classification (kingdom, phylum, class). Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis, prevention.
70. *Dracunculus medinensis*. Classification (kingdom, phylum, class). Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis, prevention.
71. *Filaria*. Classification (kingdom, phylum, class). Geographic distribution.
72. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis, prevention.
73. Classification of arthropods. Characteristic features of Phylum Arthropoda. Medical importance of arthropods.
74. Classification of insects. Characteristic features of class Insecta.
75. Development of arthropods: complete and incomplete (gradual) metamorphosis. Medical importance of insects.
76. *Ixodes persulcatus*. Classification (kingdom, phylum, subphylum, class, order). Geographic distribution. Characteristic features of hard ticks. Medical importance.
77. *Ornithodoros papillipes*. Classification (kingdom, phylum, subphylum, class, order). Geographic distribution. Characteristic features of soft ticks. Medical importance.
78. *Sarcoptes scabiei*. Classification (kingdom, phylum, subphylum, class, order). Geographic distribution. Characteristic features of mites. Medical importance. Preventive methods.
79. *Phthirus pubis*. Classification of lice. Characteristic features of lice. Medical importance of lice.
80. *Pediculus humanus capitis* and *Pediculus humanus humanus*. Classification of lice. Characteristic features of lice. Medical importance of lice.
81. *Xenopsylla cheopis* and *Pulex irritans*. Classification of fleas. Characteristic features of fleas. Medical importance of fleas.

82. *Triatoma infestans* and *Cimex lectularius*. Classification of bed bugs. Characteristic features of bed bugs. Medical importance of bugs.
83. Anopheles mosquitoes. Classification of mosquitoes. Characteristic features of Anopheles mosquitoes (eggs, larvae, pupa, wings, and mouth parts). Medical importance of Anopheles mosquitoes.
84. Phlebotomus sandflies. Latin classification. Geographic distribution. Medical importance of Phlebotomus species.
85. Culex mosquitoes. Classification of mosquitoes. Characteristic features of Culex mosquitoes (eggs, larvae, pupa, wings, and mouth parts). Medical importance of Culex mosquitoes.
86. Mechanical vectors: cockroaches and houseflies. Classification. Characteristic features. Medical importance.
87. Theory of natural foci of vector-borne (transmissible) diseases. Components of natural focus of vector-borne diseases (biotic and abiotic factors). Obligate and optional vector-borne diseases.
88. The concept of natural focus diseases (Pavlovsky Y. N.) Components of natural focus of non-vector-borne diseases (biotic and abiotic factors).
89. Important groups of human parasites. Life cycles of geo-, bio- and contagious parasites.
90. Biological vectors: ticks and lice. Classification. Characteristic features. Medical importance.
91. Ectoparasites and endoparasites. Examples. Classification. Medical importance.
92. Infection, invasion, and infestation: definitions, examples of diseases.
93. Pathogens of infections, invasion and infestations, classification of the pathogens.

And then the tasks are specified for all competencies provided for this discipline.

## 5. The content of the assessment tools of mid-term assessment

Mid-term assessment is carried out in the form of **an exam**.

*The bank of assessment tools for conducting current control and mid-term assessment of students in this discipline is presented on the Educational Portal of the PRMU - <https://sdo.pimunn.net/course/index.php?categoryid=363>*

5.1 The list of control tasks and other materials necessary for the assessment of knowledge, skills and work experience (*the teacher indicates only those tasks and other materials that are used within the framework of this discipline*) *The bank of assessment tools for conducting current control and mid-term assessment of students in this discipline is presented on the Educational Portal of the PRMU - <https://sdo.pimunn.net/course/index.php?categoryid=363>*

### 5.1.1. Questions for the discipline exam *BIOLOGY*

Question	UC-1, GPC-8, GPC-13
1	Central dogma of molecular genetics. Expression of genetic information.
2	Biological vectors: ticks and lice. Classification. Characteristic features. Medical importance.

Question	UC-1, GPC-8, GPC-13
1	Sexual reproduction in mammals. Alternation of haploid and diploid stages in the life cycle. The structure of sperm and ovum. External and internal fertilization. Advantages and disadvantages of sexual reproduction.
2	Mechanical vectors: cockroaches and house-flies. Classification. Characteristic features. Medical importance.

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Question	UC-1, GPC-8, GPC-13
1	DNA repair. Direct repair, excision repair: enzymes which take part in repair. Human diseases: result of defect of DNA repair processes.
2	Phthirus pubis. Classification of lice. Characteristic features of lice. Medical importance of lice.

Question	UC-1, GPC-8, GPC-13
1	Meiosis. The main stages. The importance of meiosis in variation.
2	Trichinella spiralis. Classification (kingdom, phylum, class). Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis, prevention.

Question	UC-1, GPC-8, GPC-13
1	Types of reproduction. Asexual reproduction: fission, spore formation, budding, fragmentation. Advantages and disadvantages of asexual reproduction. Parthenogenesis.
2	Dracunculus medinensis. Classification (kingdom, phylum, class). Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis, prevention.

Question	UC-1, GPC-8, GPC-13
1	Biological aspects of human reproduction. Gametogenesis. Stages of spermatogenesis and oogenesis. Differences between spermatogenesis and oogenesis.
2	Ancylostoma duodenale. Classification (kingdom, phylum, class). Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis, prevention.

Question	UC-1, GPC-8, GPC-13
1	Sexual reproduction in mammals. Alternation of haploid and diploid stages in the life cycle. The structure of sperm and ovum. External and internal fertilization. Advantages and disadvantages of sexual reproduction.
2	Trypanosoma brucei. Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis. Prevention.

Question	UC-1, GPC-8, GPC-13
1	Cell cycle. Phases of the cell cycle. Three types of cell cycle.
2	Classification of helminthes. Characteristic features of Phylum Platyhelminthes. Medical importance.

Question	UC-1, GPC-8, GPC-13
1	Mitosis. Stages of mitosis. Number of chromosomes and DNAs in mitotic stages. The role of mitosis.
2	Plasmodium vivax. Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis. Prevention

	of malaria.
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Question	UC-1, GPC-8, GPC-13
1	Mendel's laws of heredity. Gene, phenotype, genotype, allele, homozygous, heterozygous, monohybrid cross.
2	Strongyloides stercoralis. Classification (kingdom, phylum, class). Geographic distribution. Morphology of the parasite. Life cycle. Mechanisms and modes of invasion. Laboratory diagnosis, prevention.

## 6. Criteria for evaluating learning outcomes

*For the exam (example)*

Learning outcomes	Assessment of competence developed			
	unsatisfactory	satisfactory	good	excellent
<b>Completeness of knowledge</b>	The level of knowledge is below the minimum requirements. There were bad mistakes	The minimum acceptable level of knowledge. A lot of light mistakes were made	The level of knowledge in the volume corresponding to the training program. A few light mistakes were made	The level of knowledge in the volume corresponding to the training program, without errors
<b>Availability of skills</b>	Basic skills are not demonstrated when solving standard tasks. There were bad mistakes	Basic skills are demonstrated. Typical problems with light mistakes have been solved. All tasks have been completed, but not in full.	All basic skills are demonstrated. All the main tasks have been solved with light mistakes. All tasks have been completed, in full, but some of them with shortcomings	All the basic skills were demonstrated, all the main tasks were solved with some minor shortcomings, all the tasks were completed in full
<b>Availability of skills (possession of experience)</b>	Basic skills are not demonstrated when solving standard tasks. There were bad mistakes	There is a minimal set of skills for solving standard tasks with some shortcomings	Basic skills in solving standard tasks with some shortcomings are demonstrated	Skills in solving non-standard tasks without mistakes and shortcomings are demonstrated
<b>Characteristics of competence formation*</b>	The competence is not fully formed. The available knowledge and skills are not enough to solve professional tasks. Repeated training is required	The formation of competence meets the minimum requirements. The available knowledge and abilities are generally sufficient to solve professional	The formation of competence generally meets the requirements, but there are shortcomings. The available knowledge, skills and motivation are	The formation of competence fully meets the requirements. The available knowledge, skills and motivation are fully sufficient to solve complex professional tasks

Learning outcomes	Assessment of competence developed			
	unsatisfactory	satisfactory	good	excellent
		tasks, but additional practice is required for most practical tasks	generally sufficient to solve professional tasks, but additional practice is required for some professional tasks	
<b>The level of competence formation*</b>	Low	Below average	Intermediate	High

*For testing:*

Mark "5" (Excellent) - points (100-90%)

Mark "4" (Good) - points (89-80%)

Mark "3" (Satisfactory) - points (79-70%)

*Less than 70% – Unsatisfactory – Mark "2"*

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