Assessment tools for midterm assessment

Human genetics

Code, discipline	31.05.01 General Medicine
Qualification	General Medicine
Form of education	Full-time
Designer Department	Morphology and physiology
Graduate Department	Internal Diseases

TYPICAL TASKS FOR THE CONTROL WORK

CONTROL WORK

List of referats – 2nd semester:

1. The history and significance of genetics.
2. The structure of nucleic acids.
3. DNA replication.
4. Genetic material of viruses and prokaryotes.
5. Organization of the eukaryotic genome.
6. Cell cycle and mitosis.
7. Meiosis.
8. Basic genetic concepts and symbols.
9. Interaction of genes.
10. Interaction of genotype and environment.
11. Genetics of sex and gender-linked inheritance.
12. Mutations.
13. Recombination.
14. Transpositions.
15. Reparation.
16. Modifications.
17. Structural and functional organization of the gene.
18. The gene code.
19. Gene expression.
20. Transfer of genetic information in nature.
21. Regulation of gene expression.
22. Genetic engineering.
23. The genetic foundations of evolution.
24. Problems of genetic determination of human behavior.
25. Man as an object of genetics.
26. Human karyotype in normal and pathological conditions.
27. Human genetic diseases.
28. Diseases with a hereditary predisposition.
29. Oncogenetics.
30. Medical and genetic counseling.

31. The history of psychogenetics.
32. Methods of psychogenetics.
33. The relationship of genotype and environment in psychogenetics.
34. Formation of individual differences in ontogenesis.
35. Genetic psychophysiology.
36. Psychogenetics of intelligence.
37. Psychogenetics of development and heredity.
38. Psychogenetics of deviant behavior.
39. Determination. Problems of determination processing.
40. Regulatory genes in the process of ontogenesis.
41. Theoretical aspects of human genetics.
42. Determination of gender in ontogenesis.
43. Differentiation of gender.

TYPICAL TASKS FOR CREDIT (2nd term)

The task on the credit contains 2 theoretical questions and the genetic task.

The task for the indicators of the evaluation of the descriptor «Knows»	**Task type**
Formulate detailed answers to the following theoretical questions: 1. Chromosomes are structural components of the nucleus. Structure, composition, functions. The concept of karyotype. 2. Features of morphological and functional structure of chromosomes. Heteroaromatic. 3. Karyotype and ideogram of human chromosomes. Characteristics of human karyotype are normal. 4. Coding and realization of biological information in a cell. The code system of DNA and protein. 5. Subject, tasks, methods of genetics. Stages of development of genetics. The role of Soviet scientists (N. And.Vavilov, N. K.Koltsov, S. Serebrovsky, S. Chetverikov, S. N. Davidenkov) in the development of genetics. The struggle of materialism and idealism in the history of genetics. 6. The first and second laws of Mendel. The law of "purity of gametes". Examples. Autosomal dominant and autosomal recessive inheritance types. 7. Mendel's third law. Cytological foundations of the universality of Mendel's laws. 8. Allele genes. Definition. Form of interaction. Multiple allelism. Examples. Mechanism of occurrence. 9. Inheritance of blood groups. Inheritance of RH factor. Rhesus-conflict. 10. Nonallelic genes. Forms of their interaction. Examples. 11. Morgan's Law. Chromosome theory of inheritance. 12. Full and partial clutch gene. The concept of genetic maps of chromosomes. The method of somatic chromosome hybridization and its application for human chromosome karyotyping. 13. Chromosomal inheritance of sex. Cytogenetic methods of sex determination. Inheritance linked to the floor. Examples. 14. Genetic mechanisms of sex determination. Differentiation of sex characteristics in development. Predestination of sex. 15. Multiple aleles and polygenic inheritance on the example of man. The interaction of nonallelic genes: complementary, epistasis. 16. Genetic code. Coding and implementation of information in the cell. The code system of DNA and protein. 17. Quantitative and qualitative specificity of genes in the manifestation of signs: penetrance, expressivity, pleiotropism, genoscope.	**theoretical**

18. The structure and function of DNA. The mechanism of autoreproduction DNA. Biological significance.
19. The role of DNA and RNA in the transmission of hereditary information. Main stages: transcription, processing, translation.
20. Genotype, genome, phenotype. Phenotype as a result of the implementation of hereditary information in specific environmental conditions. Interaction of alleles in the determination of characteristics: dominance, intermediate expression, recession, codominant, allelic exclusion.
21. Classification of genes: genes of structural DNA synthesis, regulators. Gene properties (discreteness, stability, lability, specificity, pleiotropy).
22. Fine structure of genes. Features in Pro - and eukaryotes, the concept of transcriptome.
23. The principle of regulation of gene activity on the example of prokaryotes (operon model) and eukaryotes.
24. Genetic engineering. Biotechnology. Tasks, methods. Achievements, prospects.
25. Heredity and variability are the functional properties of the living, their dialectical unity. General concepts of genetic material and its properties: storage, measurement, reparation, transmission, realization of genetic information. Characteristics of diploid and haploid set of chromosomes.
26. Modification variability. The norm of reaction is genetically determined characteristics. Of modification. Adaptive nature of the modification. The role of heredity m environment in the development, training and education of man.
27. Combinative variability. Its importance in ensuring the genetic diversity of people. The system of marriage. Medical and genetic aspects of the family.
28. Mutational variability, classification of mutations by the level of damage to hereditary material. Mutations in sexual and somatic cells.
29. Chromosomal mutation: aberration, polyploidy, heteroploid; the mechanism of their formation.
30. Structural disorders (aberrations) of chromosomes. Classification according to the changes of the hereditary material. Mechanism of occurrence. Significance for biology and medicine.
31. Gene mutations, molecular mechanisms of their occurrence, the frequency of mutations in nature. Biological anti-mutation mechanisms.
32. Spontaneous and induced mutations. Their biological role. Factors of mutagenesis. Classification. Examples. Evaluation and prevention of the genetic action of radiant energy.
33. Repair of genetic material. Photoreactivation. Dark repair. Mutations associated with the violation of reparation, and their role in pathology.
34. The genotype as a whole. Nuclear and cytoplasmic heredity.
35. Methods of studying human heredity. Genealogical and twin methods, their importance for medicine.
36. Cytological method of diagnosis of human chromosomal disorders. Amniocentesis.
37. Karyotype and idiogram of human chromosomes. Bio-chemical method.
38. Hereditary human disease. Principles of treatment, methods of diagnosis and prevention. Examples.
39. The importance of genetics for medicine. Cytological, biochemical, population-statistical methods of studying human heredity. Dermatoglyphics.
40. The role of heredity and environment in ontogenesis. Critical periods of development. Teratogenic environmental factors.
41. Population structure of the species. Genetic structure of the population.
42. Ecological characteristics of populations (number, density, age and sex composition). Hardy-Weinberg rule: content and mathematical expression.
43. Elementary evolutionary factors. Mutation process, population waves, isolation, gene drift. Interaction of elementary evolutionary factors.
44. Hereditary polymorphism of natural populations. Genetic load.

45. Influence of mutation processes, mutations, isolation and gene drift on the genetic Constitution of people. The specificity of the action of natural selection in human populations. 46. Genetic cargo and its biological essence. Genetic polymorphism and adaptive potential of the population. 47. Genetic polymorphism of mankind: scales, factors of formation. The importance of genetic diversity in the past, present and future of mankind (biomedical and social aspects).	
Task for the evaluation indicator of the descriptor «Knows», «Possesses»	**Task type**
1. Six-fingered (polydactyly) is inherited as a dominant trait. What is the probability of manifestation of this trait in children from a father heterozygous for this gene, and a mother who does not have this anomaly? **2.** 2. Deafness is inherited recessive. Is it possible to give birth to a deaf-mute child from healthy parents? **3.** 3. Mioplegia (periodic paralysis) is inherited as a dominant trait. In a family where the wife is healthy and her husband suffers from myoplegia, a healthy child was born. What is the probability of having a second healthy baby? **4.** 4. Phenylketonuria (violation of the exchange of phenylalanine, which develops dementia) is inherited as a recessive trait. Is it possible to give birth to a sick child from healthy parents? **5.** 5. Aniridia (absence of iris, usually accompanied by corneal opacities and low vision) is inherited as an autosomal dominant trait. What is the probability of having healthy children in a family where one parent suffers from aniridia, and the other is normal, if it is known that the sick parent had this anomaly only the father? **6.** 6. The childhood form of amaurotic familial idiocy (Tay-Sachs disease) is inherited as an autosomal recessive trait and usually ends in death by the age of 4-5. The first child in the family died of the analyzed disease at the time when the second one should be born. What is the probability that the second child will suffer from the same disease? **7.** 7. Albinism (absence of pigment in the skin, retina and hair) is inherited in humans as an autosomal recessive trait. In a family where one of the spouses is albino and the other is normal, fraternal twins were born, one of whom is normal and the other is albino. What is the probability of having the next albino child? **8.** 8. Achondroplasia (hereditary dwarfism) is transmitted as a dominant autosomal trait. In a family where both spouses suffer from achondroplasia, a normal child was born. What is the probability that the next child will also be normal? **9.** 9. Rh-positivity (Rh+) is inherited as an autosomal dominant trait. If the genotypes of the mother and fetus do not match according to Rh proteins (mother Rh-, fetus Rh+), Rh conflict may occur, which manifests itself in hemolytic disease associated with the destruction of red blood cells, or in fetal death. Determine the probability of Rhesus conflict in marriages: a) a Rhesus-negative mother and a Rhesus-positive homozygous father for this allele pair; b) a Rhesus-negative mother and a Rhesus-positive heterozygous father for this allele pair. 10. A rare defect - anophthalmia (absence of an eyeball) is caused by a recessive autosomal gene. Homozygotes lack eyeballs on this basis, and heterozygotes have significantly smaller eyeballs than normal. What is the probability of having healthy children in a family where one parent has reduced eyeballs and the other has normal ones? 11. One of the forms of cystinuria (a violation of the metabolism of four amino acids) is inherited as an autosomal recessive trait. But in heterozygotes, there is only an increase in the content of cystine in the urine, and in homozygotes, the formation of cystine stones in the kidneys. Identify possible manifestations of cystinuria in children in a family where one spouse suffered from this disease, and the other had	**Practical**

only an increased content of cystine in the urine.

12. Familial hypercholesterolemia is inherited dominantly through autosomes. In heterozygotes, this disease is expressed in a high cholesterol content in the blood, in homozygotes, in addition, xanthomas (benign tumors) of the skin and tendons, atherosclerosis develop.

Determine the possible degree of hypercholesterolemia in children in a family where both parents have only high cholesterol in the blood.

13. Sickle cell anemia in humans is determined by the HbS gene responsible for the synthesis of hemoglobin S. The disease in homozygous individuals (HbS HbS) leads to early death. Heterozygotes (HbA HbS) are subclinically manifested, but they are resistant to malaria. People with normal hemoglobin A (HbA HbA genotype) are unstable to malaria.

a. What is the probability of having malaria-resistant children in a family where one parent is heterozygous for sickle cell anemia and the other is normal for this trait?

b. What is the probability of having malaria-resistant children in a family where both parents are resistant to this parasite?

14. Determine the probability of having a child with the same blood type as the parents:

a) in a family where the husband has blood type I and the wife has IV;

b) if the parents are heterozygous for blood type III.

15. A couple of spouses have blood groups II and III, the other couple - III and IV. The child has blood type I, whose is he?

16. Two boys were confused in the maternity hospital. The parents of one of them have blood groups I and II, the parents of the other have blood groups II and IV. The study showed that children have blood groups I and IV. Determine who is whose son?

17. The court received an application for the recovery of alimony from the alleged father. The mother and child have blood type I, and the father IV. What conclusion will the forensic examination give?

18. The court received an application for the recovery of alimony in favor of two children with blood groups II and III. The mother has an IV, and the alleged father has an I. What conclusion will the forensic examination give?

19. Which men - with blood groups I, II, III and IV, unfairly accused of paternity, have the most to justify, assuming that the frequency of genes of all four blood groups is the same and paternity disputes arise equally often for children with blood groups I, II, III and IV.

20. In humans, the dominant gene that causes brachydactyly (shortening of fingers), in a homozygous state, leads to the death of the embryo. What is the probability of having a child with brachydactyly and the probability of embryo death during the marriage of heterozygous parents?

21. Platinum color of fur in foxes dominates over silver, but in the homozygous state, the platinum gene causes the death of the embryo. Which individuals should be crossed to obtain the largest number of platinum foxes in the offspring?

22. Nail and kneecap defect syndrome is determined by a completely dominant autosomal gene. Determine the probability of manifestation of this syndrome in children in a family where one parent is heterozygous for the submitted gene, and the second is normal with respect to the studied signs.

23. In mice, the recessive gene (p) in the homozygous state leads to the appearance of a pink color of the iris, a decrease in the intensity of growth, and the premature onset of infertility. What is the probability of these signs appearing in offspring obtained from crossing two heterozygotes?

24. In humans, one form of myopia dominates normal vision, and brown eye color dominates blue. A blue-eyed, nearsighted man, whose father had normal eyesight, married a brown-eyed woman with normal eyesight, whose mother had blue eyes. What kind of offspring can be expected from this marriage?

25. In humans, curly hair dominates smooth hair, and deafness is a recessive trait. In a

family where parents hear well and have one smooth hair and the other curly, a deaf child with smooth hair was born, and their second child hears well and has curly hair. What are the genotypes of the parents? What is the probability of having a deaf child with curly hair?

26. Polydactyly (six-fingered) and the absence of small molars are transmitted as dominant signs. What is the probability of having children without abnormalities in a family where each parent has only one anomaly received from one of their parents?

27. Adult glaucoma is inherited in several ways. One form is determined by a dominant autosomal gene, the other by a recessive, also autosomal, not linked to the previous gene.

    a. What is the probability of having a child with an anomaly if both parents are heterozygous for both pairs of pathological genes?

    b. What is the probability of having children with an anomaly in a family where one of the parents is heterozygous for both pairs of pathological genes, and the other is normal in terms of vision and homozygous for both pairs of genes?

28. Humans have two types of blindness, and each is caused by an autosomal recessive gene. Determine the probability of a child being born blind if it is known that his parents are sighted, and both grandmothers suffer from the same type of hereditary blindness, according to the other pair they are normal and homozygous, and there is no hereditary blindness in the ancestry on the part of the grandfathers.

29. Fructosuria (impaired absorption of fructose) is inherited recessively, cataract is the dominant feature. What is the probability of having sick children in heterozygous parents with both pairs of genes?

30. Right-handedness and a white streak in the hair are inherited dominantly. A right-handed man with a white strand of hair married a left-handed man without a strand, they had two children: a left-handed man without a strand and a right-handed man with a strand of white hair. What is the probability of a left-handed person being born with a strand of white hair?

31. Sweet peas have a dominant purple flower color gene (P), which manifests its effect only in the presence of a complementary gene (C) from another allele pair. Gene (P) is necessary for the development of chromogen, and gene (C) causes the formation of an enzyme, under the action of which a colorless chromogen turns into a purple pigment. In the absence of one of the dominant genes, the pigment does not develop and the flowers remain white. Two white plants SSrr and ssRR are crossed. What phenotype will the first generation of hybrids have? The second one?

32. Two recessive genes (a) and (b) are known in mink. Homozygosity for each of them or both at the same time provides platinum coloring of the fur. Wild brown coloration is manifested only in the presence of two dominant genes (A) and (B). At what crossing of two platinum minks will the offspring (F1) be 100% brown? What is the phenotype cleavage in the second generation (F2)?

33. Chickens have four comb shapes due to the interaction of two pairs of genes (Rr and Pp). The (R) gene determines the pinkish crest, the (R) gene determines the pea-shaped crest. When the genes (R and P) are combined, a nut-shaped crest develops. Birds that are recessive in both genes have a simple (leaf-shaped) crest.

A homozygous individual with a pinkish crest is crossed with a homozygous individual with a pea-shaped crest. What phenotype will their offspring have in the first and second hybrid generations?

34. Budgerigars have several colors due to genes from different allele pairs: blue, green, yellow and white. When crossing blue and yellow with white, the colored form dominates in the first generation, and in the second generation a splitting of 3 blue to 1 white or 3 yellow to 1 white, respectively, is obtained. The green color is manifested in the presence of both dominant genes. Crossing white parrots with green ones in the first generation gave a splitting of 25% of each color. Determine the genotypes of the parent organisms.

35. In chickens, the dominant gene (C) causes the development of pigmented plumage, and its recessive allele is white. The epistatic gene (I) of another allele pair suppresses the action of the dominant gene, and the pigment is not formed. Therefore, chickens

homozygous for	

the recessive gene (c) are white due to the absence of pigment, and in the presence of the dominant gene (C) and the dominant gene (I), chickens are white due to the pigmentation gene by the epistatic gene. The white leghorn, homozygous for two pairs of dominant genes, is crossed with the white Wyandot, homozygous for two pairs of recessive genes. To determine the splitting by the color of the plumage in the first and second generations.

36. Pumpkin fruits can have three colors: white, yellow and green. The yellow gene (A) dominates the green one (a), and the dominant white gene (B), belonging to another allele, is epistatic with respect to both the yellow and green genes. A pumpkin with white fruits is crossed with a pumpkin with green fruits, and in the first generation all hybrids have a white color, and in the second generation splitting occurs: 12 parts with white fruits, 3 with yellow and 1 with green. What are the genotypes of the original forms?

37. In humans, the synthesis of erythrocyte group–specific proteins – antigens A and B - is determined by the dominant genes IA and IV. The non–allelic H gene controls the synthesis of the precursor protein of antigens A and B. In homozygous people with a recessive allele (hh), antigens A and B are not synthesized. Phenotypically, these people have blood type I. A married couple, where the husband and wife have blood type IV and are heterozygous for alleles of the H gene, had a child with blood type I. What is the probability of having the next children with blood type I?

38. The skin color of Blacks is controlled by two pairs of genes from different allele pairs. The intense black skin color is due to the dominant genes of both pairs, white skin color is due to their recessive alleles. Determine:

a) the possible skin color of children from marriage:
   1) men with white skin and dark-skinned women;
   2) mulatto and dark-skinned children;
   3) mulatto women and men with white skin color;

b) the probability of having a child with white skin from the marriage of two mulattoes.

39. Human growth is controlled by three pairs of uncoupled genes from different allele pairs interacting by type of polymerization. Assuming that in one of the populations the height of the shortest people, due to all recessive genes, is 150 cm, and the height of the tallest people, due to their dominant alleles, is 180 cm, determine the possible growth of children from the marriage of a short woman and a man of average height.

40. Determine which types of gametes and in what ratio are formed in a woman with the $\frac{Ed}{eD}$ genotype and a man with the $\frac{ED}{ed}$ genotype given that the E elliptocytosis gene (oval-shaped erythrocytes) and the rhesus antigen D gene are localized on the same chromosome at a distance of 20 morganides.

41. In humans, the Rh factor locus is linked to the locus that determines the shape of red blood cells, and is located at a distance of 20 morganides from it. Rh-positive factor and elliptocytosis are determined by dominant autosomal genes. The father is heterozygous for both pairs of genes. At the same time, he inherited Rh-positivity from one parent, elliptocytosis from another. The mother is Rh-negative and has normal red blood cells. Determine the possible percentages of probable genotypes and phenotypes of children in this family.

42. Cataracts and polydactyly in humans are caused by dominant autosomal genes, the distance between which is 20 morganides.

What kind of offspring can be expected in the family of parents who are heterozygous for both pairs of genes, if it is known that the mothers of both spouses suffered only from cataracts, and the fathers suffered only from polydactyly?

43. It is known that tricolor cats are always females. This is due to the fact that the genes of black and red hair are allelic and are located on the X chromosome, but none of them dominates, and when red and black are combined, tricolor individuals are formed.

a) What is the probability of obtaining tricolor kittens in offspring from crossing a

tricolor cat with a black cat? b) What offspring can be expected from crossing a red cat with a black cat? 44. Determine which types of gametes and in what ratio are formed in a woman with	

the $\underline{X}^{Hd}$ genotype and in a man with both recessive X^{hD} color blindness and hemophilia genes, if it is known that the color blindness gene and the hemophilia gene are located on the X chromosome at a distance of 9.8 morganides

45. Classical hemophilia is transmitted as a recessive trait linked to the X chromosome. A man with hemophilia marries a normal woman whose father suffered from hemophilia. What kind of children can you expect from this marriage?

46. In humans, the recessive gene that causes one of the forms of color blindness, color blindness, is localized on the X chromosome. A girl with normal eyesight, whose father suffered from color blindness, marries a normal man, whose father also suffered from color blindness. What kind of vision can be expected from the children of this marriage?

47. Anhydrous ectodermal dysplasia (absence of sweat glands, violation of thermoregulation) in humans is transmitted as a recessive trait linked to the X chromosome. A normal woman marries a man with anhydrous ectodermal dysplasia. They have a sick girl and a healthy son. Determine the probability of having the next child without an anomaly.

48. The appearance in some families of individuals characterized by a lack of phosphorus in the blood has been associated with the disease of a specific form of rickets that cannot be treated with vitamin D. In the offspring from the marriages of 14 men with this form of rickets, 21 daughters and 16 sons were born to healthy women. All the daughters suffered from a lack of phosphorus in the blood (hypophosphatemia), all the sons were healthy. What is the genetic basis of this disease? How does her inheritance differ from the inheritance of hemophilia?

49. Hypertrichosis (hair loss) of the auricle is inherited as a sign linked to the Y chromosome (manifested by the age of 17):

a) What is the probability of having children with this anomaly in a family where the father has hypertrichosis?

One form of ichthyosis (scaliness and mottled thickening of the skin) is inherited as a recessive trait linked to the X chromosome.

In a family where the woman is normal for both signs, and the husband is the owner of only hypertrichosis, a boy with signs of ichthyosis was born:

b) Determine the probability of hypertrichosis in this boy.

c) Determine the probability of having children in this family without abnormalities (both); what gender will they be?

50. In humans, the absence of sweat glands manifests itself as a recessive trait linked to the sex. Albinism is caused by an autosomal recessive gene. One married couple, normal for these two signs, had a boy with both anomalies. Specify the genotype of the son, the probable genotypes of the parents, as well as the probability of the birth of a second child with the same anomalies.

51. A man suffering from color blindness and deafness married a woman with normal eyesight and good hearing. They had a deaf, colorblind son and a colorblind daughter, but with good hearing. Determine the probability of having a daughter with both abnormalities in this family, if it is known that color blindness and deafness are transmitted as recessive signs; color blindness is linked to the X chromosome, and deafness is an autosomal sign.

52. In a family where the wife has blood type I and the husband has blood type IV, a colorblind son with blood type III was born. Color blindness is inherited as a recessive trait linked to the X chromosome. Both parents distinguish colors normally. What is the probability of having a son with normal color vision; what are his possible blood types?

53. Healthy parents had a son with hemophilia and color blindness. It is known that his wife's father was colorblind. Determine the probability of giving birth to the next child with two anomalies at the same time, given that the genes of hemophilia and color blindness are located on the X chromosome at a distance of 9.8 morganids.

Answers: 1 – 50%; 2 – possible if the parents are heterozygous; 3 – the genotype of the father (AA) – 100%, (aa) – 50%; 4 – possible if the parents are heterozygous; 5 – 50%;

6 – 25%; 7 – 50%; 8 – 25%; 9 – a) 100%, b) 50%; 10 – 50%; 11 – 50%; 12 – 75%; 13 – a) – 50%, b) – 25%; 14 – a) no, b) – 75% yes; 15 – the first pair; 16 – parents with I and II – son with I, parents with II and IV – son with II; 17 – a child with blood group I cannot have a father with group IV; 18 – a man with blood group I can be the father of these children; 19 – with I and IV blood groups; 20 – 66.6%, 25%; 21 – Aa Aa; 22 – 50%; 23 – 25% 24 – possible phenotypes of children: brown–eyed myopic, brown-eyed with normal vision, blue-eyed myopic, blue-eyed with normal vision; 25 - AaBb aabb genotypes, probability of birth 12,5%; 26 – 25%; 27 – a) 81.25%; b) – 50%; 28 – 25%; 29 – 81,25%; 30 – 25%; 31 – F1: purple, F2: 9/16 purple, 7/16 white; 32 – genotype of platinum minks (AAbb) and (aaBB), F2: 9/16 brown, 7/16 platinum; 33 – crest in F1: nut-shaped, in F2: 9/16 nut-shaped, 3/16 pink-shaped, 3/16 pea-shaped, 1/16 leaf–shaped; 34 - AaBb and aabb; 35 – F1: white plumage, F2: 13/16 white, 3/16 colored plumage; 36 – AABB and aabb; 27 – 25%; 38 – b – 6.25%; 39 – possible height in cm: 150, 155, 160, 165; 40 –; 41 –; 42 –; 43 – a) – 25%, b) – tricolor cats, red cats; 44 –; 45 – 50% of patients, 50% of healthy; 46 – 50% of sick boys; 47 – 50%; 48 –; 49 – a) 50%, b) – 100%, c) – 50%, all girls; 50 –; 51 – 12,5%; 52 –; II or III blood type; 53 – 2.45%.	