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MULTIPLE CHOICE QUESTIONS IN MEDICAL BIOLOGY

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Introduction

This multiple choice questions brochure corresponds to educational program in Medical Biology, developed on the basis of requirements provided by Ministry of Health and Ministry of Education and Science of Ukraine. It is designed for foreign medical students of Uzhhorod National University and presents the examples of solved multiple choice questions used for evaluation of students progress in the subject during year of study and not solved multiple choice questions for grading their knowledge on final exam.

Examples of solved multiple choice questions for Exam KROK are provided together with the list of Exam KROK multiple choice questions for individual solution by students. To eleviate the learning process, we presented solutions for most of the questions.

We hope that this educational edition can be useful for medical students and students of pharmacy, learning medical biology, for students of biological faculty and for all, who are interested in the subject.

B.M. Sharga

Acronims:

AI – Artificial Insemination;
ART – Assisted Reproduction Technologies;
CDK - Cyclin-Dependent Kinase;
FAP - Familial adenomatous polyposis;
PM – plasma membrane;
PKU – phenyl ketone uria;
Chr – chromosome;
STM - Scanning Tunelling Microscope;
SEM - Scanning Electron Microscope;
LM – Light Microscope;
TEM - Transmission Electron Microscope;
NGS – New Generation Sequencing;
NIPT – Non-Invasive Prenatal Testing;
FISH – Fluorescence In Situ Hybridization;
ZIFT – Zygote Intrafallopian Transfer;
GIFT – Gamete Intrafallopian Transfer;
IUT – Intra Uterine Transfer;
ICSI – Intra Cytoplasmic Sperm Injection;
SER - Smooth Endoplasmic Reticulum;
RER - Rough Endoplasmic Reticulum;
RBC(s) – Red Blood Cell(s);
MCV - Mean Cell Volume;
MCHC - Mean Cell Hemoglobin Concentration;
WHO – World Health Organization.

1. Microscopy, Cell, Organelles

1. What kind of a microscope allows to see and move the atoms? **A.*** STM; **B.** SEM; **C.** TEM; **D.** fluorescent light microscope; **E.** phase-contrast microscope.
2. Place the orders at 10 from the brackets: **A.** 1 mm = 10 m; **B.** 1 μm = 10 m; **C.** 1 nm = 10 m; **D.** 1 Å = 10 m; **E.** 1 pm = 10 m; (- 3; - 9; - 6; -10; -11).
3. What is not Light microscope type? **A.** bright-field; **B.** dark-field; **C.** phase-contrast; **D.** fluorescence; **E.*** STM.
4. Basic dyes are: **A.*** methylene blue; **B.*** basic fuchsin; **C.*** crystal violet; **D.*** safranin; **E.*** malachite green.
5. To differentiate between living and dead cells, we can use: **A.** trypan blue; **B.** methylen blue; **C.** erythrosine; **D.** propidium iodide; **E. *** all mentioned.
6. Write the magnification of microscopes from the brackets: **A.** STM…….. **B.** SEM……. **C.** LM…….... **D.** TEM…… (1500-2000; 10^8 ; 2×10^5; 5×10^5).
7. Write the resolution power (brackets) of : **A.** STM___ **B.** SEM___**C.** LM____ **D.** TEM___; (0,1-0,01 nm; 1 nm; 0.2μm; 1 nm).
8. Acid dyes are: **A.*** eosin; **B.*** rose Bengal; **C.*** acid fuchsin; **D.** safranin; **E.** malachite green.
9. The 1st compound microscope was built by **A.***Jans & Zacharia 1590; **B.** R. Hooke 1665; **C.** A. van Leeuwenhoek 1673; **D.** R.Virchow 1855; **E.** M.J. Schleiden 1839.
10. STM utilizes **A.*** curent between closest atoms; **B.** visible light; **C.** beams of electrons; **D.** UV light; **E.** IR light.
11. SEM utilizes **A.** small curent between atoms; **B.** visible light; **C.*** beams of electrons; **D.** UV light; **E.** IR light.
12. TEM utilizes **A.** small curent between atoms; **B.** visible light; **C.*** beams of electrons; **D.** UV light; **E.** IR light.
13. The distance between the center of the lens and the focal point is called the **A.***focal length; **B.** refractive index; **C.** focus; **D.** lens strength; **E.** bending distance.
14. Fixatives are: **A.** picric acid; **B.** acetic acid; **C.** glutaraldehyde; **D.** formaldehyde; **E.** all of mentioned.
15. If in fluorescence microscopy cell is subjected to green fluorescent molecules, that emit only green fluorescence, then filter of which color should be used between the objective and eyepiece? **A.** blue; **B.** red; **C.** yellow; **D.***green; **E.** orange.
16. The dark field microscopy is based on utilization of **A.*** special condenser, that prevents direct light from entering the lens and observer receives the light that has been scattered from the object; **B.** dark stains provides the black background only; **C.** black stain only; **D.** shading with heavy metals only; **E.** electron beam.
17. Confocal scanning microscope **A.*** at time illuminate the single focal plane of the object with laser; **B.*** sequencially illuminate different focal planes providing 3D image; **C.** usual light rays running in opposite directions; **D.** electron beam; **E.** UV light.

18. Transmissive electron microscopy utilizes speciments treated by **A.*** negative staining; **B.***positive staining; **C.** *shadow casting; **D.*** thin sectioning; **E.** *freeze facturing.
19. Gram staining **A.*** based on difference of peptidoglican content in cell walls of bacteria; **B.** stains used in1g quantities; **C.*** utilizes gencyan violet; **D.*** utilizes Lugole solution; **E.*** utilizes ethanol, water and fuchcine.
20. Calculate the magnification of your object: **A.** objective × 4 and eyepiece × 10; **B.** objective × 10 and eyepiece × 10; **C.** objective × 40 and eyepiece × 10; **D.** immersion objective × 90 and eyepiece × 10; **E.** immersion objective × 100 and eyepiece × 10.
21. Which of the following can be viewed in light microscope? **A.** ribosome; **B.** SER; **C.** RER; **D.*** mitochondria.
22. The fluid mosaic model of PM given by Singer and Nicolson is applicable to membranes: **A.*** Both prokaryotic and Eukaryotic; **B.** Prokaryotic; **C.** Eukaryotic; **D.** of organelles.
23. The phosphatidylserine residues are located at the: **A.*** inner leaflet of PM; **B.** outer leaflet of PM; **C.** evenly distributed on both leaflet of PM; **D.** varies according to cell types.
24. Which of the following types of cells would you expect to contain a high density of cytoplasmic intermediate filaments? **A.***Epithelial cells; **B.** Amoeba; **C.** sperm; **D.** plant cell.
25. Which organelle require intact membrane system for ATP synthesis **A.***chloroplast & mitochondria; **B.** proteasome; **C.** peroxisome; **D.** lysosome.
26. Which is true? **A.** * sterol lipids are common in human cell PM; **B.** sterols are common in bacterial PM; **C.** PM contain more than 70% proteins; **D.** The PM of all cells within an organism have the same lipid and protein composition.
27. Spherical subunits of eukaryotic chromatin composed of a core particle consisting of an octamer of histones and 146 nucleotide pairs are called: **A.** Lysosome; **B.*** Nucleosomes; **C.** Polysome; **D.** Centrosome.
28. Select the wrong statement: **A.** The chloroplasts are generally much larger than mitochondria; **B.*** Both chloroplasts and mitochondria have an internal compartment, the thylakoid space bounded by the thylakoid membrane; **C.** Both chloroplasts and mitochondria contain an inner and an outer membrane; **D.** Both chloroplasts and mitochondria contain DNA.
29. Who discovered the ER? **A. C.** Golgi; **B.***K. Porter; **C.** G.**E.** Palade; **D.** E. Chargaff.
30. The one and only eukaryotic organism without mitochondria: **A.** *Euglena*; **B.*** *Monocercomonoides*; **C.** *Amoeba*; **D.***Trypanosoma*..
31. The most common ancestor of all currently living humans is denoted as **A.** Mitochondrial haplogroups; **B.** Macro-haplogroup L; **C.** Mitochondrial Adam; **D.*** Mitochondrial Eve.
32. The Nucleolar Organizer Region (NOR) of human consists of: **A.** Chrs 13, 14, 15, 16 and 21; **B.** Chrs 12, 15, 16, 21 and 23; **C.** Chrs 14, 15, 16, 21 and 23; **D.*** Chrs 13, 14, 15, 21 and 22.

33. The Na+-K+ pump transports **A.** Na+ into the neuron and K+ out; **B.** Na+ and K+ out of the neuron; **C.** Na+ and K+ into the neuron; **D.** * K+ into the neuron and Na+ out.
34. The exchange of gases in lungs takes place by **A.** active transport; **B.** facilitated diffusion; **C.** *simple diffusion; **D.** both: **A.** and **B.**
35. Plasmodesmata is found in **A.** cell wall; **B.** Cytoplasm; **C. *** Cell membrane; **D.** Necleus.
36. Extracellular matrix includes **A.** elastins; **B.** collagens; **C.** proteoglycans; **D.*** spectrins.
37. Acrosome of sperm cell is a modified **A.** Peroxisome; **B.** None of these; **C.*** Golgi; **D.** Lysosome.
38. For the final processing of antigen, the macrophages after phagocytosis direct the engulfed material to: **A.** ER; **B.** Peroxisome; **C.** Proteasome; **D.*** Lysosome.
39. Which one of the following is NOT found in the mitochondrial matrix? **A.** Double-stranded; **B.** DNA RNA; **C.** Ribosome; **D.*** Single-stranded DNA.
40. The organelle involved in the apoptosis is **A. *** Mitochondria; **B.** Lysosome; **C.** ER; **D.** Golgi.
41. Match: **A.** prokaryotic ribosome; **B.** eukaryotic ribosome; **C.** ***E. coli***; **D.** human; **i)** 70S **ii)** 80S **iii)** 50 and 30S **iv)** 60 and 40S.
42. The average size (in nm) of prokaryotic 70S ribosomes is: **A.** 30; **B.*** 20; **C.** 40; **D.** 50.
43. *Drosophila* sperm nebenkern is a modified **A.** lysosome; **B. *** mitochondria; **C.** Golgi; **D.** nucleus.
44. Lysosomes are known as the 'suicidal bags' because of the: **A.** parasitic activity; **B.** presence of food vacuole; **C. *** hydrolytic activity; **D.** catalytic activity.
45. Post-translational modification occurs in: **A.** Mitochondria; **B.** Nucleus; **C.*** ER and Golgi; **D.** ER.
46. Integrins are membrane proteins: **A.** that are involved in ion transport; **B.** that are involved in sugar transport; **B.*** that mediate cell adhesion; **C.** faced to internal cell environment; **D.** that are found at the membrane-cytoplasm interface.
47. An integral membrane protein can be extracted with: **A.** a buffer of alkaline or acid pH; **B.** a chelating agent that removes divalent cations; **C.*** a detergent solution; **D.** a solution of high ionic strength.
48. Movement of water across membranes is facilitated by proteins called: **A.** annexins; **B.** hydropermeases; **C. *** aquaporins; **D.** selectins; **E.** transportins.
49. ABC transporters are not known to facilitate the following process: **A.** moving cancer drugs out of cancer cells; **B.** moving antibiotics out of bacteria; **C. *** moving vitamin E into lipocytes; **D.** moving chloride ions in the lung; **E.** moving membrane lipids from the inner leaflet to the outer leaflet.
50. The type of membrane transport that uses ion gradients as the energy source is: **A.** facilitated diffusion; **B.** passive transport; **C. *** secondary active transport; **D.** primary active transport; **E.** simple diffusion.

51. Outermost thin living protective layer of animal cell is **A.*** cell membrane/ plasma membrane; **B.** cell wall; **C.** Cell barrier; **D.** Cell Layer.
52. Bacterial cell wall is mainly composed of **A. *** peptidoglycan; **B.** glycoprotein; **C.** glycan; **D.** muropeptides.
53. Outermost thick dead protective layer of plant and bacterial cell are called as **A.***cell; wall; **B.** cell membrance; **C.** cell layer; **D.** cell barrier.
54. The eukaryotic cell walls and animal cell extracellular matrices **A.** are inflexible; **B.*** They are built to a common overall structure that can be described as 'fibres in a matrix'; **C.*** Their protein components are synthesized by ribosomes of the RER; **D.** They limit the diffusion into the cell.
55. The cell walls of bacteria and eukaryotic cells have the same general function of **A.***preventing cell lysis in hypotonic environments; **B.** diffusion; **C.** active transport; **D.** endo- and exocytosis.
56. The fibronectins **A.** are involved in signaling; **B.*** have an essential role in linking the extracellular matrix to its underlying cells; **C.** are connected to the cytoskeleton; **D.***are disulphide linked dimers, with each polypeptide composed of a number of binding domains joined together by short flexible segments.
57. Which of the following eukaryotic cell wall components are nitrogenous compounds?**A.***chitin; **B.** β- 1,3 glucans; **c)** pectin; **D.** lignin.
58. Membrane fusion leading to neurotransmitter release requires the action of: **A.** cadherins; **B.** selectins; **C.** flipases; **D.*** tSNARE and vSNARE.
59. Which of the following are mineralized biological structures/mateials? **A.***bone; **B.*** Diatom cell walls; **C.** glycosaminoglycans; **D.** the pectins of plant cell.
60. What is used to distinguish between living/viable and dead/non-viable cells to assess the viability of a cell culture **A.***metylene blue; **B.** Gram staining; **C.***erythrosine; **D.***trypan blue.
61. The site of cellular respiration in prokaryotes is **A.** rhibosome; **B.** chrs; **C. *** PM; **D.** nucleus.
62. The organelle that helps in penetration of sperm into egg during fertilization is **A.** nucleus; **B.** peroxisome; **C. ***lysosome; **D.** mitochondrion.
63. Conversion of fatty acids to carbohydrates takes place in **A.** nucleus; **B.** peroxisome; **C. *** Glyoxysomes; **D.** mitochondrion.
64. H_2O_2 clearance inside the cells is carried out by **A.** glyoxysomes; **B.** peroxisome; with enzyme peroxidase; **C. *** peroxysome with enzyme catalase; **D.** peroxysome with enzyme amino oxidas**e.**
65. Facilitated diffusion through a biological membrane is: **A.** driven by ATP; **B.** *driven by a difference of solute concentration; **C.** endergonic; **D.** generally irreversible; **E.** not specific with respect to the substrat**e.**
66. Membrane proteins are: **A.** sometimes covalently attached to lipid; **B.** * have all of the properties listed; **C.** composed of the same 20 amino acids found in soluble proteins; **D.** diffuse laterally in the membrane unless they are anchored; **E.** are sometimes covalently attached to carbohydrat**e.**
67. The shortest α helix protein segment spaning a PM has ≈ **A.**5; **B.*** 20; **C.** 50; **D.** 10; **E.** 7 amino acid residues.

68. A process not involving the fusion of 2 membranes or 2 regions of the same membrane is: **A.** endocytosis; **B. ***entry of glucose into cells; **C.** entry of enveloped viruses into cells; **D.** exocytosis.
69. The specificity of the potassium channel for K+ over Na+ is mainly the result of the: **A.** hydrophobicity of the channel; **B.*d**ifferential interaction with the selectivity filter protein; **C.** phospholipid composition of the channel; **D.** presence of carbohydrates in the channel; **E.** presence of cholesterol in the channel.
70. Place in correct order the function of each: **i)** ribosome; **ii)** chloroplast; **iii)** Golgi; **iv)** mitochondria; **A.** carbohydrate synthesis; **B.** translation; **C.** secretory centre; **D.** β-oxydation.
71. rRNA synthesis takes place in **A.** *nucleolus; **B.** nucleus; **C.** cytoplasm; **D.** rybosomes.
72. Which of the following organelles contain coding DNA **A.***chloroplast, mitochondrion and nucleus; **B.** chloroplast; **C.** mitochondrion; **D.** nucleus.
73. The cell theory was postulated by **A.** Matthias J. Schleiden **B. *** all of them; **C.** Rudolf Virchow; **D.** Theodor Schwann.
74. The 1st culture of human cells was begun by George Gey (Johns Hopkins Univ.) in 1951. It was culture of **A.** squamous epithelium cells; **B. *** HeLa cells; **C.** liver cells; **D.** hepatocytes.
75. The *microvilli* containing cells are **A.***epithelial layer of cells lining the inner intestinal wall; **B.** squamous epithelium cells; **C.** gonial cells; **D.** cancer cells.
76. The stalked particles that project from the mitochondrion inner membrane in a shape of mushrooms are the sites of **A.*** ATP synthesis; **B.** pinocytosis; **C.** translation; **D.** phagocytosis.
77. Prokaryotes are essentially devoid of membranous organelles. Exceptions: **A.*** mesosomes; **B.*** photosynthetic membranes; **C.** nucleoid; **D.** nucleolus.
78. Nucleus contains chromosomes and numerous smaller structures: **A.*** Cajal bodies; **B.*** gemini of coiled bodies (GEMS); **C.*** interchromatin granule clusters (“speckles”); **D.** mesosomes.
79. The rough endoplasmic reticulum (RER) engaged in **A.*** protein synthesis; **B.*** proteins glycosylation; **C.** protein transport to transitional portion of SER; **D.** DNA synthesis.
80. The oligosaccharide chains of glycoproteins are modified in the Golgi cisternae **A.** cis; **B.** medial; **C.** trans; **D.*** in all of these.
81. Smooth endoplasmic reticulum (SER) synthesizes **A.**lipids; **B.**phospholipids; **C.**steroids; **D.*** all of thes**e.**
82. SER **A.*** detoxifies drugs, alcohol, poisons; **B.*** adds and modifies carbohydrates; **C.*** divides the media for independent reactions; **D.*** transports substances into/out of the cells.
83. The Nobel Prize in Physiology or Medicine 2013 was awarded for discoveries of **A.*** machinery regulating vesicle traffic, a major transport system in our cells; **B.** osmosis; **C.** apoptosis; **D.** cell lysis.

84. Deficiency of plasma thromboplastin component as blood clotting factor leads to **A.** * Christmas disease; **B.** Stuart disease; **C.** Thrombocytopenia; **D.** Thrombosis.
85. 80S large subunit of eukaryotic ribosome composed of **A.***28S 5.8S 5S 18S; **B.** 29S + 5S + 5.8S; **C.** 16S+17S + 5S; **D.** 25S + 5S + 5.8S.
86. Glucose transport into erythrocytes is an example of: **A.***facilitated diffusion; **B.** antiport; **C.** electrogenic uniport; **D.** active transport; **E.** symport.
87. Which NaCl solution leads to the red blood cells shrinkage? **A.*** hypertonic; **B.** hypotonic; **C.** isotonic; **D.** ultratonic.
88. What best describes endocytosis? **A.** cell infection by intracellular form of parasite; **B.** cell infection by intracellular bacteria; **C.** cell apoptosis; **D.*** These are pinocytosis (cell drinking) and phagocytosis (cell eating) of large polar molecules, macromolecular complexes and some bacteria or viruses.
89. Which is NOT included to the 'Absolute values' for RBC indices? **A.** MCV **B.** MCHC **C.** MCH **D.** *aggregation test.
90. Coated pits in plasma membrane are regions of receptor-mediated endocytosis. The surfaces of the pits are coated with **A.*** clathrin; **B.** calcium; **C.** integrin; **D.** all of these.
91. The pH in early endosome is **A.** 2.2-3.2; **B.*** 6.0-6.5; **C.** 4.0-4.5; **D.** 3.0-3.5.
92. The pH in late endosome is **A.***4.5-5.5; **B.** 2.2-3.2; **C.** 6.0-6.5; **D.** 3.0-3.5.
93. Lipid rafts are subdomains of PM **A.** that are low in content of cholesterol; **B.** that are low in content of glycosphingolipids; **C.** that are low in content of cholesterol; and high in content of glycosphingolipids; **D.*** that are high in content of cholesterol and glycosphingolipids. These regions are resistant to extraction with non-ionic detergents.

2. Cell Cycle, Mitosis, Regeneration

1. Which of the following sequence correctly describes the cell cycle? **A.** Cytokinesis → Mitosis → G1 → G2; **B.** M → G1 → G2 → Cytokinesis; **C.** G1 → G2 → M → Cytokinesis; **D.*** S → G2 → M → Cytokinesis → G1.
2. In human somatic cells, the number of kinetochore after the S phase of cell cycle is: **A.***92; **B.** 46; **C.** 23; **D.** 40.
3. The shortest phase of the cell cycle is: **A.** Telophase; **B.** Metaphase; **C.** Prophase; **D.***Anaphase.
4. Which is the most variable stage of the cell cycle? **A.**S phase; **B.**G2 phase; **C.***G1 phase; **D.** M phase.
5. The DNA replication in the heterochromatic region of a cell is completed during phase **A.*** G2; **B.** S; **C.** M; **D.** G1.
6. The synthesis of histones in eukaryotic cells occurs during phase: **A.***S; **B.**G2; **C.** M; **D.** G1.
7. The longest phase of cell cycle is: **A.*** Prophase; **B.** Telophase; **C.** Metaphase; **D.** Anaphas**e.**

8. Which of the following statement is true? **A.*** CDKs are inactive in the absence of a partner cyclin; **B.** Cyclin possess catalytic activity in the presence of GTP; **C.** CDK is not necessary to regulate the cell cycle checkpoints; **D.** In Eukaryotes only one Cyclin and many CDKs are present.
9. The active Cyclin-CDK complex regulates the cell cycle through: **A.*** phosphorylation of specific proteins; **B.** Methylation of specific proteins; **C.** Cleavage of specific proteins; **D.** Dephosphorylation of specific proteins.
10. The first cyclin produced in the cell cycle, in response to extracellular signals is: **A.*** Cyclin D; **B.** Cyclin E; **C.** Cyclin B; **D.** Cyclin A.
11. Which of the following cyclin-CDK complex initiates the degradation of nuclear membrane during the cell cycle? **A.***Cyclin B-CDK1; **B.** Cyclin D-CDK4; **C.** Cyclin E-CDK2; **D.** Cyclin A-CDK4.
12. Which of the following is not an actual cell cycle checkpoint? **A.*** S checkpoint; **B.** M checkpoint; **C.** Spindle checkpoint; **D.** G1 checkpoint.
13. Spindle assembly checkpoint operates at: **A.*** End of metaphase; **B.** Beginning of Anaphase; **C.** End of anaphase; **D.** End of G2 phas**e.**
14. Which of the following statements is true about cyclins and CDK: **A.***CDKs are constitutively expressed in cells; Cyclins are synthetized at specific stages of the cell cycle; **B.** CDKs and cyclins are synthesized at specific stage of the cell cycle; **C.** Both synthesized at G0 phase; **D.** Both groups are oligonucleotides.
15. The activities of protein kinases are regulated by **A.***cyclins; **B.** vitamins; **C.** water; **D.** by number of chromosomes.
16. The cdc 2 kinase is produced at the end of **A.*** G1 and G2; **B.** G1 and M; **C.** G0; **D.** G2 and M.
17. The compaction of the chromosomes takes place after **A.*** H1 histones phosphorylation; **B.**phosphorylation of nuclear lamines; **C.** phosphorylation of transcription factors; **D.** cytokinesis.
18. The fusion of G1 and S stages cells induces **A.***replication in G1 nucleus; **B.** mitosis; **C.** cytokinesis; **D.** division of the nucleus.
19. The M phase is triggered in embrio cells of frog and several invertebrates by activation of protein kinase **A.***MPF; **B.** cdc2; **C.** p53; **D.** p21.
20. The cdc2 kinase is active at the end of **A.***G1 and G2; **B.** only G1 and M; **C.** G2 and M; **D.** cytokinesis.
21. To be active cdc2 kinase of yeast must be phosphorylated **A.***at threonine residue Thr 161; **B.** Thr 14; **C.** Tyr 15; **D.** Thr 14 and Tyr 15.
22. In somatic cell cycle the DNA synthesis take place in **A.** G1; **B.** G2; **C.** *S phase; **D.** prophas**e.**
23. In somatic cell cycle **A.** in G1 DNA content is double the amount of DNA present in the original cell; **B.** G2 phase follows mitosis; **C.** short interphase is followed by a long mitotic phase; **D.***DNA replication takes place in S phase.
24. Microtubule is involved in the **A.***cell division; **B.** DNA recognition; **C.** muscule contraction; **D.** membrane contraction.

25. Best material for study of mitosis by students in laboratory is **A.** squamous cells; **B.** ovary; **C.** testes; **D.** *root tip cells.
26. Which one of the following precedes reformation of the nuclear envelope during M phase of cell cycle? **A.***contractile ring and fragmoplast formation; **B.** decondensation of chromosomes; **C.** reassembly of nuclear laminae; **D.** formation of contractile ring and transcription of chromosomes.
27. A cell divides every one minut**e.** At this rate it can fill a 100 ml of beaker in one hour. How much time does it take to fill a 50 ml of beaker? **A.** 29; **B.** 30; **C.***59; **D.** 60 min.
28. Cell plate formation present in **A.** bacterial; **B.** mycoplasmal; **C.** animal; **D.***plant cells.
29. Which is the typical stage for DNA replication? **A.** *S-phase; **B.** G1-phase; **C.** G2-phase; **D.** metaphas**e.**
30. The marked drop in protein synthesis and virtual sessation of RNA synthesis was noted during stage **A.***M; **B.** S; **C.** G1; **D.** G2.
31. Histones and their mRNA synthesis take place almost exclusively in phase **A.***S; **B.** M; **C.** G1; **D.** G2.
32. Nucleus must migrate to cell center in vacuolated plant cells **A.** in telophase; **B.** before anaphase; **C.** after profase; **D.***before prophac**e.**
33. Once replication is completed, the mRNA for histones are **A.** selectively destroyed; **B.** masked and preserved; **C.** replicated by RNA polymerase; **D.** replicated into cDN**A.**
34. The 4 events (i. Replicated chrs, each consisting of 2 chromatids condence and become visible; ii. Microtubules are assembled into mitotic spindle; iii. nucleolus and nuclear envelope disappear; iv. Centriole moves to opposite poles) take place during **A.***prophase; **B.** metaphase; **C.** anaphase; **D.** telophase.
35. At which stage of mitosis the spindle fibers attached to kinetochores (small disc-shaped structures at the surface of centromers) of chrs and chromosomes line up at the equator of the spindle to form metaphase plate? **A.** prophase; **B.*** metaphase; **C.** anaphase; **D.** telophas**e.**
36. At which stage of mitosis the centromeres split, chromatids separate and move to opposite poles? **A.** prophase; **B.** metaphase; **C.*** anaphase; **D.** telophase.
37. At which stage of mitosis the chromosomes gather at opposite poles, nuclear envelopes assembles around chromosome clusters, nucleolus, ER, Golgi complex reform? **A.** prophase; **B.** metaphase; **C.** anaphase; **D.*** telophase.
38. Cytokinesis is the **A.** cell movement; **B.*** division of protoplast of the cell into two daughter cells after karyokinesis (nuclear division); **C.** cell growth; **D.** cytoplasm movement.
39. Appearance of furrow in plasma membrane which deepens and joins in the centre dividing cell cytoplasm into two is **A.*** animal cytokinesis; **B.** plant cytokinesis; **C.** bacterial division; **D.** viral budding.
40. Formation of new cell wall begins with the formation of cell plate which represents the middle lamella between the walls of two adjacent cells.

A. animal cytokinesis; **B.*** plant cytokinesis; **C.** bacterial division; **D.** viral budding.

41. Mitosis is significant for **A.** growth by addition of cells; **B.** maintenance of surface/volume ratio and chrs number; **C.** regeneration, repear and wound healing; **D.** reproduction in unicellular organism; **E.** all of these.
42. The fusion of mitotic and non-mitotic HeLa cells in G1 results in production of **A.*** long non-doubled condenced chromosomes; **B.** long doubled condenced chromosomes; **C.** pulverized chromosomes; **D.** normal doubled chromosomes.
43. The fusion of mitotic and non-mitotic HeLa cells in G2 results in production of **A.** long non-doubled condenced chromosomes; **B.*** long doubled condenced chromosomes; **C.** pulverized chromosomes; **D.** normal doubled chromosomes.
44. The fusion of S nucleus and M stages HeLa cells induces **A.** replication in G1 nucleus; **B.***production of pulverised chromosomes; **C.** production of single stranded long chromosomes; **D.** production of double long chromosomes.
45. The patients with scleroderma produce antibodies against **A.*** centromere proteins of metaphase chromosome; **B.** spindle proteins; **C.** aster proteins; **D.** centriole proteins.
46. Ataxia talangiectasia is treated by **A.*** the inhibitors of cell cycle; **B.** mitotic cyclins; **C.** cyclins of cytokinesis; **D.** cyclins of S phas**e.**
47. The wee 1 kinase inhibits ativity of **cdc 2** kinase by phosphorilation of **A.*** Thr 14 and Tyr 15; **B.** Thr 161; **C.** Thr 14; **D.** Tyr 15.
48. The **cdc25** phosphatase makes **cdc 2** kinase active again by removing phosphates from **A.*** Thr 14 and Tyr 15; **B.** Thr 161; **C.** Thr 14; **D.** Tyr 15.
49. CAK activates **cdc 2** kinase by phosphorilation of **A.** Thr 14 and Tyr 15; **B.*** Thr 161; **C.** Thr 14; **D.** Tyr 15.
50. Mitotic chromosome can fluoresce when illuminated by excitation light following the treatment with **A.*** daunomycin; **B.***ethydium bromide; **C.** topoisomerase II; **D.** helicase.
51. Which cells can't be induced to division? **A.** lymphocyte; **B.** human liver cell; **C.** stem cell; **D.*** erythrocyte.
52. Which cells can be induced to division? **A.*** lymphocyte; **B.*** human liver cell; **C.** stem cell; **D.** erythrocyte.
53. The DNA damage activates genes **A.** p53; **B.** Hus; **C.** Rad; **D.*** all of mentioned. Major checkpoints in the cell cycle are **A.** at G1-S transition; **B.** at G2-M transition; **C.** in M phase; **D.*** A, B, **C.**
54. Match production of cyclins and cell cycle phases: **A.** cyclin D and E; **B.** cyclin A; **C.** cyclin B; **i)** phase G1; **ii)** phase S; **iii)** phase G1.
55. Cyclin D activates the **A.*** Cdk 1; **B.*** Cdk 2; **C.*** Cdk 4; **D.*** Cdk 5.
56. Cyclin E activates the **A.** Cdk 1; **B.***Cdk 2; **C.** Cdk 4; **D.** Cdk 5.
57. The organelles fragmented during mitosis are **A.** mitochondria; **B.** lysosomes and peroxysomes; **C.** chloroplasts; **D.***Golgi complex and endoplasmic reticulum.

58. Mitosis can take place in cells which are **A.*** diploid and haploid cells; **B.** diploid only; **C.** haploid only; **D.** tetraploid only.
59. Kinetochore is the **A.** attachment site for microtubules of spindle; **B.** plate like structure; **C.** residence site of motor proteins; **D.*** all of thes**e.**
60. The miniature functioning organ-like structures are called; **A.*** organoids; **B.**young organs; **C.** organ mini-copies; **D.** a, b, c
61. Brain neural stem cells differentiate into **A.*** specialized brain cells only; **B.** brain cells and specialized skin cells; **C.** all types of specialized cells; **D.** specialized blood cells.
62. Up to day several organs were grown *in vitro* **A.** uterus, urinary bladder; **B.** liver, gal bladder; **C.** small kidney and beating small heart; **D.** trachea, lung, skin; **E*** all of these.
63. 2D cell culture method was invented by **A.*** Wilhelm Roux in 1885; **B.** F. Crick and J. Watson 1953; **C.** A.Fleming 1942; **D.** K.Mullis 1985.
64. The extracellular matrix is substituted in artificial cell media by **A.***hydrogels; **B.** chemical meshes; **C.** bones; **D.** muscles.
65. Which cell cultures can be used for replication of viruses and production of antiviral vaccines **A.** mammalian; **B.** avian; **C.** plant; **D.** microbial **E.** all of these.
66. The method for maintaining of whole embryo, organ or organoid is called **A.*** organ culture; **B.** tissue culture; **C.** single cell culture **D.** batch culture.
67. The optimum pH for culturing of mammalian cells is **A.** 2.2-4.2; **B*** 7.2-7.4; **C.** 8.0-9.2; **D.** differ for different species.
68. Which culture is used to grow explanted tissues **A*** tissue culture; **B.** organ culture; **C.** cell culture; **D.** single cell culture.
69. Haemopoetic cells derived from blood, spleen and bone marrow are usually cultivated as **A.*** suspension cells; **B.** adherent cells; **C.** living cells; **D.** tissue.
70. Usually, cells derived from tissues are cultivated as **A.** cell suspension culture; **B.** floted tissue; **C.** adherent to the glass of culture vessel; **D.** adherent to the surface of hydrogel.
71. Repetitive regeneration can be seen in **A.** Molluscs; **B.** Tadpole; **C.*** Hydra; **D.** None of these.
72. The method of asexual reproduction that can be called as a mode of regeneration is **A.*** fragmentation; **B.** budding; **C.** sporulation; **D.** binary fission.
73. Regeneration can be seen in which of the following **A.** *Plasmodium*; **B.** *Spongilla*; **C.** Earthworm; **D.*** Starfish.
74. Which of the following organs can be regenerated in Echinodermata? **A.** Eyes; **B.** Pedicellariae; **C.*** Arms and disc; **D.**Digestive system.
75. The damaged leg is not regenerated in___. **A.** *Frog; **B.** Crab; **C.** Salamander; **D.** Frog's tadpole.

76. The repair by cell division in the damaged tissue is called ____. **A.** Exponential growth; **B.** Deaccelerating growth; **C.*** Epimorphosis regeneration; **D.** Morphallaxis regeneration.

77. Restorative regeneration is ___. **A.** Healing of wounds; **B.** Formation of a new entity from a piece of the body of the parent; **C.*** A regular process in which the dead and worn-out cells of some organs are continuously replaced by new cells; **D.** All of these.

78. Ability to give rise to a new individual entity from body parts is **A.** Reproduction; **B.** Fragmentation; **C.*** Regeneration; **D.** Fission.

79. Regeneration of a limb or tail is an example of **A.*** Epimorphosis; **B.** Autotomy; **C.** Compensatory hypertrophy; **D.** Morphallaxis.

80. Epimorphosis is regeneration through **A.** The repatterning of existing cells as seen in hydra; **B.*** The reinitiation of division in existing cells, followed by patterning, as occurs in amphibians such as newts; **C.** The repatterning of existing cells as seen in amphibians; **D.** The reinitiation of embryonic growth from remaining cells as seen in Hydra.

81. Growth occurs through **A.** increases in cell size; **B.** increases in cell number; **C.** increases in the volume of extracellular matrix between cells; **D.** substitution of died cells by new cells; **E.*** all of mentioned.
82. Neurons, red blood cells, and keratinocytes are not dividing. In which stage of cell cycle are they live? **A.***G0 phase; **B.** S stage; **C.** G1; **D.** G2.
83. The amount of DNA in the nucleus controls the cells volume: the more DNA, the larger volume. What do experiments with tetraploidy in salamanders tell us about growth control?
    A.* The animals grow to a normal size, and contain only half as many cells, indicating that growth is regulated at the level of absolute size, rather than cell number.
    B. The animals grow to twice the normal size, indicating that growth is regulated at the level of the number of cells present.
    C. The animals end up with cells that are twice as big, but only half as many, resulting in an animal that is half its normal size, indicating that the number of cells is the critical determinant of growth.
    D. The animals grow to a normal size, and contain only half as many cells, indicating that growth is regulated by the total amount of DNA present in an organism.
    E. The animals form tadpoles that are twice as big as usual, but die during metamorphosis, indicating that the abnormal ploidy is incompatible with adult survival.
84. Disease, injuries, and birth defects that compromise the function of the pituitary may lead to decreased stature (height). What treatment might be prescribed, and what would be its rationale? **A.***Loss of pituitary function could lead to decreased growth hormone production, and hence short stature;

recombinant human growth hormone might be prescribed. **B.** Since growth hormone controls growth hormone releasing hormone and somatostatin production in the hypothalamus, its absence would be compensated for by administration of those hormones. **C.** Since the pituitary is responsible for secretion of luteinizing hormone and follicle stimulating hormone, both of which are required for normal fertility, replacement therapy with these hormones may be prescribed for fertility problems, but no therapy would be possible for the short stature. **D.** Since growth hormone controls growth hormone releasing hormone and somatostatin production in the hypothalamus, its absence would be compensated for by administration of those hormones. **E.** Since the pituitary is located under the brain, above the roof of the mouth, no intervention is possible since this location is hard to reach.

85. Adult human bone **A.** grows only at the extreme ends (epiphysis); **B.** grows only in the center (diaphysis); **C.*** grows only at the growth plates between the epiphysis and the diaphysis; **D.** grows throughout its length; **E.** does not grow at all after maturity is reached.

86. Cancer is believed to often arise from stem cells, rather than fully differentiated cells. Which of the following are consistent with this view? **A.** Stem cells are actively dividing and express few differentiated functions, so they may have fewer changes to undergo than do fully differentiated cells in becoming cancer cells; **B.** Osteoblasts are the proliferating precursors of the chondrocytes; **C.** Osteoblasts are maturing chondrocytes, capable of secreting the cartilage present in the growth plate; **D.** Osteoblasts are enlarged chondrocytes present in the hypertrophic zone of the growth plate; **E.** *All of the above are reasons that cancer cells may more readily arise from stem cells than from fully differentiated cells.

87. Is there a difference between oncogenes and tumor suppressor genes? **A.** Stem cells are actively dividing and express few differentiated functions, so they may have fewer changes to undergo than do fully differentiated cells in becoming cancer cells; **B.** DNA replication is necessary for mutations to occur, and stem cells are replicating their DNA whereas differentiated cells are for the most part not replicating their DNA; **C.** Teratocarcinomas are tumors that arise from germ cells or embryonic stem (ES) cells, under certain circumstances, demonstrating that tumors can arise from stem cells without further mutation; **D.** *Yes, oncogenes are mutated versions ofgenes that promote abnormal cell division (such as *ras* and *myc*), whereas tumor suppressor genes are genes that normally hold cell division in check when it is not appropriate (such as *Rb* and *p53*); **E.** All of the above are reasons that cancer cells may more readily arise from stem cells than from fully differentiated cells.

88. What are osteoblasts? **A.** Osteoblasts are the stem cells that give rise to chondrocytes; **B.** Osteoblasts are the proliferating precursors of the chondrocytes; **C.** Osteoblasts are maturing chondrocytes, capable of secreting the cartilage present in the growth plate; **D.** Osteoblasts are enlarged

chondrocytes present in the hypertrophic zone of the growth plate; **E.***Osteoblasts are bone-forming cells that derive from stem cells in the bone marrow, and therefore have no lineage relationship to chondrocytes.

89. Insects such as *Drosophila* undergo three molts before becoming a pupa and undergoing metamorphosis. Molting, which is also called 'ecdysis', is controlled by what hormone? **A*.** ecdysone; **B.** juvenile hormone; **C.** cytokinin; **D.** auxin; **E.** growth hormone.
90. Metamorphosis of amphibians is triggered by environmental cues that act on the: **A.** thyroid; **B.** pituitary; **C *** hypothalamus; **D.** eye; **E.** embryo.
91. Cells are able to divide only fixed number of times in culture, that reflects the relative life-span of the organism, because: **A.** conditions *in vitro* and *in vivo* are identical; **B*** in each organism, the number of cells divisions are genetically determined, than the organism undergoes senescence and dies; **C.** the cells of different species grow not all equally *in vitro*; **D.** cells in culture live for the same age as the organism of their origin; **E.** cells in old culture are faced to the same oxidative damage, that leads to aging in the organism.
92. Which is consistent with a model for aging in which DNA damage cause senescence and aging? **A.** The DAF-16 protein of *C. elegans* acts as stress responses activator; **B.** Dietary restriction reduces the production of DNA-damaging free radicals in the mitochondria; **C.** Werner's syndrome is a premature aging, possibly due to a defect in DNA repair; **D.** None of these corresponds to a model for aging and senescence; **E.*** All of these are in accordance to a aging model based on DNA damage.
93. Epimorphosis is regeneration through: **A.** repatterning of existing cells, as occurs in *Hydra*; **B.** the reinitiation of division in existing cells, followed by patterning, as occurs in *Hydra*; **C.** *the reinitiation of division in existing cells, followed by patterning, e.g., as in newts; **D.** repatterning of existing cells, as occurs in amphibians; **E.** reinitiation of embryonic growth from the remaining cells, as in Hydra.
94. When the blastema forms after amputation of a newt limb, what processes must the cells undergo in order for regeneration to occur? **A.** The cells must only begin to divide for regeneration to occur; **B.** The cells must simply dedifferentiate in order for regeneration to occur; **C.** The overlying wound epidermis takes on a role similar to that of the apical ectodermal ridge in normal limb development, and limb regeneration can then occur; **D.** Some cells in the blastema will transdifferentiate after amputation, and this allows regeneration to proceed; **E.*** Dedifferentiation, cell division, transdifferentiation, and formation of an AER-like function are all involved.
95. If the nerve supply to a newt limb is severed before amputation, how will this affect regeneration? **A.** It will have no effect, since regeneration involves growth of new muscle, bone, and connective tissue; **B.** Regeneration of most tissues will occur normally, but regeneration of the nerves will not occur; **C.** Outgrowth will occur, but the identity of the limb will be lost and normal proximo-distal patterning will not occur; **D.*** A blastema will form but will not

grow, and regeneration will fail; **E.** No regeneration occurs, and the stump heals over as it would in a mammal.

96. 'Intercalary growth' in a regenerating amphibian limb means that if a distal blastema is grafted to a proximal stump: **A.** the distal blastema grows back, to regenerate proximal elements, then out, to regenerate distal structures; **B.*** the stump grows out to regenerate proximal structures, until the positional values of the blastema are produced, at which time the distal blastema takes over and completes outgrowth of distal structures; **C.** the distal blastema grows out, regenerating distal structures, resulting in a limb lacking intermediate structures; **D.** the distal blastema grows proximally, intercalating intermediate structures between it and the stump, then growth stops, resulting in a regenerate lacking distal structures; **E.** the stump grows out, intercalating intermediate structures between it and the distal blastema, then growth stops, resulting in a regenerate lacking distal structures.
97. How does the dose-dependence of retinoic acid treatment support the notion that a gradient of retinoic acid can act as a morphogen along the proximo-distal axis in the limb? **A.** Treatment with high levels of retinoic acid causes a proximal blastema to be respecified as a distal blastema, and only distal structures are regenerated; **B.** Treatment with high levels of retinoic acid causes any blastema to form only distal structures; **C.** Treatment with high levels of retinoic acid causes any blastema to be respecified as a proximal blastema, but it will form only proximal structures; **D.*** Treatment with high levels of retinoic acid causes a distal blastema to be respecified as a proximal blastema, and regeneration of a full limb may be initiated from proximal values; **E.** Treatment with retinoic acid affects only distal blastemas, and causes them to form only proximal structures.
98. What is especially exciting about research into regeneration in zebrafish? **A.** Treatment with high levels of retinoic acid causes a proximal blastema to be respecified as a distal blastema, and only distal structures are regenerated; **B.** Removal of the eye results in regeneration of the eye, and since zebrafish and humans have very similar eyes, this research may lead to new therapies for eye damage in humans; **C.*** Limited regeneration of heart muscle can occur in zebrafish, and the ability to study zebrafish genetically will enhance our ability to understand the genetic basis of regeneration; **D.** Treatment with high levels of retinoic acid causes a distal blastema to be respecified as a proximal blastema, and regeneration of a full limb may be initiated from proximal values; **E.** Treatment with retinoic acid affects only distal blastemas, and causes them to form only proximal structures.
99. Is regeneration in *Hydra* similar to regeneration in vertebrates, or is it fundamentally different in some way? **A.*** Regeneration in *Hydra* occurs through a repatterning of existing cells by morphallaxis, unlike regeneration in vertebrates, which occurs through epimorphosis; **B.** Regeneration in *Hydra* occurs through the reinitiation of cell division in existing cells, followed by repatterning of those cells, very much like regeneration in

vertebrates; **C.** Regeneration in *Hydra* occurs through the reinitiation of cell division in existing cells, followed by repatterning of those cells, which is totally different from regeneration in vertebrates; **D.** Regeneration in *Hydra* occurs through the reinitiation of cell division in existing cells, followed by repatterning of those cells, whereas regeneration in vertebrates occurs through a process of repatterning of existing cells; **E.** Regeneration in *Hydra* occurs through the reinitiation of embryonic growth and patterning, in contrast to regeneration in vertebrates which occurs through a process of epimorphosis.

100. What molecular marker of head identity is found in the apical tip of a *Hydra* during head regeneration? **A.** Hox genes from the 3' (anterior) end of the *Hydra* Hox complex; **B.** A bud characteristic of the budding region; **C.** BMPs; **D.** Nodal; **E.*** Wnt.
101. Puberty is initiated by pulse release of _____hormone. **A.** somatostatin; **B.** Growth hormone; **C.*** Gonadotropin-releasing hormone; **D.** Insulin-like growth factors; **E.** Growth hormone-releasing hormone.
102. What statement is correct when comparing morphallaxis and epimorphosis? **A.** Epimorphosis: a new boundary is established at the cut and the positional values are changed; **B.** In epimorphosis, regeneration occurs by repatterning of existing tissue; **C.** *Regeneration of amphibian limbs involves epimorphosis; **D.** In planarians, only morphallaxis is involved in regeneration; **E.** All of these.

3. Meiosis

1. Cells in which chromosomes are in one set is classified as **A.*** haploid; **B.** diploid; **C.** benign; **D.** stem cells.
2. The production of gametes takes place by **A.** mitosis; **B.*** meiosis; **C.** meiosis than mitosis; **D.** mitosis than meiosis.
3. What is correct about meiotic cell division **A.*** 1 replication and 2 divisions; **B.** 2 replications and 1 division; **C.** 2 replications and 2 divisions; **D.** 1 replication and 1 division.
4. The type of meiosis occurring in protists and fungi is **A.** terminal; **B.** zygotic; **C.***sporic; **D.** intermediate meiosis.
5. Feature of meiosis I is **A.***separation of homologous chromosomes; **B.** separation of chromatids; **C.** duplication of DNA content; **D.** movement of chromosoms to the poles.
6. DNA in meiotic bivalents breaks for recombination at which stage of prophase **A.***leptotene; **B.** zygotene; **C.** pachytene; **D.** diplotene.
7. If one chromosome during gametes formation in one gamete did not segregate at anaphase II and this gamete will fuse with normal gamete the resulting zygote will be with **A.** haploidy; **B.** dyploidy; **C.** polyploidy; **D.***aneuploidy.
8. The type of meiosis in plants is **A.** terminal; **B.** zygotic; **C.** sporic; **D.*** intermediate meiosis.
9. The type of meiosis in all multicellular animals is **A.*** terminal; **B.** zygotic; **C.** sporangial; **D.** intermediate meiosis.

10. In organisms with 'initial meiosis' the meiotic division is completed **A.*** just after fertilization; **B.** just before the production of gametes; **C.** in the gametophyte formation; **D.** in the sporophyte formation.
11. Crossing over takes place at **A.*** prophase I; **B.** prophase II; **C.** metaphase I; **D.** anaphase II.
12. Meiotic bivalent consists of **A.** 2 chromatids 1 centromere; **B. 4** chromatids 1 centromere; **C.** 2 chromatids 2 centromere; **D.*** 4 chromatids 2 centromer**e.**
13. The lateral elements of sinaptonemal complex (S**C.** consist of **A.*** cohesion; **B.** adhesion; **C.** lamin; **D.** chromatin.
14. During gametes formation the alleles which do not undergo recombination segregates during **A.** *meiosis I; **B.** meiosis II; **C.** mitosis; **D.** cleavage.
15. In human female the immature oocytes rest in **A.***prophase I; **B.** telophase I; **C.** prophase II; **D.** telophase II.
16. Meiosis is type of cell division for production of **A. *** gametes; **B.** somatic cells; **C.** somatic cells & gametes.
17. Meiosis I is a type of reductional division due to **A.** pairing of homologous chromosomes; **B.** separation of chromatids; **C.** crossing over; **D.*** separation of homologous bivalents.
18. In meiosis daughter cells differ from mother cell and among themselves due to **A.** crossingover; **B.** segregation; **C.** independent assortment; **D.*** crossingover, segregation and independent assortment.
19. Which statement is best characterize the evolutionary significance of meiosis? **A.** meiosis is necessary for sexual reproduction; **B.** meiosis alternates with mitosis; **C.** the same genetic system is passed between generations; **D.***genetic recombinations are possible from generation to generation.
20. Meiosis II is a type of equational division due to **A.** pairing of homologous chromosomes; **B.** separation of homologous bivalents; **C.** crossing over; **D.*** separation of chromatids.
21. Points of attachment where non-sister chromatids of homologous chromosomes are joined with each other at certain points are called **A.** covalent; **B.** *chiasmata; **C.** tetrad; **D.** bivalent.
22. Germ cells are cells that gives rise to **A.** eggs only; **B.** ovaries; **C.** sperms only; **D. ***gametes.
23. Phases of meiosis are subdivided into **A.** metaphase II and anaphase II; **B.** telophase II; **C.** prophase II; **D.*** all of abov**e.**
24. Number of chromosomes in parent cells are **A.** 48 chromosomes; **B.** not equal; **C.** 38 chromosomes; **D.** *equal.
25. Sporic meiosis: In gametophyte generation, mitosis undergoes in zygote to become **A.** haploid gametophyte; **B.** diploid gametophyte; **C.** haploid sporophyte; **D.** *diploid sporophyt**e.**
26. Abnormal separation of chromosomes is classified as **A.** diploid budding; **B.** haploid budding; **C.*** non-disjunction; **D.** disjunction.
27. Pair of homologous chromosomes is classified as **A.** tetravalent; **B.** trivalent; **C.***bivalent; **D.**covalent.

28. Example of organisms that produces haploid gametes through mitosis includes **A.** diploid; hydra; **B.***haploid fungi; **C.** diploid algae; **D.** haploid flagellat**e.**
29. In anaphase I of meiosis, chromosomes contains one pair of **A.** daughter nucleosomes; **B.** sister nucleosomes; **C.** *sister chromatids; **D.** daughter chromatids.
30. Period of rest in which daughter cells enters after meiosis I is **A.** karyokinesis; **B.** cytokinesis; **C.** *vacuokinesis; **D.** interkinesis.
31. Haploid daughter cells produced in primary sprematocytes are **A.** secondary spermatids; **B.** primary spermatocytes; **C. *** primary spermatids; **D.** secondary spermatocytes.
32. After completion of meiosis I in primary oocytes, number of haploid cells produced are **A.** 1; **B.** 3; **C.** *2; **D.** 4.
33. Haploid cells production by secondary oocytes after completion of meiosis II are **A.** first polar body; **B.** * second polar body; **C.** secondary spermatids; **D.** secondary spermatocytes.
34. Meiosis II completion in secondary oocyte leads to production of **A.** 2 diploid cells; **B. *** 2 haploid cells; **C.** 1 haploid cell; **D.** 1 haploid and 1 diploid cell.
35. Process by which haploid daughter cells are produced by division of diploid cells is called **A.** Mitosis; **B.*** meiosis; **C.** cytokinesis; **D.** cell fission.
36. Cell division process meiosis undergoes in **A.***germ cell; **B.** any of somatic cell; **C.** erythrocytes; **D.** neurons.
37. Meiosis was discovered by **A.*** Oscar Hertwig; **B.** Oscar Wilde **C.** John Oscar; **D.** Ernst Oscar.
38. Meiosis is considered as means of reproduction **A. ***sexual; **B.** asexual; **C.** by budding; **D.** by fission.
39. Meiosis occurs in **A.** somatic; **B.** conductive; **C.** epithelial; **D.*** reproductive cells.
40. Meiosis II is equational division due to **A.** crossover; **B.** disjunction of homologous chromosomes; **D. *** separation of chromatids; **C.** pairing of homologous chromosoms.
41. Segregation of gene alleles occurs during **A.** *anaphase I; **B.** zygotene/ pachytene; **C.** diplotene; **D.** anaphase II.
42. Synapsis occurs between **A.** mRNA and ribosomes; **B.** *two homologous chromosomes; **C.** male and female gametes; **D.** spindle fibers and centrosomes.
43. During which stage of prophase I the crossingover takes place **A.** leptotene; **B.** zygotene; **C.** * pachytene; **D.** diplotene**.**
44. Separation of sister chromosomes during anaphase II is called **A.** non-disjunction; **B.** haploid budding; **C.** diploid budding; **D.** *disjunction.
45. Phase which is reversal of prophase is called **A.** prophase I; **B.** anaphase I; **C.** *telophase I; **D.** metaphase I.
46. Process by which homologous chromosomes forms pairs by lining up with each other is called **A.** electro kinesis; **B.** cytokinesis; **C.** intrakinesis; **D.***synapsis.
47. Second part of meiosis which is similar to mitosis is **A.** meiosis I; **B.** *meiosis II; **C.** meiosis III; **D.** meiosis IV.

48. Chromatin converted into ordered structures known as **A.** ribosomes; **B.***chromosomes; **C.** lysosomes; **D.** centrosom**e.**
49. Longest phase of meiosis is **A.** prophase II; **B.** *prophase I; **C.** prophase III; **D.** prophase IV.
50. Continuous variations are attributed to **A.** polyploidy; **B.** *crossing over; **C.** mutations; **D.** chromosomal aberrations.
51. The exchange by DNA matherial between parental and maternal chromosomes in meiosis is called **A.** synapsis; **B.*** crossing over; **C.** dyads formation; **D.** bivalents formation.
52. The daughter cells in meiosis differ from parent cell amongst themselves due to **A.***segregation, independent assortment and crossing over; **B.** segregation; **C.** independent assortment; **D.** crossing over.
53. During which stage of prophase I the crossingover takes place **A.** * pachytene; **B.** leptotene; **C.** zygotene; **D.** diplotene**.**
54. Meiosis is term by **A.** Robertson; **B.** *Farmer & Moore **C.** Flemming; **D.** Blackman.
55. During meiosis chromatids of individual chromosomes are separated by **A.** Metaphase I; **B.*** Anaphase II; **C.** Anaphase I; **D.** Metaphase II.
56. The evolutionary significant stage of meiosis is **A.** gametes; **B.** genetically similar daughter cells; **C.** *recombinations; **D.** four daughter cells.
57. In metaphase I, the centromeres **A.** undergo division; **B.** divide but not separate; **C.** *do not divide **C.** divide, but not separate; **D.** are not similar.
58. Chiasmata represents site of **A.** disjunction; **B.** synapsis; **C.*** crossing over; **D.** termination.
59. The stage of chiasmata observation is **A.** leptotene; **B.*** diplotene; **C.** pachitene; **D.** zygoten**e.**
60. Crossing over usually occurs between **A.** 2 nuclei; **B.** sister chromatids of bivalent; **C.** 2 bivalents; **D.***non-sister chromatids of a bivalent.
61. Name the phase of prophase I when synaptonemal complex dissolves, chromatids become clear and bivalents called tetrads **A.** pachytene; **B.** diakinesis; **C.** zygotene; **D.** *diplotene.
62. Synapsis occurs between **A.** 2 somatic cells; **B.** mRNA and ribose; **C.** 2 somatic cells; **D.** *2 homologous chromosomes.
63. Bread like thickening present over leptotene chromosomes are **A.** *kinetochores; **B.** centromeres; **C.** puffs; **D.** chromosomes.
64. Basis of development from single cell into multicellular body is **A.** osmosis; **B.** infusion; **C.*** mitosis; **D.** meiosis.
65. In anaphase I, chromosome is pulled to poles to form **A.** 4 diploid sets; **B.** 2 diploid sets; **C.** *2 haploid sets; **D.** 4 haploid sets.
66. Phase of meiosis II in which nuclear envelope and nucleoli disappears is classified as **A.** *prophase II; **B.** prephase II; **C.** ribo-phase II; **D.** S-phase II.
67. Considering phases of meiosis II, uncoiling of chromosomes into chromatin is classified as **A.** micro phase I; **B.** nano phase II; **C.** *telophase II; **D.** telephase I.

68. Phase of meiosis I which consists of metaphase I, prophase I, telophase I and anaphase I is a **A.** synopsis; **B.** cytokinesis; **C.** micro dialysis; **D.***karyokinesis.
69. Step of meiosis which generates genetic variation is classified as meiosis **A.*** I; **B.** II; **C.** III; **D.** IV.
70. Division of cytoplasm is classified as **A.*** cytokinesis; **B.** karyokinesis; **C.** kinematics; **D.** osmosis.
71. Phase of meiosis in which spindle fibers of kinetochore will be shorten is classified as **A. *** anaphase I; **B.** neophase I; **C.** tropic phase I; **D.** tetra phase I.
72. Meiosis occurs after differentiation in gametogenesis of **A.** male; **B.*** female; **C.** of both; **D.** of neither.
73. Significance of meiosis for inheritance was 1st described by **A. C.**W. Flemming; **B.** * August Weismann; **C.** Wacław Mayzel; **D.** Erwin Chargaff.
74. Interphase is followed by **A.** meiosis III; **B.** meiosis I; **C.** meiosis II; **D.** *both b and **c.**
75. Meiosis is important element for **A.** asexual reproduction; **B.** budding; **C.** binary fission; **D.** *sexual reproduction.
76. Maintenance of chromosomal set is considered as importance of **A.** thylakoids; **B.** phragmoplast; **C.** mitosis; **D.*** meiosis.
77. Meaning of Greek word 'meioun' is **A.** to surrounds; **B.** to destroy; **C.** *to make smaller; **D.** to make larger.
78. Phase of meiosis II in which sister chromatids are pulled apart and centromeres are cleaved is called **A.** metaphase II; **B.** anaphase II; **C.** *anaphase II; **D.** microphase II.
79. Homologous chromosomes will remain as bivalent after **A.** passing over; **B.*** crossing over; **C.** taking over; **D.** making over.
80. Nuclear envelope is formed around **A.** each make over set; **B.*** each haploid set; **C.** each diploid set; **D.** each cross over set.
81. Crossing over is event of **A.** leptotene; **B.** zygotene; **C.** diplotene and diakinesis; **D. ***pachytene**.**
82. Gametic or terminal meiosis is characteristic of **A.*** all multicellular animals; **B.** *many protozoa; **C.*** few lower plants; **D.** all eukaryotes.
83. Zygotic or initial meiosis takes place **A.*** as breaf period just after fertilization; **B.** period before fertilization; **C.** in human and other mammals; **D.** in plants only.
84. Human female: every oocyte in the ovary has entered meiotic prophase I **A.*** approximately at time of birth; **B.** at time of puberty; **C.** in embrio stage; **D.** at 1st trimester of pregnancy.
85. Gametes differentiate from **A.***gonial cells; **B.** squamous epithelium cells; **C.** blood cells; **D.** epidermal cells.
86. Who described significance of meiosis for inheritance and reproduction? **A.** *August Weismann; **B.** Jane Austen; **C.** Ernst James; **D.** Arthur Austen.
87. Step of meiosis which generates genetic variation is classified as **A.** meiosis II; **B. ***meiosis I; **C.** meiosis IV; **D.** meiosis III.

88. In gametophyte generation, mitosis undergoes in zygote to become **A.** haploid gametophyte; **B. ***diploid sporophyte; **C.** haploid sporophyte; **D.** diploid gametophyt**e.**
89. Meiotic phase in which spindle fibers of kinetochore will be shorten is **A.** tetra phase I; **B.** *anaphase I; **C.** tropic phase I; **D.** neophase I.
90. Unfertilized egg is stimulated to complete the second meiotic division after **A.** telophase II; **B.** *being contacted by a sperm; **C.** cytokinesis; **D.** karyokinesis.
91. Two siblings show lot of phenotypic differences. Which event during gametogenesis contributes maximally to the difference? **A*** independent assortment; **B.** mutation; **C.** recombination; **D.** environment.
92. Two men, the identical twins, marry two women who are also identical twins. Each family has a son. The sons are more genetically similar than is usual for first cousins, howewer, not identical. Why? **A.*** They are genetically different due to independent assortment in meiosis; **B.** They are genetically different due to mutations; **C.** They are genetically identical because mutations are rare; **D.** They are genetically identical, as they share the same genes, however phenotypically different due to environment.

4. Fertilisation, early development, assisted reproductive technologies and gene therapy

1. All of the following structures are necessary for blastocyst implantation EXCEPT? **A.** endometrium in progestational phase; **B.*** zona pellucida; **C.** syncytiotropho-blast; **D.** cytotrophoblast; **E.** functional layer of endometrium.
2. A 22 – year old woman presents at the ER with severe abdominal pain on the left side with signs of abdominal bleeding. She has been sexually active without contraception and missed her last menstrual period. Which of the following disorders must be as an option in the diagnosis? **A.** Ovarian cancer; **B.** Appendicitis; **C.** Normal pregnancy; **D.*** Ectopic tubal pregnancy; **E.** Toxemia of pregnancy.
3. Mesoderm is formed from **A.** Hypoblast cells; **B.** Extraembryonic ectoderm; **C.** Notochordal cells; **D.*** Epiblast cells; **E.** Amnioblasts.
4. Which of the following statements regarding the uteroplacental circulation is CORRECT? **A.** Lacunae form within the cytotrophoblast; **B.** Hydrolytic enzymes produced by the trophoblast degrade the endothelium of embryonic capillaries; **C.*** It is established during the second week of development; **D.** It is a transient nutrient supply for the blastocyst during implantation; **E.** It only forms in ectopic implantations.
5. Between which two layers is the extraembryonic mesoderm located? **A.***Exocoelomic membrane and cytotrophoblast; **B.** Epiblast and hypoblast; **C.** Syncytiotrophoblast and endometrium; **D.** Exocoelomic membrane and syncytiotrophoblast; **E.** Syncytiotrophoblast and cytotrophoblast.

6. Which of the following statements regarding the epiblast is CORRECT? **A.** It is composed of small cuboidal cells; **B.** It forms the roof of the blastocyst cavity; **C.***It forms the primitive streak; **D.** Notochordal cells intercalate into it.
7. Rubella virus infection in woman during pregnancy resulted in baby with ventriculoseptal cardiac defect. In which period was the mother most likely to have contracted the acute viral infection? **A.** Weeks 1-5 before fertilization; **B.***Weeks 1-5 after fertilization; **C.** Months 4-5 after fertilization; **D.** Months 5-6 after fertilization; **E.** Weeks 9 to 12 after fertilization.
8. The process of gastrulation is first indicated by the formation of the **A.** Prechordal plate; **B.** Cloacal membrane; **C.***Primitive streak; **D.** Neural tube; **E.** Somites.
9. A 27 year old woman experiences episodes of bright red vaginal bleeding at week 28, week 32 and week 34 of pregnancy. The bleeding spontaneously subsided each tim**e.** Ultrasound examination showed the placenta located in the lower right portion of the uterus over the internal os. What is the diagnosis? **A.** Hydatidiform mole; **B.** Premature rupture of the amniotic membrane; **C.*** Placenta previa; **D.**Toxemia of pregnancy; **E.**Vasa previa**.**
10. A newborn presents with craniofacial abnormalities and a cardiac defect involving the outflow tract of the heart. Why are you not surprised? **A.** Paraxial mesoderm contributes to formation of both areas; **B.** HOX genes contribute to both areas and could be involved; **C.** Body folding is important for both areas and may produce combined defects; **D.** The mother took fertility drugs; **E.** *Neural crest cells contribute greatly to development of both regions.
11. Which of the following is NOT derived from ectoderm? **A.** Epidermis; **B.** Enamel of teeth; **C.*** Dermis of skin; **D.** Forebrain; **E.** Mammary gland.
12. If an embryo failed to form the mesoderm germ layer which of the following would not develop? **A.** Hindbrain; **B.** Schwann cells; **C.** *Aorta; **D.** Intestinal epithelia; **E.** Nails.
13. Where do ectopic pregnancies most often occur? **A.** Ovary; **B.** Mesentery of the intestine; **C.** Abdomen; **D.***Ampullae region of uterine tube; **E.** Isthmus region of uterine tub**e.**
14. Which of the following will form the lens of the eye? **A.** Lateral plate mesoderm; **B.***Ectoderm; **C.** Neural crest cells; **D.** Endoderm; **E.** Intermediate mesoderm.
15. Splitting of the lateral plate mesoderm forms the **A.** Somites; **B.** Paraxial and intermediate mesoderm; **C.** Yolk sac cavity; **D.***Intraembryonic cavity; **E.** Amniotic cavity.
16. Where are melanocytes derived from? **A.** Mesoderm; **B.** Mesenchyme; **C.** Ectoderm; **D.***Neural crest cells **E.** Dermis.
17. What portion of the blastocyst will give rise to the embryo? **A.** Cytotrophoblast; **B.** Outer cell mass; **C.** Endoderm; **D.***Inner cell mass **E.** Ectoderm.
18. Where are the excretory units of the urinary system derived from? **A.** Endoderm; **B.** Lateral plate mesoderm; **C.** Ectoderm; **D.** Splanchnic mesoderm; **E.***Intermediate mesoderm.

19. A sacrococcygeal teratoma is a tumor that arises from remnants of the **A.** Neural plate; **B.** Cloacal membrane; **C.** Posterior neuropore; **D.*** Primitive streak; **E.** Notochord.
20. The amniotic cavity appears on the eighth day as a slit-like space between the trophoblast and the **A.** Extraembryonic mesoderm; **B.*** Embryoblast; **C.** Exocoelomic membrane; **D.** Connecting stalk; **E.** Chorion.
21. What are the cells in the early dividing embryo called? **A.*** Blastomeres; **B.** Embryoblasts; **C.** Epithelial cells; **D.** Gametes; **E.** Pronuclei.
22. Where does fertilisation normally take place? **A.** *Ampulla; **B.** The cervix; **C.** The ovaries; **D.** The uterine cavity; **E.** The uterine tub**e.**
23. When the conceptus consists only of placental tissue what is the fluid chamber in the blastocyst called? **A.** Amniotic cavity; **B.** Blastocoele; **C.** Chorionic cavity; **D.** Exocoelomic cavity; **E.** Lacuna**e.**
24. In 50% of cases, spontaneous abortion (pregnancy loss before 20 weeks of gestational ag**E.** is believed to be due to **A.***Fetal chromosomal abnormalities; **B.** Hydatidiform moles; **C.** Incorrect formation of embryoblast and tropoblast; **D.** Incorrect implantation into the uterine wall; **E.** Insufficient nutrition to the embryo
25. The purpose of the tertiary villi is **A.** to stop abnormal implantation; **B.** anchoring the blastocyst into the uterine wall; **C.** mechanical support for a capillary network; **D.** to act as precursors to trophoblast lacunae; **E.** *to provide nutrition and oxygen to the embryo.
26. The outer layer of the oocyte is **A.** *corona radiata; **B.** exocoelomic membrane; **C.** external perimetrium; **D.** morula; **E.** zona pellucida.
27. What are sinusoids? **A.*** Congested and dilated maternal capillaries; **B.** Enzymes; **C.** Extensions from the syncytiotrophoblast into the endometrium; **D.** Structures in the ovary that aid follicle development.
28. Mitochondria in human sperm cell occupy **A.***mid-piece; **B.** tail; **C.** sperm head; **D.** there no mitochondria in the sperm.
29. What is NIPT? **A.** FISH-based analysis which measures signals from chr 21; **B.*** NGS-based method which measures gene dose abnormalities in cell-free DNA in a maternal blood sample; **C.** NGS-based method which measures gene dose abnormalities in cell-free DNA in an amniotic fluid sample; **D.** Array-CGH-based method which measures deletions and amplifications in a placenta sample.
30. As human hands form during development, they contain webs between the fingers. However, most human babies are born without this webbing present. Which of the following processes causes the webbing to disappear? **A.*** Apoptosis **B.** none of these **C.** Necrosis **D.** Regeneration
31. The best place to insert the transgene in fertilized egg is **A.** male pronucleus; **B.** *female pronucleus; **C.** cleavage cells; **D.** cytoplasm.
32. The dorsal mutant in *Drosophila* will result in **A.*** dorsalization of ventral side; **B.** ventralization of dorsal side; **C.** no effects; **D.** anterior-posterior pattern formation defects.

33. The emergence of polarity in an ebryo is a result of **A.** negative and positive charges interaction with early development; **B.** cytoplasmic differences between cells; **C.** *cytoplasmic determinants within cells. **D.** all of these.
34. Anterior-posterior limb axis and dorsal-ventral nerve plate are determined by **A.** Pax3 **B.** Bicoid **C.** cactus **D.*** Sonic hedgehog.
35. Capacitation is the **A.** *maturation of the sperm in female oviduct; **B.** meiosis in egg cell after penetration of sperm; **C.** sperm maturation in a man body; **D.** egg maturation after fertilization by sperm.
36. Homeotic genes are responcible for the **A.*** development; **B.** homeostasis; **C.** cell cycle; **D.** gene regulation.
37. *Sxl* genes of *Drosophila* regulate expression at the level of **A.** transcription; **B.** translation; **C.*** post-transcriptional level; **D.** post-translational level.
38. Homeotic genes are responcible for **A.** maintaining the gups between the segments; **B.** coding of morphogenesis; **C.** providing of gradients within developing embryo; **D.*** regulate development of anatomical structures.
39. Dorsal lip of amphibians is equivalent to the ____in chickens. **A. *** Henson node; **B.** animal pole; **C.** vegetal pole; **D.** primitive groove.
40. The mosaic development pattern is always **A.** conditional; **B.** *autonomous; **C.** regulative; **D.** non-autonomous.
41. During development the homing of the cell is mediated by **A.** *integrin; **B.** laminin; **C.** cadherin; **D.** selectin.
42. To what defect mutation in homeotic genes can lead? **A.** anterior portion of the embryo fail to develop; **B.** several adjasent segments will be missing; **C.** The embryo will develop with every other segment failing to form; **D.*** the development of segments will be changed wholesale from normal to different segment.
43. The establishment of dorsal-ventral and anterior-posterior axes is called **A.** differentiation; **B.*** pattern formation; **C.** morphogenesis; **D.** division.
44. Which treatment is an example of somatic gene therapy? **A.** growing a replacement organ from a person's stem cells; **B.** injecting a functional dominant allele into the liquid in the eye to correct a retinal disease; **C.** introducing an extra allele for a growth hormone into sheep embryos; **D.** joining a sperm cell, mother's nucleus and an enucleated donor oocyte to avoid mitochondrial disease in baby.
45. Which human viruses are best potential vectors for gene therapy? **A.*** adenoviruses and herpesviruses; **B.** papilloma viruses; **C.** hepatitis C virus; **D.** hepatitis B virus.
46. What technique involves fertilization outside the body of the female? **A.** Intrauterine fertilization **B.*** *In vitro* fertilization **C.** *In vivo* fertilization **D.** *Ex vivo* fertilization.
47. In the test tube baby program, what method is used for implantation of embryo from 1-8 cell stage? **A.*** Zygote intra fallopian transfer; **B.** Intra uterine transfer; **C.** Zygote inter fallopian transfer; **D.** Inter uterine transfer.

48. What method can be used for carrying out *in vivo* fertilization for a sterile but fertile female? **A.*** gamete intra fallopian transfer **B.** Zygote intra fallopian transfer **C.** Intra uterine transfer **D.** artificial insemination.
49. What technique is used to inject the sperm directly into the ovum? **A.** ZIFT; **B.** GIFT; **C.** IUT; **D.** *ICSI.
50. Who pioneered *in vitro* fertilization resulted in birth of first 'test-tube baby'? **A.***R. Edwards, P.Steptoe, J. Purdy; **B.** E. Chargaff; **C.** T.Morgan; **D.** L. Brown.
51. Transgenesis is a transfer of gene(s) from one organism to another organism with following functioning of transgene in new host. The transgene can be delivered by physical transfection methods: **A.** injection of fertilized ovum pronucleus; **B.** particle bombardment; **C.** ultrasound; **D.** electroporation; **E.*** by all of these.
52. Transgenesis with use of lentiviruses as transgene vectors has been applied to many of laboratory animals, particularly, **A.** rodents (mouse and rat); **B.** birds; **C.** different monkeys; **D.** bovine; **E.** pigs; **F.*** all of these.
53. The transgene can be delivered by **A**. chemical transfection, including DNA transformation at the presence of calcium phosphate; **B.** retrovirus-mediated gene transfer; **C.** bactofection; **D.*** all of these.
54. Which is best characteristic of heterologous protein is **A.** expressed in intact cells; **B.** *not expressed in intact cells, however, can be produced after cell transgenesis; **C.** any protein consisting of different subunits **D.** a complex protein.

5. Mendelian Genetics, crosses, sex-chromosomes, linkage

1. The genotypes of the parents were AABBccddeeFF and aabbCCEEff. What would be the genotype of the progeny? **A.** AABBccDDeeFf; **B.** AaBbCcDdEeFf*; **C.** aaBBccDDeeFF; **D.** AaBbCCddEeFf.
2. Which of the following crosses never results in recessive fenotype? **A.** *aabb × AABB; **B.** aabb × AaBb; **C.** aabb × AABb; **C.** AaBb × AaBb.
3. How many of AaBb × AaBb offspring will breed pure? **A.***1/4; **B.** 1/8; **C.** 1/14; **D.** 1/16.
4. When two different black body *Drosophila* mutants were crossed, all progeny have wild type body color. It means mutation is: **A.** co-dominant; **B.** allelic; **C.** non-allelic*; **D.** epistati**c.**
5. Lethal mutations always present in populations due to: **A.** mutation and natural selection balance*; **B.** frequency-dependent selection; **C.** positive selection; **D.** negative selection.
6. Polydactyly is coded by dominant gene, however many individuals with single dominant allele do not show any sign of the condition due to: **A.** incomplete penetrance*; **B.** variable expressivity; **C.** co-dominance; **D.** incomplete dominance.
7. The possible number of gametes types from genotype AABbCCDdEe will be: **A.** 4; **B.** 8*; **C.** 16; **D.** 32.

8. G.Mendel worked with trait demonstrating **A.** epistasis; **B.** co-dominance; **C.** incomplete dominance; **D.** dominance and recessiveness*.
9. Three alleles of *I* gene control ABO blood groups in human. Six different genotypes for blood groups are possibl**e.** How many phenotypes can occur? **A.** three; **B.** one; **C.** four*; **D.** two.
10. If two organisms with genotype AaBb are mated what is the probability of AABB genotype in progeny? **A.**1/4; **B.**1/8; **C.**1/16*; **D.**1/2.
11. In non-allelic genes interaction the 9:7 ratio in F2 represents **A.** epistasis; **B.** co-dominance; **C.** incomplete dominance; **D.** complementary genes interaction*.
12. What kind of cross is used to verify if offsprings is heterozygous? **A.** reciprocal cross; **B.** back cross; **C.** test-cross*; **D.** cris-cross.
13. The suppression of the activity of one gene by another non-allelic gene is called **A.** epistasis; **B.** co-dominance; **C.** incomplete dominance; **D.** complementary genes interaction*.
14. The best medium to grow *Drosophila melanogaster* in laboratory is: **A.** agar-agar; **B.** cow dung; **C.** wet bread; **D.** ripe banana*.
15. The phenotype of an organism is a result of **A.** genotype and environment interaction*; **B.** mutation and nutrition; **C.** cytoplasmic effects; **D.** environmental changes and sexual dimorphism.
16. What is the probability of tongue roller son if father is non-roller and mother is roller, whose father was non-roller? **A.*** 1/4; **B.** 1/2; C. 1/8; D. 1/16.
17. Genes A, B and C assort independently. What is the probability that female with genotype AaBBCc when mated with male AAbbCc will produce an offspring with genotype AABbcc? **A.** 1/2; **B.** 1/4; **C.** 1/8*; **D.** 1/16.
18. What is the probability of AaBBCc production from the cross AaBbCc × AaBbCc? **A.***1/16 **B.**1/4 **C.**1/8 **D.**1/2
19. Cystic fibrosis is **A.** recessive authosomal disease; **B.** dominant authosomal disease; **C.** sex chromosome recessive disease*; **D.** sex chromosome dominant disease.
20. Human blood groups are inherited with genes interaction **A.** incomplete dominance **B.** dominance **C.** recessive epistasis **D.*** codominance
21. The segregation of genotypes in dihybrid cross with no genes interaction is **A.*** 9:3:3:1 **B.** 3:1 **C.** 3:3:1 **D.** 3:2:1.
22. Most often cells sampling for chromosomal abnormalities analyses in fetus (biochemical and karyotyping) is carried out by procedures of **A.*** amniocentesis **B.*** chorionic villus sampling **C.** mother vaginal epidermis biopsy **D.** 1 and 2.
23. B - brown eyes, b - blue eyes allele, mom is Bb, dad is BB. What are the eye color possibilities in future children? **A.***all brown **B.** all blue **C.** 50% blue, 50% brown **D.** 25% blue, 75% brown **A.** all Bb **B.***1/2BB: 1/2 Bb **C.** all BB **D.** all bb.
24. Curly hair is recessive, straight is dominant. Mom has curly hair, dad has both of dominant alleles for straight hair. Predict the genotypes and phenotypes of

hair in kids: **A.***100% straight **B.** 50% curled **C.** 75% curled **D.**100% curled **1)*** *Cc* **2)** 1/2 *CC*, 1/2 *cc* **3)** 1/2 *CC*, 1/2 *cc* **4)** 1/4*CC* 1/2*Cc* 1/4*cc*

25. Black hair is homozygous dominant, brown hair is heterozygous, blond hair is homozygous recessive (incomplete dominance). Mom and dad are brown haired. Choose the genotypes and phenotypes of kids: **A.***BB 2Ba aa* **B.** *BB Ba aa* **C.** *2BB Ba aa* **D.** *BB Ba 2aa* of kids **1)***1/4 black 1/2brown 1/4blond* **2)** 1/2 black 1/2brown 1/2blond **3)** 1/4 black 1/4 brown 1/4 blond **4)** 1/2 black 1/2 brown 1/16 blond.
26. Attached earlobes are dominant over free hanging earlobes. Mom is *BB* and dad is *bb*. Choose the genotypes and phenotypes of kids: **A.***All *Bb* **B.** Bb:BB, 1:1 **C.** *BB 2Ba aa* **D.** *2BB Ba aa* **1)*** all with attached earlobes **2)** all with hanging earlobes **3)** 1:1 **4)** 1/4 attached 1/2 hunging **4)** all hunging
27. Voice pitch in dad is low, in mom is high. What voice pitch is expected in child? **A.** tall **B.** short **C.** medium **D.** short : tall, 1:1
28. Freckles are recessive and no freckles is dominant trait. Wife has freckles and husband has no freckles, however his mother has freckles. Choose the genotypes and phenotypes of kids: **A.***1/2Ff : 1/2ff **B.** 1/2FF 1/4Ff 1/4ff **C.** 1/4FF 1/2Ff 1/4ff **D.** 1/4Ff 1/4Ff 1/2ff **1)***Frecked/No freckled, 1:1 **2)** all are freckled **3)** no freckles in all **4)** 1/4 freckled
29. Long whiskers in seals are dominant and short are recessive. One parent and all offsprings have the dominant homozygote genotype. Another parent genotype is **A.***the same **B.** heterozygote **C.** recessive homozygote
30. What kind of genes interaction was manifested in cross of snapdragons with red and white petals? **A.*** incomplete dominance **B.** dominance **C.** recessive epistasis **D.** codominance
31. Mother has dip lips protrusion, father has no lips protrusion, child has a intermediate lips protrusion. What kind of genes interaction is manifested in this family? **A.*** incomplete dominance **B.** dominance **C.** recessive epistasis **D.** codominance
32. Mom has OA and dad has OB. What blood types are possible in children? **A.*** O, A, B, AB **B.** O, A, B **C.** A, B, AB **D.** O, AB
33. Estimate the genotypes and phenotypes in parents from genotypes of children if dark color in hair is dominant **A.** DD, 2Dd, dd **B.**DD, Dd **C.** dd, Dd **D.** Dd **1)** DD×dd **2)** dd×Dd **3)** DD×Dd **4)** Dd×Dd **i)** dark × blond **ii)** dark × dark
34. In 1911, T.H. Morgan collected the following crossover gene frequencies while studying *Drosophila*. Bar-shaped eyes are indicated by the *B* allele, and carnation eyes are indicated by the allele C. Fused veins on wings (A. and scalloped wings (S) are located on the same chromosomes. Gene combinations and recombination frequencies are: A/B -2.5%, A/C – 3%, B/C – 5.5%, B/S - 5.5%, A/S - 8%, C/S – 11%. Choose the correct genes order: **A.***CABS **B.** ABSC **C.** BSCA **D.** SCAB and build a chromosome map.
35. The following chart shows the crossover frequencies for some genes onto automosome of an organism. Genes and crossover frequencies are as follows:

P&Q 5%, P&R 8%, P&S 12%, Q&R 13%, Q&S17%. Choose the correct genes order: **A.*** QPRS **B.** PRSQ **C.** RSQP **D.** SQPR and build a chromosome map.

36. For series of experiments a linkage group composed of genes W, X,Y and Z was found to show the following gene combinations. All recombinants are expressed per 100 fertilized eggs. W-X 5, W-Y 7, W-Z 8. Choose the correct genes order: **A.*** WXYZ **B.** XYZW **C.** YZWX **D.** ZWXY and construct a gene map.
37. In *Drosophilla*, the genes for eye color A wing shape B, body color C are found on the same chromosome. The following crossover freequencies were determined for these genes in experiments. Crossover frequencies for these genes were as follows. A-B 12.5%, A-C 6%, B-C 18.5%. What is the correct sequence of A, B and C genes on the chromosome. **A.*** BAC **B.** ACB **C.** CBA
38. Estimate the correct sequence of genes on chromosome and construct a gene map **A.** *ACDFB **B.** CDFBA **C.** DFBAC **D.** FBACD given the following information concerning crossover frequency A&B 24%, A&C 8.0%, C&D 2.0%, A&F 16%, F&B 8%, D&F 6%.
39. Information: Most of the males show disease. All sons from affected mother are diseased. Female develop disease only when her father is diseased and mother is carrier or diseased. According to this information, what is the mode of inheritance? **A.*** X-linked recessive; **B.** X-linked dominant; **C.** Y-linked recessive; **D.** Y-linked recessive.
40. The inbreeding coefficient of offspring on marriage between brother and sister sibling will be: **A.*** 0.25; **B.** 0.5; **C.** 0.9; **D.** 0.8.
41. *Drosophila*: XO are males, XXY are females. Human: XX are females, XY are males. Which statement is NOT correct? **A.*** Sex determination in humans is based on the ratio of number of X chrs to autosomes; **B.** Sex determination in *Drosophila* is based on the ratio of number of X chrs to autosomes; **C.** Y chr is sex determinant in human; **D.** Y chr is not a sex determinant in *Drosophila.*
42. Individuals having X chr and short arm of Y chr are male while individuals having X chr and long arm of Y chr are female. This proves that **A.*** genes for maleness are located on short arm of Y chr; **B.** genes for maleness are located on long arm of Y chr; **C.** genes for maleness are located on X chr; **D.** genes for maleness are located on short arm of X chr.
43. A cross between a red-eyed male fly and white-eyed female fly results in red-eyed female and white-eyed male progenies. While reciprocal cross produces all offsprings with red eyes. The trait for eye color is **A.*** Sex-linked trait; **B.** sex-influensed trait; **C.** mixed trait; **D.** autosomal trait.
44. Paternal grand father is hemophilic. The probability of hemophilic grandson is **A.*** 0; **B.**0.5; **C.**0.25; **D.**0.75
45. The dosage compensation in mammal females is achieved by **A.*** methylation of X chr; **B.** elimination of one chr **C.** hyperactivation of one chr **D.** hyperactivation of one autosome.
46. Hemophilia A and B have almost the same phenotypes, however, they result from different genes mutation on X chr. This is an example of **A.*** locus

heterogeneity; **B.** variable expressivity; **C.** recessive gene epistatic action **D.** dominant gene epistatic action.

47. The relatives pair with highest genetic correlation is **A.***brothers; **B.** brother-sister; **C.** father-mother; **D.** half siblings.
48. The X chr to autosome ratio in particular *Drosophila* fly is 1.5. This is **A**.*meta-female; **B.** meta-male; **C.** male **D.** female.
49. The map unit is **A.*** centiMorgan; **B.** MilliMorgan; **C.** MicroMorgan; **D.** NanoMorgan.
50. The fenomenon of suppression of crossover in one region by crossover in near region is called **A.*** interference; **B.** incidence; **C.** penetrance; **D.** epistasis.
51. What is the coefficient of coincidence? **A**.* a ratio of observed to expected crossovers; **B.** number of expected crossovers; **C.** number of observed crossovers; **D.** difference between observed and expected crossovers.
52. The genetic balance theory in sex determination was suggested by **A.** Morgan; **B.*** Bridges; **C.** Barbara McClintock; **D.** Chargaff.
53. The Barr body phenomenon was first explained by **A.***M. Lyon; **B.** Bridges; **C.** Barbara McClintock; **D.** Chargaff.
54. The coefficient of coincidence is a measure of **A.***interference; **B.** penetrance; **C.** expressivity **D.** dominance.
55. The point mutation was first described in Ancon sheep by **A.** *Seth Wright; **B.** Bridges; **C.** Barbara McClintock; **D.** Morgan.
56. Genes A and B are 80 cM apart in a linkage map. If double heterozygote test crossed, the number of progeny with parental phenotype will be: **A.*** equal to the number of offsprings with recombinant phenotype; **B.** more than the number of offsprings with recombinant phenotype; **C.** less than the number of offsprings with recombinant phenotype; **D.** Could be less or more depending on whether the genes linked in *trans* or *cis* orientation, respectively.
57. The allelic heterogeneity (production of similar phenotypes by different mutant alleles at the same locus) is observed in **A.** PKU; **B.** albinism; **C.** alkaptonuria; **D.** β-thalassemia; **E.** all of these.
58. Genetic polymorphs are best described best by statement **A.** they have altered protein structure and function; **B.***they are normal variants resulting from alterations of DNA sequence; **C.** They are detected in clinical examinations; **D.** They are detected by cytogenetic analysis.
59. Which of the following has an effect upon the clinical phenotype of X-linked disorders: **A.***new mutations; **B.*** Lyonization; **C.** reduced penetrance; **D.** variable expressivity.
60. What do all human males inherit from their mothers only **A.** chr 13; **B.*** mtDNA and X-chr; **C.** *SRY* gene; **D.** chr18.

6. Human karyotype and chromosomal abberations

1. Who coined the term ‘chromatin’ to describe the thread like material of the nucleus? **A.***W. Flemming; **B.** W.Roux; **C. E.** Strasburger; **D.** Boveri.

2. Who coined the term chromosomes **A.***Waldeyer; **B.** Chargaff; **C.** Morgan **D.** Shwann.
3. The metacentric chrs usually seen in a shape of capital **A.***V; **B.** I; **C.** Z; **D.** O.
4. The human Y chr is reach in **A**.*heterochromatin; **B.** euchromatin; **C.** both: heterochromatin and euchromatin; **D.** femaleness genes.
5. The haploid set of the chromosomes is called as: **A.** proteome; **B.** genomics; **C.***genome; **D.** genes.
6. The term 'chromosome' was coined by: **A.** W. Flemming; **B.** W.Roux; **C.***Waldeyer; **D.** Sutton.
7. The lowest level of chromosome organization is: **A.** solenoid; **B.***nucleosome; **C.** 30 nm fibre; **D.** none of these.
8. Which of the following statement is incorrect: **A.** Chromosome number is constant within individuals in a species in an ecosystem; **B.*** Chromosome number is constant within different species in an ecosystem; **C.** Chromosome number is constant within different somatic cells of an organism; **D.** All of these
9. Which of the following has the largest number of chromosome? **A.** *Haplopappus gracilis*; **B.***_Ophioglossum reticulatum_; **C.** *Pisum sativum*; **D.** redwood tree.
10. The number of autosome in humans **A.***44; **B.** 21 pairs; **C.** 46; **D.** 45.
11. Which of the following statement is incorrect **A.***In human males, there are 44 autosomes and a pair of homomorphic sex chromosomes; **B.** In human females, there are 44 autosomes and a pair of homomorphic sex chromosomes; **C.** In human males, there are 44 autosomes and a pair of heteromorphic sex chromosomes; **D.** In humans, there are 44 autosomes and a pair of sex chromosomes.
12. The size of chromosome is measured during **A.** prophase; **B.***metaphase; **C.**anaphase; **D.** all of these.
13. A chromosome with a very short arm and a very long arm is termed as: **A.**Telocentric; **B.***Acrocentric; **C.** Metacentric; **D.** Sub-metacentric.
14. Chromosome is thickest during: **A.** prophase; **B.***metaphase; **C.** anaphase; **D.**interphase.
15. A functional chromosome has: **A.** a centromere; **B.** a telomere; **C.** an origin of replication; **D.***all of these.
16. The diagrammatic representation of karyotype (morphological representation of chromosomes) of a species is called: **A.***Idiogram; **B.** cladogram; **C.** ecogram; **D.** chromogram.
17. Euchromatin: **A.** Genetically active chromatin with genes; **B.** stains lightly; **C.** is partially condensed; **D.***all of these.
18. Chromatin has: **A.** DNA; **B.** DNA and proteins; **C.***DNA, RNA and proteins; **D.** none of these.
19. The technique which is used to diagnosed Klinefelter's syndrome(XXY) is: **A.***Karyotyping; **B.** Somatic cell genetics; **C.** Pedigree analysis; **D.** none.

20. Which type of banding was first to view chromosomes band under a fluorescence microscope? **A.** C- banding; **B.** R-banding; **C.** G-banding; **D.***Q-banding.
21. Mutation on X-chromosome in human causes hemophilia.What will be the consequences of mating between a normal female and a hemophiliac male? **A.**50% daughter will be normal and 50% son will be hemophilia**c.** **B.***All daughters will be carriers and all sons will be normal; **C.** All daughters will be normal and all sons will be carrier; **D.** None.
22. Albinism occurs due to lack of an enzyme. Which of the following enzymes' deficiency or inactivity causes albinism? **A.** Catalase; **B.** Fructokinases; **C.*** Tyrosinase; **D.** None.
23. What is the sex complement of a male child who has Down's syndrome? **A.***XY; **B.**XO; **C.**XX; **D.**XXX.
24. Trypsin treatment of the chrs followed by Giemsa stainig is applied in **A.*** G-banding; **B.** C-banding; **C.** R-banding; **D.** Q-banding.
25. A mutation that causes changes in a DNA sequence has no effect on the expression of any gene? **A.*** Silent mutation; **B.** Nonsense mutation; **C.** Transition mutation; **D.** All of the above.
26. Aminopurine causes mutations by: **A.** Insertion; **B.** Frameshift mutation; **C.*** Base pair change; **D.** Duplication.
27. The site where the mutation occurs at a higher rate than normal the normal rate is known as: **A.** Mutation sites; **B.*** Hotspot; **C.** Suppressor site; **D.** None.
28. What is the number of bar bodies in Klinefelter's syndrome with XXXXY condition? **A.** Two; **B.***Three; **C.** Four; **D.** Five.
29. Which of the following chemical mutagen causes the transition mutation GC to AT? **A.***Hydroxylamine; **B.** 2-amino purine; **C.** Acridine orange; **D.** All of these.
30. The mutation which changes a codon specifying an amino acid into a stop codon? **A.** Frameshift mutation; **B.*** Non-sense mutation; **C.** Missense mutation; **D.** Deletion mutation.
31. The enzyme which is responsible for initial recognition of lesion in case excision repair mechanism? **A.** DNA polymerase; **B.** AP Exonuclease; **C.***DNA glycosylase; **D.** All of the above.
32. Which of the following is the most appropriate example of point mutation? **A.***Sickle cell anemia; **B.** Thalassemia; **C.** Night blindnes;s **D.** Down's syndrome.
33. What is the characteristic of genetic code that minimizes the probability of mutation? **A.** Triplet; **B.*** Degeneracy; **C.** Universality; **D.** Non-overlapping.
34. Which of the following disorder is caused by lack of DNA repair activity? **A.** Haemophilia; **B.***Xeroderma pigmentosum; **C.** Sickle cell anemia; **D.** None of the above.
35. The mutagenic agent that is used to induce mutation in agriculture? **A.** Cosmic rays; **B.** Ultraviolet rays; **C.***gamma-rays; **D.** All of the above.
36. In which of the following syndromes the number of chromosomes is equal

A. Turner syndrome and Down's syndrome; **B.** Gynandromorphy and Turner's syndrome; **C.** Turner's syndrome and Klinefelter's syndrome; **D.***Klinefelter's syndrome and Down's syndrome.

37. Patau's syndromes occur due to the nondisjunction of chromosomes during cell division and also known as: **A.***Trisomy 13; **B.** Trisomy 18; **C.** Trisomy 21; **D.** Trisomy 14.
38. A woman with a balanced Robertsonian translocation has a high risk for… **A.** Cancer; **B.** Intellectual diability and malformations; **C.*** Repeated miscarriage; **D.** Having children with trisomy 18.
39. Which chromosomal aberrations is important to detect and has therapeutic impact on leukemia patients? **A.** t(8;14); **B.** inv(16) **C.*** t(9;22); **D.** t(1;19).
40. 22-year old Maria and 28-year old Robert are two siblings with genetically confirmed neurofibromatosis 1 due to mutation in the *NF1* gene. Maria has 10 café au lait macules (>5 mm diameter), optic glioma of the left eye, 15 neurofibromas, and a plexiform neurofibroma on the left arm. Her brother has instead only 3 café au lait macules and 2 neurofibromas on the back. The disease severity is therefore different in brothe and sister. This phenomenon is called **A.** reduced penetrance; **B.** gonadal mosaicism; **C.*** variable expressivity; **D.** mitotic recombination.
41. Frank is a 27-years old man whose mother developed Huntington's disease at 44 years of age. Frank's grandmother also had Huntington's disease at 53 years of age. Frank is wondering if he should test himself and if he could develop the disease before 40 years old. You reply that this is possible because of: **A.** Mosaicism; **B.** Penetrance; **C.** Meiosis; **D.*** Anticipation.
42. Several hereditary cancer syndromes exhibit an autosomal dominant inheritance pattern, however an individual that inherits a mutated gene does not have to develop cancer. How come? **A.** Variabel phenotype; **B.*** Reduced penetrance; **C.** Exon-skipping; **D.** Incomplete pathogenicity.
43. Which of the following hereditary cancer syndromes should primarily be considered in a family consisting of: a man with colon cancer at the age of 55 years, his sister endometrial cancer at 67 years of age, their father colon cancer at 53 years of age and their paternal grandfather's sister rectal cancer at 34 years of age? **A.** FAP; **B.*** Lynch syndrome; **C.** Peutz-Jeghers syndrome; **D.** Wermer's syndrom.
44. The chromosome *A*, abcdefg(o)hijklmn, is normal with centromere "(o)". The rest of chrs are produced due to abberations in *A*: **B.** abcdefg(o)hijkl **C.** dcbaefg(o)hijklmn **D.** abc(o)gfedhijklmn **E)** abcabcdefg(o)hijklmn **F)** abcfg(o)hijklmn **G)** abcdefg(o)hijklmncba **H)** abcdefg(o)gfedcba. Recognize them and mutch with corresponding terms in brackets (tandem *dup*lication; terminal *del*etion; paracentric inversion; pericentric inversion; interstitial *del*etion; reversed *dup*lication; isochromosome. Solution. **B.** terminal *del*etion; **C.** paracentric inversion; **D.** pericentric inversion; **E)** tandem *dup*lication; **F)** interstitial *del*etion; **G)** reversed *dup*lication; **H)** isochromosome.

45. Which is observed after crossover between chromosome having a pericentric inversion and a normal chromosome? **A.*** segmental deletion and duplication; **B.** isochromosome; **C.** bridge formation; **D.** ring chromosome.
46. Which syndrome is saused by Robertsonian translocation between Chr 21 and Chr 14 in the human? **A**.* Down; **B.** Patau; **C.** Edwards; **D.** Turner.
47. Presence of an extra chromosome in karyotype is most likely due to **A.*** non-disjunction; **B.** duplication; **C.** inversion; **D.** deletion.
48. Polyploids created by complete set of chromosomes duplication are called **A**.* autopolyploids; **B.** aneuploids, **C.** diploids **D.** haploids.
49. What is used to detect nucleolar organizing region? **A.***silver stain; **B.** G-banding; **C.** C-banding; **D.** R-banding.
50. Which is NOT true about translocations? **A.** They can lead to gain and loss of genetic information in offspring of translocations carriers; **B.** They can lead to cancer, if present in somatic cells; **C.** They can be used in mapping of disese-coding genes; **D.** Their frequency increases with increasing of parents age.
51. In translocation, the exchange of chromosomal segments take place **A.** Within the same chr; **B.** between homologous chrs; **C.** between non-homologous chrs; **D.** both: B and C.
52. When short arm in a chr is very short, the chr is called **A.***acrocentric; **B.** telocentric; **C.** metacentric; **D.** submetacentric.
53. Which is balanced aberration **A.***inversion; **B.** isochomosome; **C.** insertion **D.** deletion.
54. Find a ploidy aberration. **A.***92, XXXX; **B.** 48, XXXY; **C.**47, XYY **D.** 45,X.
55. Deletions in sex chrs are tolerated better than in autosomes, because: **A.*** sex chrs cotain less of genes and two of sex chrs are in human body **B.** they are smaller in size, than autosomes **C.** they are larger in size, than autosomes **D.** neither of these.
56. The terminal deletions can be recognized by **A.** sticky ends of the chrs; **B.** they make shorter chrs than chunk deletions; **C.** transfactors; **D.** rybosomes.
57. What effect is expected from the deletion mutation of a gene in a telomere? **A.** no effects; **B.** death of an organism; **C.** mild effect onto phenotype; **D.** hazardous effect on a health.
58. You just hybridized two cells. Cell 1 has deletion in chr 2, cell 2 is normal. What will you expect to observe? **A.*** Buckling of chromatin in chr 2 from the cell 2 corresponding to deleted chromatin; **B.** twisting and loops formation between the chromatins of to cells; **C.** no observable changes; **D.** Buckling of chromatin in cell 1.
59. The appearance of recessive phenotype due to deletion of dominant gene is called a **A.*** pseudo-dominance; **B.** co-dominance; **C.** imperfect dominance; **D.** hemi-dominance.
60. Deletion of DNA region resulted in overexpression of gene *F*. What most possibly was deleted? **A.*** negative regulator (silencer, insulator, *etc.*) of gene *F* was deleted; **B.** Part of the gene *F*; **C.** promoter of the gene *F*; **D.** enhancer of the gene *F*.

61. What is not true about Notch gene in *Drosophila*? **A.** Notch gene codes for wing indentation; **B.** It is lethal in homozygous state; **C.***It is recessive to Facet; **D.** expressed in hererozygotes.
62. Which is not a type of translocation? **A.***tandem; **B.** reciprocal; **C.** simple; **D.** intercalary.
63. Which part of the gene is responsiable for translocation? **A.***Long terminal repeats on both ends of translocating fragment; **B.** inner part of the gene; **C.** coding gene parts; **D.** non-coding gene parts.
64. If part of the chr is transferred to non-homology chr, what is NOT true about following events? **A.** the pairing in meiosis will be affected; **B.*** the translocated chr will be fragmented during anaphase; **C.** the pairing will be between 4 homology chrs; **D.** usually, resulted gamete will not be viable.
65. Homologous chrs move to the same pole during anaphase in case of **A.***translocation; **B.** inversion; **C.** breaking; **D.** doubling.
66. In which case segregation of translocated chrs result in viable gamete? **A.***alternate segregation; **B.** homologous chrs move to the same pole; **C.** adjacent chrs move with homology chrs to the same pole **D.** adjacent chrs move with homology chrs to the different poles.
67. Which is the result of reciprocal translocation between human chrs 8 and 14? **A.*** Burkitt's lymphoma; **B**.thalassemia; **C.** trychothiodystrophy; **D.** Marfan syndrome.
68. What can happen if XIC in result of translocation is transferred to the chr 3 of human? **A.***The chr 3 will undergo lyonisation; **B.** The chr 3 will stick to X chr; **C.** The chr 3 will disappear; **D.** The chr 3 will replicate.
69. In which of followed duplications fragment could be passed to another homology chr or an extra chr? **A.** displaced; **B.*** transposed; **C.** tandem duplication; **D.** reverse tandem duplication.
70. The tandem duplication produce _____and reverse tandem duplication produce_____ **A. ***buckling, hairpin; **B.** hairpin, hairpin; **C.** buckling, buckling; **D.** hairpin, buckling.
71. Which of two sequences ATATATATAT or CGCGCGCGCG has more high probability of being duplicated? **A.** both are unlikely to be duplicated; **B.** both have the same probability for duplication; **C.** CGCGCGCGCG; **D.** ATATATATAT.
72. Which of following can be due to duplication? **A.*** pleiotropy; **B.** co-dominance; **C.** incomplrte dominance; **D.** dominance.
73. Which of events can be resposable for Down's syndrome? **A.***duplication of part of the long arm of chr 21 and its transfer to the long arm of chr 14; **B.** X and Y chrs crossover; **C.** loss of Y chr **D.** translocation between chrs 8 and 12.
74. If one gene is duplicated and one copy of the gene is not expressed, what effect can be observed on phenotype? **A.** mutant phenotype; **B.*** normal phenotype; **C.** mutant phenotype at low temperature; **D.** mutant phenotype at high temperature.

75. What happens according Strisinger's model? **A.*** Daughter strand slippage of DNA polymerase results in looping wich is stabilized by repetitive sequences. This leads to the increase of number of repeats in daughter strand; **B.** ribosome slippage cause duplication; **C.** parent strand slippage of DNA polymerase results in duplication in parent strand; **D.** the polymerase returns back and resynthesizes.
76. Duplication in gene results in mutant eye phenotype. What can prevent this effect? **A.***duplication in normal eye color; **B.** deletion of both genes; **C.** reverse tandem duplication; **D.** translocation of eye gene to another chr.
77. Which is not true about inversion? **A.** inverted chrs are usually viable; **B.** inversion involving centromere is paracentric; **C.** inversion not involving centromere is pericentric; **D.*** two DNA strads will not pair, if one of them contains inverted segment.
78. Which one is pericentric inversion of chr A-B-O-C-D-E-F-G ("O" stands for centromere)? **A.*** A-B-O-C-F-E-D-G; **B.** A-B-O-C-D-E; **C.** A-G-F-E-D-C-O-B; **D.** B-O-C-D-E-F-G.
79. Which one is paracentric inversion of chr A-B-O-C-D-E-F-G ("O" stands for centromere)? **A.** A-B-O-C-F-E-D-G; **B.** A-B-O-C-D-E; **C.*** A-G-F-E-D-C-O-B; **D.** B-O-C-D-E-F-G.
80. Fil the gups: Due to looping during paring_____inversion reduces crossover in _____female. **A.***pericentric, heterozygous; **B.** paracentric, heterozygous; **C.** paracentric, homozygous; **D.** pericentric, homozygous.
81. What are the results of single crossingover with pericentric inversion? **A.*** 2 normal, 1 acentric and 1 dicentric; **B.** 2 dicentric and 2 acentric chrs; **C.** 3 normal and 1 acentric; **D.** 4 normal chrs.
82. Why long pericentric inversions usually don't suppress the crossovers? **A.** There is enough space for double crossover; **B.** long segments are recognized; **C.** non-crossovers segregate normally into gametes; **D.** none of these.
83. The wrong option is **A.***double crossover in paracentric inversion is lethal; **B.** paracentric inversion crossover products are not viable; **C.** paracentric non-crossover gametes segregate normally; **D.** there is genetic imbalance in gametes produced in paracentric inversion crossover.
84. In which options duplication and deletion result in inversions? **A.** chrs 22 and 9; **B.** chr 8; **C.** chr 14; **D.*** chr 3.
85. How many of DNA strands are involved into pericentric inversion loop? **A.**1; **B.** 2; **C.** 3; **D.***4, however, only 2 recombine.
86. Genetic variation in the nuclear genome that is expected to have a harmful effect on gene function is eproximately **A.** 40%; **B.** 20%; **C.**10%; **D.***1%.

7. Pedegree analysis

1. Female originate from family with Duchenne muscular dystrophy (a rare X-linked recessive disorder) history. She has six children (age 2, 3, 4, 5, 7 and 10)

and is now pregnant again. Based on the pedigree below, what is the accurate risk that the fetus (diamond) will have Duchenne muscular dystrophy?

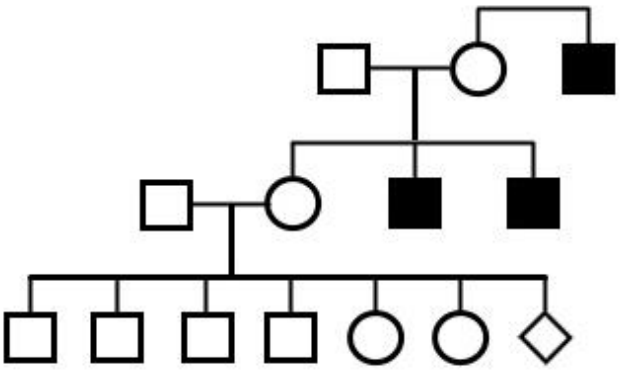


Fig. By D.B. Pylypiv

A. 1/4;
B. 1/2;
C. *1/8;
D. 1/6.
E. 2/3
F. 1/3

2. Which is the most probable inheritance pattern of the trait? Half-shaded individuals are heterozygous carriers.

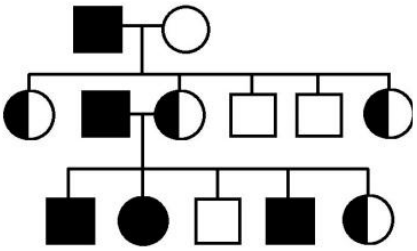


Fig. By D.B. Pylypiv

A. autosomal dominant;
B. mitochondrial DNA inheritance;
C.*X-linked recessive;
D. X-linked dominant;
E. Autosomal recessive;
F. Y-linked.

3. Which is the most probable inheritance pattern of the trait?

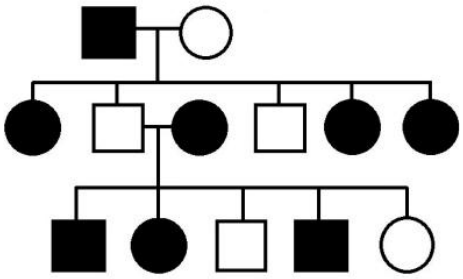


Fig. By D.B. Pylypiv

A. autosomal dominant;
B. mitochondrial DNA inheritance;
C. X-linked recessive;
D. *X-linked dominant;
E. Autosomal recessive;
F. Y-linked.

4. Which is the most probable inheritance pattern of the trait?

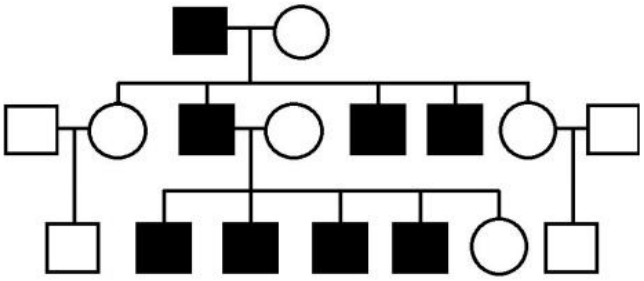


Fig. By D.B. Pylypiv

A. autosomal dominant;
B. mitochondrial DNA inheritance;
C. X-linked recessive;
D. *Y-linked;
E. Autosomal recessive.
F. X-linked dominant;

5. Deduce the inheritance pattern for trait in pedigree.

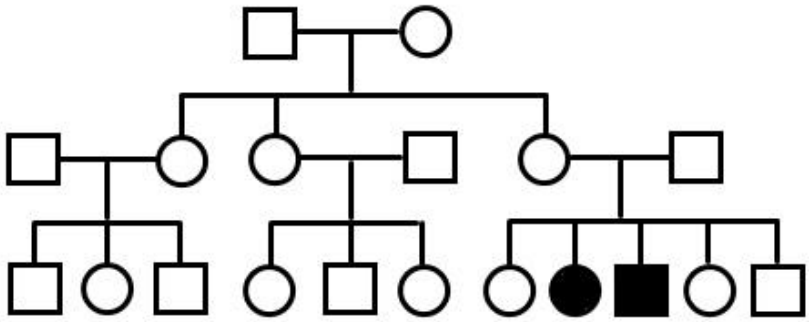


Fig. By D.B. Pylypiv

A.*autosomal recessive;
B. mitochondrial DNA inheritance;
C. X-linked recessive;
D. X-linked dominant;
E. Autosomal dominant;
F. Y-linked.

6. Deduce the inheritance pattern for trait in pedigree.

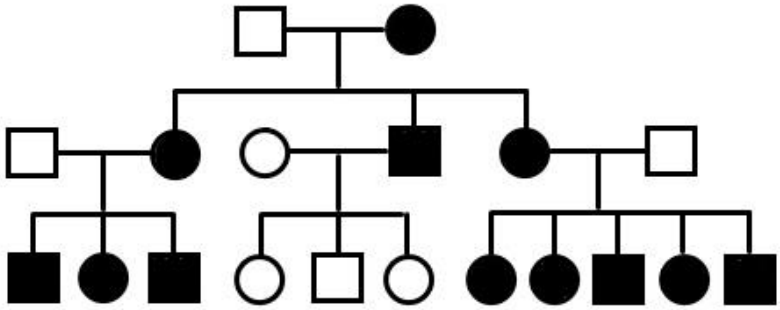
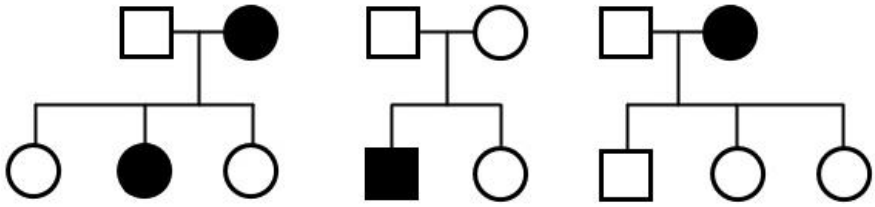


Fig. By D.B. Pylypiv

A. autosomal recessive;
B. *mitochondrial DNA inheritance;
C. X-linked recessive;
D. X-linked dominant;
E. Autosomal dominant;
F. Y-linked.

7. Deduce the inheritance pattern for trait from study of 3 families presented below.

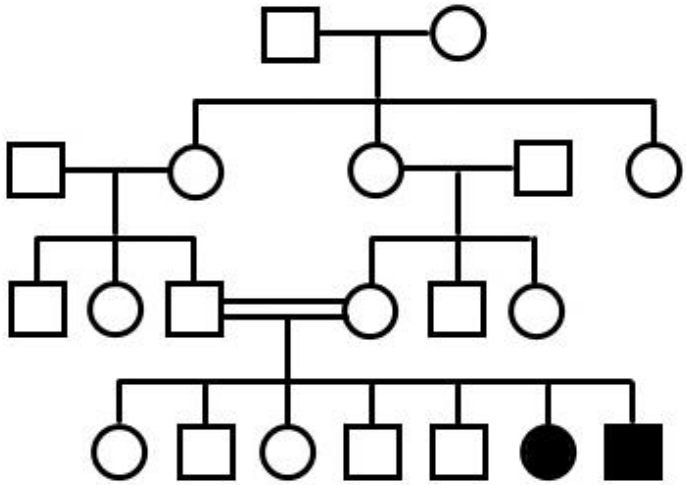


Family 1 Family 2 Family 3

Fig. By D.B. Pylypiv

A. X-linked recessive;
B. X-linked dominant;
C. autosomal dominant;
D.* autosomal recessive.
E. mitochondrial DNA inheritance.

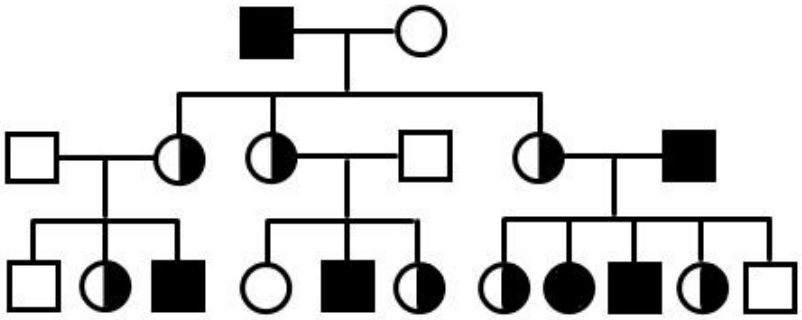
8. Deduce the inheritance pattern for trait in pedigree.



A. X-linked recessive;
B. X-linked dominant;
C. autosomal dominant;
D.* autosomal recessive;
E. mitochondrial DNA inheritance;
F. Y-linked.

Fig. By D.B. Pylypiv

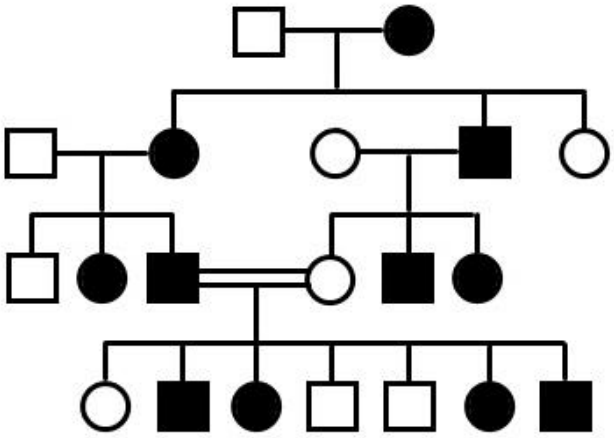
9. This is a pedigree for red color blindness. Deduce the inheritance pattern for trait in pedigree.



A. autosomal recessive;
B. mtDNA inheritance;
C. X*-linked recessive;
D. X-linked dominant.
E. autosomal dominant;
F. Y-linked.

Fig. By D.B. Pylypiv

10. Deduce the inheritance pattern for trait in pedigree.



A. *autosomal dominant;
B. autosomal recessive;
C. mitochondrial DNA inheritance;
D. X-linked recessive;
E. X-linked dominant;
F. Y-linked.

Fig. By D.B. Pylypiv

8. Penetrance, expressivity, anticipation, lethal alleles

1. What is penetrance? **A.*** The % of individuals with a given genotype which exhibits the corresponding phenotype; **B.** The % of individuals with a given phenotype which exhibits the corresponding genotype; **C.** the penetration of a gene into cytoplasm; **D.** the ability of the chromosome to penetrate through plasma membrane.
2. A degree to which particular genotype is expressed is called **A.***expressivity; **B**. penetrance; **C.** interference; **D.** coefficient of variation.
3. 22-year old Maria and 28-year old Robert are two siblings with genetically confirmed neurofibromatosis 1 due to mutation in the *NF1* gene. Maria has 10 café au lait macules (>5 mm diameter), optic glioma of the left eye, 15 neurofibromas, and a plexiform neurofibroma on the left arm. Her brother has instead only 3 café au lait macules and 2 neurofibromas on the back. The disease severity is therefore different in brothe and sister. This phenomenon is called **A.** reduced penetrance; **B.**gonadal mosaicism; **C.***variable expressivity; **D.** mitotic recombination.
4. Ferdinand is a 27-years old man whose mother developed Huntington's disease at 44 years of age. Ferdinand's grandmother also had Huntington's disease at 53 years of age. Ferdinand is wondering if he should test himself and if he could develop the disease before 40 years old. You reply that this is possible because of: **A.** Mosaicism; **B.** Penetrance; **C.** Meiosis; **D. *** Anticipation.
5. Several hereditary cancer syndromes exhibit an autosomal dominant inheritance pattern, however an individual that inherits a mutated gene does not have to develop cancer. How come? **A.** Variabel phenotype; **B.***Reduced penetrance; **C.** Exon-skipping; **D.** Incomplete pathogenicity
6. Which of the following hereditary cancer syndromes should primarily be considered in a family consisting of: a man with colon cancer at the age of 55 years, his sister endometrial cancer at 67 years of age, their father colon cancer at 53 years of age and their paternal grandfather's sister rectal cancer at 34 years of age? **A.** Familial adenomatous polyposis (FAP); **B.*** Lynch syndrome; **C.** Peutz-Jeghers syndrome; **D.** Wermer's syndrome.
7. All of the following can affect the dominant inheritance with EXCEPTION of **A.*** Lyonisation; **B.** reduced penetrance; **C.** age-dependent non-penetrance; **D.** new mutation.
8. Anticipation is often observed in **A.** Myotonic dystrophy; **B.** Hantington's; **C.** Fragile X syndrome; **D.***all of these.
9. The increase in incidence of fragile X with subsequent generations is known as the paradox of **A.***Sherman; **B.** Chargaff; **C.** Brown; **D.** Lee.
10. Myotonic dystrophy is caused by expansion of the microsatellite repeats **A.*** CTG or CCTG; **B.** CAG; **C.** CGG; **D.** ATT.
11. Hantington's disease is caused by expansion of the microsatellite repeats **A.** CTG or CCTG; **B.***CAG; **C.** CGG; **D.** ATT.
12. Fragile X syndrome is caused by expansion of the microsatellite repeats **A.** CTG or CCTG; **B.**CAG; **C.*** CGG; **D.** ATT.

13. Homozygotic combination in genotype is **A.***sometime expressed; **B.** newer expressed; **C.** always **D.** it is not studied yet.
14. The dominant gene for disease is not penetrant for an individual. Which of the following statements is wrong for this individual? **A.***the gene will be not penetrant in offspring also; **B.** the expressivity is 0%; **C.** The pedigree must not express the disease for this individual; **D.** The genotype here did not make proper expression in the phenotype.
15. Which of the trait shows only variation in expressivity? A*osteoporosis imperfecta; B. polydactyly; C. brachydactyly; D. pea seed colour.
16. Expressivity does not depend on **A.** environment; **B.** genotype; **C.***linkage; **D.** penetrance.
17. Gregor Mendel worked with genes, that are **A.*** 100% penetrant with 100% expressivity; **B.** variable in penetrance and expressivity; **C.** variable in expressivity only; **D.** variable in penetrance only.
18. Which statement is NOT true about 100% penetrance? **A.***It provides 100% expressivity; **B.** It provides phenotypic similarity in all recessive genotypes; **C.** It provides phenotypic similarity in all heterozygotic genotypes; **D.** Dominant genotypes demonstrate phenotypes different from recessive.
19. A person homozygotic to lethal allele **A.** always die; **B.*** may not express the genotype; **C.** always express the genotype; **D.** has severe abnormalities.
20. The lethal mutation of yellow mice is **A.***deletion; **B.** insertion; **C.** non-sense; **D.** point mutation.
21. Which mice will die? **A.***homozygous yellow; **B.** homozygous black; **C.** heterozygous agouti; **D.** homozygous white.
22. Which genetic combination is lethal in *Aurea* snapdragon, because of clorophyll absence? **A.** heterozygotic; **B.** homozygotic recessive; **C.*** homozygotic dominant; **D.** neither of these.
23. What is NOT observed for Tay Sach's disease? **A.*** It leads to death of heterozygous; **B.** HEXA gene problem; **C.** CNS is damaged; **D.** It is fatal within 2-3 years of life.
24. Hypodontia variants are coded by **A.** X-linked dominant; **B.** X-linked recessive; **C.** autosomal dominant; **D.** autosomal recessive; **E.*** any of these genes.
25. Which statement is true? **A.** Recessive lethal alleles are constantly removed from population, while Dominant lethals remain **B.***If expressed in individuals before reproductive age dominant lethal alleles are constantly removed from population, while recessive lethals remain; **C.** Both: dominant and recessive lethals always present equally in population. **D.** Only one kind of lethals (dominant or recessive) is present in population.
26. Hantington's disease affects people at the age **A.** 10; **B.** 20; **C.*** starting from about 30; **D.** randomly.

9. Population genetics and Hardy-Weinberg equilibrium

1. When *Drosophila* larvae were incubated at 37ºC, one of the emerged imago had a crossveinless phenotype. Crossveinless is known as mutation in this species.

When this crossveinless fly was mated with known crossveinless mutant all the progeny had wild phenotype. The 37ºC emerged crossveinless imago is **A.***phenocopy; **B.** conditional mutant; **C.** penetrance; **D.** pleiotropy.

2. 200 individuals population is in Hardy-Weinberg equilibrium with the allele frequency of A = 0.7 and a = 0.3. The number of heterozygotes Aa in population is: **A.** 18; **B.** 42; **C.*** 84; **D.** 98.
3. In a population of 10 000 000 individuals death rate is 12 per 1000 and birth rate is 18 per 1000. What is the annual population rise? **A.***60 000; **B.** 5 000; **C.** 14 000 **D.** 500 000.
4. In a population in Hardy-Weinberg equilibrium with two alleles b and B having allele frequency 0.7 and 0.3, how many individuals in a sample of 250 can be heterozygous (BB.? **A.** 52; **B.** *105; **C.** 21; **D.** 42.
5. Two populations are in exponential growth with the initial difference in growth rate of 10%. Predict the difference between population size after 10 generations. **A.** 1:1; **B.** 4:1; **C.** 2:1; **D.** *10:1.
6. For population with only triploid organisms the Hardy-Weinberg equation will be **A.** $(p+q)^3=1$; **B.** $(p+q)^2=1$; **C.** $(p+q+r)^3=1$; **D.*** $(p+q+r)^2=1$.
7. If the frequency of recessive disease allele in a population of 10 000 is 0.04, the number of diseased people is **A.***16; **B.** 496; **C.** 36000; **D.** 400.
8. In a population the frequency of B1 is 0.75 and B2 is 0.25. After the generation the phenotype frequency will be **A.*** 0.5625; 0.375; 0,0625; **B.** 0.5625; 0.0625; 0.375; **C.** 0,750; 0,250; 0,350; **D.** 0.5625; 0.1525; 0.0625.
9. The blood group O frequency in a population is 25%. The rest of individuals in the population have blood group A and B in ratio 1:1. What is the ratio of allelic frequency between blood group O, A and B? **A.** 1:1:1; **B.*** 2:1:1; **C.** 1:1:2; **D.** 3:3:1.
10. Evolutionating population **A.*** is not in Hardy-Weinberg equilibrium; **B.** is in Hardy-Weinberg equilibrium **C.** contains only homozygous individuals; **D.** contains only heterozygous individuals.
11. If product of particular gene in one species is on 90% same to the product of other gene in other species, such genes are called **A.***orthologous; **B.** allologous; **C.** paralogous; **D.** perilogous.
12. Weight-dependent mortality in babies is an example of **A.** disruptive selection; **B.** *stabilizing selection; **C.** directional selection; **D.** abortive selection.
13. Which of the following are characteristics of stabilizing selection? **A.***operates in stable environments; **B.** selects the complex genotypes; **C.** selects homozygotes only; **D.** selects heterozygotes only.
14. Directional selection is know also as **A.***progressive selection; **B.** position selection; **C.** retrogressive selection; **D.** main selection.
15. What happens during disruptive selection? **A.** one peak is formed; **B.** both extreme values are rejected; **C.*** members of both extreme values are selected and average value gets rejected; **D.** average value gets selected.
16. How many peacks are there in disruptive selection? **A.** 3; **B.*** 2; **C.**1; **D.** 4.

17. Which is not a characteristic of population Hardy-Weinberg equilibrium? **A.** all alleles frequencies remains constant from generation to generation; **B.** gene pool remains constant; **C.** described by Hardy-Weinberg equation; **D.*** all alleles frequencies change from generation to generation.
18. Total sum of all the frequencies in Hardy-Weinberg equilibrium is equal to **A.** 1; **B.** 2; **C.** 3; **D.** 4.
19. Which NOT affects the Hardy-Weinberg principle? **A.***genetic drop; **B.** gene migration; **C.** gene drift; **D.** mutation.
20. The process when one species migrate from one to another place and frequency of the gene alleles changed is called **A.***gene migration; **B.** gene drift; **C.** gene travel; **D.** gene recombination.
21. What is the founder effect? **A.*** formation of new species due to migration of population or its part to the new place; **B.** named after John Founder; **C.** change in allele frequency; **D.** no change in allele frequency.
22. Production of new phenotypes results from **A.*** pre-existing useful mutation; **B.** post-existing useful mutation; **C.** pre-existing harmful mutation; **D.** post-existing harmful mutation.

10. Parasitology MCQs for Medical Biology Exam

1. A boy has a prolapsed rectum. Doctor found small worms resembling whips attached to its mucos**a.** A stool sample microscopy reveals eggs that are barrel shaped, with bipolar plugs. Cause? Select one: **A.** *Trichuris trichiura*; **B.** *Echinococcus granulosus*; **C.** *Ascaris lumbricoides*; **D.** *Enterobius vermicularis.*

2. A diagnostic finding for *Diphylobothrium latium.* **A.** 3.cyst; **B.** 1.ovoid, operculated eggs in stool; **C.** 2.rosette shape uterus in proglottids; **D.** 1 and 2.

3. A *Diphylobothrium latium* egg is approximately: **A.** 110 μm; **B.** 45 μm; **C.** 65-70 μm; **D.** 55 μm.

4. A lady presents complaints to her gynecologist on vaginal itching, frothy, yellow discharge, painful urination. She had a sex with several men in the past 2 weeks. Cultures are negative for bacterial growth, but organisms are visible via a wet preparation on low power. The most likely causal agent is Select one: **A.** Candida albicans; **B.** *Chlamydia trachomatis*; **C.** *Trichomonas vaginalis*; **D.** *Trichophyton rubrum.*

5. When humans have cystic hydatid disease, the causative agent and host classification are *Cestoda*, **A.** *Echinococcus granulosus*; **B.** *Echinococcus vogeli*; **C.***Taenia saginata*; **D.** *Taenia solium*; **E.** *Diphyllobothrium latum.*

6. A protozoan cyst that contains four nuclei, median bodies and axonemes should be identified as **A.** *Dientamoeba fragilis*; **B.** *Giardia lamblia*; **C.** *Pentatrichomonas hominis*; **D.** *Trichomonas vaginalis*.

7. A useful concentration method used to detect microfilariae Wuchereria bancrofti
is the: **A.** formalin-ethyl acetate concentration; **B.** Baermann's method; **C.** miracidial hatching; method; **D.** membrane filter metho**d.**

8. A woman is prescribed the drug of choice for treating *Trichomonas vaginalis*. What side-effect to expect? Select one: **A.** Cinchonism; **B.** Flushing, tachycardia, nausea, vomiting, and orthostatic hypotension with alcohol consumption; **C.** Hemolytic anemia in G-6-PD individuals; **D.** Exacerbation of psoriasis

9. After India ink injection, the gravid proglottids of which cestode contain seven to thirteen branches on each side of the main uterine stem? Select one: **A.** *Taenia solium*; **B.** *Taenia saginata*; **C.** *Diphyllobothrium latum*; **D.** *Dipylidium caninum*.

10. All about *Toxoplasma gondii* is correct EXCEPT: *T. gondii* can be Select one: **A.** a cause of encephalitis in immunocompromised patients; **B.** transmitted by cat feces; **C.** diagnosed by finding trophozoites in the stool; **D.** transmitted across the placenta to the fetus.

11. All these parasites are not pathogenic EXCEPT one: **A.** *Trichomonas vaginalis*; **B.** *Trichomonas hominis*; **C.** *Trichomonas tenax*; **D.** *Chilomastic Mesnil*.

12. Amebic dysentery is caused by Select one: **A.** *Dientamoeba fragilis*; **B.** *Euglena*; **C.** *Entamoeba histolytica*; **D.** *E. dispar*.

13. An operculated cestode egg that can be recovered in human feces is… Select one: **A.** *Paragonimus westermani*; **B.** *Clonorchis sinensis*; **C.** *Diphyllobothrium latum*; **D.** *Dipylidium caninum*.

14. Babesiosis is caused by…Select one: **A.** *Babesia duncani*; **B.** *Babesia microti*; **C.** by all of these; **D.** *Babesia divergens*.

15. Bedbugs *Cimex lectularius* fed on human blood can survive without eating… Select one: **A.** years; **B.** several weeks; **C.** one week; **D.** one month.

16. Cestodes… Select one: **A.** have male and female worms; **B.** have female worms only; **C.** are hermaphrodites; **D.** have male worms only.

17. Cestodes are distinguished from other flatworms by the absence… Select one: **A.** nervous system; **B.** reproductive system; **C.** excretory system; **D.** digestive system.

18. Chigger *Orientia tsutsugamushi*, in some Asian countries act as the vector of… Select one: **A.** scrub typhus; **B.** Dysentery; **C.** all of these; **D.** Malaria.

19. *Clonorchis sinensis* and *Fasciola hepatica* have principally similar life cycles. The difference is in… : Select one: **A.** source of metacercaria for human; **B.** none of these; **C.** absence of cercaria in *Fasciola hepatica*; **D.** absence of snail in *Clonorchis sinensis* cycl**e.**

20. Clonorchis sinensis is… Select one: **A.** has females, males and hermaphrodites; **B.** has females and males; **C.** monoecious, i.**e.**, adult has both male and female reproductive organs; **D.** only females.

21. *Cryptosporidium parvum*, *Cyclospora cayetanensis*, and *Isospora belli* are considered to be… Select one: **A.** *Sporozoa*; **B.** *Coccidia*; **C.** *Metazoa*; **D.** *Microsporidi***a.**

22. Culture methods are used for… : Select one: **A.** *Trypanosoma*; **B.** Malarial parasite; **C.** *Leishmania*; **D.** all of these; **E.** *Amoeba*.

23. Cysticercus is the larva of… Select one: **A.** liver fluke; **B.** Tapeworms; **C.** Ascaris; **D.** Roundworms.

24. *Diphyllobothrium* is found in...Select one: **A.** Europe, Asia and the Americas; **B.** South America; **C.** only in Europe; **D.** in Ukrain**e.**

25. Duodenal drainage is used in the recovery of which 2 intestinal parasites? Select one:**A.** hookworm and *Entamoeba histolytica*; **B.** Trichuris trichiura and *Entamoeba coli*; **C.** Strongyloides stercoralis and *Giardia lamblia*; **D.** Balantidium coli and *Ascaris lumbricoides*.

26. Each is correct EXCEPT: Hookworm infection. Select one: **A.** caused by *Necator americanus*; **B.** is acquired by when filariform larvae penetrate the skin **C.** is diagnosed by finding the trophozoite in the stool; **D.** causes anemia.

27. Each of the following is transmitted by eating row fish or seafood EXCEPT: Select one: **A.** *Ancylostoma duodenale*; **B.** *Diphyllobothrium latum*; **C.** *Paragonimus westermani*; **D.** *Clonorchis sinensis*.

28. Each of the following parasites has an intermediate host as part of its life cycle EXCEPT: Select one: **A.** *Trichomonas vaginalis*; **B.** *Echinococcus granulosus*; **C.** *Toxoplasma gondii*; **D.** *Taenia solium*.

29. Each of the following parasites passes through the lung during human infection EXCEPT: Select one: **A.** *Wuchereria bancrofti*; **B.** *Strongyloides stercoralis*; **C.** *Necator americanus*; **D.** *Ascaris lumbricoides*.

30. Each of the following statements concerning *Diphyllobothrium latum* is correct EXCEPT: Select one: **A.** is transmitted through undercooked fish; **B.** is a tapeworm that has a scolex with a circle of hooks; **C.** it causes a megaloblastic anemia due to vitamin B12 deficiency; **D.** has operculated eggs.

31. What type of disease is caused by *Echinococcus granulosus*? Select one: **A.** Alveolar echinococcus; **B.** Hydatid disease; **C.** Diarrhoea; **D.** B12 deficiency.

32. Elimination of rodents is a control measure for which cestode? Select one: **A.** *Diphyllobothrium*; **B.** *Echinococcus*; **C.** *Hymenolepis*; **D.** *Taenia***e.**

33. Excretory organs in *Taenia* are: Select one: **A.** Nephrones; **B.** flame cells; **C.** Kidneys; **D.** Nephridi**a.**

34. Falling leaf like movement in microscopic liquid preparations is characteristic of… Select one: **A.** *Taenia solium*; **B.** *Echinococcus granulosus*; **C.** *Toxoplasma gondii*; **D.** *Trichomonas vaginalis*.

35. First intermediate host of *Diphyllobrothrium latum* is a… Select one: **A.** Pork; **B.** Chicken; **C.** Crustaceans, including copepods; **D.** Fish, particularly pike and salmonids (trout, salmon).

36. Flat worms are… Select one: **A.** 1 and 2 **B.** 1. *T. solium*; **C.** 4. ***E.*** *vermicularis*; **D.** 3. ***A.*** *lumbricoides*; **E.** 2. *T. saginata*.

37. Humans are the only definitive hosts for… Select one: **A.** *Echinococcus*; **B.** *Hymenolepis nana*; **C.** *Taenia*; **D.** *Diphyllobothrium*.

38. Humans are the only definitive hosts for… Select one: **A.** *Taenia*; **B.** *Hymenolepis nana*; **C.** *Echinococcus*; **D.** *Diphyllobothrium*.

39. Humans can serve as both the intermediate and definitive host in infections caused by: Select one: **A.** *Schistosoma japonicum*; **B.** *Ascaris lumbricoides*; **C.** *Hymenolepis nana*; **D.** *Enterobius vermicularis*.

40. If a patient has watery diarrhea, the stage in the life cycle of the intestinal protozoa that is most likely to be seen in the permanent stained smear is the… Select one: **A.** Trophozoite; **B.** Cyst; **C.** Precyst; **D.** Pretrophozoite.

41. List *Taenia solium* facts. Select one: **A.** pork tapeworm, pig is intermediate host; **B.** fish is intermediate host; **C.** tissue tapeworm; **D.** *Platyhelminthes*.

42. Loa Loa - subcutaneous filariasis has a vectors: Select one: **A.** 1. day-biting deer fly (*Chrysops silacea.*; **B.** 1 and 2; **C.** 2. mango flies (*Chrysops dimidiata*; **D.** 3. *Anopheles* mosquito.

43. Malaria is caused by *Plasmodium.* Select one option: **A.** *falciparum*; **B.** *malariae*; **C.** *ovale*; **D.** *vivax*; **E.** by all of thes**e.**

44. Match the *Diphyllobothrium* to common names. Select one: **A.** the pork tapeworm; **B.** the beef tapeworm; **C.** the fish tapeworm; **D.** hydatit worm.

45. Match the *Echinococcus granulosus* to common names. Select one: **A.** the fish tapeworm; **B.** hydatit worm; **C.** the pork tapeworm; **D.** the beef tapeworm.

46. Match the *Echinococcus granulosus* to common names. Select one: **A.** the fish tapeworm; **B.** hydatit worm; **C.** the pork tapeworm; **D.** the beef tapeworm.

47. Match the *Hymenolepis nana* to common names… Select one: **A.** the pork tapeworm; **B.** the dwarf tapeworm; **C.** hydatit worm; **D.** the beef tapeworm;

48. Match the Taenia to common names. Select one: **A.** the beef/pork tapeworm; **B.** hydatit worm; **C.** the cat tapeworm; **D.** the fish tapeworm;

49. Microscopic examination of morning sputum can identify: Select one: **A.** *Paragonimus westermani* eggs; **B.** *Strongyloides stercoralis* larva; **C.** hookworm larvae, and rarely Entamoeba histolytica; **D.** all of these; **E.** *Ascaris lumbricoides* larvae.

49. Not feeding dogs the uncooked offal of sheep is a preventative measure for which cestode infection. Select one: **A.** *Taenia*; **B.** *Echinococcus;* **C.** *Hymenolepis nana;* **D.** *Diphyllobothrium.*

50. Onchosphere occurs in… Select one: **A.** *Planaria*; **B.** *Taenia*; **C.** *Ascaris*; **D.** *Fasciola.*

51. Packets of eggs are characteristic for the… Select one: **A.** dog and cat; **B.** *Taenia saginata*; **C.** Coracidium; **D.** *Taenia solium.*

52. Parasite that may be sexually transmitted is… Select one: **A.** *P. hominis*; **B.** *T.vaginalis*; **C.** ***E.****hominis*; **D.** ***D.*** *fragilis*.

53. Pigs or dogs are the source of human infection by each of the following parasites EXCEPT: Select one: **A.** *Echinococcus granulosus*; **B.** *Trichinella spiralis*; **C.** *Taenia solium*; **D.** *Ascaris lumbricoides*.

54. Proglottid is… Select one: **A.** small anterior hooked attachment organ; **B.** each individual segment; **C.** none above **D.** division of body into segments immediately following the scolex/neck.

55. *Pthirus pubis*, the crab lice, infest… Select one: **A.** 1. hair in the pubic area in adults; **B.** 2. eye lashes in children; **C.** 1 and 2; **D.** 3. head hair.

56. *Sarcocystis* species capable of causing human infection are: Select one: **A.** Sarcocystis suihominis; **B.** all of these; **C.** *Sarcocystis bovihominis* (*S. hominis*); **D.** *Sarcocystis nesbitti*.

57. Second Intermediate Host of *Diphyllobrothrium latum* Select one: **A.** Chicken; **B.** Pork; **C.** Fish, particularly pike and salmonids (trout, salmon); **D.** Crustaceans, including copepods.

58. Strobila is… Select one: **A.** each individual segment; **B.** small anterior hooked attachment organ; **C.** division of body into segments immediately following the scolex/neck; **D.** none abov**e.**

59. Symptoms of leishmaniasis are… Select one: **A.** all of these; **B.** post-kala-azar skin rashes; **C.** cutaneous lesions; **D.** visceral organs damage; **E.** mucocutaneous lesions.

60. *Taenia solium* is a Select one: **A.** dog tapeworm; **B.** fish tapeworm; **C.** cat tapeworm; **D.** pork tapeworm.

61. Tapeworm is placed in the class… Select one: **A.** *Sporozoa*; **B.** *Suctoria*; **C.** *Cestoda*; **D.** *Trematoda*.

62. Tapeworms does not possess digestive system as it… Select one: **A.** does not require solid food; **B.** obtains food through general surface; **C.** does not require food; **D.** lives in intestine.

63. Tapeworms obtain their food from… Select one: **A.** all the above; **B.** outer surface; **C.** Suckers; **D.** Mouth.

64. The examination of sputum and stool may be necessary to diagnose infection with Select one: **A.** *Wuchereria bancrofti*; **B.** *Trichinella spiralis*; **C.** *Paragonimus westermani*; **D.** *Fasciola hepatica*.

65. The first intermediate host of ***D.*** *datum* is… Select one: **A.** Flea; **B.** Beef; **C.** Rats; **D.** Copepod.

66. The infective stage of Enterobius vermicularis is… Select one: **A.** Larva; **B.** non of the above; **C.** Cyst; **D.** Eggs.

67. The lice *Pediculus humanus* capitis (head lous**E.**, *Pediculus humanus* humanus (body lous**E.**, *Pthirus pubis* (crab lous**E.** transmit… Select one: **A.** relapsing fever and typhus; **B.** Scaby; **C.** Malaria; **D.** Leishmaniasis.

68. The main anatomic location of Schistosoma mansoni adult worms is: Select one: **A.** Bone marrow; **B.** Lung alveoli; **C.** Renal tubules; **D.** Intestinal venules;

69. The most sensitive detection method of Acanthamoeba spp. from lens care solutions or corneal biopsies is the… Select one: **A.** Giemsa staining method; **B.** use of monoclonal reagents for the detection of antibody; **C.** use of non-nutrient agar cultures seeded with *Escherichia coli*; **D.** trichrome staining procedure.

70. Who is the intermediate host of *Taenia solium*? Select one: **A.** Cattle; **B.** Fish; **C.** Pork; **D.** Humans.

71. The only one *Ciliophora*, a human parasite, is Select one: **A.** *Balantidium coli*; **B.** *Entamoeba histolytica*; **C.** *Sarcoptes scabeii*; **D.** *Plasmodium falciparum*.

72. The parasites that may be letal for AIDS patient are Select one: **A.** 1.*Cystoisospora belli*; **B.** 3. *Giardia lambilia*; **C.** 1, 2; **D.** 2.*Cryptosporidium parvum*.

73. The Trichomonas diagnosis is based on Select one: **A.** overnight culture or 2-7 day in vitro culture; **B.** cervical smear: a transparent "halo" around superficial cell nucleus; **C.** Discovery of trophozoite with "corkscrew" or “falling leaf” motility in fresh vaginal, urethral, prostatic secretions, or urine sediment (following prostate massag**E.** diluted in saline; **D.** all of these; **E.** Antibody and DNA-based tests.

74. The *Trichomonas* diagnosis is based on… Select one: **A.** Discovery of trophozoite with "corkscrew" or “falling leaf” motility in fresh vaginal, urethral, prostatic secretions, or urine sediment (following prostate massage. diluted in saline; **B.** all of these **C.** cervical smear: a transparent "halo" around superficial cell nucleus; **D.** Antibody and DNA-based tests; **E.** overnight culture or 2-7 day in vitro culture.

75. Ticks in the genera *Ixodes* have NOT been implicated in disease… Select one: **A.** Scabies; **B.** Babesiosis; **C.** Lyme disease; **D.** human granulocytic ehrlichiosis; **E.** Russian spring-summer encephalitis.

76. Ticks in which genera have been implicated in tick paralysis? Select one: **A.** 1 and 2; **B.** 1 and 3; **C.** 2. *Ixodes*; **D.** 3. *Amblyomma*; **E.** 1. *Dermacentor*.

77. To collect eggs (and sometime female worm) from patient infected with *Enterobius vermicularis* we use… Select one: **A.** non of the above; **B.** Syringe; **C.** the adhesive part of the Swube tube or sticky tape applied to the perianal area first thing in the morning; **D.** Pipett**e.**

78. Transfer of *Taenia* to secondary hosts occurs as… Select one: **A.** Cysticercus; **B.** Morula; **C.** Egg; **D.** Onchosphere**.**

79. Transmission of *Taenia saginata* Select one: **A.** unwashed fruits; **B.** Ingestion of undercooked fish; **C.** Ingestion of larval form in undercooked beef; **D.** Ingestion of undercooked pork.

80. Transmission of *Taenia saginata* Select one: **A.** Ingestion of undercooked fish; **B.** Ingestion of larval form in undercooked beef; **C.** Ingestion of undercooked pork; **D.** unwashed fruits.

81. Transmission of *Taenia solium* is by… Select one: **A.** Ingestion of undercooked fish; **B.** Ingestion of undercooked pork; **C.** unwashed fruits; **D.** Ingestion of undercooked chicken.

82. Treatment of *Trichomonas vaginalis* infection is by… Select one: **A.** Metronidazole (Flagyl®) and other nitroimidazoles, such as tinidazole; **B.** Streptomycine; **C.** Nistatin; **D.** Penicillin.

83. *Trichomonas vaginalis* is… Select one: **A.** Roundworm; **B.** Ectoparasite; **C.** luminal protozoa; **D.** tissue protozoa.

84. Urinary schistosomiasis is diagnosed by *S. haematobium* eggs presence in urin**e.** Select one: **A.** eggs usually shed in the urine around midday, so an optimum urine specimen is collected at noon; **B.** eggs usually shed in the urine around midnight, so an optimum urine specimen is collected at midnight; **C.** eggs usually shed in the urine during whole day around, thus any urine sample can be used; **D.** eggs usually shed in the morning urine, so an optimum urine specimen is collected at morning.

85. Urinary-genital system colonizer is… Select one: **A.** *Dientamoeba fragilis*; **B.** *Trichomonas vaginalis*; **C.** *Pentatrichomonas hominis*; **D.** *Trichomonas tenax*.

86. What are cestodes commonly known as? Select one: **A.** Flukes; **B.** Roundworms; **C.** Nematodes; **D.** Tapeworms.

87. What are the vectors of tick-borne relapsing fever (TBRF) spirochetes? Select one: **A.** *Ornithodoros turicata*; **B.** *Ornithodoros hermsi*; **C.** all of these; **D.** *Ornithodoros moubat**a.***

88. What is coenurus? Select one: **A.** common name for a cestode; **B.** the larval form of multiceps species; **C.** the outer covering of a cestode; **D.** larval form of *Dipylidium caninum*;

89. What is correct about *Taeni**a.*** Select one: **A.** male organs occur in the anterior proglottides; **B.** female organs occur in the anterior proglottides; **C.** male organs occur in the posterior proglottides; **D.** mature proglottides contain both female and male organs.

90. What is NOT true about *Sarcoptes scabiei* ? Select one: **A.** the parasite is hermaphrodite; **B.** septic pustules may develop after scratching, if the hygiene is poor; **C.** characteristic rash and burrows observed when smeared black ink on the skin is wiped away; **D.** microscopic examination of a skin scraping shows the mites.

91. What is NOT true about *Tunga penetrans*? Select one: **A.** female shed ≈100 eggs over a 2-week period, after which it die and are sloughed by the host's skin; **B.** penetrates the stratum corneum and burrows into the stratum granulosum; **C.** it has two larval stages; **D.** spread in Europe.

92. What is true about *Taenia saginata…* Select one: **A.** pig is intermediate host; **B.** rostellar hooks are absent; **C.** there are two large suckers on scolex; **D.** rostellum has double circle of hooks.

93. What is true of *Taenia solium…* Select one: **A.** oral suckers; **B.** an abdomen is absent; **C.** it has head, neck and thorax; **D.** the animal has no mouth.

94. When freshly passed in stools, the oocysts are not immediately infective (thus, direct fecal-oral transmission can't occur) in which of the following?: Select one: **A.** 1. *Cyclospora cayetanensis*; **B.** 2. *Cystoisospora belli*; **C.** 1 and 2; **D.** 3. *Cryptosporidium parvum.*

95. Which of the following act as an intermediate host for *Anisakis* species? Select one: **A.** Crustaceans, fish and squid; **B.** Fish; **C.** *Anisakis* species have no intermediate hosts; **D.** Snail.

96. Which of the following are true for *T. solium*? Select one: **A.** It has more uterine branches per proglottid than *T. saginata*; **B.** Less proglottids are passed per day than in *T. saginata*; **C.** More proglottids are passed per day than *T. saginata*; **D.** It's scolex has four suckers and no hooks.

97. Which of these worms needs the cyst-filled organs of the intermediate host (containing daughter cysts and protoscolices) to be eaten to continue its lifecycle? Select one: **A.** *Diphyllobothrium*; **B.** *Hymenolepis*; **C.** *Echinococcus*; **D.** *Taenia.*

98. Which one is NOT a fly that may cause myiasis in humans? Select one: **A.** *Cochliomyia hominovorax*; **B.** *Musca domestica*; **C.** *Dermatobia hominis*; **D.** *Cordylobia anthropophagi*; **E.** *Chrysomya bezziana.*

99. Which statement is NOT true about trypanosomiasis? Select one: **A.** the vector of the disease is Tse tse fly (*Glossina* genus); **B.** *Trypanosoma brucei gambiense,* causing chronic African trypanosomiasis ("West African sleeping sickness"); **C.** *Trypanosoma brucei rhodesiense,* causing acute African trypanosomiasis ("East African sleeping sickness"); **D.** *Trypanosoma brucei brucei* is a parasite primarily of cattle and occasionally other animals, and under normal conditions does not infect humans; **E.** the vector of the disease is *Anopheles mosquito*.

100. Which tapeworm does not have a scolex bearing 4 suckers? Select one: **A.** *Diphyllobothrium latum*; **B.** radiological methods **C.** *Dipylidium caninum* **D.** hydatid cyst disease.

101. Which tapeworm is known to be able to cause a B12 deficiency? Select one:

A. *T. solium*; **B.** *Diphyllobothrium*; **C.** *Echinococcus granulosus*; **D.** There is no correct answer.

102. Which worms belong to the *Taenidae* family? Select one: **A.** *Spirometra*; **B.** *Echinococcus*; **C.** *Hymenolepis*; **D.** *Diphyllobothrium*.

103. Who are reservoir hosts of *Diphyllobothrium*? Select one: **A.** bears; **B.** humans; **C.** Dogs; **D.** Cats.

104. Who are the definitive hosts of *Taenia solium* and *saginata*? Select one: **A.** dog; **B.** humans; **C.** fish; **D.** Pork.

105. Who is the definitive host of *Dipylidium caninum*? Select one: **A.** fish; **B.** flea; **C.** Humans; particularly children, dogs, and cats; **D.** Pork.

106. Who is the definitive host of *Taenia saginata*? Select one: **A.** fish; **B.** pork; **C.** humans; **D.** cattle.

107. Who is the definitive host of *Taenia solium*? Select one: **A.** humans; **B.** pork; **C.** fish; **D.** Cattle.

108. Who is the intermediate host of *Dipylidium caninum*? Select one: **A.** fish; **B.** humans, particularly children, dogs, and cats; **C.** pork; **D.** Flea.

109. Who is the intermediate host of *Taenia saginata*? Select one: **A.** fish; **B.** humans; **C.** cattle; **D.** pork.

110. Who is the intermediate host of *Taenia solium*? Select one: **A.** Humans; **B.** Cattle; **C.** Fish; **D.** Pork.

11. Cytology and Genetics MCQs for Medical Biology Exam

111. Autophagy and heterophagy are processes associated with the function of… Select one: **A.** Microbodies; **B.** Vacuole; **C.** Nucleus; **D.** Lysosome; **E.** Mitochondrion.

112. Best material for study of mitosis by students in laboratory is… Select one: **A.** squamous cells; **B.** testes; **C.** ovary; **D.** root tip.

113. Brain neural stem cells differentiate into… Select one: **A.** specialized brain cells only; **B.** specialized blood cells; **C.** brain cells and specialized skin cells; **D.** all types of specialized cells.

114. Chronic myelogenous leukemia (CML) cancer is due to… Select one: **A.** deletion of a specific chromosomal region; **B.** a loss of part of the short arm of chr 5; **C.** "Philadelphia chromosome," a result of a translocation involving chrs 9 and 22; **D.** addition to chr 7.

115. Dad is tall, mom is short. What height is expected in child? Select one: **A.** short : tall, 1:1; **B.** short; **C.** medium; **D.** tall.

116. Down syndrome is result of trisomy of chromosome…Select one: **A.** 18; **B.** 5; **C.** 21; **D.**13.

117. During meiosis crossing over occurs at…: Select one: **A.** Diplotene; **B.** Pachytene; **C.** Diakinesis; **D.** leptotene**.**

118. Embryonic stem cells can differentiate into…Select one: **A.** all types of specialized cells in the body; **B.** artificial skin producing cells; **C.** insulin producing cells; **D.** brain stem cells and specialized brain cells only.

119. First three-parental babe was born in 2016 as assisted reproductive technology treatment result to…Select one: **A.** avoid male infertility problem; **B.** avoid female infertility problem; **C.** fuse 3 unrelated gametes; **D.** prevent mitochondrial disease in child.

120. Fixatives are: Select one: **A.** all of mentioned; **B.** picric acid; **C.** glutaraldehyde; **D.** formaldehyde; **E.** acetic acid.

121. G-banding patterns is used to detect… Select one: **A.** deletions; **B.** insertions; **C.** all of these; **D.** chromosomal translocations.

122. H_2O_2 clearance inside the cells is carried out by… Select one: **A.** ribosome; **B.**peroxysome with enzyme peroxidase; **C.** peroxysome with enzyme catalase; **D.** peroxysome with enzyme amino oxidase; **E.** Glyoxysomes with enzyme izocitrate liase.

123. Human blood group alleles A or B are inherited with genes interaction: Select one: **A.** duplicated genes; **B.** recessive epistasis; **C.** complementation; **D.** full dominance with O allele, codominance with A or B allel**e.**

124. Human cells ‘fed’ when grown in a lab by… Select one: **A.** antibodies; **B.** cells; **C.** salts; **D.** proteins & sugars.

125. Ideally, the microscope should be parfocal, that is: Select one: **A.** the microscope should have 2 immersion objectives: for oil and air; **B.** the image should remain in focus when objectives are changed; **C.** the microscope should have 2 high magnification objectives; **D.** none of these; **E.** the image should not remain in focus when objectives are changed.

126. In a conventional light microscope, the best possible resolution is: Select one: **A.** 1 - 2 μm; **B.** 20 - 30 μm; **C.** 0.01 - 0.05 μm; **D.** 0.3 – 0.2 μm; **E.** 5 - 10 μm.

127. In anaphase I of meiosis, chromosomes contains one pair of… Select one: **A.** daughter nucleosomes; **B.** sister chromatids; **C.** daughter chromatids; **D.** sister nucleosomes.

128. Indicate karyotype of normal human sperm? Select one: **A.** 22, Y; **B.** 23, X; **C.** 46, XY; **D.** 46, XX.

129. Kind of microscope which allows to see and move the atoms is: Select one: **A.** fluorescent microscope; **B.** phase contrast microscope; **C.** Scanning tunelling microscope (STM); **D.** transmission electron microscope (TEM); **E.** Scanning electron microscope (SEM).

130. Large macromolecular complexes, viruses, bacteria crossing the plasma membrane by means of… Select one: **A.** active transport; **B.** phagocytosis; **C.** diffusion; **D.** pinocytosis.

131. Meiosis II performs Select one: **A.** synthesis of DNA and centromere; **B.** separation of homologous chromosoms; **C.** separation of chromatids; **D.** separate of sex chromosomes.

132. Mice without p21 gene… Select one: **A.** 1. can regenerate the limbs; **B.** 1 and 3; **C.** 2. can prevent cancers; **D.** 3. unable to prevent the cancers.

133. Mitosis is similar to… Select one: **A.** meiosis II; **B.** both a and b; **C.** meiosis I; **D.** none of these.

134. Most often cells sampling for chromosomal abnormalities analyses in fetus (biochemical and karyotyping) is carried out by procedures of… Select one: **A.** mother vaginal epidermis biopsy; **B.** chorionic villus sampling; **C.** amniocentesis; **D.** 1 and 2.

135. Oxysomes are ATP synthases present on… Select one: **A.** outer mitochondrial membrane; **B.** outer mitochondrial membrane facing cytosol; **C.** outer nuclear membrane; **D.** inner mitochondrial membrane; **E.** between the membranes.

136. Particular disease is coded by dominant gene. What is the probability of healthy children if mom and dad are diseased heterozygotes by this trait? Select one: **A.** 100%; **B.** 25%; **C.** 50%; **D.** 75%.

137. Particular disease is coded by recessive trait. What is the probability of the disease in children if mom and dad are healthy heterozygotes by this trait? Select one: **A.** 100%; **B.** 50%; **C.** 75%; **D.** 25%.

138. Phenotypes ratio at Dominant epistasis genes interaction is… Select one: **A.** 15:1; **B.** 12:3:1; **C.** 9:3:4; **D.** 9:7.

139. Phenotypes ratio at Dominant suppression by A of dominant allele B… Select one: **A.** 9:3:4; **B.** 13:3; **C.** 9:3:3:1; **D.** 9:7.

140. Phenotypes ratio at Recessive epistasis genes interaction is… Select one: **A.** 9:3:3:1; **B.** 15:1; **C.** 9:7; **D.** 9:3:4.

141. Phenotypes ratio Complementary genes interaction is… Select one: **A.** 15:1; **B.** 9:3:4; **C.** 9:3:3:1; **D.** 9:7.

142. Phenotypic segregation in Duplicate genes interaction is… Select one: **A.** 9:3:4; **B.** 9:3:3:1; **C.** 9:7; **D.** 15:1.

143. RBCs in the blood repel each other due to: … Select one: **A.** The concave shape of RBCs; **B.**Carbohydrates moieties of glycophorin A on RBC membrane surface contain negatively charged sialic acid residues; **C.** Amino acids in the peripheral portion of glycophorin A are negatively charged; **D.** lack of membrane organelles.

144. Recessive lethal diseases in human are…Select one: **A.** Phenylketonuria; **B.** Congenital ichthyosis; **C.** cystic fibrosis; **D.** Duchenne muscular dystrophy; **E.** all of thes**e.**

145**.** Stem cells can be obtained from… Select one: **A.** pulpy interior of the teeth; **B.** umbilical cord blood; **C.** all of these; **D.** inner cell mass of blastocyst; **E.** a fetus

146. The cause of Cri du chat (cry of the cat) syndrome results from… : Select one: **A.** chr 5 short arm truncation; **B.** reciprocal translocation; **C.** chromosome cycle formation; **D.** chr 21 trisomy.

147. The dark-field microscope is used to identify bacteria… Select one: **A.** *Salmonella*, the causative agent of salmonellosis; **B.** *Yersinia enterocolitica*, the causative agent of waterborne gastroenterites; **C.** *Treponema pallidum*, the causative agent of syphilis; **D.** *Campylobacter*, the major causative agent of diarea; **E.** ***E.****coli*, the causative agent of colites.

148. The favism is an example of a… Select one: **A.** semilethal; **B.** sex-linked conditional lethal; **C.** dominant autosomal lethal; **D.** recessive autosomal lethal.

149. The fluorescence microscope causes specimen to fluoresce or phosphoresce by exciting the substances in preparation with… Select one: **A.** violet light; **B.** any light resulting in excitation of matters that are able to fluoresce or phosphoresce; **C.** all of these; **D.** blue light; **E.** ultraviolet light.

150. The fusion of G1 and S stages cells induces… Select one: **A.** mitosis **B.** replication in G1 nucleus **C.** division of the nucleus **D.** cytokinesis.

151. The genotype of one of Klinefelter's syndromes variants is… Select one: **A.** XXY; **B.** XX; **C.** XXX; **D.** XO.

152. The lethal and yellow coat allele discovered by Lucien Cuénot in laboratory mice and "creeper" allele in chicken have more than one distinct phenotypic effect. They are said to be Select one or more: **A.** strong; **B.** recessive; **C.** weak; **D.** pleiotropi**c.**

153. The miniature functioning organ-like in vitro structures are called… Select one: **A.** young organs; **B.** organ mini-copies; **C.** all of these; **D.** organoids.

154. The movement of water through semi-permeable membrane (plasma membrane from region of smaller solute concentration to the region of higher solute concentration is called… **A.** facilitated diffusion; **B.** active transport; **C.** Diffusion; **D.** osmosis.

155. The Na+-K+ pump transports the ions by means of **A.** facilitated diffusion; **B.** pinocytosis; **C.** osmosis; **D.** simple diffusion; **E.** active transport.

156. The number of Barr bodies is equal to: **A.** Number of X chromosomes -2; **B.** Number of X chromosomes +1; **C.** Number of X chromosomes +3; **D.** Number of X chromosomes -1; **E.** Number of X chromosomes +2.

157. The organelles fragmented during mitosis are: **A.** Golgi complex and endoplasmic reticulum; **B.** mitochondria; **C.** lysosomes and peroxysomes; **D.** chloroplasts.

158. The segregation of genotypes in dihybrid cross with no genes interaction is **A.** 3:2:1; **B.** 3:1; **C.** 3:3:1; **D.** 9:3:3:1.

159. To differentiate between living and dead cells, we can use staining with: **A.** propidium iodide; **B.** with each of mentioned; **C.** methylen blue; **D.** erythrosine; **E.** trypan blu**e.**

160. Transmission electron microscopy is utilizing… **A.** IR light; **B.** visible light; **C.** UV light; **D.** current between closest atoms; **E.** beams of electrons.

161. Two *Drosophila* homozygotes were crossed and the F1 heterozygote is crossed back with the double recessive individual. The progeny was as follows: 510 a+b+, 490 ab, 45 a+b and 55ab+. Estimate distance (L) between a and b genes. Which one is the correct a-b map?... Select one: **A.** a 10% b; **B.** a 1% b; **C.** a 5% b; **D.** a 100% **b.**

162. Unfertilized egg is stimulated to complete the second meiotic division after… Select one: **A.** Cytokinesis; **B.** telophase II; **C.** being contacted by a sperm; **D.** karyokinesis.

163. Up to date several organs were grown *in vitro*... Select one: **A.** liver, gal bladder; **B.** all of these; **C.** small kidney and beating small heart; **D.** uterus, urinary bladder; **E.** trachea, lung, skin.

164. Visualization principles in SEM and TEM differ: Select one: **A.** SEM uses yellow light reflected from the specimen surface and TEM uses yellow light passed through specimen; **B.** TEM uses yellow light reflected from the specimen surface and SEM uses yellow light passed through specimen; **C.** SEM uses electrons reflected from the specimen surface, providing its picture and TEM uses electrons passed through specimen, providing internal structures picture; **D.** TEM uses electrons reflected from the specimen surface, providing its picture and EM uses electrons passed through specimen, providing internal structures pictur**e.**

165. What is the correct order of development (from first stage to last)? Select one: **A.** Blastocyst →Zygote → Embryo → Fetus; **B.** Fetus→ Zygote → Blastocyst → Embryo; **C.** Zygote → Blastocyst → Embryo → Fetus; **D.** Embryo →Zygote → Blastocyst → Fetus.

166. What organs in our body can regenerate after surgery to previous size… Select one: **A.** Uterus; **B.** Liver; **C.** respiratory tract; **D.** intestin**e.**

167. Which is impractical for assisted reproductive technology… Select one: **A.** gamete/ 8-cell embrio transfer; **B.** blastocysts growing and transfer; **C.** Intracytoplasmic sperm injection; **D.** *In vitro* fertilization.

168. Which is NOT true? A phase-contrast microscope… Select one: **A.** construction, in which deviated and undeviated or undiffracted light rays tend to cancel each other out; **B.** produces bright background, while the unstained object appears dark and contrasty; **C.** produces dark background, while the unstained object appears bright; **D.** has the condenser with an annular stop, an opaque disk with a thin transparent ring; **E.** has a phase ring in the phase plate, a special optical disk located in the objective.

169. Which of the following cells do not reside in the extracellular matrix? Select one: **A.** All of these; **B.** Fibroblasts; **C.** Adipose cells; **D.** Mesenchymal stem cells; **E.** Hepatocytes.

170. Which of the following is involved in lipid metabolism? Select one: **A.** Smooth ER; **B.** Ribosome; **C.** Golgi; **D.** Rough ER; **E.** Peroxysomes.

171. Which of the following sequence correctly describes the cell cycle? Select one: **A.** S → G2 → M → Cytokinesis → G1; **B.** G1 → G2 → M → Cytokinesis; **C.** Cytokinesis → Mitosis → G1 → G2; **D.** M → G1 → G2 → Cytokinesis.

172. Which one has NOT X-linked inheritance? Select one: **A.** red colour blindness; **B.** Hemophilia; **C.** vitamin D-resistant rickets (XLH); **D.** DAZ (spermatogenesis deleted in azoospermia;

173. Which one has NOT the Y-linked inheritance? **A.** SOX21(baldness gene); **B.** AZF1 (azoospermia factor 1); **C.** AZF2 (azoospermia factor 2); **D.** hemophilia.

174**.** In F2 cross offsprings show the trait ratio 15:1. How many of genes interact? **A.** *2; **B.** 4; **C.** 6; **D.** 8.

12.Examples of MCQs in Medical Biology for Exam KROK – 1 for individual solution by students

1. At the stage of translation in the rough endoplasmic reticulum, the ribosome moves along the mRN**A.** Amino acids are joined together by peptide bonds in a specific sequence, and thus polypeptide synthesis takes plac**e.** The sequence of amino acids in a polypeptide corresponds to the sequence of: **A.** mRNA codons; **B.** tRNA nucleotides; **C.** tRNA anticodons; **D.** rRNA nucleotides; **E.** rRNA anticodons.
2. The organisms to be identified have a nucleus surrounded by a nuclear membrane. Genetic material is concentrated predominantly in the chromosomes that consist of DNA strands and protein molecules. These cells divide mitotically. Identify these organisms: **A.** Eukaryotes; **B.** Bacteriophages; **C.** Prokaryotes; **D.** Viruses; **E.** Bacteria.
3. During cell division DNA replication occurs after a signal is received from the cytoplasm, then a certain portion of the DNA helix unwinds and splits into two individual strains. What enzyme facilitates this process? **A.** Helicase; **B.** RNA polymerase; **C.** Ligase; **D.** Restrictase; **E.** DNA polymerase.
4. Cells of healthy liver actively synthesize glycogen and proteins. What organelles are the most developed in them? **A.** Granular and agranular endoplasmic reticulum; **B.** Cell center; **C.** Lysosomes; **D.** Mitochondria; **E.** Peroxisomes.
5. At a certain stage of cell cycle chromosomes reach cellular poles, undergo despiralization; nuclear membranes are being formed around them; nucleolus is restore**d.** What stage of mitosis is it? **A.** Telophase; **B.** Prophase; **C.** Prometaphase; **D.** Metaphase; **E.** Anaphas**e.**
6. Human red blood cells contain no mitochondri**a.** What is the main pathway for ATP production in these cells? **A.** Anaerobic glycolysis; **B.** Aerobic glycolysis; **C.** Oxidative phosphorylation; **D.** Creatine kinase reaction; **E.** Cyclase reaction.
7. Along with normal hemoglobin types there can be pathological ones in the organism of an adult. Name one of them: **A.** HbS; **B.** HbF; **C.** HbA1; **D.** HbA2 **E.** HbO_2.
8. Cells of a person working in the Chornobyl Exclusion Zone have undergone a mutation in DNA molecul**e.** However, with time the damaged interval of DNA molecule has been restored to its initial structure with a specific enzym**e.** In this case the following occurred: **A.** Repair; **B.** Replication; **C.** Transcription; **D.** Reverse transcription; **E.** Translation.

9. Different functional groups can be presented in the structure of L-amino acid's radicals. Identify the group that is able to form ester bond: **A.** –OH; **B.** –SH; C-$CONH_2$; **D.** -CH_3; **E.** -NH_2.
10. Examination of a patient revealed reduced contents of magnesium ions that are necessary for attachment of ribosomes to the granular endoplasmatic reticulum. It is known that it causes disturbance of protein biosynthesis. What stage of protein biosynthesis will be disturbed? **A.** Translation; **B.** Transcription; **C.** Replication; **D.** Aminoacid activation; **E.** Termination.
11. Labeled aminoacids alanine and tryptophane were introducted to a mouse in order to study localization of protein biosynthesis in its cells. Around what organellas will the accumulation of labeled aminoacids be observed? **A.** Ribosomes; **B.** Agranular endoplasmic reticulum; **C.** Cell centre; **D.** Lysosomes; **E.** Golgi apparatus.
12. Highly injured person gradually die**d.** Please choose the indicator of biological death: **A.** Autolysis and decay in the cells; **B.** Disarray of chemical processes; **C.** Loss of consciousness; **D.** Absence of palpitation; **E.** Absence of movements.
13. Part of the DNA chain turned about 180 degree due to gamma radiation. What type of mutation took place in the DNA chain? **A.** Inversion; **B.** Deletion; **C.** Doubling; **D.** Translocation; **E.** Replication.
14. Tuberculosis can be treated by means of combined chemotherapy that includes substances with different mechanisms of action.What antituberculous medication inhibits transcription of RNA into DNA in mycobacteria? **A.** Rifampicin; **B.** Isoniazid; **C.** Streptomycin; **D.** Ethionamide; **E.** Para-aminosalicylic acid.
15. You are studying functioning of a bacteria operon. The operator gene has been released from the repressor gen**e.** Immediately after this the following process will start in the cell: **A.** Transcription; **B.** Translation; **C.** Replication; **D.** Processing; **E.** Repression.
16. The cell of the laboratory animal was overdosed with Roentgen rays. As a result albuminous fragments formed in the cytoplasm. What cell organoid will take part at their utilization? **A.** Lysosomes; **B.** Golgi complex; **C.** Ribosome; **D.** Endoplasmic reticulum; **E.** Cells centre.
17. In course of practical training students studied a stained blood smear of a mouse with bacteria phagocyted by leukocytes. What cell organella completes digestion of these bacteria? **A.** Lisosomes; **B.** Mytochondrions; **C.** Granular endoplasmic reticulum; **D.** Golgi apparatus; **E.** Ribosomes.
18. Examination of cell culture got from a patient with lysosomal pathology revealed accumulation of great quantity of lipids in the lysosomes. What of the following diseases is this disturbance typical for? **A.** Tay-Sachs disease; **B.** Gout; **C.** Phenylketonuria; **D.** Wilson disease; **E.** Galactosemia.
19. Golgi complex exports substances from a cell due to the fusion of the membrane saccule with the cell membran**e.** The saccule contents flows out. What process is it? **A.** Exocytosis; **B.** Endocytosis; **C.** Active transport; **D.** Facilitated diffusion; **E.** All answers are false.

20. In the life cycle of a cell during mitosis a natural change in the amount of genetic material occurs. The DNA doubles at the following stage: **A.** Interphase; **B.** Prophase; **C.** Metaphase; **D.** Anaphase; **E.** Telophase.
21. Protective function of saliva is based on several mechanisms, including the presence of enzyme that has bactericidal action and causes lysis of complex capsular polysaccharides of staphylococci and streptococci. Name this enzyme: **A.** Lysozyme; **B.** Alpha-amylase; **C.** Oligo-1,6-glucosidase; **D.** Collagenase; **E.** Beta-glucuronidase.
22. Streptomycin and other aminoglycosides prevent the joining of formylmethionyl-tRNA by bonding with the 30S ribosomal subunit. This effect leads to disruption of the following process: **A.** Translation initiation in procaryotes; **B.** Translation initiation in eucaryotes; **C.** Transcription initiation in procaryotes; **D.** Transcription initiation in eucaryotes; **E.** Replication initiation in procaryotes.
23. Ionizing radiation or vitamin E deficiency affect the cell by increasing lysosome membrane permeability.What are the possible consequences of this pathology? **A.** Partial or complete cell destruction; **B.** Intensive protein synthesis; **C.** Intensive energy production; **D.** Restoration of cytoplasmic membrane; **E.** Formation of maturation spindl**e.**
24. Untrained people often have muscle pain after sprints as a result of lactate accumulation. This can be caused by intensification of the following biochemical process: **A.** Glycolysis; **B.** Gluconeogenesis; **C.** Pentose phosphate pathway; **D.** Lipogenesis; **E.** Glycogenesis.
25. Examination of newborns in one of the Ukrainian cities revealed a baby with phenylketonuria. The baby's parents don't suffer from this disease and have two other healthy children. Specify the most likely parents' genotype with phenylketonuria gene: **A.** Aa × Aa; **B.** AA × aa; **C.** aa × aa; **D.** Aa × aa; **E.** Aa × AA.
26. A couple has a son with haemophili**a.** The parents are healthy but the maternal grandfather also has haemophilia. Specify the type of inheritance: **A.** Recessive sex-linked; **B.** Recessive autosomal; **C.** Dominant sex-linked; **D.** Semidominance; **E.** Autosomal dominant.
27. A pregnant woman underwent AB0 blood typing. Red blood cells were agglutinated with standard sera of the I and II blood groups, and were not agglutinated with the III group serum. What is the patient's blood group? **A.** B(III); **B.** 0(I); **C.** A(II); **D.** AB(IV).
28. A 25-year-old patient consulted a doctor about dysmenorrhea and infertility. Examination revealed that the patient was 145 cm high and had underdeveloped secondary sex characteristics, alar folds on the neck. Cytological study didn't reveal any Barr bodies in the somatic cells. What diagnosis was made? **A.** Turner's syndrome; **B.** Klinefelter syndrome; **C.** Morris syndrome; **D.** Trisomy X syndrome; **E.** Marfan syndrome.
29. A 35-year-old male patient has been referred by an andrologist for the genetic counselling for the deviations of physical and mental development. Objectively:

the patient is tall, has asthenic constitution, gynecomastia, mental retardation. Microscopy of the oral mucosa cells revealed sex chromatin (single Barr body) in 30% of cells. What is the most likely diagnosis? **A.** Klinefelter syndrome; **B.** DiGeorge syndrome; **C.** Down syndrome; **D.** Recklinghausen's disease; **E.** Cushing pituitary basophilism.

30. Examination of an 18-year-old girl revealed the following features: hypoplasia of the ovaries, broad S houlders, narrow pelvis, shortening of the lower extremities, "sphinx neck". Mental development is normal. The girl was diagnosed with Turner's syndrom**e.** What kind of chromosome abnormality is it? **A.** Monosomy X; **B.** Trisomy X; **C.** Trisomy 13; **D.** Trisomy 18; **E.** Nullisomy X.
31. An 18-year-old male has been diagnosed with Marfan syndrom**e.** Examination revealed a developmental disorder of connective tissue and eye lens structure, abnormalities of the cardiovascular system, arachnodactylia. What genetic phenomenon has caused the development of this disease? **A.** Pleiotropy; **B.** Complementarity; **C.** Codominance; **D.** Multiple allelism; **E.** Incomplete dominanc**e.**
32. An 18-year-old woman has body disproportion, wing-like folds on the skin of her neck, underdeveloped ovaries, nuclei of her buccal epithelium cells have no Barr bodies. Dermatoglyphics method revealed that her adt angle is 66o. What provisional diagnosis can be made in this case? **A.** Turner's syndrome; **B.** Cri du chat (cat cry) syndrome; **C.** Kleinfelter's syndrome; **D.** Patau's syndrome; **E.** Edwards' syndrom**e.**
33. During determining the blood group according to the AB0 system with salt solutions of monoclonal antibodies agglutination did not occur with any of the solutions. What blood group is it? **A.** 0 (I); **B.** A (II); **C.** B (III); **D.** AB (IV).
34. **55.** Sex chromosomes of a woman didn't separate and move to the opposite poles of a cell during gametogenesis (meiosis). The ovum was impregnated with a normal spermatozoon. Which chromosomal disease can be found in her child? **A.** Turner's syndrome; **B.** Down's syndrome; **C.** Patau's syndrome; **D.** Edwards' syndrome; **E.** Cat cry syndrom**e.**
35. A doctor was addressed by a 30-yearold man. There is a probability of the patient being HIV-positiv**e.** To clarify the diagnosis the doctor proposed to perform polymerase chain reaction. The basic process in this kind of investigation is: **A.** Gene amplification; **B.** Transcription; **C.** Genetic recombination; **D.** Genomic mutation; **E.** Chromosome mutation.
36. It is known that the gene responsible for development of blood groups according to AB0 system has three allele variants. Existence of the IV blood group can be explained by the following variability form: **A.** Combinative; **B.** Mutational; **C.** Phenotypic; **D.** Genocopy; **E.** Phenocopy.
37. Sex chromatin was detected during examination of a man's buccal epithelium. It is characteristic of the following chromosome disease: **A.** Klinefelter's syndrome; **B.** Down's disease; **C.** Turner's syndrome; **D.** Triple X syndrome; **E.** Hypophosphatemic rickets.

38. A person with the fourth blood group (genotype IA I B) has in erythrocytes both antigen A controlled by allele IA and antigen B controlled by allele IB . This phenomenon is an example of the following gene interation: **A.** Codominance; **B.** Complementarity; **C.** Semidominance; **D.** Polymery; **E.** Epistasis.
39. A 2-year-old boy is diagnosed with Down syndrom**e.** What chromosomal changes can cause this disease? **A.** Trisomy 21; **B.** Trisomy 13; **C.** Trisomy X; **D.** Trisomy 18; **E.** Monosomy X.
40. **61.** Blood group of a 30-year-old man has been determined before a surgery. The blood was Rhesus-positiv**e.** Agglutination did not occur with standard 0 (I), A (II), and B (III) serums. The blood belongs to the following group: **A.** 0 (I); **B.** A (II); **C.** B (III); **D.** AB (IV).
41. Sex chromatin was detected during examination of a man's buccal epithelium. It is characteristic of the following chromosome disease: **A.** Klinefelter's syndrome; **B.** Down's disease; **C.** Turner's syndrome; **D.** Triple X syndrome; **E.** Hypophosphatemic rickets.
42. Parents of a sick 5-year-old girl visited a genetic consultation. Karyotype investigation revealed 46 chromosomes. One chromosome of the 15th pair was abnormally long, having a part of the chromosome belonging to the 21st pair attached to it. What mutation occurred in this girl? **A.** Translocation; **B.** Deletion; **C.** Inversion; **D.** Deficiency; **E.** Duplication.
43. Determining a patient's blood group with monoclonal test-reagents revealed positive agglutination reaction to anti-A and anti-B reagents, and negative reaction to anti-**D.** What blood group does this patient have? **A.** IV (AB) Rh (-); **B.** II (A) Rh (+); **C.** III (B) Rh (-); **D.** IV (AB) Rh (+); **E.** I (0) Rh (+).
44. Deaf parents with genotypes DDee and ddEE gave birth to a child with normal hearing. Specify the interaction of D and E genes: **A.** Complementary interaction; **B.** Complete dominance; **C.** Epistasis; **D.** Polymery; **E.** Overdominance.
45. A young family came for a genetic counseling to identify the father of their child. The husband insists that the child does not resemble him at all and cannot possibly be his. Polymerase chain reaction method for person identification is based on the following: **A.** Gene amplification; **B.** Nucleotide deletion; **C.** Genetic recombination; **D.** Missense mutation; **E.** Transduction.
46. Clinical presentations of a woman allowed provisionally diagnosing her with X polysomy. Cytogenetic method is applied to clarify the diagnosis. The diagnosis will be confirmed if the patient's karyotype is: **A.** 47, XXX; **B.** 48, XXXY; **C.** 48, XXYY; **D.** 47, XXY; **E.** 46, XX.
47. A 45-year-old woman gave birth to a boy with cleft maxilla (cleft lip and palate. On additional examination there are significant disturbances of the boy's nervous, cardiovascular, and visual systems. Karyotype investigation allowed diagnosing the patient with trisomy 13. What syndrome is present in the boy? **A.** Patau; **B.** Down; **C.** Kleinfelter; **D.** Turner; **E.** DiGeorge.

48. Woman applied to the medico-genetic consulting centre for information about the risk of haemophilia in her son. Her husband has been suffering from this disease since birth. Woman and her parents are healthy (don't have haemophilia. Is the boy likely to have the disease in this family? **A.** All boys will be healthy; **B.** All boys will be ill; **C.** 50/% of the boys will be ill; **D.** 25/% of the boys will be ill; **E.** 75/% of the boys will be ill.
49. A man suffering from a hereditary disease married a healthy woman. They got 5 children, three girls and two boys. All the girls inherited their father's disease. What is the type of the disease inheritance? **A.** Dominant, X-linked; **B.** Autosomal recessive; **C.** Asutosomal dominant; **D.** Y-linked; **E.** Recessive, X-linked.
50. There is the change of teeth at the 6-8-year-old children: deciduous are replaced by permanent. What embrionic tissues are the sources of formation of permanent teeth tissues? **A.** Ectodermal epithelium of a tooth plate and mesenhime; **B.** Entodermal epithelium of a tooth plate and mesenhime; **C.** Mesodermal epithelium and mesenhime; **D.** I, II brachial arches; **E.** Entodermal epithelium and mesoderm.
51. White-haired, with blue eyes girl was born in healthy parents. Irritability, anxiety, troubled sleep and feeding developed in the first months of life of the infant. What method of genetic investigation should be used for the exact diagnosis? **A.** Biochemical; **B.** Cytological; **C.** Twin; **D.** Genealogical; **E.** Population-statistical.
52. While studing of the family tree with history of hypertrichosis (hyperhirsutism of the ear) this sign was founded only in the men and it was inherited from father to the son. Define the type of hypertrichosis inheritance? **A.** Connected with Y-chromosome; **B.** Autosomal- recessive; **C.** Autosomal-dominant; **D.** Connected with X-chromosome recessive; **E.** Connected with X-chromosome dominant.
53. Genetic structure of eukaryote is "exon-intron-exon". This structure-functional organization of gene caused transcription peculiarities. What will be pro-i-RNA according to the schema? **A.** Exon-intron-exon; **B.** Exon-exon-intron; **C.** Exon-exon; **D.** Intron-exon; **E.** Exon-intron.
54. It is known that the gene responsible for development of blood groups according to AB0 system has three allele variants. If a man has IV blood group, it can be explained by the following variability form: **A.** Combinative; **B.** Mutational; **C.** Phenotypic; **D.** Genocopy; **E.** Phenocopy.
55. A woman with the III (B), Rh (-) blood group gave birth to a child with the II (A) blood group. The child is diagnosed with hemolytic disease of newborn caused by rhesus incompatibility. What blood group and Rh are likely in the father? **A.** II (A., Rh+; **B.** I (0), Rh+; **C.** III (B., Rh+; **D.** I (0), Rh; **E.** II (A., Rh.
56. A family of students who came from Africa got a child with anemia signs. The child died soon. Examination revealed that the child's erythrocytes have abnormal semilunar shap**e.** Specify genotypes of the child's parents: **A.** Aa × Aa **B.** Aa × aa **C.** AA × AA **D.** aa × aa **E.** Aa × AA.

57. A 28-year-old female patient consulted a gynecologist about sterility. Examination revealed underdeveloped ovaries and uterus, irregular menstrual cycl**e.** Analysis of the sex chromatin revealed 2 Barr's bodies in most somatic cells. What chromosome disease is most likely? **A.** Triple X syndrome; **B.** Edwards' syndrome; **C.** Patau's syndrome; **D.** Klinefelter's syndrome; **E.** Turner's syndrome.
58. A boy has I (I0 I0) blood group and his sister has IV (IA IB) blood group. What blood groups do their parents have? **A.** II (IA I0) and III (IB I0); **B.** II (IA IA) and III (IB I0); **C.** I (I0 I0); and IV (IA I B); **D.** III (IB I0) and IV (IA IB; **E.** I (I0 I0) and III (IB I0).
59. A patient in a transplantation centre underwent heart transplantation. The organ was taken from a donor who died in a road accident. Foreign heart can be rejected as a result of development of transplantation immunity. It is usually prevented by means of: **A.** Immunosuppressors; **B.** Chemotherapy; **C.** Ultrasound; **D.** Enzymes; **E.** X-ray therapy.
60. Hartnup disease is caused by point mutation of only one gene which results in disturbance of tryptophane absorption in the bowels and its resorption in the renal tubules. It is the reason for disorder of both digestive and urination systems. What genetic phenomenon is observed in this case? **A.** Pleiotropy; **B.** Complementary interaction; **C.** Polymery; **D.** Codominance; **E.** Semidominance.
61. Cytogenetic examination of a patient with reproductive dysfunction revealed normal karyotype 46 XY in some cells, but most cells have karyotype of Klinefelter's syndrome - 47 XXY. Such cell heterogenity is called: **A.** Mosaicism; **B.** Inversion; **C.** Transposition; **D.** Duplication; **E.** Monomorphism.
62. As a result of prophylactic medical examination a 7 year old boy was diagnosed with Lesch-Nyhan syndrome (only boys fall ill with it). The boy's parents are healthy but his grandfather by his mother's side suffers from the same disease. What type of disease inheritance is it? **A.** Recessive, sex-linked; **B.** Dominant, sex-linked; **C.** Autosomal recessive; **D.** Autosomal dominant; **E.** Semidominance.
63. Exposure to colchicine resulted in metaphase plate of a human containing 23 chromosomes more than it is normal. Name this mutation: **A.** Polyploidy; **B.** Aneuploidy; **C.** Polyteny; **D.** Inversion; **E.** Translocation.
64. A married couple came for a genetic counseling. The husband suffers from insulin-independent diabetes mellitus, while the wife is healthy. What is the probability of their child developing insulin-independent diabetes mellitus? **A.** Higher than in the population; **B.** The same as in the population; **C.** Lower than in the population; **D.** 100%; **E.** 50%.
65. An infant has been diagnosed with microcephaly. Doctors suspect that this brain disorder developed due to the fact that the mother had been taking actinomycin D during her pregnancy. What germinal layers have been affected by this

teratogen? **A.** Ectoderm; **B.** Entoderm; **C.** Mesoderm; **D.** Entoderm and mesoderm; **E.** All germinal layers.

66. Examination of duodenal contents revealed some pyriform protozoa with twin nuclei and four pairs of flagella. There were two supporting filaments between the nuclei and a suctorial disc on the ventral sid**e.** What representative of protozoa was revealed in this patient? **A.** *Lamblia*; **B.** *Toxoplasma*; **C.** *Leishmania*; **D.** Intestinal trichomonad; **E.** *Trypanosome*.
67. A patient who has recently arrived from an endemic area presents with elevated body temperature, headache, chills, malaise, that is with the symptoms which are typical for a common col**d.** What laboratory tests are necessary to prove or to disprove the diagnosis of malaria? **A.** Microscopy of blood smears; **B.** Study of lymph node punctate; **C.** Urinalysis; **D.** Study of cerebrospinal fluid; **E.** Microscopy of bone marrow punctate.
68. As an example of specific human parasites one can name Plasmodium falciparum, human pinworm and some others. The source of parasite invasion in these cases is always a human. Such specific human parasites cause the diseases that are called: **A.** Anthroponoses; **B.** Zoonoses; **C.** Anthropozoonoses; **D.** Infections; **E.** Multifactorial diseases.
69. A group of Ukrainian tourists returning from Samarqand was bringing with them gerbils. During examination in customs office ulcers were detected on the skin of the animals. What protozoa is the most likely to cause the disease in the animals, if mosquitos are the carriers? **A.** *Leishmania tropica major*; **B.** *Balantidium coli*; **C.** *Plasmodium falciparum*; **D.** *Trypanosoma cruzi*; **E.** *Toxoplasma gondii*.
70. A patient diagnosed with acute dysentery has been treated for 3 days in an infectious diseases hospital. On admission there were complaints of high temperature, stomachache and fluid excrements with mucus up to 8-10 times a day. What sample should be taken for analysis? **A.** Feces; **B.** Urine; **C.** Bile; **D.** Liquor; **E.** Blood.
71. A patient consulted a physician about chest pain, cough, fever. Roentgenography of lungs revealed eosinophilic infiltrates that were found to contain larva**e.** What kind of helminthiasis are these presentations typical of? **A.** *Ascariasis*; **B.** *Echinococcosis*; **C.** *Fascioliasis*; **D.** *Cysticercosis*; **E.** *Trichinosis*.
72. In one of Polessia regions there was an outbreak of helminthiasis manifested by cramps and facial edemas. The developed preventive measures in particular included ban for eating infested pork even after heat processing. What helminthiasis was the case? **A.** *Trichinosis*; **B.** *Taeniarhynchosis*; **C.** *Teniasis*; **D.** *Echinococcosis*; **E.** *Alveococcosis*.
73. Autopsy of a Middle-Eastern woman, who had been suffering from wasting fever for a long time, revealed enlarged blackened liver and spleen. Bone marrow was hyperplastic and black-colored as well. Cerebral cortex was smoky grey. What disease is it characteristic of? **A.** Malaria; **B.** AIDS; **C.** Epidemic typhus; **D.** Sepsis; **E.** Hepatitis.

74. In the South and Central America there can be found a species of trypanosomes that is the causative agent of Chagas disease. What animal is the infection carrier specific to this disease? **A.** Triatomine bug; **B.** Cockroach; **C.** Tsetse fly; **D.** Mosquito; **E.** Gnat.
75. During dehelmintization there was a 3.5-meter-long tapeworm produced from the patient's intestine.There are 4 suckers and hooks on the tapeworm's scolex. Mature segments of the tapeworm are immobile and have up to 12 uterine branches. What disease is it? **A.** Teniasis; **B.** Echinococcosis; **C.** Beef tapeworm infection; **D.** Diphyllobothriasis; **E.** Opisthorchiasis.
76. According to the data of WHO, for about 250 mln of Earth population fall ill with malaria. This disease is mostly spread in tropical and subtropical regions. Range of its spread falls into the areal of the following mosquitoes: **A.** *Anopheles*; **B.** *Culex*; **C.** *Aedes*; **D.** *Mansonia*; **E.** *Culiseta*.
77. In the perianal folds of a 5-year-old girl her mother has found some white "worms" that caused itch and anxiety in the child. The "worms" were sent to the laboratory. During examination the physician saw white filiform helminths 0.5-1 cm long, with pointed ends, some helminths had twisted ends. What is the most likely diagnosis? **A.** Enterobiasis; **B.** Diphyllobothriasis; **C.** Teniasis; **D.** Ascaridiasis; **E.** Opisthorchiasis.
78. Larvae were detected occasionally on the microscopic examination of the sputum of the patient with pneumonia. Eosinophiles were detected on the blood examination. What helminthiasis can be diagnosed? **A.** Ascariasis; **B.** Enterobiosis; **C.** Trichocephaliasis; **D.** Paragonimiasis; **E.** Opistorchis.
79. A patient consulted an urologist about pain during urination. Analysis of his urine taken in the daytime revealed eggs with a characteristic sharp point. It is known from the anamnesis that the patient has recently returned from Australia. What is the most likely diagnosis? **A.** Urogenital schistosomiasis; **B.** Intestinal schistosomiasis; **C.** Japanese schistosomiasis; **D.** Opisthorchiasis; **E.** Dicroceliasis.
80. A child complains of general weakness, loss of appetite, a troubled sleep, itching in theperianal area. The provisional diagnosis is enterobiasis. In order to specify this diagnosis it is necessary to perform: **A.** Scraping from perianal folds; **B.** Roentgenoscopy; **C.** Biopsy of muscle tissue; **D.** Immune diagnostics; **E.** Duodenal contents analysis.
81. A patient has acne on his face. Microspcopic examination of scrapings from the affected areas revealed living porrect vermiform arthropoda 0,2-0,5 mm large with four pairs of short extremities in the front part of their bodies. What is the laboratory diagnosis? **A.** Demodicosis; **B.** Scabies; **C.** Myiasis; **D.** Pediculosis; **E.** Phthiriasis.
82. A patient working at a pig farm complains about paroxysmal abdominal pain, liquid feces with admixtures of mucus and blood, headache, weakness, fever. Examination of large intestine revealed ulcers from 1 mm up to several cm large, feces contained oval unicellular organisms with cilia. What disease should be

suspected? **A.** Balantidiasis; **B.** Amebiasis; **C.** Toxoplasmosis; **D.** Lambliasis; **E.** Trichomoniasis.

83. A doctor revealed tissues injury on patient's scalp with localized suppurations and diagnosed his disease as myiasis. This infestation is caused by larvae of the following insect: **A.** Wohlfahrtia fly; **B.** Kissing bug; **C.** Stable fly; (Stomoxys calcitrans); **D.** Malarial mosquito; **E.** Mosquito.
84. A patient with probable liver abscess was delivered to a surgical department. The patient for a long time had been on an assignment in an African country and had recurrent cases of acute gastrointestinal disturbanc**e.** What protozoan disease can it be? **A.** Amebiasis; **B.** Trypanosomiasis; **C.** Leishmaniasis; **D.** Malaria; **E.** Toxoplasmosis.

13.Examples of solved MCQs in Medical Biology for Exam KROK – 1

85. Researchers obtained mutant cells without nuclei In the first place they will have disturbed synthesis of **A.*** Ribosomal RNA (rRNA.; **B.** Transfer RNA (tRNA.; **C.** Lipids; **D.** monosaccharides; **E.** Polysaccharides.
86. Oval and round organelles with double wall are seen at the electron micrograph. The outer membrane is smooth, the inner membrane is folded into cristae contain ATPase synthetase. These are: **A.***Mitochondria; **B.** Golgi complex; **C.** lysosomes **D.** centrioles **E.** ribosomes.
87. The substance blocks nucleotide phosphorylation in the mitochondria. What is disturbed in the first place? **A.** *ATP synthesis; **B.** protein synthesis; **C.** functional protein molecules integration; **D.** fragmentation of mithochondria.
88. A 28 y. o. patient with hepatocerebral degeneration revealed an impairment of ceruloplasmin synthesis. This defect is associated with **A.***Rough endoplasmic reticulum; **B.** Smoth endoplasmic reticulum; **C.** Golgi complex; **D.** lysosomes; **E.** mithochondria.
89. EM study of a cell revealed roundish bubbles confined by a membrane and containing a lot of various hydrolytic enzymes. These organelles provide intracellular digestion and protective functions. They are: **A.*** lysosomes; **B.** centrosomes; **C.** endoplasmic reticulum; **D.** ribosomes; **E.** mithochondria.
90. Study has revealed high content of hydrolytic enzymes in cytoplasm. This phenomenon indicates high activity of the following organelles: **A.*** lysosomes; **B.** centrosomes; **C.** endoplasmic reticulum; **D.** ribosomes; **E.** mithochondria.
91. Vitamin E deficient cell had been affected by ionizing radiation. This induced an intensified release of hydrolytic enzymes into the cytoplasm and thus a complete destruction of intracellular structures – autolysis. This phenomenon is caused by: **A.*** lysosomes; **B.** centrosomes; **C.** endoplasmic reticulum; **D.** ribosomes; **E.** mithochondria.
92. Benign tumor EM sample showed a lot of small (15-20 nm) spherical bodies consisting of two unequal subunits. These are **A**.* ribosomes;

B. centrosomes; **C.** endoplasmic reticulum; **D.** centrosomes; **E.** mithochondria.

93. A 50 y. o. woman had her tooth extracted. The tissue regenerate. Which is the most active organelle during this process? **A**.* ribosomes; **B.** centrosomes; **C.** smooth endoplasmic reticulum; **D.** postlysosomes; **E.** mithochondria.
94. The formation of ribosome subunits was disturbed in course of an experiment by action of mutagenic factors. This will have an effect on the following methabolic process: **A.*** protein biosynthesis; **B.** carbohydrate biosynthesis; **C.** ATP synthesis; **D.** photosynthesis; **E.** biooxydation.
95. The leukocyte culture was mixed with staphylococci. Neutrophile leukocytes engulfed and digested bacterial cells. This process is termed **A***phagocytosis; **B.** pinocytosis; **C.** diffusion; **D.** facilitated diffusion; **E.** osmosis.
96. A patient is being operated under inhalation narcosis with nitrous oxide. It has evident lipophilic properties. How this preparation is transported through biological membranes? **A.*** passive diffusion; **B.** active transport; **C.** facilitated diffusion; **D.** filtration; **E.** pinocytosis.
97. A drug with apparent lipophilic properties is prescribed to the patient. What is the main mechanism of its absorption? **A.*** passive diffusion; **B.** active transport; **C.** facilitated diffusion; **D.** filtration; **E.** binding to the transport proteins.
98. Testosterone and its analogs increase the mass of skeletal muscles that allows to use them for treatment of muscular dystrophy. Due to interaction of the hormone with what cell substrate is this action caused? **A.*** nuclear receptors; **B.** membrane receptors; **C.** Ribosomes **D.** chromatin **E.** proteins-activators of transcription.
99. Nucleoli of nuclei were damaged due to irradiation of tissue culture. Regeneration of which organelles becomes hampered in cytoplasm? **A.***Ribosomes; **B.** Lysosomes; **C.** Golgi apparatus; **D.** endoplasmic reticulum **E.** microtubules.
100. Low levels of albumins and fibrinogen were detected in the patient's blood. Decreased activity of what organelle of the liver hepatocyte can most probably cause it? **A.***granular endoplasmic reticulum; **B.** smooth endoplasmic reticulum; **C.** mitochondrion; **D.** Golgi complex; **E.** lysosomes.
101. Life cycle of a cell includes the process of DNA autoreduplication. As a result of it monochromatid chromosomes turn into bichromatid ones. What period of cell cycle does this phenomenon fall into? **A.** *S; **B.** Go; **C.** G1; **D.** G2; **E.** M.
102. Analysis of electron diffraction pattern of a cell revealed mitochondria destruction. This might result in abnormal course of the following cell process: **A.***oxidation of organic substances; **B.** nuclear division; **C.** crossingover; **D.** cleavage; **E.** phagocytosis.
103. Nucleolar organizers of the 13-15, 21, 22 human chromosomes contain about 200 cluster genes that synthesize RN**A.** These regions of chromosomes bear the information on the following type of RNA: **A.***rRNA; **B.** tRNA; **C.** mRNA; **D.** snRNA; **E.** tRNA + rRNA.

104. To what total ATP quantity is the full glucose oxidation and its linking with phosphorylation equivalent ? **A.***38; **B.**8; **C.**12; **D.** 52; **E.** 58.
105. On an electron micrograph a scientist has identified a structure formed by 8 histone proteins and part of DNA molecule that makes about 1.75 revolutions around the protein molecules. Which structure has been identified? **A.** nucleosome; **B.** elementary fibril; **C.** half-chromatid; **D.** chromatid; **E.** chromosome.
106. Chromosomal complement of a woman contains a chromosome with arms p and q of equal length. What morphological type does this chromosome belong to? **A.*** metacentric; **B.**telocentric; **C.**acrocentric; **D.** submetacentric; **E.** subacrocentric.
107. Normal, actively dividing cells of human red bone marrow are analyze**d.** What number of cells' chromosomes is typical for G1 period? **A.*** 46; **B.** 48; **C.** 47; **D.** 45; **E.** 23.
108. An EM micrograph presents a cell that has no nucleoli and nuclear membrane. Chromosomes have free position, centrioles migrate to the poles. What phase if cell cycle is it typical for? **A.***Prophase; **B.** methaphase; **C.** anaphase; **D.** telophase; **E.** interphase.
109. Pediatrician noticed, that the chil'ds cry sounds like cat's mewing. He revealed also microcephalia and valvular defect. By means of cytogenetic method he determined the child's karyotype – 46 XY, 5p. At what stage of the mitosis was the patient's karyotype analyzed? **A.***methaphase; **B.** promethaphase; **C.** prophase; **D.** anaphase; **E.** telophase.
110. A specimen of an onion rootlet includes a cell in which the fully condensed chromosomes are located in the equatorial plane making the monaster. What phase of the mitotic cycle is the cell in? **A.*** Metaphase; **B.** Early telophase; **C.** Prophase **D.** Interphase; **E.** Late telophase.
111. Studying the mitotic cycle phases of an onion root the reseachers revealed a cell with chrs lying in equatorial plane in form of star. What phase of mitosis is it? **A.*** Metaphase; **B.** Early telophase; **C.** Prophase **D.** Interphase; **E.** Late telophase.
112. While studying maximally spiralized chromosomes of human karyotype the process of cell division was stopped in the following phase: **A.*** Metaphase; **B.** Prophase; **C.** Interphase; **D.** Anaphase; **E.** Telophase.
113. Moving of the daughter chromatids to the poles of the cell is observed in the mitotically dividing cell. On what stage of the mitotic cycle is this cell? **A.***Anaphase; **B.** Metaphase; **C.** Telophase; **D.** Prophase; **E.** Interfase.
114. At a certain stage of cell cycle, daughter chromosomes have reached cellular poles, undergo decondencation; nuclear membranes reform around them, nucleolus reappears. What stage of mitosis is it? **A.***telophase; **B.** methaphase; **C.** anaphase; **D.** Prophase; **E.** Interfase.
115. According to the law of constant chromosome number, each species of most animals has a definite and constant number of chromosomes. The mechanism

providing this constancy in sexual reproduction of the organisms is called: **A.** *meiosis; **B.** shizogony; **C.** amitosis; **D.** regeneration; **E.** gemmation.

116. During postsynthetic period of mitotic cycle the synthesis of tubulin proteins was disturbed. These proteins take part in construction of division spindle. It can lead to the disturbance of: **A.***chromosome disjunction; **B.** spiralization of chr; **C.** cytokinesis; **D.** despiralisation of chrs; **E.** mitosis duration.
117. Students study the stages of gametogenesis. They analyze a cell with haploid number of chromosomes, with each chromosome consisting of two chromatids. The chromosomes are located in the equatorial plane of the cell. Such situation is typical of the following stage of meiosis: **A.*** Metaphase of the second division; **B.** Metaphase of the first division; **C.** Anaphase of the first division; **D.** Anaphase of the second division; **E.** Prophase of the first division.
118. During EM analysis of salivary gland the cell fragments were revealed which are surrounded by a membrane and contain condenced particles of nuclear substance and solitary organelles; the inflammatory reaction around these cells is absent. What process is meant? **A.***apoptosis; **B.** karyorhexis; **C.** coagulation necrosis; **D.** karyopicnosis **E.** karyolysis.
119. During embryogenesis the epithelial band also known as vestibular plate gives rise to development of vestibule of mouth. What biological mechanism of the programmed death of cells provides growth of buccolabial sulcus from epithelial plate? **A.***apoptosis; **B.** necrosis; **C.** meiosis; **D.** paranecrosis; **E.** amitosis.
120. Blood of a child and putative father was reffered to forensic medical examination for affiliation. What chemical components should be identified in the blood under study? **A*** DNA; **B.** tRNA; **C.** rRNA; **D.** mRNA; **E.** snRNA.
121. Ability to divide is characteristic of prokaryotic and eukaryotic cells. Prokaryotic cell division is different from that of eukaryotic, but there is one molecular process that is the basis of both type division. Name this process. **A.** *DNA replication; **B.** reparation; **C.** gene amplification; **D.** translation; **E.** transcription.
122. Epitelial regeneration of mucous membrane of oral cavity (cell reproduction) was accompanied by semiconservative DNA replication (selfreproduction). Nucleotides of a new DNA chain are complementary to: **A.***maternal chain; **B.** sense codons; **C.** DNA-polymerase; **D.** Introns; **E.** RNA-polymerase enzyme.
123. Under the influence of physical factors, defects in DNA molecule can occur. Ultraviolet irradiation, for instance, can cause formation of dimers. Dimers are two adjacent pyrimidine bases joined together. Name these bases: **A.***Thymine and cytosine; **B.** Adenin and guanine; **C.** Guanine and thymine; **D.** Guanine and Cytosine; **E.** Adenine and thymine.
124. An experiment proved that UVirradiated skin cells of patients with *xeroderma pigmentosum* restore the native structure of DNA slower than the cells of healthy people due to the defect in repair enzym**e.** What enzyme takes part in

this process? **A.** Endonuclease; **B.** RNA ligase; **C.** Primase; **D.** DNA polymerase; **E.** DNA gyrase.

125. Patient with pigmentary xeroderma are characterized by anomalously high sensitivity to UV rays that causes skin cancer as a result of enzyme systems incapability to restore damages of hereditary apparatus of cells. What process abnormality is this pathology connected with? **A.***DNA reparation; **B.** Genetic conversion; **C.** DNA recombination; **D.** genetic complementation; **E.** DNA reduplication.
126. Skin of patients with *xeroderma pigmentosum* is very sensitive to the sun radiation, there is a risk of skin cancer development. The reason for this is hereditary deficiency of UF endonuclease. As a result of this defect the following process is disturbed: **A***DNA reparation; **B.** transcription; **C.** DNA replication; **D.** translation; **E.** Initiation.
127. Patients suffering from *xeroderma pigmentosum* have extremely photosensitive due to disrupted excision repair. Specify the process that is affected in such patients: **A.** *repair of DNA molecule; **B.** intronextraction and exon connection; **C.** maturation of mRNA; **D.** synthesis of protein primary structure; **E.** Synthesis of mRNA.
128. In the course of evolution there appeared molecular mechanism for correction of damaged DNA molecules. This process is called: **A.*** DNA reparation; **B.** transcription; **C.** translation; **D.** replication; **E.** processing.
129. In cells of a person who has worked in Chornobyl Exclusion Zone, DNA underwent mutation. However, over the course of time, the original DNA structure has been restored with specific enzymes. What occurred in this case? **A**.*repair; **B.** transcription; **C.** translation; **D.** replication; **E.** reverse transcription.
130. According to the model of double DNA helix that was suggested by Watson and Creek, it was established that one of chains would not be lost during replication and the second chain would be synthesized complementary to the first on**e.** What way of replication is it? **A.*** Semiconservative; **B.** Analogous; **C.** Identical; **D.** Dispersed; **E.** Conservative.
131. During cell division, DNA replication occurs by a signal from the cytoplasm, and a certain portion of the DNA helix unwinds and splits into two individual strains. What enzyme facilitates this process? **A.***Helicase; **B.** RNA polymerase; **C.** ligase; **D.** restrictase; **E.** DNA polymerase.
132. RNA that contains AIDS virus penetrated into a leukocyte and by means of reverse transcriptase forced a cell to synthetize a viral DNA. This process is based upon: **A.*** Reverse transcription; **B.** Operon repression; **C.** Reverse translation; **D.** Operon depression; **E.** Convariant replication.
133. During reproduction of some RNA-containing viruses that cause tumors in animals, genetic information can be transmitted in the opposite direction from the RNA to the DNA via a specific enzyme. The enzyme of reverse transcription is called: **A.***Reverse transcriptase; **B.** DNA polymerase; **C.** ligase; **D.** primase; **E.** topoisomerase.

134. T-lymphocytes are determined to be affected with HIV. In this case viral enzyme reverse transcriptase (RNA-dependent DNA-polymerase); **E.** catalyzes the synthesis of: **A.** DNA based on the viral RNA matrix; **B.** Viral RNA based on the DNA matrix; **C.** Viral protein based on the viral RNA matrix; **D.** Viral DNA based on the DNA matrix; **E.** mRNA based on the viral protein matrix.
135. RNA polymerase B(II) is blocked due to amanitine poisoning (poison of deathcup). It disturbs: **A.***synthesis of mRNA; **B.** synthesis of tRNA; **C.** reverse transcription; **D.** primers synthesis; **E.** Maturation of mRNA.
136. It was found out that some compounds, for instance fungi toxins and some antibiotics can inhibit activity of RNA-polymerase. What process will be distributed in case of inhibition of this enzyme? **A***transcription; **B.** processing; **C.** replication; **D.** translation; **E.** reparation.
137. Genetic information is stored in DNA but does not participate directly in protein synthesis within the cell. What process ensures transfer of genetic information into polypeptide chain? **A.*** translation; **B.** DNA replication; **C.** synthesis of mRNA; **D.** synthesis of tRNA; **E.** synthesis of rRNA.
138. Patient has reduced content of magnesium ions that are necessary for the ribosomes attachment to the granular ER. This causes disturbance in protein biosynthesis. What stage of protein biosynthesis will be disturbed? **A.*** translation; **B.** transcription; **C.** replication; **D.** amino acid activation; **E.** termination.
139. Infectious diseases are treated with antibiotics (streptomycin, erythromycin, chloramphenicol). They inhibit the following stage of protein synthesis **A.***translation; **B.** transcription; **C.** replication; **D.** processing; **E.** splicing.
140. Labelled amino acids alanine and tryptophane were injected to a mouse in order to study localization of protein synthesis in its cells. The labelled amino acids will be accumulated near the following organellas: **A.** ribosomes; **B.** SER; **C.** cell centre; **D.** lysosomes; **E.** Golgi complex.
141. One of the protein synthesis stages is recognition. The first mRNA triplet starts UAU triplet. What complementary triplet is found in tRNA? **A.** AUG; **B.** AAA; **C.** GUG; **D.** UGU; **E.** CUC.
142. It was proved that a molecule of immature mRNA (precursor mRNA. contained more triplets than amino acids found in synthesized protein. The reason for that is that translation is normally preceded by: **A.***processing; **B.** initiation; **C.** reparation; **D.** mutation; **E.** replication.
143. Inside a human cell the informational RNA containing both exons and introns was delivered to the granular endoplasmic reticulum to the ribosomes. What process does NOT take place? **A.***processing; **B.** replication; **C.** transcription **D.** translation; **E.** prolongation.
144. At the stage of translation in RER, the ribosome moves along the mRNA. Amino acids are joined together by peptide bonds in a specific sequence, and thus polypeptide synthesis takes place. The sequence of amino acids in a

polypeptide corresponds to the sequence of **A.** mRNA codons; **B.** tRNA nucleotides; **C.** tRNA anticodons; **D.** rRNA nucleotides; **E.** rRNA anticodons.

145. A cell of granular endoplasmic reticulum is at the stage of translation, when mRNA advances to the ribosomes. Amino acids get bound by peptide bonds in a certain sequence, thus causing polypeptide biosynthesis. The sequence of amino acids in a polypeptide corresponds with the sequence of **A.***mRNA codons; **B.** tRNA nucleotides; **C.** tRNA anticodons; **D.** rRNA nucleotides; **E.** rRNA anticodons.
146. The students studied peculiarities of genetic code and found out that there are amino acids corresponded by 6 codons, 5 amino acids – 4 different codons. Other amino acids are codified by three or two codons and only two amino acids are codified by one codon. What peculiarity of genetic code did the students find out? **A**.* redundancy; **B.** versatility; **C.** collinearity; **D.** unidirectionality; **E.** triplety.
147. It is known that information about amino acid sequence in a protein molecule is stored as a sequence of four nucleotide types in a DNA molecule, and different amino acids are encoded by different quality of triplets ranging from one to six. Name this property of genetic code: **A***degeneracy; **B.** universality; **C.** disjoining; **D.** triplety; **E.** specifity.
148. In some regions of South Africa there is a spread sickle-shaped cell anemia, in which erythrocytes have shape of a sickle as a result of substitution of glutamic acid by valine in the hemoglobin molecule. What is the cause of this disease? **A.*** Gene mutation; **B.** Disturbance of mechanisms of genetic information realization; **C.** Crossingover; **D.** Genomic mutations; **E.** Transduction.
149. Treatment of a patient with hereditary form of immunodeficiency involved gene therapy: the enzyme gene was introduced into the cells of the patient by means of a retrovirus. What property of the genetic code allows to use retroviruses as vectors of functional genes? **A.***universality; **B.** specificity; **C.** collinearity; **D.** unidirectionality; **E.** triplety.
150. Substitution of glutamic acid on valine was revealed while examining initial molecular structure. For what inherited pathology is this symptom typical? **A.*** sickle cell anemia; **B.** thalassemia; **C.** favism; **D.** Minkowsky-Shauffard disease; **E.** gemoglobinosis.
151. In some areas of South Africa many people have sickle cell disease characterized by red blood cells that assume an abnormal sickle shape due to substitution of glutamic acid by valin in the hemoglobin molecule. What is the cause of this disease? **A***Gene mutation; **B.** disturbance of the genetic information transmission; **C.** crossing-over; **D.**genomic mutation; **E.** transduction.
152. As a result of treatment of viral RNA with nitrous acid, UCA triplet mutated to UGA triplet. What kind of mutation occurred? **A.***transition; **B.** missense; **C.** nucleotide deletion; **D.** nucleotide insertion; **E.** transduction.

153. You are studying functioning of a bacteria operon. The operator gene has been released from the repressor gene. Immediately after this the following process will start in the cell: **A.***transcription; **B.** translation; **C.** replication; **D.** processing; **E.** repression.
154. In mountains some clinically healthy people present with anemia phenotype. Test reveal sickle red blood cells. What is the genotype of such people? **A.***Aa; **B.** AA; **C.** aa; **D.** AaBb; **E.** AABB.
155. One of the parents has phenylketonuria recessive gene. What is the probability to have a babe with phenylketonuria? **A.***0%; **B.** 25%; **C.**50%; **D.**75%; **E.** 100%.
156. An underage patient has signs of achondroplasia (dwarfism). It is known that this is a monogenic disease and the gene that is responsible for the development of such abnormalities is a dominant on**e.** The development of that child's brother is normal. Specify the genotype of the healthy child: **A.** *aa; **B.** AA; **C.** Aa; **D.** AaBb; **E.** AABB.
157. Examination of newborns revealed the baby with PKU. Which is the most probable genotype of the healthy parents? **A.***Aa × Aa; **B.** Aa × AA; **C.** aa × Aa; **D.** AA × AA; **E.** aa ×aa.
158. One of the parents has recessive gene of PKU. What is the probability of PKU diseased child in this family? **A.***0%; **B.** 25%; **C.**50%; **D.**75%; **E.** 100%.
159. Parents are heterozygous for PKU gene. They have two sons with PKU and healthy daughter. What is the probability of PKU in their next child? **A.*** 25%; **B.** 0%; **C.**50%; **D.**75%; **E.** 100%.
160. Particular kind of premolar teeth absence is an autosomal recessive factor. Healthy parents with normal dental system have a child with absent premolar teeth. What is the probability of healthy children in this family? **A.** 25%; **B.** 0%; **C.**50%; **D.***75%; **E.** 100%.
161. A wide cleft between incisors of mother and father is dominant trait. They are both homozygous. What genetic regularity will be observed in their children? **A.***uniformity of first generation hybrids; **B.** hybrid segregation in phenotype; **C.** linked inheritance; **D.** non-llinked inheritance; **E.** independent inheritance of the trait.
162. Hurtnup's disease is caused by point mutation of only one gene. It results in abnormal absorbtion of trypthophane in intestine and it abnormal reabsorbtion in renal tubules. This caused synchronous disorders of digestive and urinary excretion systems. What genetic phenomenon is observed in this case? **A.***pleiotropy; **B.** complementary interaction; **C.** polimery; **D.** codominance; **E.** semi-dominance.
163. 20 y. o. boy has a Marfan syndrome with symptoms of concaved chest arachnodactyly, lens deformation, abnormalities of cardio-vascular system. **A.***pleiotropy; **B.** complementary interaction; **C.** polimery; **D.** codominance; **E.** semi-dominance.

164. Cystinuria manifests itself in a human as cystine stones in the kidneys (homozygous individuals) or increased cystine content in the urine (heterozygous individuals). Cystinuria is a monogenic disorder. Determine the type of interaction between the genes of cystinuria and normal urine cystine excretion: **A.*** Semidominance; **B.** Epistasis; **C.** Complete dominance; **D.** Complementarity; **E.** Codominance.
165. A family of healthy students who came from Africa got a child with anemia. The child died soon. Examination revealed that the child's erythrocytes have abnormal semilunar shape. Specify the genotypes of the child's parents: **A.***Aa × Aa; **B.** Aa × AA; **C.** aa × Aa; **D.** AA × AA; **E.** aa ×aa.
166. A woman with III (B., Rh- blood group born a child with II (A. blood group. The child is diagnosed with hemolytic disease if newborn as a result of rhesus incompatibility. What blood group is the child's father likely to have? **A.***II(A.,Rh+; **B.** I(0), Rh+ **C.** III(B., **D.** Rh+;I(0), Rh-; **E.** II(A.,Rh-.
167. A female with II(A.,Rh-blood group born a child with IV (AB. blood group. The child is diagnosed with hemolytic disease if newborn as a result of rhesus incompatibility. What blood group is the child's father likely to have? **A.** II(A.,Rh+; **B.** I(0), Rh+ **C.** * III(B.Rh+, **D.** Rh+;I(0), Rh-; **E.** II(A.,Rh-.
168. A boy has I (I^0I^0) blood group and his sister has IV($I^AI^{B.}$ blood group. What blood groups do their parents have? **A.*** II (I^AI^0) and III (I^BI^0); **B.** II ($I^AI^{A.}$ and III(I^BI^0); **C.** I(I^0I^0) and IV($I^AI^{B.}$; **D.** III (I^BI^0) IV($I^AI^{B.}$; **E.** I (I^0I^0) and III (I^BI^0).
169. Heterozygous parents with A(II) and B(III) blood group according to the ABO system have got a child. What is the probability that the child has 0(I) blood group? **A.***25%; **B.** 100%; **C.** 75%; **D.** 50%; **E.** 0%.
170. Human X chr contains a dominant gene that is responsible for normal blood clotting. An autosomal dominant gene plays a similar role. Lack of any of these genes leeds to the coagulation disorder. The form of interaction between these genes is called: **A.***Complementarity; **B.** Epistasis; **C.** polymerism; **D.** codominance; **E.** pleiotropy.
171. A woman with 0(I) blood group has born a child with AB blood group. This woman's husband has A blood group. What genetic interaction explains this phenomenon? **A.** recessive epistasis; **B.***dominance; **C.** polymery; **D.** incomplete dominance; **E.** complementation.
172. Human skin color intensity is controlled by several independent dominant genes. The bigger quantity of these genes, the more intensive pigmentation. What is the type of interaction between these genes? **A.***polymery; **B.** pleiotropy; **C.** epistasis; **D.** codominancy; **E.** complementarity.
173. A married couple consulted a specialist at the genetic consultation about probability of having children with hemophilia. Both spouses are healthy, but the wife's father has hemophilia. In this family hemophilia may be passed to: **A*** half of sons; **B.** to sons and daughters; **C.** daughters only; **D.** half of daughters; **E.** to all of their children.
174. A couple applied to a genetic consultation about probability of X-linked vitamin resistant rachitis (dominant trait) in their children. Father is healthy,

mother is heterozygous and suffers from this disease. Vitamin resistant rachitis can be inherited by **A.*** half of their daughters and sons; **B.** daughters only; **C.** sons only; **D.** all children **E.** all children will be healthy.

175. Enamel hypoplasia is caused by a dominant gene localized in the X chr. Mother has normal enamel and father has enamel hypoplasia. Which of children will have this anomaly? **A.***only the daughters; **B.** All the children; **C.** only the sons; half of the daughters; **E.** half of the sons.
176. Very big teeth is Y-linked trait. Mother has normal teeth, son has large teeth. What is the probability of large teeth in father? **A.** 25%; **B.** *100%; **C.** 75%; **D.** 50%; **E.** 0%.
177. It is known that the gene responsible for the development of the MN blood groups has two allelic states. If the gene M is considered as the initial gene, the allelic gene N appeared due to: **A.***mutations; **B.** gene combinations; **C.** DNA repair; **D.** DNA replication; **E.** crossing-over.
178. Continuous taking of some drugs foregoing the pregnancy increase the risk of giving to a child with genetic defects. How this effect is called? **A.***mutagenic effect; **B.** embryotoxic effect; **C.** teratogenic effect; **D.** fetotoxic effect; **E.** blastomogenic effect.
179. A child with a normal karyotype is diagnosed with cleft lip and hard palate, defects of the cardiovascular system, microcephaly. The child's mother suffered rubella during pregnancy. This pathology in the child may be an example of: **A.** Genocopy; **B.** Trisomy; **C.*** Phenocopy; **D.** Monosomy.
180. A woman got infected with rubella during pregnancy. The child was born with malformations: cleft lip and palate. The child's genotype is normal. These malformations are manifestation of **A.*** modification variability; **B.** polyploidy; combinatory variability; **C.** combinatory variability; **D.** mutation; **E.** aneuploidy.
181. A mother had taken synthetic hormones during pregnancy. Her daughter was born with hirsutism formally resembling of adrenal syndrom**e.** Such manifestation of variability is called: **A.*** Phenocopy; **B.** Mutation; **C.** Recombination; **D.** Heterosis; **E.** Replication.
182. A mother had taken synthetic hormones during pregnancy. Her daughter was born with hairiness formally resembling of adrenogenital syndrome. Such manifestation of variability is called: **A.*** Phenocopy; **B.** Mutation; **C.** Recombination; **D.** Heterosis; **E.** Replication.
183. As a result of iodine deficiency in foodstuffs Transcarpathian people often have endemic goiter. This disease is caused by the following type of variability: **A**.*modification; **B.** mutation; **C.** combinatorial; **D.** ontogenetic; **E.** correlative.
184. Tetracycline taking in the first half of pregnancy causes abnormalities of fetus organs and systems, including tooth hypoplasia and alteration of their color. What type of variability is the child's disease related to? **A**.*modification; **B.** mutation; **C.** combinatorial; **D.** hereditary; **E.** recombination.

185. As a result of treatment of viral RNA with nitrous acid, UCA triplet mutated to UGA triplet. What kind of mutation occurred? **A.***transition; **B.** nucleotide deletion; **C.** missense; **D.** nucleotide insertion; **E.** inversion.
186. Part of the DNA chain turned about 180^o due to γ radiation. What type of mutation took place in the DNA chain? **A.***inversion; **B.** deletion; **C.** doubling; **D.** translocation; **E.** replication.
187. In a cell the mutation of the first exon of structural gene took place. The number of nucleotide pairs has decreased – 250 pairs instead of 290. Determine the type of mutation: **A.***deletion; **B.** inversion; **C.** duplication; **D.** translocation; **E.** non-sense mutation.
188. 46 chromosomes were revealed on karyotype examination of the 5-year-old girl. One of the 15th pair of chromosomes is longer than usual due to connected chromosome from the 21 pair. What type of mutation does this girl have? **A.*** Translocation; **B.** Deletion; **C.** Inversion; **D.** Insufficiency; **E.** Duplication.
189. In a genetical laboratory in course of work with DNA molecules of white rats of Wistar's line a nucleotide was substituted for another one. At that only one amino acid was substituted in the peptide. This result is caused by the following mutation: **A.***transversion; **B.** deletion; **C.** duplication; **D.** displacement of reading frame; **E.** translocation.
190. A cell at the stage of mitosis anaphase was stimulated by colchicine that inhibits chromosome separation to the poles. What type of mutation will be caused? **A.***Polyploidy; **B.** Inversion; **C.** Deletion; **D.** Duplication; **E.**Translocation.
191. The ABO blood system exist due to three alleles of one gene. If a man has IV blood group, it can be explained by the following variability form: **A.***combinative; **B.** mutational; **C.** phenotypic; **D.** genocopy; **E.** phenocopy.
192. A child with a normal karyotype is diagnosed with cleft lip and hard palate, defects of the cardiovascular system, microcephaly. The child's mother suffered rubella during pregnancy. This pathology in the child may be an example of: **A.***genocopy; **B.** trisomy; **C.** phenocopy; **D.** monosomy; **E.** disomy.
193. Analysis of the family history of children with Van der Woude syndrome revealed that in their families one of the parents had the typical for this syndrome defects (cleft lip and palate, lip pits regardless of gender). What is the type of inheritance of this syndrome? **A.***Autosomal dominant; **B.** X-linked recessive; **C.** X-linked dominant; **D.** Autosomal recessive; **E.** Multifactorial.
194. Examination of a 12-year-old boy with developmental lag revealed achondroplasia (dwarfism due to growth disorder of epiphyseal cartilages of long tubal bones). This desease is **A.***heritable, dominant; **B.** heritable, recessive; **C.** acquired; **D.** inherited X-linked; **E.** congenital.
195. A couple has a son with haemophilia. The patterns are healthy, but the maternal grandfather also has haemophilia. Specify the type of inheritance: **A.***recessive sex-linked; **B.** recessive autosomal; **C.** dominant sex-linked; **D.** semidominants; **C.** autosomal dominant.

196. A healthy woman has three sons affected by color blindness who were born after her two marriages. Children both of her husbands are healthy. What is the most possible pattern of inheritance of this disease? **A*** X-linked recessive; **B.** Y-linked; **C.** autosomal recessive; **D.** autosomal dominant; **E.** X-linked dominant.
197. The study of the genealogy of a family with hypertrichosis (helix excessive pilosis) has demonstrate that this symptoms is manifested in all generations only in men and is inherited by son from his father. What is the type of hypertrichosis inheritance? **A*** Y-linked; **B.** autosome-resistant; **C.** autosome-dominant; **D.** X-linked recessive; **E.** X-linked dominant.
198. A genetics specialist analyzed the genealogy of a family and found that both males and females may have the illness, not across all the generations, and that healthy parents may have ill children. What is the type of illness inheritance? **A.***autosomal recessive; **B.** autosomal dominant; **C.** X-linked recessive; **D.** X-linked dominant; **E.** Y-linked.
199. 7 y.o. boy is diagnosed with daltonism. His parents are healthy and have normal color vision, but his grandfather on his mother's side has the same abnormality. What is the type of the abnormality inheritance? **A.***recessive, sex-linked; **B.** dominant autosomal; **C.** dominant sex-linked; **D.** Y-linked; **E.** autosomal recessive.
200. A 7 y.o. boy is diagnosed with Lesch-Nyhan syndrome (only boys can be affecteD.. His parents are healthy but his grandfather by his mother's side has the same diagnosis. What is type of disease inheritance? **A.*** recessive, sex linked; **B.** dominant, sex linked; **C.** autosomally recessive; **D.** autosomally dominant; **E.** semidominance.
201. A man with hereditary disease married a healthy woman. They got 5 children: 3 girls and 2 boys. All the girls inherited father's diseases. What is the type of the disease inheritance? **A.***Dominant, X-linked; **B.** autosomal recessive; **C.** autosomal dominant; **D.** Y-linked; **E.** recessive, X-linked.
202. A 16 y. o. girl consulted dentist about dark colour of tooth enamel. Analysis of her pedigree revealed that this pathology was inherited by all girls from father and by 50% of boys from mother. The mode of inheritance: **A.***dominant X-chromosome-linked; **B.** recessive, X-chromosome linked; **C.** recessive; Y-chromosome linked; **D.** autosomal dominant; **E.** autosomal recessive.
203. The hereditary enamel hypoplasia occurs in every generation of a pedigree. In women, the anomaly occurs more frequently than in men. Male patients only pass this trait to their daughters. What is the inheritance mode of the disease? **A.*** X-linked dominant; **B.** autosomal dominant; **C.** autosomal recessive; **D.** Y-linked dominant; **E.** Y-linked recessive.
204. A couple has a son with haemophilia. The parents are healthy but maternal grandfather also has haemophilia. Specify the type of inheritance: **A.***recessive sex-linked; **B.** recessive autosomal; **C.** dominant sex-linked; **D.** semidominance; **E.** autosomal dominant.

205. What is the percentage of blood group concordance in monozygotic twins? **A.*** 100%; **B.** 25%; **C.** 75%; **D.** 50%; **E.** 0%.
206. Galactosemia is diagnosed in a child. Concentration of glucose in the blood has not considerably changed. What enzyme deficiency caused this illness? **A.***galactose-1-phosphate uridintransferase; **B.** amylo-1,6-glucosidase; **C.** phosphoglucomutase; **D.** galactokinase; **E.** hexokinase.
207. A child blood presents high content of galactose, glucose concentration is low. There are such presentations as cataract, mental deficiency, adipose degeneration of liver. What disease is it? **A.***galactosemia; **B.** diabetes mellitus; **C.** lactosemia; **D.** steroid diabetes; **E.** fructosemia.
208. Examination of cell culture got from a patient with lysosomal pathology revealed accumulation of great quantity of lipids in the lysosomes. What of the following diseases is this disturbance typical for? **A***Tay-Sachs disease; **B.** Gout; **C.** phenylketonuria; **D.** D.Wilson disease; **E.** galactosemia.
209. Examination of the 6 y.o. child revealed that baby couldn't fix his eyes, didn't keep his eyes on toys, eye ground had the cherry-red spot sign. Laboratory analyses showed that brain, liver and spleen had high rate of ganglioside glycometide. What congenital disease is the child ill with? **A*** Tay-Sachs disease; **B.** B. Wilson's syndrome; **C.** Turner's syndrome; **D.** Niemann-Pick disease; **E.** MacArdle disease.
210. The man has hemophilia, the woman is healthy and there were no cases of hemophilia in her family. What is the risk of having sick child in this couple? **A.*** 100%; **B.** 25%; **C.** 75%; **D.** 50%; **E.** 0%.
211. Mother had noticed her 5-year-old child's urine become dark in color. Bile pigments in urine were not detected. The diagnosis of alkaptonuria was made. What pigment is deficient? **A.*** homogentisic acid oxidase; **B.** phenylpyruvate decarboxylase; **C.** phenylalanine hydroxylase; **D.** tyrosinase; **E.** oxyphenylpyruvate oxidase.
212. Healthy parents have got a fair-haired blue-eyed girl. Irritability, anxiety, sleep and feeding disturbance developed in the first month of the infant's life. Neurological examination revealed developmental lag. What method of genetic investigation should be used for the exact diagnosis? **A.***biochemical; **B.** cytological; **C.** gemellary; **D.** genealogical; **E.** population-statistical.
213. Albinos can't stand sun impact – they don't aquire sun-tan but get sunburns. Disturbed metabolism of what aminoacid underlies this phenomenon? **A.***phenylalanine; **B.** methionine; **C.** Tryptophan; **D.** glutamic acid; **E.** histidine.
214. A 1,5 year old child was taken to the hospital. The examination revealed dementia, disorder of motor function regulation, hypopigmentation of skin, high rate of phenylalanine in blood. What is the most probable diagnosis? **A.***phenylketonuria; **B.** galactosemia; **C.** tyrosinosis; **D.** Down's syndrome; **E.** mucoviscidosis.
215. A 2 y. o. child with mental and physical retardation has been delivered to a hospital. He presents with frequent vomiting after having meals. There is

phenylpyruvic acid in urine. Which metabolism abnormality is the reason for this pathology? **A.*** amino acid metabolism; **B.** lipidic metabolism; **C.** carbohydrate metabolism; **D.** water-salt metabolism; **E.** phosphoric Ca metabolism.

216. To prevent long-term effect of 4-day malaria a 42-year-old patient was prescribed primaquine. On the 3rd day from the begin of treatment there appeared stomach and heart pains, dyspepsia, general cyanosis, hemoglobinuria. What caused side effects of the preparation? **A.***genetic insufficiency of glucose-6-phosphate dehydrogenase; **B.** cumulation of the preparation; **C.** decreased activity of microsomal liver enzymes; **D.** delayed urinary expression of the preparation; **E.** Drug potentiation by other preparations.
217. A 3 year old child with fever was given aspirin. It resulted in intensified RBC haemolysis. Hemolytic anemia might have been caused by congenital insufficiency of the following enzyme: **A.***genetic insufficiency of glucose-6-phosphate dehydrogenase; **B.** glucose-6-phosphatase; **C.** glycogen phosphorylase; **D.** glycerol phosphate dehydrogenase; **E.** γ-glutamiltransferase.
218. Nappies of a newborn have dark spots that witness of formation of homogentisic acid. Metabolic imbalance of which substance is it connected with? **A.***Thyrosine; **B.** galactose; **C.** methionine; **D.** cholesterin; **E.** tryptophane.
219. In case of alkaptonuria, homogentisic acid is excretedin urine in large amounts. The development of this disease is associated with a disorder of metabolism of the following amino acid: **A.*** tyrosine; **B.** phenylalanine; **C.** alanine; **D.** methionine.
220. A patient has been diagnosed with alkaptonuria. This is caused by deficiency of the following enzyme: **A.*** oxidase of homogentisic acid; **B.** phenylalanine hydroxylase; **C.** glutamate dehydrogenase; **D.** pyruvat dehydrogenase; **E.** DOPA decarboxylase.
221. Examination of a 6 days old infant revealed phenyl pyruvate and phenyl acetate excess in his urine. What aminoacid metabolism is disturbed in the child's organism? **A.*** phenylalanine; **B.** tryptophan; **C.** methionine; **D.** histidine; **E.** arginine.
222. Analysis of newborn's urine revealed phenylpyruvic acid. Its presence in urine is associated with the following pathology: **A.***phenylketonuria; **B.** alkaptonuria; **C.** albinism; **D.** tyrosinosis; **E.** gout.
223. A 13 year-old patient complains of general weakness, dizziness, fatiguability. Mental retardation is also observed. Examination revealed high concentration of valine, isoleucine and leucine in blood and urine. The patient's urine has a specific smell. What is the likely cause of such condition? **A.***maple syrup urine disease; **B.** Addison's disease; **C.** tyrosinosis; **D.** histidinemia; **E.** Basedow's disease.

224. A stillborn child was found to have thickened skin resembling of the tortoise shell, underdeveloped auricles. Histological examination of skin revealed hyperkeratosis, atrophy of the granular epidermis layer; inflammatory changes were not present. What is the most likely diagnosis? **A***. ichtiosis; **B.** leukoplakia; **C.** xeroderma; **D.** erythroplakia; **E.** dermatomyositis.
225. Hypertrichosis is the Y-linked character. The father has hypertrichosis, and the mother is healthy. In this family, the probability of having a child with hypertrichosis is: **A.*** 0.5; **B.** 0.25; **C.** 0.125; **D.** 0.625; **E.** 1.
226. Children with Lesch-Nyhan syndrome have a severe form of hyperuricemia accompanied by the formation of tophi, urate calculi in the urinary tracts, as well as serious neuro-psychiatric disorders. The cause of this disease is the reduced activity of the is the following enzyme: **A.***Hypoxanthine-guanine phosphoribosyltransferase; **B.** xanthine oxidase; **C.** dihydrofolate reductase; **D.** thymidylate synthase; **E.** karbamoyl phosphate synthetase.
227. Wilson's disease is a disorder of copper transport which leads to the accumulation of this metal in brain and liver cells. It is associated with a disturbance in the synthesis of the following protein: **A.***ceruloplasmin; **B.** haptoglobin; **C.** siderophilin; **D.** metallothionein; **E.** transcobalamin.
228. A child has a history of hepatomegaly, hypoglycemia, seizures, especially on an empty stomach and in stressful situations. The child is diagnosed with Gierke disease. This disease is caused by the genetic defect of the following enzyme: **A.***glucose-6-phosphatase;**B.**amyloid-1,6-glycosidase;
C. phosphoglucomutase; **D.** Glycogen phosphorylase; **E.** glucokinase.
229. In patients with glycogenolysis, that is von Gierke's disease the conversion of glucose-6-phosphate into glucose is inhibited, which is accompanied by the improper breakdown of glycogen in the liver. The cause of this condition is the following enzyme deficiency: **A.***glucose-6-phosphatase; **B.** glycogen phosphorylase; **C.** glucose-6-phosphate dehydrogenase; **D.** phosphofructokinase; **E.** phosphoglucomutase.
230. Child has encephalopathy, caused by heritable mitochondrial disorder. How mitochondrial disorders are inherited? **A.*** from mother to all her children; **B.** from father to all his children; **C.** from mother to daughters; **B.** from father to sons; **E.** from father to daughters.
231. A woman with A (II), Rh- blood had a child with B (III), Rh+ blood. The child was diagnosed with congenital anaemia of newborns. What is the most likely cause of its development? **A.*** Rhesus incompatibility; **B.** hereditary chromosomal pathology; **C.** AB0-incompatibility; **D.** intrauterine intoxication; **E.** intrauterine infection.
232. An individual has rounded face, broad forehead, a mongoloidal type of eyelid fold, flat hands, and stubby fingers. What diagnosis can be put to the patient? **A.***Down's syndrome; **B.** Klinefelter's syndrome; **C.** alkaptoneuria, **D.** supermale; **E.** Turner's syndrome.

233. A boy is diagnosed with Down syndrome. What chromosomal changes may be the cause of this disease? **A.***trisomy 21; **B.** trisomy 13; **C.** trisomy 18; **D.** trisomy X; **E.** monosomy.
234. A patient has retardation, small height, brachydactyly, mongoloid slant. Analysis of his karyotype revealed trisomy 21. What chromosomal anomaly is it? **A.** Down's disease; **B.** Klinefelter's syndrome; **C.** Turner's syndrome; **D.** trisomy X; **E.** specific fetopathy.
235. Child has body shortness, mental deficiency, mongoloid palpebral tissures, epicantal fold, anlarged grooved tongue protruding from the mouth, high palate, maldentition, diastema, cross striation of lips. What hereditary disease are these presentations typical for? **A.** Down's disease; **B.** Patau's syndrome; **C.** Turner's syndrome; **D.** Klinefelter's syndrome; **E.** Edwards.
236. There are trisomy, translocational and mosaic forms of Down's syndrome. What method of human genetics can be applied to differentiate the said forms of Down's syndrome? **A.***cytogenetical; **B.** gemellary; **C.** genealogical; **D.** biochemical; **E.** population statistics method.
237. Examination of a 7 y. o. child revealed the following symptoms: small height, broad roundish face, closely placed eyes with narrow palpebral fissures, half-open mouth. Valvular defect has been also diagnosed. These clinical presentations are most likely typical for Down's syndrome. Name the cause of such pathology: **A.***trisomy of 21 chr; **B.** trisomy of the 13 chr; **C.** trisomy X chr; **D.** partial monosomy; **E.** Non-disjunction of sex chromosomes.
238. An 8 month old child has non-closed palate, a number of eye defects, microcephaly, disorder of cardiovascular system. Cytogenetic analysis revealed 47 chrs with an additional 13^{th} chr. What diagnosis can be made on the basis of clinical observations and cytogenetic examinations? **A*** Patau's syndrome; **B.** Cat cry syndrome; **C.** Edwards' syndrome; **D.** Down's syndrome; **E.** Klinefelter's syndrome.
239. Healthy parents with unremarkable family history have the child with multiple developmental defects. Cytogenetic analysis revealed the trisomy 13 in the somatic cells (Patau syndrome). What phenomenon has caused the defects? **A.** Abnormal gametogenesis; **B.** Somatic mutation; **C.** Recessive mutation; **D.** Dominant mutation; **E.** Chromosomal mutation.
240. Autopsy of a newborn boy revealed polydactylia, microcephalia, cheiloschisis and uranoschisis as well as hypertrophy of parenchimatous organs. These defects correspond with the description of Patau's syndrom**e.** What is the most probable cause of this pathology? **A.*** Trisomy of the 13th chromosome; **B.** Trisomy of the 18th chromosome; **C.** Trisomy of the 21st chromosome; **D.** Nondisjunction of sex chromosomes; **E.** Partial monosomy.
241. Medical examination at the military registration and enlistment office revealed that a 15-year-old boy was high, with eunuchoid body proportions, gynecomastia, female pattern of pubic hair distribution. The boy had also fat deposits on the thighs, no facial hair, high voice, subnormal intelligence

quotient. Which karyotype corresponds with this disease? **A.** 47, XXY; **B.** 45, XO; **C.** 46, XX; **D.** 46, XY; **E.** 47, XXX.

242. A 35 y. o. male patient has been reffered by an andrologist for the genetic comselling for the phisical and mental deviations. Objectively: the patients is tall, has asthenic constitution, gynecomastia, mental retardation. Microscopy of oral mucosa cells revealed Barr bodies in 30% of the cells. What is the likely diagnosis. **A.*** Klinefelter's syndrome; **B.** DiGeorge syndrome; **C.** Down's syndrome; **D.** cushing pituitary basophilism; **E.** Recklinghausen's disease.
243. A boy referred to a genetics clinic was found to have 1 drumstick in blood neutrophils. The boy is likely to have the following syndrome: **A.*** Klinefelter's; **B.** Down's; **C.** Turner's; **D.** Edwards'; **E.** Trisomy X.
244. An 18 y. o. boy applied to a geneticist. The boy has asthenic constitution: narrow shoulders, broad pelvis, nearly hairless face. Evident mental deficiency. The provisional diagnosis was Klinefelter's syndrome. What method of clinical genetics will enable the doctor to confirm this diagnosis? **A.***cytogenetic; **B.** genealogical; **C.** twin study; **D.** dermatogliphics; **E.** population and statistical.
245. X-chromatin test of somatic cells is used for quick diagnostics of hereditary diseases caused by variants of sex chromosomes number. What is the karyotype of a male, whose cells mostly contain one X-chromatin body? **A.***47, XXY; **B.** 48,XXXY; **C.** 49, XXXXY; **D.** 46, XY; **E.** 45, XO.
246. Detection of X-chromatin in somatic cells is used for the quick diagnosis of hereditary diseases associated with a change in the sex chromosome number. Vast majority of a man's cells have three X-chromatin bodies. What is the man's karyotype? **A.*** 49, XXXXY; **B.** 45X; **C.** 46, XY; **D.** 47, XXY; **E.** 48, XXXY.
247. A 32 y. o. man is tall, he has gynecomastia, adult woman pattern of hair distribution, high voice, mental deficiency, sterility. Provisional diagnosis is Klinefelter's syndrome. In order to specify diagnosis it is necessary to analize: **A.***caryotype; **B.** leukogram; **C.** spermatogenesis; **D.** blood group; **E.** genealogy.
248. Cytogenetic examination of a patient with dysfunction of the reproductive system revealed normal karyotype 46, XY in some cells, but most cells have Klinefelter's syndrome karyotype 47, XXY. Such phenomenon of cell inhomogeneity is called: **A.***mosaicism; **B.** inversion; **C.** transposition; **D.** duplication; **E.** monomorphism.
249. A 28 y. o. female patient consulted a gynecologist about sterility. Examination revealed underdeveloped ovaries and uterus, irregular menstrual cycle. Study of sex chromatin revealed 2 Barr's bodies in most somatic cells. What chromosome disease is the most probable in this case? **A.***triple X syndrome; **B.** Edwards' syndrome; **C.** Patau's syndrome; **D.** Klinefelter's syndrome; **E.** Turner's syndrome.
250. According to the phenotypic diagnosis a female patient has been provisionally diagnosed with X-chromosome polysomia. This diagnosis can be confirmed

by a cytogenetic method. what karyotype will allow to confirm the diagnosis? **A.*** 47 (XXX); **B.** 48 (XXXY); **C.** 48 (XXYY); **D**. 47 (XXY); **E.** 48 (XX).

251. When examination a female patient a doctor observed the following: misshapen auricles, elevated palate, teeth growth disorder; mental retardation, no disruption of reproductive function. Provisional diagnosis is the "super women" syndrome. Point out the karyotype of this disease. **A.*** 47 (XXX); **B.** 47 (XXY); **C.** 47 (XYY); **D**. 47 (YYY); **E.** 45 (XO).
252. A woman has been diagnosed with Turner's syndrome (karyotype 45, XO). How many pairs of autosomes do her somatic cells contain? **A.***45; **B.** 23; **C.** 22; **D.** 44; **E.** 24.
253. Sex chromosomes of a woman didn't separate and move to the opposite poles of a cell during gametogenesis (meiosis). The ovum was impregnated with a normal spermatozoon. Which chromosomal disease can be found in her child? **A.*** Turner's syndrome; **B.** Down's syndrome; **C.** Patau's syndrome; **D.** Edwards' syndrome; **E.** Cat cry syndrome.
254. Abnormal chromosome disjunction during meiosis resulted in formation of an ovum with 22 autosomes and polar body with 24 chrs. If such an ovum would be fertilized with a normal spermatozoon (22+X) the child might have the following syndrome: **A.*** Turner's syndrome; **B.** Down's syndrome; **C.** Patau's syndrome; **D.** Klinefelter's syndrome; **E.** Edwards' syndrome.
255. Mother and father are healthy. Mothe underwent amniocentesis for fetal karyotyping. The fetal karyotype revealed 45, XO. What syndrome can be expected in the baby? **A.*** Turner's syndrome; **B.** Down's syndrome; **C.** Patau's syndrome; **D.** Klinefelter's syndrome; **E.** Edwards' syndrome.
256. A girl who was provisionally diagnosed as Turner's syndrome came to the genetic consultation. The diagnosis can be specified by **A.*** sex chromatin test; **B.** genealogical; **C.** hybridological; **D.** biochemical; **E.** dermatoglyphic.
257. Examination of an 18 y. o. girl revealed the following features: ovarian hypoplasia, broad shoulders, narrow hips, shortening of the lower extremities, webbed neck. Mental development is normal. The patient has been diagnosed with Turner's syndrome. What chromosomal abnormality does this patient have? **A.***monosomy X; **B.** trisomy X; **C.** trisomy 13; **D.** trisomy 18; **E.** nullisomy X.
258. A 25 y. o. patient consulted a doctor about dysmenorrhea and infertility. Examination revealed that the patient was 145 cm high and had underdeveloped secondary sex characteristics, alar folds on the neck. Cytological study didn't reveal any Barr bodies in somatic cells. What diagnosis was made? **A.*** Turner's syndrome; **B.** trisomy X; **C.** Patau's syndrome; **D.** Klinefelter's syndrome; **E.** Morris syndrome.
259. A female patient saught medical genetic consultation. Physical examination revealed pterygium colli deformity (webbed neck), broad chest, underdeveloped breasts. Study of buccal epithelium cells revealed no X-chromatin in the nuclei. This indicates that the patient has the following

syndrome: **A.** Turner's; **B.** Klinefelter's; **C.** Patau's; **D.** Down's; **E.** Edwards'.

260. Amniocentesis revealed two sex chromatin bodies (Barr bodies) in each cell of the sample. What disease is this character typical for? **A.** Trisomy X; **B.** Klinefelter syndrome; **C.** Turner's syndrome; **D.** Down's syndrome; **E.** Patau syndrome.
261. Analysis of amniotic fluid that was obtained as a result of amniocentesis (puncture of amniotic saC. revealed cells the nuclei of which certain sex chromatin (Barr's body). What can it be evidence of? **A.*** development of female fetus; **B.** development of male fetus; **C.** genetical disorder of fetus development; **D.** trisomy; **E.** polyploidy.
262. The history of the post-embryonic period of ontogenesis from birth to puberty is called **A.*** juvenile period; **B.** the first period of adulthood; **C.** senium; **D.** the second period of adulthood; **E.** Advanced age.
263. As a result of expression of some genome components the embryo cells acquire typical morphological, biochemical and functional properties. Name this process: **A.***differentiation; **B.** capacitation; **C.** reception; **D.** determination; **E.** induction.
264. Examination of uterine cavity revealed an embryonate ovum that wasn't attached to the endometrium. The embryo is at the following stage of development: **A.***blastocyst; **B.** zygote; **C.** morula; **D.** gastrula; **E.** neurula.
265. At a certain stage of development of a human embryo one can observe formation of a cavity in its structure, small light blastomeres on the periphery and large dark blastomeres at one of the poles. The embryo at this stage of development is called: **A.***blastocyst; **B.** morula; **C.** zygote; **D.** gastrula; **E.** blastodisk.
266. In Western Europe nearly half of all congenital malformations occur in the children conceived in the period when pesticedes were used extensively in the region. These congenital conditions result from the following influence: **A***teratogenic; **B.** mutagenic; **C.** mechanical; **D.** carcinogenic; **E.** malignization.
267. A newborn boy has been diagnosed with hydrocephalus. Doctors consider it to be caused by teratogenic factors. What germ layer is affected by teratogen? **A.***ectoderm; **B.** endoderm; **C.** endoderm and mesoderm **D.** mesoderm **E.** all embryo germ layers.
268. En embryo has a disturbed development of blood-vascular system caused by a teratogenic factor. This disturbance occurred in the following germ layer: A.*mesoderm; B. endoderm; C. exoderm; D. endoderm and mesoderm; E. endoderm and ectoderm.
269. As a result of a development anomaly a newborn has malformation of major salivary glands. This anomaly is caused by the damage of the following embryonal structure: **A.***ectoderm; **B.** splanchnotom; **C.** somites; **D.** entoderm; **E.** mesenchyme.

270. Microspecimen analysis of child's finger skin revealed that epidermis has signs of inadequate development. What embryonal leaf was damaged in the process of development? **A***ectoderm; **B.** mesoderm; **C**. entoderm; **D**. mesenchyma; **E**. ectomesenchyma.
271. A newborn child has microcephalia. Doctors believe that it is the result of mother's taking actinomycin D during pregnancy. What embryonal leaf was influenced by this teratogen? **A***ectoderma; **B.** mesoderm; **C**. entoderma; **D**. all leaves; **E**. entoderma and mesoderma.
272. A woman who was infected with *Toxoplasma* during the pregnancy has a child with multiple congenital defects. This is result of: **A.***teratogenesis; **D.** cancerogenesis; **C.** biological mutagenesis; **D.** chemical mutagenesis; **E.** recombination.
273. An alcoholic woman has born a girl with mental and physical developmental lag. Doctors diagnosed the girl with fetal alcohol syndrome. What effect is the cause of the girl's state? **A.** Teratogenic; **B.** Mutagenic; **C.** Malignization; **D.** Carcinogenic; **E.** Mechanic.
274. A woman who had taken alcohols during her pregnancy had a child with cleft palate and upper lip. These presentations are indicative of some chromosomal anomalies. What process do they result from? **A.***teratogenesis; **D.** cancerogenesis; **C.** mutagenesis; **D.** phylogenesis; **E.** ontogenesis.
275. A woman who had taken alcohols during her pregnancy had a child with cleft palate and upper lip. It is known that some chromosomal diseases have the same traits. What can be a cause for this abnormalities? **A.***teratogenesis; **D.** cancerogenesis; **C.** mutagenesis; **D.** phylogenesis; **E.** ontogenesis.
276. An 8-week-pregnant woman with acute respiratory disease and temperature rise up to 39.0 oC has called in a doctor. The doctor insisted on her avoiding taking paracetamol, because in this period of pregnancy there is a risk of its: **A.*** Teratogenicity; **B.** Embryotoxicity; **C.** Fetotoxicity; **D.** Hepatotoxicity; **E.** Allergenicity.
277. On autopsy of a still-born infant it is revealed heart development abnormalities: ventricles are not separated, originates from the right part single arterial trunk. For what class of vertebrate is such heart construction characteristic? **A.*** Amphibian; **B.** Fishes; **C.** Reptiles; **D.** Mammals; **E.** Birds.
278. A patient has undergone an amputation of lower extremity. Some time later paintful nodules appeared in a stump. Amputatious neuromas were found put at the microscopic examination. To what pathological processes do those formations relate? **A.***regeneration; **B.** dystrophy; **C.** inflammation; **D.** hyperemia; **E.** metaplasia.
279. A couple had a child with Down's disease. Mother is 42 years old. This disease is most probably caused by the following impairment of prenatal development: **A.***gametopathy; **B.** blastopathy; **C.** embryopathy; **D.** non-specific fetopathy; **E.** specific fetopathy.
280. For the purpose of myocardium infarction treatment a patient was injected with embryonal stem cells derived from this very patient by means of therapeutic

cloning . What transplantation type is it? **A.*** Autotransplantation; **B.** Allotransplantation; **C.** Xenotransplantation; **D.** Isotransplantation; **E.** Heterotransplantation.

281. A patient has a skin defect as a result of an extensive burn. In order to mask this defect the surgeons transplanted a skin flap from other body part of this patient. What type of transplantation is it? **A.***autotransplantation; **B.** explantation; **C.** allotransplantation; **D.** xenotransplantation; **E.** homotransplantations.
282. A 30-year-old patient has undergone keratoplasty in the transplantation center, cornea has been taken fron a donor, who died in a road accident. What kind of transplantation was performed? **A.*** Allotransplantation; **B.** Autotransplantation; **C.** Xenotransplantation; **D.** Explantation; **E.** Heterotransplantation.
283. A female patient underwent liver transplantation. 1.5 month after it her condition become worse because of reaction of transplant rejection. What factor of immune system plays the leading part in the rejection? **A.***T-killers; **B.** interleukin-1; **C.** natural killers; **D.** B-lymphocytes; **E.** T-helpers.
284. Following exposure to radiation a lot of mutant cells appeared in a patient. Some time later most of them were detected and destroyed by the following cells of the immune system: **A.*** T-lymphocytes-killers; **B.** Plasmoblasts; **C.** T-lymphocytes-supressors; **D.** B-lymphocyte; **E.** Stem cells.
285. Patients with similar complaints applied to the doctor: weakness, pain in the intestines, disorder of GIT. Examination of the faeces revealed that one patient with four nucleus cysts should be hospitalized immidiately. For what protozoa are such cysts typical? **A.*** Dysenteric amoeba; **B.** Intestinal amoeba; **C.** *Balantidium*; **D.** *Trichomonas*; **E.** *Lamblia*.
286. When doctors of a sanitary and epidemiologic institution examine employees of public catering establishments they often reveal asymptomatic parasitosis, that is when a healthy person is a carrier of cysts that infect other people. What causative agent CANNOT parasitize in such a way? **A.*** dysenteric amoeba; **B.** malarial plasmodium; **C.** enteral trichomonad; **D.** dermatotropic leishmanial; **E.** viscerotropic leishmanial.
287. A patients with suspected liver abscess was admitted to the surgical department. The patient had been staying for a long time of business in one of African countries and fell repeatedly ill with acute gastrointestinal disorders. What protozoal disease may the patient be now ill with? **A.*** amebiasis; **B.** trypanosomiasis; **C.** leishmaniasis; **D.** malaria; **E.** toxoplasmosis.
288. A patient complains of frequent bowel movements and stool with blood admixtures (“raspberry jelly” stool). Microscopic examination revealed large mononuclear cells with absorbed red blood cells. What protozoon is this morphological structure typical for? **A.***_Entamoeba histolytica_; **B.** _Giardia lamblia_; **C.** _Campylobacter jejuni_; **D.** _Toxoplasma gondii_; **E.** _Balantidium coli_.
289. A 40-year-old patient presents with abdominal pain, frequent loose stools with mucus and blood. Stool analysis revealed vegetative forms of some protozoa

sized 30-40 microns, with short pseudopodia, containing large amounts of phagocytosed erythrocytes. What protozoan disease does the patient have? **A.*** amebiasis; **B.** leishmaniasis; **C.** trichomoniasis; **D.** giardiasis; **E.** toxoplasmosis.

290. Microscopy of dental plaque revealed unicellular organisms. Their cytoplasm had two distinct layers, barely visible core, wide pseudopodia. The patient is most likely to have: **A.***_Entamoeba gingivalis_; **B.** _Entamoeba histolytica_; **C.** _Entamoeba coli_; **D.** _Giardia lamblia_; **E.** _Trichomonas tenax_.
291. Carious cavities of a 29 y. o. patient contain the parasitic protozoa. It is established that they relate to the Sarcodina class. Specify the single-celled organism: **A.***_Entamoeba gingivalis_; **B.** _Entamoeba coli_; **C.** _Entamoeba histolytica_; **D.** _Amoeba proteus_; **E.** _Lamblia intestinalis_.
292. Examination of the duodenal contents revealed some pear-shaped protozoa with two nuclei and four pairs of flagella. The organisms had also two axostyles between the nuclei and a ventral adhesive disc. What protozoan representative was found in the patient? **A.** *_Lamblia_; **B.** _Toxoplasma_; **C.** _Leishmania_; **D.** Intestinal trichomonad; **E.** _Trypanosome_.
293. A duodenal content smear of a patient with indigestion contains protozoa 10-18 mcm large. They have piriform bodies, 4 pairs of filaments, are symmetrically located nuclei in the broadened part of body. What kind of the organism is it? **A.***_Lamblia_; **B.** Dysenteric amoeba; **C.** _Trichomonas_; **D.** intestinal ameba; **E.** _Balantidium_.
294. Parents with ill child came to the infectionist. They worked in one of the Asian countries for a long tim**e.** Child has eathy colored skin, loss of appetite, laxity, enlarged liver, spleen, peripheral glands. What protozoan illness can this child have? **A.*** Visceral leishmaniasis; **B.** Balantidiasis; **C.** Amebiasis; **D.** Toxoplasmosis; **E.** Lambliasis.
295. A patient has roundish ulcers on his face, inflammation and enlargement of lymph nodes. These symptoms turned up as a result of mosquito bites. Laboratory examination of discharge from the ulcers revealed unicellular aflagellar microrganisms. What is the most probable diagnosis? **A.***dermatotropic leishmaniasis; **B.** toxoplasmosis; **C.** scabies; **D.** tripanosomiasis; **E.** myasis.
296. Examples of human-specific parasite are malaria Plasmodium, Enterobius vermicularis and some other. The source of invasion of such parasites is always a human. Such human specific parasites cause diseases that are called: A.*anthroponotic; B. zoonotic; C. anthropozoonotic; D. infectious; E. multifactorial.
297. A businessman came to India from South America. On examination the physician found that the patient was suffering from sleeping-sickness. What was the way of invasion? **A.*** As a result of bug's bites; **B.** As a result of mosquito's bites; **C.** C.With contained fruits and vegetables; **D.** Through dirty hands; **E.** After contact with a sick dogs.

298. While examining a blood smear taken farm a patient and stained by Romanovsky's method a doctor revealed some protozoa and diagnosed the patient with Chagas disease. What protozoan is the causative agent of this disease? **A.*** *Trypanosoma crusi*; **B.** *Toxoplasma gondii*; **C.** *Leishmania donovani*; **D.** *Leishmania tropica*; **E.** *Trypanosoma brucei*.
299. A patient has symptoms of inflammation of urogenital tracts. Examination of a vaginal smear revealed big monocellular, pear-shaped organisms with the pointed spike at the posterior end of body, big nucleus and undulating membran**e.** What protozoa were found in the smear? **A.*** *Trichomonas vaginalis*; **B.** *Trichomonas hominis*; **C.** *Trichomonas buccalis*; **D.** *Trypanosoma gambiense*; **E.** *Lamblia intestinalis*.
300. Microscopical examination of discharges from the gums of a patient ill with paradontosis revealed some protozoan pear-shaped organisms 6-13 micrometers long. The parasite has one nucleus and undulating membrane, there are four flagella at the front of its body. What protozoan was found? **A.*****Trichomonas*; **B.** *Leishmania*; **C.** *Amoeba*; **D.** *Balantidium*; **E.** *Lamblia*.
301. A gynaecologist was examining a patient and revealed symptoms of genital tract inflammation. A smear from vagina contains pyriform protozoa with a spine, flagella at their front; there is also an undulating membran**e.** What disease can be suspected? **A.** Urogenital trichomoniasis; **B.** Lambliasis; **C.** Intestinal trichomoniasis; **D.** Toxoplasmosis; **E.** Balantidiasis.
302. A female patient has symptoms of inflammation of urogenital tracts. A smear from the vaginal mucous membrane contained big unicellular pyriform organisms with a sharp spike on the back end of their bodies; big nucleus and undulating membrane. What protozoa were revealed in the smear? **A.*** *Trichomonas vaginalis*; **B.** *Trichomonas hominis*; **C.** *Trichomonas buccalis*; **D.** *Trypanosoma gambiense*; **E.** *Lamblia intestinalis*.
303. A journalist's body temperature has sharply increased in the morning three weeks after his mission in India, it was accompanied with shivering and bad headache. A few hours later the temperature decreased. The attacks began to repet in a day. He was diagnosed with tropical malaria. What stage of development of Plasmodium is infective for anopheles-female? **A.***gametocytes; **B.** shizontes; **C.** merozoites; **D.** microgamete; **E.** sporosoites.
304. A patient has been brought to the hospital with the complaints of headache, pain in left hypochondrium. He has been ill for 1.5 weeks. The sudden illness began with the increase of body temperature up to 39.9^{o}C. In three hours the temperature decreased and hydropoiesis began. The attacks repeat rhythmically in 48 hours. The patient had visited one an African country. The doctors have suspected malaria. What method of laboratory diagnostics is necessary to use? **A.*** blood examination; **B.** immunological tests; **C.** stool examination; **D.** examination of vaginal and urethral discharge; **E.** urine examination.

305. A patient who has recently come from an endemic area presents with elevated body temperature, headache, chills, malaise, that is with the symptomswhich are typical for a common cold. What laboratory tests are necessary to confirm or to refuse the diagnosis of malaria? **A.*** microscopy of blood smear; **B.** study of lymph node punctate; **C.** urinalysis; **D.** study of cerebro-spinal fluid; **E.** microscopy of bone marrow punctate.
306. Patient developed fever two weeks after hemotransfusion. What protozoal disease can be suspected? **A.*** malaria; **B.** toxoplasmosis; **C.** leishmaniasis; **D.** amebiasis; **E.** trypanosomiasis.
307. A lymph node punctate of a patient with suspected protozoal disease was examined. Examination of the stained specimen (Romanovsky's stain) revealed some crescent bodies with pointed end, blue cytoplasm and red nucleus. What protozoan were revealed in the smears? **A.*** Toxoplasms; **B.** Malarial plasmodiums; **C.** Dermotropic leishmania; **D.** Viscerotropic leishmania; **E.** Trypanosomes.
308. A punctate sample has been taken from the lymph node of a patient with preliminary diagnosis of protozoan disease. The preparation was processed with Giemsa staining and the following detected were: crescent-shaped bodies with pointed tips, blue cytoplasm and red nuclei. What protozoa have protozoa have been detected in the preparation? **A.***Toxoplasma; **B.** trypanosome; **C.** viscerotropic *Leishmania*; **D.** Plasmodium malariae; **E.** dermatotropic *Leishmania*.
309. A woman delivered a dead child with multiple developmental defects. What protozoan disease might have caused the intrauterine death? **A.***Toxoplasmosis; **B.** Leishmaniasis; **C.** Malaria; **D.** Amebiasis; **E.** Lambliasis.
310. A man is ill with a protozoan disease characterized by cerebral affection and loss of sight. Blood analysis revealed halfmoon shape unicellular organisms with pointed ends. This disease is caused by **A.*** *Toxoplasma*; **B.** *Leishmania*; **C.** lamblia; **D.** *Amoeba*; **E.** trichomonad.
311. A. married couple applied to the genetic consultation in order to consult about their child with multiple abnormalities (microcephaly, idiocy, etc.). the woman has had an illnesses during her pregnancy but she didn't take any teratogens or mutagens. The parents' and the child's karyotype is normal. Anamnesis study revealed that the family kept a cat. What gravidic disease caused the child's abnormalities? **A.*** *Toxoplasmosis*; **B.** *Leishmaniosis*; **C.** dysentery; **D.** balantidiasis; **E.** trichomoniasis.
312. Slime, blood and protozoa 30-200 micrometers of length have been revealed in man's feces. The body is covered with cilias and has correct oval form with a little bit narrowed, forward and wide round shaped back end. On the forward end a mouth is visible. In cytoplasm there are two nucleuses and two short vacuoles. For whom are the described attributes typical? **A.*** *Balantidium*; **B.** lamblia; **C.** dysenteric amoeba; **D.** Trichomonas; **E.** intestinal amoeba.

313. A patient working at a pig farm complains about paroxysmal abdominal pain, liquid feces with admixtures of mucus and blood, headache, weatness, fever. Examination of large intestine revealed ulcers from 1 mm up to several cm large. Feces contained oval, unicellular, organisms with cilia. What disease should be suspected? **A.***balantidiasis; **B.** toxoplasmosis; **C.** lambliasis; **D.** trichomoniasis; **E.** amebiasis.
314. A male patients has fever and enanthesis. As a result of the examination involving serological test he has been diagnosed with *Fasciola hepatica*. It was found out that the patient had been infected through raw river water. Which stage of *Fasciola* life cycle is invasive for human? **A.***adolescaria; **B.** metacercaria; **C.** ovum; **D.** miracidium; **E.** cysticercus.
315. A patient complains of pain in the area of his liver. Duodenal intubation revealed yellowish, oval, narrowed at the poles eggs with an operculum at the end. Size of these eggs is the smallest among all helminth eggs. What is the most probable diagnosis? **A.***Opisthorchosis; **B.** Teniasis; **C.** Beef tapeworm infection; **D.** Echinococcosis; **E.** Diphyllobothriasis.
316. Coprological examination of a patient's feces revealed small operculate eggs. It is known from the anamnesis that the patient often consumes fish. What fluke parasitizes in the patient's organism? **A.***cat liver fluke; **B.** blood fluke; **C.** lung fluke; **D.** liver fluke **E.** lancet fluke.
317. A patient has been preliminary diagnosed with paragominiasis, the disease caused by lung flukes. The parasite entered the patient's body through: **A.*** eating of half-cooked lobsters and crabs; **B.** eating of unwashed vegetables **C.** eating of half-cooked or dried fish; **D.** contact with an infected cat; **E.** drinking raw water from open reservoirs.
318. A patient has a pain during urination. Analysis of his urine taken in the daytime revealed eggs with a characteristic sharp point. It is known from the anamnesis that the patient has recently returned from Australia. What is the most likely diagnosis? **A***urogenital schistosomiasis; **B.** intestinal schistosomiasis; **C.** Japanese schistosomiasis; **D.** opisthorchiasis; **E.** dicroceliasis.
319. A man visited Lebanon. Soon after return he felt pain and heaviness in perineum and suprapubic region. On examination he was diagnosed with urogenital schistosomiasis. In what way could he become infected? **A.***by swimming in contaminated waters; **B.** eating of unwashed fruits or vegetables **C.** eating of insufficiently salted fish; **D.** eating of half-cooked meat of cattle; **E.** by eating undercooked meet of crayfish or crabs.
320. A 26-year-old woman consulted a doctor about having stool with white flat moving organisms resembling noodles. Laboratory analysis revealed proglottids with the following characteristics: long, narrow, with a longitudinal channel of the uterus with 17-35 lateral branches on each side. What kind of intestinal parasite was found? **A.** Taeniarhynchus saginatus; **B.** *Taenia solium*; **C.** *Hymenolepis nana*; **D.** *Diphyllobothrium latum*; **E.** *Echinococcus granulosus*.

321. Dehelmintization revealed some long fragments of helmint with segmented structure. Mature segments were rectangular, 30 × 12 mm large, closed-type matrix was in form of the stem with 17-35 lateral branches. **A.*** hookless tapeworm; **B.** *Alveococcus*; **C.** *Echinococcus*; **D.** dwarf tapeworm; **E.** armed tapeworm.
322. In case of some helminthiases, an affected person can detect helminth himself because mature segments of the causative agent are able to crawl out of the anus. This is typical for the following disease: **A.*** beef tapeworm infection; **B.** pork tapeworm infection; **C.** hymenolepiasis; **D.** bothriocephaliasis; **E.** echinococcosis.
323. Father bought some pork at the market. What disease may the membersof this family catch supposed this meat didn't stand veterinary control? **A.***taeniosis; **B.** beef tapeworm infection; **C.** hymenolepiasis; **D.** echinococcosis; **E.** *Fasciola hepatica*.
324. Father bought some pork at the market. What disease may the membersof this family catch supposed this meat didn't stand veterinary control? **A.*** pork tape worm infection; **B.** beef tape worm infection; **C.** hymenolepiasis; **D.** echinococcosis; **E.** liver fluck infection.
325. Dehelmintization results in helminth came out with feces. It has segmented body, small head with four suckers and hooks. Name the type of helminth: **A.*** armed tapeworm; **B.** unarmed tapeworm; **C.** dwarf tapeworm, **D.** Echinococcus; **E.** broad tapeworm.
326. A female patient consulted a physician about digestive disorder, extended abdominal pain. Examination revealed drastic decrease in hemoglobin concentration. It is known from the anamnesis that while living in the Far East the patient used to eat freshly-salted caviar. Some relatives living with her had the similar condition. What is the most likely diagnosis? **A.*** Diphyllobothriasis; **B.** Echinococcosis; **C.** Teniasis; **D.** Trichiniasis; **E.** Ascaridiasis.
327. Child has frequent stomachaches, loss appetite, nausea, constipation. Stool analysis detected rounded eggs with double capsules and oncospheres localized in their centers. The child was diagnosed with hymenolepiasis. What route of transmission lead to progressively intense infection? **A.*** autoinvasion; **B.** sexual; **C.** immediate contagion; **D.** alimentary; **E.** contamination.
328. A shepherd, who tended to the flock of sheep with his dogs, gradually developed pain in the chest and bloody expectorations. X-ray revealed spheric helminth larvae in the patient's lungs. Specify the helminth that could be the causative agent of this disease: **A.***_Echinococcus_; **B.** _Hymenolepis nana_; **C.** _Diphylobotrium latum_; **D.** _Fasciola hepatica_; **E.** _Taenia solium_.
329. A shepherd, who tended to the flock of sheep with his dogs, consulted a doctor about pain in his right subcostal area, nausea, vomiting. Roentgenoscopy revealed a tumor-like formation. What kind of helmintiasis might be

suspected? **A.***_Echinococcus_; **B.** ascariasis; **C.** enterobiasis; **D.** taeniarhynchosis; **E.** taeniasis.

330. The guide of the scientific expedition in India was native who always was with his dog. What invasive diseases can be transmitted by the dog if it is the source of invasion? **A.*** Echinococcosis; **B.** Teniasis; **C.** Paragonimiasis; **D.** Dicroceliasis; **E.** Fascioliasis.
331. A scientific expedition in India was guided by a native who had never parted with his dog. What invasion diseases can be transmitted to the participants of the expedition as the result of contact with this dog if it is known to be the source of invasion? **A.*** Echinococcosis; **B.** Teniasis; **C.** Paragonimiasis; **D.** Dicroceliasis; **E.** Fascioliasis.
332. During an abdominal surgery a 46-year-old patient working at a meat processing plant was found to have a very dense round formation 11 cm in diameter which was localized in the right lobe of the liver. The cross section of the formation has a porous appearance due to a large number of small vesicles with layers of dence connective tissue. The surrounding tissues have visible necrotic areas and proliferation of granulation tissue including many eosinophils and foreign body giant cells. What disease can be thought of in this case? **A*** *Echinococcus multiocularis*; **B.** malaria; **C.** hepatitis; **D.** hepatic rhabdomyosarcoma; **E.** calculous cholecystitis.
333. Microscopic examination of the sputum of a patient with pneumonia occasionally revealed some larvae. Eosinophiles were detected on blood examination. What helminthiasis can be diagnosed? **A.*** ascariasis; **B.** enterobiosis; **C.** trichocephaliasis; **D.** paragominiasis; **E.** opistorchosis.
334. Helminthological examination of patient's feces revealed oval brown eggs with tuberous external membrane. Name the type of helminth: **A.***ascarid; **B.** pinworm; **C.** trichocephaliasis; **D.** paragonimiasis; **E.** opisthorchosis.
335. A shepherd, who has tended sheep together with dogs presents with chest pain and blood splitting. X-ray examination revealed a roundish neoplasm in his lungs. Immunological reactions confirmed the preliminary diagnosis. Specify the helminth that is most probable causative agent of the case: **A.***_Echinococcus_; **B.** dwarf tapeworm; **C.** broad tapeworm; **D.** common liver fluke; **E.** armed tapeworm.
336. A patient consulted a physician about chest pain, cough, fever. Roentgenography of lungs revealed eosinophilic infiltrates which were found to contain the larvae. What kind of helmintiasis are these presentations typical for? **A.***ascarid; **B.** *Echinococcus*; **C.** fascioliasis; **D.** cysticercosis; **E.** trichinosis.
337. A 10-year-old child complains of weakness, nausea, irritability. Helminthes of white color and 5-10 mm long were found on the underwear. On microscopy of the scrape from the perianal folds achromic ova of the unsymmetrical form were reveale**d.** Indicate what helminth is parasiting on the child? **A.** *Enterobins vermicularis*; **B.** *Ascaris lumbricoides*; **C.** *Ancylostoma duodenalis*; **D.** *Trichina*; **E.** *Trichuris*.

338. During regular examination of schoolchildren it was revealed that a 10 year old girl had asymmetric oval eggs with a larva in the scrape from her perianal folds. What diagnosis should be made? **A.*** Enterobiasis; **B.** Ascariasis; **C.** Amebiasis; **D.** Trichocephalosis; **E.** Ancylostomiasis.
339. Microscopy of perianal folds scrape has revealed colourless eggs in the shape of asymmetrical ovals sized 50 ×23 micrometers. Name the kind of helminth. **A.*** Pin worms (*Enterobius vermicularis*); **B.** *Ascaris lumbricoides*; **C.** whipworms (*Trichuris*); **D.** hookworms (*Ancylostoma duodenalis*); **E.** dwarf tapeworm (*Hymenolepis nanA.*.
340. In the perianal folds of a 5-year-old girl her mother has found some white "worms" that caused itching and anxiety in the child. The "worms" examination in laboratory demonstrated white filiform helminths 0.5-1 cm long, with pointed ends, some helminthes had twisted ends. What is the most likely diagnosis? **A.*** Pin worms (*Enterobius vermicularis*); **B.** *Ascaris lumbricoides*; **C.** taeniasis; **D.** Diphyllobothriasis; **E.** Opisthorchiasis.
341. A mother consulted a pediatrician about small white filiform helminths about 1 cm long, with pointed ends that she found on her child's underwear. According to the mother, the child sleeps badly, grits his teeth, scrathes the area of anus. Specify the helminth type: **A.*** pinworm; **B.** ascarid; **C.** Trichuris; **D.** armed tapeworm; **E.** hookworm.
342. In the vermiform appendix there was found a white helminth, 40 mm long with thin filiform forward end. Ecscrements contained oval eggs with plugs at the poles. Determine the kind of helminth. **A.** pinworm; **B.*** whipworms (*Trichuris*); **C.** ascarid; **D.** armed tapeworm; **E.** hookworm.
343. A miner consulted a physician about the appearance of body rash followed by a loss of appetite, bloating, duodenal pain, frequent bowel movements, dizziness. Ovoscopic probes of feces and duodenal contents revealed some eggs covered with a transparent membrane through which 4-8 germinal cells could be seen. What disease is likely to have occurred in the patient? **A.*** Ancylostomiasis; **B.** Strongyloidiasis; **C.** Trichocephaliasis; **D.** Hymenolepiasis; **E.** Enterobiasis.
344. Two days after consumption of smoked pork a patient got face and eye-lid edemata, gastrointestinal disturbances, abrupt temperature rise, muscle pain. Blood analysis showed full-blown eosinophili**a.** What helminth could the patient be infected with? **A.*** Trichina; **B.** Pinworm; **C.** Ascarid; **D.** Whipworm; **E.** Hookworm.
345. In one of Polessye regions there was an outbreak of helminthiasis manifested by cramps and facial edemas. The developed preventive measures in particular included ban for eating infested pork even after heat processing. What helminthiasis was the case? **A.*** *Trichinosis*; **B.** *Taeniarhynchosis*; **C.** *Teniasis*; **D.** *Echinococcosis*; **E.** *Alveococcosis*.
346. A 15-year-old girl was delivered to the hospital with inflammation of wermiform appendix. Blood analysis revealed signs of anaemia. Her feces contained lemon shaped helminthic eggs (50 × 30 micrometers) with "plugs"

on the poles. What type of helminth is it? **A.*** *Trichuris*; **B.** pinworm; **C.** bookworm; **D.** *Echinococcus*; **E.** *Hymenolepis nana*.

347. A man has worked in an African country for 3 years. A month after his return to Ukraine he consulted an ophthalmologist and complained about eye ache, eyelid edema, lacrimation and temporary visual impairment. Underneath the eye conjunctiva the doctor revealed helminths 30-50 mm long with elongated filiform body. What diagnosis might be suspected? **A.*** Filariasis; **B.** Diphyllobothriasis; **C.** Ascaridiasis; **D.** Enterobiasis; **E.** Trichocephaliasis.
348. A hospital in Donetsk region admitted th patients members of the same family – with eyelid and face edemata, fever, eosinophilia, headache, muscule pain. The disease developed on the 7-10 day after eating the pork sausage sent by the patients' relatives from Khmelnitsky region. What is your provisional diagnosis? **A.***trichinosis; **B.** echinococcosis; **C.** teniasis; **D.** cysticercosis; **E.** taeniarhynchosis.
349. While on holyday in the countryside a boy found a spider with the following morphological peculiarities: body length of 2 cm, round black abdomen with two rows of red dots on its dorsal surface, four pairs of segmented extremities covered with tiny black hairs. Identify this arthropod: **A.***karakurt spider; **B.** scorpion; **C.** solifugae; **D.** mite; **E.** tarantula.
350. While on holyday in the countryside a boy found a spider with the following morphological peculiarities: body length at the rate of 2 cm, round black abdomen with two rows of red dots on its dorsal surface, four pairs of segmented extremities covered with tiny black hairs. Identify this arthropod: **A.***steppe spider (*Latrodectus tredecimguttatus*); **B.** scorpion; **C.** solifugae; **D.** mite; **E.** tarantula.
351. A patient complains of skin itch, especially between fingers, in the inguinal creases, on the lower abdomen. Examination of these regions revealed there some small vesicles. Laboratory diagnostics allowed to establish that this condition had been caused by representative of *Arthropoda*. Specify the disease caused by this arthropod: **A.***Scabies; **B.** Demodicosis; **C.** Myiasis; **D.** pediculosis; **E.** dermatotropic leishmaniasis.
352. A patient has acne on his face. Microscopic examination of scrapings from the affected areas revealed living porrect vermiform arthropoda 0.2-0.5 mm large with four pairs of short extremities in the front part of their bodies. What is the laboratory diagnosis? **A.***demodicosis; **B.** scabies; **C.** myiasis; **D.** pediculosis; **E.** phthiriasis.
353. A young man has the following symptoms: purulent acne on the face; wrinkled, hyperemic skin; eyebrows and eyelashes are falling out. A doctor has made a diagnosis of demodicosis (demodectic mange). What preventive measures can be recommended? **A.***maintaining personal hygiene; **B.** repellents; **C.** donor blood check-up; **D.** protection from mite bites; **E.** processing premises with insecticedes.
354. A patient with suspicion on epidemic typhus was admitted to the hospital. Some arachnids and insects have been found on his fat. Which of them may be

a carrier of the pathogen of epidemic typhus? **A.***lice; **B.** spiders; **C.** bed-bugs; **D.** cockroaches; **E.** houseflies.

355. A sick man with high temperature and a lot of tiny wounds on the body has been admitted to the hospital. Lice have been found in the folds of his clothing. What disease can be suspected?
356. A patient presents with acne and inflammatory alterations in his face skin. Microscopical investigation of lesion foci has revealed live arthropods sized 0.2-0.5 mm. They have vermiform form and four pairs of short thin limbs located in the middle part of the body. What is the laboratory diagnosis? **A.***demodicosis; **B.** scabies; **C.** dermamyiasis; **D.** pediculosis; **E.** phthiriasis.
357. A sick man with high temperature and a lot of tiny wounds on the body has been admitted to the hospital. Lice have been found in the folds of his clothing. What disease can be suspected? **A.***epidemic typhus; **B.** tularemia; **C.** scabies; **D.** malaria; **E.** plague.
358. Mother of a boy who had recently returned from a summer camp found some small whitish insects up to 3 mm long on the child's clothing. Specify the parasite: **A.*** *Pediculus humanus humanus*; **B.** *Phtirus pubis*; **C.** *Pulex irritans*; **D.** *Cimex lectularius*; **E.** *Blattella germanica*.
359. A child complains of having an itch in occipital and temporal region of head. After examination his mother found superficial ulcers as a result of scratching and white nits in the hair. Name the pathogenic organism: **A***head louse; **B.** body louse; **C.** Human flea; **D.** screwworm fly; **E.** pubic louse.
360. In the armpits of a patient the small (1-1.5 mm), dorsoventrally flattened, wingless, blood-sucking insects were found. Their larvae developed in the armpits too. What disease is caused by the insects? **A.***phthiriasis; **B.** sleeping sickness; **C.** Chagas' disease; **D.** plague; **E.** relapsing fever.
361. According to the data of WHO, for about 250 min of Earth population fall ill with malaria. This disease is mostly spread in tropical and subtropical regions. Range of its spread falls into the areal of the following mosquitoes: **A.***_Anopheles_; **B.** *Culex*; **C.** *Aedes*; **D.** *Mansonia*; **E.** *Culiseta.*
362. A doctor revealed tissues injury on patient's scalp with localized suppurations and diagnosed his disease as myiasis. This infestation is caused by larvae of the following insect: **A.*** Wohlfahrt fly; **B.** kissing bug; **C.** stable fly (*Stomoxys calcitrans*); **D.** malarial mosquito; **E.** mosquito.
363. A group of students has representatives of different races. One of the students has straight black hair and overhanging skin fold of superior eyelid – epicanthus. What race does this student most probably represent? **A.***mongoloid; **B.** negroid; **C.** europeoid; **D.** australoid; **E.** ethiopian.
364. Representatives of a certain human population have height variability, elongated torso, increased length of limbs, decreased size and volume of rib cage dimentions, decreased volume of muscle mass, increased perspiration, decreased size and volume of rib cage dimensions, decreased volume of muscle mass, increased perspiration, decreased indices of base methabolism and fat synthesis. What climate do these adaptive evolutionary changes

correspond to? **A.***tropical; **B.** temperate; **C.** arctic; **D.** mountain; **E.** intermediate.

365. Indigenous population of Pamir has the following characteristic features: high rate of base metabolism, elongated tubular bones, wide rib cage, high blood oxygen capacity due to increased number of erythrocytes, high hemoglobin level. What type of ecological adaptation is it? **A.*** mountain; **B.** subtropical; **C.** arctic; **D.** tropical; **E.** temperate.
366. After a thorough examination the patient who had returned from Central Asia to Ukraine was diagnosed with spring-summer encephalitis. Its pathogen might have entered the body through the bite of the following arthropod: **A.***dog-louse; **B.** taiga tick; **C.** argasid tick (*Ornithodorus papillipes*); **D.** itch mite; **E.** mosquito.
367. Medical examination of some youths revealed in their axillary regions grey insects 1.0-1.5 mm large, with short broad body covered with hair. What insects were revealed? **A.***pubic louse; **B.** flea; **C.** head louse; **D.** bed bug; **E.** itch mite.
368. A boy found a spider with the following morphological characteristics: it is 2 cm long, has roundish black abdomen with two rows of red spots on its dorsal side; four pairs of jointed limbs are covered with small black hairs. What arthropod is it? **A.*** Karakurt spider; **B.** Scorpion; **C.** Solpuga; **D.** Mite; **E.** Tarantula.

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