Sample tests proposed for final examination on Molecular biology
examination session January, 2009
CS – single choice test (1 answer)
CM – multiple choices test (2-4 answers)

1) **CS** Which of the following is **not** a property of viruses?
   a) they represent cellular forms of life;
   b) they have DNA or RNA;
   c) they reproduce in host cells only;
   d) they can not synthesize own substances;
   e) they haven't ribosomes.

2) **CS** What are the main components of eukaryotic cell?
   a) nucleus, smooth endoplasmic reticulum, chromatin;
   b) cytoplasm, nucleus, plasma membrane;
   c) cytoplasm, nucleus, chromosomes;
   d) nucleus, mitochondria, cell membrane;
   e) cytoplasm, nucleolus, ribosomes.

3) **CS** Which of the following does **not** refer to cytoplasm organelles?
   a) cell center;
   b) Golgi apparatus;
   c) chromosome;
   d) ribosome;
   e) mitochondrion.

4) **CS** Choose a correct statement to the prokaryotic cells:
   a) division by mitosis and meiosis;
   b) have diploid number of chromosomes;
   c) have nucleus;
   d) contain ribosomes;
   e) they are larger than eukaryotic cells.

5) **CS** Which of the following is **not** a property of prokaryotes?
   a) presence of intracellular membranes;
   b) presence of ribosomes;
   c) simple direct division;
   d) presence of cell envelope;
   e) absence of centrioles.

6) **CS** Which of the following structures is common in all bacteria?
   a) mesosomes;
   b) flagella;
   c) ribosomes;
   d) Golgi apparatus;
   e) nucleus.

7) **CM** Molecular Biology studies:
   a) molecular basis of the universal properties of life;
   b) macromolecules and their functions;
   c) mechanisms of regulation of biological processes;
d) cell division and cell death;
e) structure and function of tissues and organs.

8) **CM** Which of the following properties shared by all organisms are considered as the reason to accept the hypothesis that viruses are living things?
   a) ability to reproduce;
   b) ability to produce energy bee using enzymes;
   c) growth;
   d) self assembly;
   e) presence of organelles.

9) **CM** Which of the following are properties of viruses?
   a) they reproduce independently;
   b) they reproduce in host cells;
   c) they have DNA or RNA as genetic material;
   d) they synthesize their own ATP;
   e) they contain cytoplasm.

10) **CM** Which of the following features are common for all bacteria?
    a) they can't live in anaerobic environment;
    b) they use flagella for movement;
    c) they can live both in anaerobic and aerobic environments;
    d) they reproduce asexually;
    e) they have no nucleus.

11) **CS** What is the nucleus like structure in bacteria:
    a) mesosome;
    b) RNA;
    c) polysome;
    d) ribosome;
    e) nucleoid.

12) **CM** Which of the following structures are not common in prokaryotic and eukaryotic cells?
    a) nucleoid;
    b) ribosomes;
    c) mesosomes;
    d) nucleus;
    e) DNA.

13) **CS** Which of the following is absent in prokaryotic cells?
    a) ribosome;
    b) nucleoid;
    c) cytoplasm;
    d) mesosome;
    e) lysosome.

14) **CM** Which of the following are eukaryotic organisms?
    a) plants;
    b) animals;
    c) viruses;
d) bacteria;
e) prions.

15) CS Which of the following is characteristic for both prokaryotic and eukaryotic cells?
   a) they contain nucleus;
   b) they are unicellular organisms only;
   c) they contain mesosomes;
   d) they contain DNA;
   e) they are aerobic organisms only.

16) CS Genetic material in prokaryotic cells:
   a) is represented by double-stranded molecules of DNA;
   b) is stored in nucleus;
   c) is a single molecule of RNA;
   d) is separated from cytoplasm;
   e) is represented by single-stranded DNA.

17) CM Genetic material in eukaryotic cells:
   a) is stored in ribosomes;
   b) is RNA;
   c) is stored in mitochondria;
   d) is linear DNA;
   e) is stored in nucleus.

18) CM Which of the following are absent in all bacteria?
   a) flagella;
   b) DNA;
   c) Golgi complex;
   d) nucleus;
   e) ribosomes.

19) CS While viruses produce their own protein coat, which one of the following is not taken from
    the host cell?
   a) essential energy;
   b) ribosomes;
   c) tRNA;
   d) host DNA;
   e) amino acids.

20) CM, Characteristic of polysaccharides:
   a) are monomers;
   b) have structural role;
   c) contain information;
   d) have catalytic role;
   e) have energetic role.

21) CM, Functions of lipids:
   a) catalytic;
   b) energetic;
c) deposition;  
d) structural;  
e) signaling.

22) CM. Proteins consist of:  
a) alpha-amino acids;  
b) beta-amino acids;  
c) 20 types of monomers;  
d) four types of monomers;  
e) are copolymers.

23) CM. Proteins are located in:  
a) nucleus;  
b) cytoplasm;  
c) ribosomes;  
d) mitochondrion;  
e) DNA.

24) CM. Monomers of proteins are:  
a) nucleotides;  
b) 20 types of amino acids;  
c) alpha-amino acids;  
d) fatty acids;  
e) polypeptides.

25) CM. The functions of proteins are:  
a) structural;  
b) protection;  
c) energetic;  
d) storing of information;  
e) enzymes.

26) CM. Characterization of primary structure of proteins:  
a) presence of alpha-helixes and beta-sheets;  
b) presence of hydrogen bonds;  
c) presence of covalent bonds;  
d) presence of peptide bonds;  
e) presence of phosphodiester bonds.

27) CM. The secondary structure of proteins is provided by:  
a) presence of alpha-helixes and beta-sheets;  
b) presence of hydrogen bonds;  
c) presence of covalent bonds;  
d) presence of peptide bonds;  
e) presence of phosphodiester bonds.

28) CM. Deoxyribose represents:  
a) a carbohydrate;  
b) a monosaccharide;  
c) a pentose;
d) a polysaccharide;
e) a sugar from ATP.

29) CM. Ribose represents:
a) a carbohydrate;
b) a monosaccharide;
c) a pentose;
d) a polysaccharide;
e) a sugar from ATP.

30) CM. The monomers for RNA:
a) are nucleotides;
b) contain deoxyribose;
c) contain purinic and pyrimidinic bases;
d) the monomers are joined via hydrogen bonds;
e) there is a single difference between monomers for RNA and DNA.

31) CS. The main bond that link monomers in polymers is:
a) hydrogen;
b) covalent;
c) disulphide;
d) hydrophobic;
e) ionic.

32) CS. Phosphodiester bonds:
a) are between amino acids;
b) link nitrogenous bases;
c) connect the 3' end of one nucleotide to the 5' end of the next;
d) are characteristic for all polymers;
e) ensure the primary structure of proteins.

33) CS. The main biological role of carbohydrates is:
a) structural;
b) catalytic;
c) reception;
d) energetic;
e) storing of information.

34) CS. The main biological role of lipids is:
a) structural;
b) catalytic;
c) reception;
d) energetic;
e) storing of information.

35) CS. All of these characterize proteins except:
a) alpha-helix;
b) beta-sheet;
c) double helix;
d) primary structure;
e) globular form.

36) CS. The polypeptide backbone is determined by:
   a) hydrogen bonds;
   b) covalent bonds;
   c) ionic bonds;
   d) van der Waals attractions;
   e) disulphide bonds.

37) CS. Nucleotide contains:
   a) nitrogenous base;
   b) amino acid;
   c) glucose;
   d) polysaccharide;
   e) protein.

38) CS. Purinic bases are:
   a) A and T;
   b) G and A;
   c) T and C;
   d) T and G;
   e) A and U.

39) CS. Pyrimidinic bases are:
   a) A and T;
   b) G and A;
   c) T and C;
   d) T and G;
   e) A and U.

40) CM. Characteristic of phosphodiester bonds:
   a) are present in proteins;
   b) orientation 3' - 5';
   c) link the residues of phosphoric acid;
   d) link two riboses;
   e) use phosphoric group from position alpha.

41) CM. Secondary structure of DNA is determined by:
   a) two parallel strands;
   b) two complementary strands;
   c) is a right-handed helix;
   d) content of purinic and pyrimidinic bases is different;
   e) purines complementary link to the pyrimidines from opposite strand.

42) CM. The proprieties of DNA:
   a) neutral pH;
   b) self-replication;
   c) self-repair;
   d) basic pH;
   e) acid pH.
43) CM. Which of the following are characteristics of DNA?
   a) association with proteins;
   b) complementary base pairing;
   c) association with carbohydrates;
   d) presence of covalent and non-covalent bonds;
   e) globular shape.

44) CM. Functions of RNA in eukaryotes:
   a) storing of genetic information;
   b) decoding of hereditary message;
   c) transporting of genetic information;
   d) transporting of amino acids;
   e) structural.

45) CS. Are properties of proteins excepting:
   a) denaturation;
   b) renaturation;
   c) heterogeneity;
   d) replication;
   e) conformation.

46) CS. Complementary bases:
   a) Adenine and Thymine;
   b) Guanine and Adenine;
   c) Thymine and Uracil;
   d) Thymine and Guanine;
   e) Guanine and Uracil.

47) CS. Phosphodiester bonds link:
   a) two bases from the same strand;
   b) two bases from opposite strands;
   c) two pentoses from the same strand;
   d) two phosphoric residues;
   e) nitrogenous base and pentose.

48) CS. In DNA the hydrogen bonds link:
   a) two bases from the same strand;
   b) two nitrogenous bases from opposite strands;
   c) two pentoses from the same chain;
   d) two phosphoric residues;
   e) nitrogenous base and pentose.

49) CS. It is only DNA's characteristic:
   a) renaturation;
   b) supercoiling;
   c) heterogeneity;
   d) replication;
   e) polarity.
50) CS. The secondary structure of DNA in living systems is represented by:
a) one polynucleotide chain;
b) one polypeptide chain;
c) double B-helix;
d) alpha-helixes and beta-sheets;
e) two polypeptide chains.

51) CS. Main function of tRNA:
a) transports of information from nucleus to cytoplasm;
b) serves as template for protein synthesis;
c) transports the amino acids to the ribosome;
d) storing of genetic information;
e) is a part of enzymes.

52) CS. Secondary structure of RNA:
a) double helix;
b) alpha-helixes and beta-sheets;
c) complex with basic proteins;
d) two strands connected via phosphodiester bonds;
e) folding of one chain of RNA.

53) CS. RNA's molecules have the next proprieties, **excepting**:
a) are single-stranded;
b) heterogeneity;
c) replication;
d) structural;
e) storing of information.

54) CS. DNA interacts with:
a) basic proteins;
b) acid proteins;
c) carbohydrates;
d) polysaccharides;
e) lipids.

55) CS. Nucleosome represents:
a) secondary structure of DNA;
b) interaction between histones and non-histones;
c) complex between DNA and histones;
d) a complex between DNA and RNA;
e) folding of DNA characteristic for prokaryotes and eukaryotes.

56) CS The main component of biological membrane:
a) lipid layer;
b) lipids and proteins;
c) lipids and carbohydrates;
d) proteins and oligosaccharides;
e) glicocalyx.
57) CS Self-assembly of biological membrane is a result of:
a) protein heterogeneity;
b) phospholipid heterogeneity;
c) cholesterol properties;
d) presence of hydrophilic and hydrophobic parts in phospholipids;
e) presence of oligosaccharides.

58) CS Which of the following is the main characteristic of the plasma membrane?
a) it is a thin layer;
b) it is selectively permeable;
c) it contains proteins;
d) it contains lipids;
e) it is permeable to water.

59) CS Which of the following is not a function of phospholipid layer?
a) it is an effective barrier;
b) interactions with other molecules;
c) transport of non-polar substances;
d) catalytic;
e) transport of water.

60) CS Which of the following is not a constituent of cell membrane?
a) lipids;
b) proteins;
c) nucleic acids;
d) carbohydrates;
e) cholesterol.

61) CS What is the current accepted model of plasma membrane?
a) sandwich model;
b) fluid-mosaic model;
c) rug model;
d) three-layer model;
e) none of the above.

62) CS The plasma membrane:
a) consists of a lipid monolayer;
b) is a part of cell surface apparatus;
c) is completely impermeable;
d) is completely permeable;
e) none of the above.

63) CS Glycocalix:
a) is situated on the external surface of all cell membranes;
b) ensures the individuality of cells;
c) participates in selective transport of substances;
d) ensures the mechanical resistance of membrane;
e) is the structure of cytoplasm.

64) CS Which of the following structures has a double membrane?
a) mitochondria;
b) lysosomes;
c) Golgi complex;
d) ribosomes;
e) peroxisomes.

65) CS  A membrane protein located entirely outside of lipid buried is called:
a) peripheral;
b) integral;
c) structural;
d) lipid-anchored;
e) carrier.

66) CM  What does provide cholesterol in plasma membrane?
a) fluidity;
b) rigidity;
c) specificity;
d) transport;
e) signaling.

67) CS  Which of the following is **not** a difference between different internal membranes?
a) contents of proteins;
b) functions;
c) lipid protein ratio;
d) DNA/RNA ratio;
e) presence of glycocalix.

68) CS  Which of the following substances pass through plasma membrane by simple diffusion?
a) proteins;
b) ions;
c) macromolecules;
d) non-polar molecules;
e) polar molecules.

69) CS  Active transport:
a) can be directed both up and down concentration gradient;
b) requires ATP hydrolysis;
c) does not require energy;
d) refers to microtransport only;
e) none of the above.

70) CS  Porin is a constituent of:
a) plasma membrane;
b) nuclear envelope;
c) mitochondrial membrane;
d) lysosome membrane;
e) glycocalix.

71) CS  Which of the following is **not** a function of plasma membrane?
a) it maintains the integrity of the cell;
b) it allows selective transport of molecules;
c) it is important for communication between cells;
d) it is crucial for the synthesis;
e) it is storing genetic information.

**72) CS** Passive transport is:
a) transport of molecules out of the cell only;
b) transport of molecules into the cell only;
c) transport of water molecules only;
d) transport of molecules down the concentration gradient;
e) transport of ions only.

**73) CS** Which of the following is not a function of glycocalix?
a) cell adhesion;
b) mechanical resistance;
c) deposition of cations;
d) right orientation of proteins in plasma membrane;
e) ensures the individuality of cell.

**74) CS** Which of the following structures does not have membrane?
a) ribosome;
b) nucleus;
c) lysosome;
d) peroxisome;
e) mitochondrion.

**75) CM** Which of the following are components of cell membrane?
a) phospholipides;
b) cholesterol;
c) proteins;
d) nucleic acids;
e) ATP.

**76) CM** Membrane proteins:
a) have catalytic function;
b) provide the shape of cell;
c) are tissue specific;
d) are heterogeneous;
e) ensure the selective permeability of membrane.

**77) CM** Which of the listed below provide a biological individuality for membrane?
a) different proteins;
b) different phospholipides;
c) glycalyx;
d) cell receptors;
e) content of cholesterol.

**78) CM** Na$^+$ - K$^+$ pump:
a) represents a carrier protein;
b) controls osmotic pressure in cell;
c) has an ATP-ase activity;

79) **CM** Which of the function listed below are shared by glycolipids and glycoproteins in plasma membrane?

a) to serve as a barrier for water soluble molecules;

b) to serve as receptors for hormones;

c) to protect cells from the environmental factors;

d) they have no special function;

e) to provide the mechanical resistance.

80) **CM** Phagocytosis:

a) is a form of endocytosis;

b) includes the ligand-receptor interaction;

c) includes the ligand-ligand interaction;

d) provides the transport of macromolecules out of the cell;

e) provides the transport of macromolecules into the cell.

81) **CM** Which of the following statements about co-transport are correct?

a) it is one of the macro-transport forms;

b) includes pinocytosis and phagocytosis;

C) it is shared by Na\(^+\) - K\(^+\) pump;

d) it provides the transport of substances in one direction;

e) it is a type of transport of small molecules.

82) **CM** Which of the following are function of plasma membrane in eukaryotes?

a) protection against environmental hazards;

b) it links cells together by junctions;

c) energetic;

d) transport of substances;

e) control of cell pH;

83) **CM** Which of the following refer to membranous organelles?

a) ribosome;

b) centriol;

c) lysosome;

d) Golgi complex;

e) nucleus.

84) **CM** Which of the following are the types of active transport?

a) ionic pumps;

b) diffusion;

c) endocytosis;

d) exocytosis;

e) osmosis.

85) **CM** Which of the following statements about gap junctions are correct?

a) it is a type of transport through plasma membrane;

b) it is provided by carrier proteins;
c) it is a type of cell connection;
d) it makes bridges and channels between two adjacent cells;
e) it provides a close attachment between cells.

86) CM Which of the following statements describe cell connections?
a) two adjacent cells are held together by them;
b) they may take the form of junctions or channels between cells;
c) two adjacent cell organelles are held together by them;
d) they are present in nucleus;
e) their type depends on the type of cell.

87) CM Desmosomes:
a) they are present in cardiac muscle;
b) form bridges and channels between two adjacent cells;
c) they are located in nuclear envelope;
d) they link together two cells;
e) they are formed by filaments.

88) CM Which of the following substances go through plasma membrane by endocytosis?
a) proteins;
b) macromolecules;
c) polar molecules;
d) liposoluble small molecules;
e) water.

89) CM Which of the following serve as receptors for hormones?
a) phospholipids;
b) cholesterol;
c) glycolipids;
d) glycoproteins;
e) mineral salts.

90) CM Choose the single membrane organelles from the listed below:
a) mitochondria;
b) nucleus;
c) lysosome;
d) ribosome;
e) peroxisome.

91) CM Which of the following describe passive transport?
a) endocytosis;
b) Na⁺ - K⁺ pump;
c) ionic channel;
d) diffusion;
e) osmosis.

92) CS Cardiolipin:
a) is a component of plasma membrane;
b) provides impermeability of nuclear envelope;
c) provides impermeability of internal mitochondrial membrane;
d) is a component of external mitochondrial membrane;
e) is a special protein.

93) CM Which of the following are intercellular connections?
a) nuclear pores;
b) desmosomes;
c) gap junctions;
d) tight junctions;
e) synapses.

94) CM Which of the following are not components of plasma membrane?
a) glycolipids;
b) phospholipids;
c) murein;
d) cardiolipin;
e) glycoproteins.

95) CS Which of the following organelles is found in both plant and animal cells?
a) large vacuoles;
b) plastids;
c) centrosome;
d) Golgi complex;
e) cell wall.

96) CS In which of the following organelles organic molecules are not synthesized?
a) lysosomes;
b) endoplasmic reticulum;
c) mitochondria;
d) Golgi bodies;
e) ribosomes.

97) CS In which of the following ways of transport is the Golgi complex active?
a) passive transport;
b) exocytosis;
c) osmosis;
d) diffusion;
e) pinocytosis.

98) CS In which of the following processes is the mitochondria active?
a) lipid synthesis;
b) glucose synthesis;
c) ATP synthesis;
d) phagocytosis;
e) exocytosis.

99) CS Which of the following substances is not produced in mitochondria?
a) rRNA;
b) tRNA;
c) ATP;
d) catalase;  
e) proteins.

100) CS Which of the following organelles has constant number of copies in animal cells?  
a) mitochondria;  
b) ribosomes;  
c) centriols;  
d) lysosomes;  
e) nuclei.

101) CS The function of lysosomes is:  
a) protein synthesis;  
b) oxidation of fatty acids;  
c) degradation of substances;  
d) glycogen synthesis;  
e) phospholipid synthesis.

102) CM Ribosomes:  
a) are non-membranous organelles;  
b) are bounded by a single membrane;  
c) are bounded by a double membrane;  
d) are found in both pro- and eukaryotic cells;  
e) are found in both cytoplasm and mitochondria.

103) CM Both protein and RNA may be found in:  
a) plasma membrane;  
b) mitochondria;  
c) ribosome;  
d) lysosome;  
e) peroxisome.

104) CM Which of the following statements about Golgi complex are correct?  
a) it is a membrane complex of flattened sacs;  
b) it consists of a large and a small subunits;  
c) represents a scaffold of the cell;  
d) represents a sorting and holding area for proteins;  
e) it participates in cell secretion.

105) CM Proteins are synthesized:  
a) by ribosomes;  
b) in mitochondria;  
c) in nucleus;  
d) by lysosomes;  
e) by nucleosomes.

106) CM Proteins are modified and packaged in:  
a) nucleus;  
b) endoplasmic reticulum;  
c) ribosomes;  
d) cytoplasm;
e) Golgi complex.

107) CM Which of the following are functions of lysosomes?
- a) protein synthesis;
- b) ATP synthesis;
- c) cell digestion;
- d) self-digestion;
- e) cell defense.

108) CM Which of the following are functions of Golgi complex?
- a) storing of genetic information;
- b) cell secretion;
- c) modification of substances;
- d) protein synthesis;
- e) transport of substances.

109) CM Endoplasmic reticulum:
- a) may be of two types;
- b) is a network of vesicles;
- c) is a network of membrane cisterns, and vacuoles;
- d) is present in prokaryotic cell its membranes;
- e) contains ribophorin.

110) CM Microtubules:
- a) elements of cytoskeleton, 6-7 nm in diameter;
- b) elements of cytoskeleton, 20-25 nm in diameter;
- c) elements of desmosomes;
- d) consist of actin;
- e) consist of tubulin.

111) CM Microfilaments:
- a) are found in both prokaryotic and eukaryotic cells;
- b) participate in cell motility;
- c) are 20-25 nm in diameter;
- d) consist of protein actin;
- e) consist of protein tubulin.

112) CM Which of the following are not elements of cytoskeleton?
- a) microfilaments;
- b) intermediate filaments;
- c) intermediate tubules;
- d) microtubules;
- e) chromatin fibers.

113) CM The rough endoplasmic reticulum:
- a) contacts with nuclear envelope;
- b) contains ribophorins;
- c) participates in the synthesis of lysosomal enzymes;
- d) participates in sorting of proteins;
- e) participates in intracellular transport.
114) **CM.** The Golgi apparatus:
- a) contains a *cis* membrane and a *trans* membrane;
- b) the external surface contain polysaccharides;
- c) the lysosomes are formed in *trans* Golgi network (TNG);
- d) the *cis* vesicles have endoplasmic reticulum origin;
- e) *trans* vesicles have an endosomal origin.

115) **CM.** Lysosomes:
- a) contain synthetases;
- b) contain catalase;
- c) contain nucleases;
- d) contain cardiolipin;
- e) contain proteases.

116) **CM.** Peroxisomes:
- a) are membranous organelles;
- b) their membrane's origin is ER;
- c) their origin is GA;
- d) have the same function as lysosomes;
- e) are lysosomal residues.

117) **CM.** Mitochondrion:
- a) the outer membrane contains porin;
- b) the inner membrane contains hydrolytic enzymes;
- c) contains genetic information;
- d) are self-reproducible;
- e) participate in glucose oxidation.

118) **CM.** The centrioles:
- a) consist of actin;
- b) consist of tubulin;
- c) consist of triplets of microtubules;
- d) are present in all cells;
- e) participate in movement of flagellum.

119) **CM.** Cytoskeleton:
- a) participates in cell junctions;
- b) participates in transport of substances;
- c) participates in formation of the extra cellular matrix;
- d) consists of microtubules and actin filaments;
- e) participate in cell division.

120) **CM.** Microfilaments:
- a) consist of tubulin;
- b) consist of laminin;
- c) consist of actin;
- d) are present in mitotic spindle;
- e) assure endocytosis.
121) **CM.** Smooth endoplasmic reticulum:
   a) contacts with nuclear envelope;
   b) contains ribophorins;
   c) catalyzes the synthesis of carbohydrates;
   d) participates in sorting of proteins;
   e) participates in intracellular transport.

122) **CM.** The Golgi apparatus:
   a) contains a *cis* network and a *trans* network;
   b) the outer surface contains ribosomes;
   c) lysosomes are produced in *cis* Golgi network (CNG);
   d) *cis* vesicles are produced in ER;
   e) *trans* vesicles contain selected substances.

123) **CM.** Lysosomes:
   a) contain lipases;
   b) contain porin;
   c) contain H⁺-pump;
   d) contain catalase;
   e) contain protease.

124) **CM.** Peroxisomes:
   a) are membranous organelles
   b) are produced in GA;
   c) membranes are produced in ER;
   d) regulate the quantity of secreted substances;
   e) participate in cell detoxification.

125) **CM.** The mitochondrion:
   a) the outer membrane contains cardiolipin;
   b) the inner membrane contains cardiolipin;
   c) contains ribosomes;
   d) contains RNA;
   e) participates in oxidation of fatty acids.

126) **CM.** The flagellums of eukaryotes:
   a) consist of actin;
   b) consist of tubulin;
   c) consist of triplets of microtubules;
   d) are present in all cells;
   e) are covered by a membrane.

127) **CM.** The microtubules:
   a) participate in association of cells in tissues;
   b) participate in transport of substances;
   c) are present in extracellular matrix;
   d) consist of actin;
   e) participate in cell division.

128) **CM.** Actin:
a) is present in centrioles;
b) is present in flagellum;
c) is present in myofibrils;
d) is present in mitotic spindle;
e) assures endocytosis.

129) **CM.** Importance of DNA condensation:
a) reduces the quantity of DNA;
b) regulation of the gene activity;
c) assures formation of chromosomes;
d) protection of DNA;
e) assures the equal distribution of genetic information.

130) **CM.** There are parts of interphase nucleus:
a) nuclear matrix;
b) ER;
c) chromatin;
d) nuclear envelop;
e) nucleolus.

131) **CM.** Choose the characteristics of heterochromatin:
a) it is less stained;
b) is not active;
c) transcription cannot take place;
d) replication takes place lately in S phase of cell cycle;
e) it is more condensed.

132) **CM.** Particularities of histones:
a) are acid proteins;
b) contain arginine and lysine;
c) are present only in some tissues;
d) have basic proprieties;
e) interact with DNA.

133) **CM.** The nuclear pore:
a) consists of a central canal surrounded by proteins;
b) assures transport of macromolecules;
c) the number of pores is constant;
d) assures just transport into nucleus;
e) contains histones.

134) **CM.** Nucleolus:
a) is the place where rRNA is synthesized;
b) is surrounded by a membrane;
c) contains a fibrillar component;
d) is the place of synthesis of proteins;
e) contains a granular component.

135) **CM.** Nuclear matrix:
a) assures the shape of nucleus;
b) in all cells has the same structure;
c) contains non-histones;
d) contains enzymes;
e) assures attachment of DNA.

136) CM. Characteristics of nucleus:
a) heterochromatin is genetically active;
b) contains non-active genes;
c) all human cells contain a nucleus;
d) all cells contain the same number of nucleolus;
e) contains chromatin with different levels of condensation.

137) CM. From the nucleus are exported:
a) RNA;
b) enzymes;
c) ribosomes;
d) ribosomal proteins;
e) histones.

138) CM. Parts of nuclear envelope:
a) one membrane;
b) nuclear lamina;
c) two membranes;
d) pore complex;
e) nucleolus.

139) CM. Characteristics of heterochromatin:
a) contains highly condensed DNA;
b) is active;
c) may contain structural genes;
d) replication takes place early in S-phase of cell cycle;
e) diffuse DNA.

140) CM. Functions of nucleus:
a) translation of genetic information;
b) regulation of cell activity;
c) deposits the main quantity of cellular DNA;
d) assures replication of DNA and transcription of RNA;
e) synthesis of ATP.

141) CM. Nuclear lamina:
a) represents a fibrillar network;
b) contains sites for DNA binding;
c) is completely separated from inner nuclear membrane;
d) assures the shape of nucleus;
e) assures regulation of cell cycle.

142) CM. Histones:
a) are heterogeneous proteins;
b) are present in all tissues;
c) have acid properties;
d) have catalytic functions;
e) are part of nucleosomes.

143) CM. Which of the following are transported through nuclear pore?
a) RNA;
b) enzymes;
c) ribosomes;
d) chromosomes;
e) histones.

144) CM. Centromere:
a) assures binding of mitotic spindle;
b) joins the arms of chromosomes;
c) joins two chromatids;
d) is present only in some chromosomes;
e) usually chromosomes contain some centromeres.

145) CM. Nucleolar organizer:
a) is present in some chromosomes;
b) regulates the nuclear activity;
c) is the fibrillar component of nucleolus;
d) assures synthesis of proteins;
e) contains genes for rRNA.

146) CM. Chromatin contains:
a) histones;
b) acid proteins;
c) DNA;
d) ATP;
e) RNA.

147) CS Which of the following describes the replication?
a) it is a transcription of DNA;
b) it leads to reduction of genetic material;
c) it is expression of the genetic information;
d) it is a process of gene reading;
e) it represents the duplication of the genetic information.

148) CS Which of the following represents the main mechanism of replication?
a) semiconservative;
b) conservative;
c) single-directional;
d) dispersed;
e) recombinative.

149) CS Which of the following does not referred to components of replication?
a) DNA as a template;
b) RNA;
c) dNTP;
d) NTP;
e) DNA-polymerase.

150) CS Which of the following describes the function of DNA-polymerase?
  a) unwinding of DNA;
  b) synthesis of the primers;
  c) breakage of one or both strands;
  d) synthesis of new DNA strands;
  e) binding of DNA fragments.

151) CS Which of the following describes the function of primase?
  a) unwinding of DNA;
  b) synthesis of the primers;
  c) breakage of one or both strands;
  d) synthesis of new DNA strands;
  e) binding of DNA fragments.

152) CS Which of the following describes the function of helicase?
  a) unwinding of DNA;
  b) synthesis of the primers;
  c) breakage of one or both strands;
  d) synthesis of new DNA strands;
  e) binding of DNA fragments.

153) CS Which of the following describes the function of DNA ligases?
  a) unwinding of DNA;
  b) synthesis of the primers;
  c) breakage of one or both strands;
  d) synthesis of new DNA strands;
  e) binding of DNA fragments.

154) CS Which of the following describes the function of topoisomerases?
  a) unwinding of DNA;
  b) synthesis of the primers;
  c) breakage of one or both strands;
  d) synthesis of new DNA strands;
  e) binding of DNA fragments.

155) CS The number of ORI in prokaryotic cell is:
  a) one;
  b) two;
  c) three;
  d) ten;
  e) many.

156) CS The number of ORI in eukaryotic cell is:
  a) two;
  b) one;
  c) ten;
d) many;
e) four.

157) CM Which of the following enzymes participate in initiation of replication?
   a) DNA-polymerase;
   b) DNA-helicase;
   c) ligases;
   d) primase;
   e) telomerase.

158) CM Replication of mitochondrial DNA:
   a) is provided by DNA-polimerase;
   b) is initiated by RNA polymerase;
   c) is controlled by 2 promoters;
   d) is controlled by many ORI;
   e) is controlled by 2 ORI.

159) CM Okazaki fragments:
   a) represents primers;
   b) are about 150 nucleotides in eukaryotes;
   c) are about 1000 nucleotides in eukaryotes;
   d) are joined by DNA-ligase;
   e) are synthesized from the lagging strand.

160) CM Which of the following are the components necessary for replication?
   a) NTP;
   b) dNTP;
   c) DNA as a template;
   d) RNA as a template;
   e) primase.

161) CM Primosome:
   a) proteins that participate at initiation;
   b) provides DNA repair;
   c) it is a short fragment of RNA;
   d) includes DNA helicase;
   e) includes primase.

162) CM Mitochondrial DNA:
   a) has many ORI;
   b) has one ORI;
   c) has two ORI;
   d) is replicated in S - phase only;
   e) replication don't depend on replication of nuclear DNA.

163) CM Which of the statements listed below describes telomeres?
   a) they occupy a central part of chromosome;
   b) represent the ends of linear chromosomes in eukaryotes;
   c) consists of many copies of a short repeating sequence which are added by telomerase;
   d) they are replicated by the same mechanism like entire DNA;
e) they are replicated by a specific mechanism.

164) CM DNA repair:
a) is a restoration of tertiary structure of DNA;
b) is a restoration of primary structure of DNA;
c) takes place during mitosis;
d) may be prereplicative and postreplicative;
e) has different mechanisms.

165) CM Which of the following can cause defects in DNA molecules?
a) processing;
b) replication errors;
c) splicing;
d) depurinisation;
e) formation of thymine dimers.

166) CM Which of the following mechanisms are involved in DNA repair?
a) excision repair;
b) recombination repair;
c) SOS repair;
d) processing repair;
e) translation repair.

167) CM Which of the enzymes listed below participate in nucleotide excision repair?
a) DNA-ligase;
b) DNA-polymerase lambda;
c) DNA-polymerase sigma and epsilon;
d) AP-hydrolase;
e) DNA-glycosylase.

168) CM Replicon represents:
a) functional unit of replication;
b) a sequence which can replicate independently;
c) a sequence which contains origin of replication;
d) an Okazaki fragment;
e) a fragment of DNA, characteristic only for eukaryotes.

169) CM Enzymes that assure replication in eukaryotes:
a) DNA-polymerases alpha, gamma;
b) telomerase;
c) DNA-polymerases I, II, III;
d) DNA-helicases;
e) primase.

170) CM Enzymes that assure replication in prokaryotes:
a) DNA-polymerases alpha, beta, gamma;
b) telomerase;
c) DNA-polymerases I, II, III;
d) DNA-helicases;
e) DNA-ligase.
171) CM. Processes which take place during replication:
a) synthesis of DNA;
b) synthesis of mRNA;
c) synthesis of rRNA;
d) denaturation of DNA;
e) ligation.

172) CM. Components required for replication:
a) nucleotides which contain ribose;
b) enzymes;
c) histones;
d) nucleotides which contain deoxyribose;
e) nonhistones.

173) CM. Characteristics of replication in eukaryotes:
a) takes place in interphase;
b) both strands of molecules are synthesized continuously;
c) all DNA replicates simultaneously;
d) period of replications depends on condensation of DNA;
e) mitochondrial DNA replicates concomitant with nuclear DNA.

174) CS. Show up the incorrect characteristic of DNA:
a) is a double stranded molecule;
b) consists of nucleotides;
c) contains complementary strands;
d) contains identical strands;
e) contains genetic information.

175) CS. DNA consists of:
a) nucleosides;
b) nucleotides;
c) nitrogenous bases, hexose and ATP;
d) nitrogenous bases and phosphates;
e) nitrogenous bases and amino acids.

176) CS. Okazaki fragments are linked by:
a) DNA-polymerase;
b) DNA-helicase;
c) primase;
d) DNA-ligase;
e) histones.

177) CS Which of the following statement about gene is not shared by modern point of view?
a) gene represents a fragment of DNA;
b) gene encodes for a polypeptide chain or RNA;
c) gene can mutate to various form;
d) gene consists of transcribed and regulatory regions;
e) all genes are made of DNA.
178) **CS** How many genes does human genome contain?
   a) $\sim 1000$;
   b) $\sim 100000$;
   c) $\sim 30000$;
   d) $\sim 10^5$;
   e) $\sim 5$.

179) **CS** According to the modern point of view:
   a) gene consists of introns;
   b) gene has no promoter;
   c) gene consists of transcribed and regulatory regions;
   d) all genes are made from DNA;
   e) all genes are made from RNA.

180) **CS** Which of the following is a common characteristic of both prokaryotic and eukaryotic genes?
   a) they have introns and exons;
   b) they are transcribed in nucleus;
   c) they are monocistronic;
   d) they are polycistronic;
   e) they consist of transcribed and regulatory regions.

181) **CS** Introns:
   a) they are coding fragments;
   b) a part of regulatory region;
   c) they are present in both prokaryotes and eukaryotes;
   d) have coding and non-coding regions;
   e) their number is various and depends on the complexity of protein.

182) **CS** The number of exons:
   a) is constant in all genes;
   b) is various and depends on the complexity of the encoded protein;
   c) is equal in both prokaryotic and eukaryotic genes;
   d) is less than the number of introns;
   e) is the same with the number of introns.

183) **CS** Which of the following is not present in both prokaryotic and eukaryotic genes?
   a) intron;
   b) exon;
   c) promotor;
   d) terminator;
   e) start point.

184) **CS** Which of the following are characteristics of pseudogenes?
   a) they are copies of one of the genes with the same effect;
   b) they are sequences resulted from duplication;
   c) they are active in all tissues;
   d) they may be classified in there classes;
   e) they are inactive in all tissues.
185) CS  Which of the following is not an example of the I-st class genes?

a) gene for 5,8S rRNA;
b) genes for mRNA;
c) genes for 18S rRNA;
d) genes for 28S rRNA;
e) none of above.

186) CS  Which of the following is a II-nd class gene?

a) genes for tRNA;
b) genes for rRNA 5S;
c) genes for rRNA 5,8S;
d) structural genes;
e) genes for rRNAs 18S.

187) CM  I-st class genes:
a) encode for rRNA 5,8S, 18S, 28S;
b) encode for mRNA and sn RNAs;
c) are transcribed by RNA-polymerase III;
d) are present in all tissues;
e) are active in all tissues.

188) CM  Prokaryotic genes:
a) must always have a promoter;
b) are interrupted by non-coding sequences;
c) have a start codon usually coding for methionine;
d) show exact colinearity of DNA;
e) may be polycistronic.

189) CM  Eukaryotic structural genes:
a) have no differences from prokaryotic genes;
b) have the coding region interrupted by non-coding sequences;
c) have regulatory regions involved in the control of transcription;
d) have a start codon usually coding for methionine;
e) are monocistronic.

190) CM  Which of the following statements about mitochondrial genome are correct?

a) it is represented by a linear molecule of DNA;
b) it is represented by a circular molecule of DNA;
c) has no introns;
d) it contains 13 genes for tRNA, 22 structural genes and 2 genes for rRNA;
e) it cooperates with the nuclear genome.

191) CM  Which of the following are correct for the mitochondrial DNA?

a) it is represented by a circular molecule of DNA;
b) has no introns;
c) includes 13 structural genes;
d) genes are inherited through the paternal line;
e) almost of the nucleotides are encoding sequences.

192) CM  Transposons:
a) can never cause mutations;
b) are fragments of DNA that can move to a different position in a genome;
c) are proteins that can move from one cell to another;
d) may cause some pathologies in human;
e) can modify the activity of other genes.

193) CM The operon:
a) is a protein;
b) is a fragment of DNA;
c) is a transcription unit in prokaryotes;
d) normally contains an operator, a promoter and structural genes;
e) is a transcription unit in eukaryotes.

194) CM Enhancers:
a) are fragments of DNA;
b) are gene regulatory elements;
c) can amplify the activity of the promoters;
d) are always located near the promoter;
e) may be in both eukaryotic and prokaryotic genes.

195) CM Which of the following describe operator?
a) is a DNA sequence coding for a regulator protein;
b) is a protein sequence binding another protein;
c) is a DNA sequence binding for a regulator protein;
d) is a protein sequence binding a steroid hormone;
e) may activate or block structural genes.

196) CM. Prokaryotic genes contain:
a) introns and exons;
b) only introns;
c) only exons;
d) promoter and terminator;
e) transcribed region.

197) CM. The promoter:
a) is the sequence recognized by RNA-polymerase;
b) it is necessary for all transcription units;
c) it is a regulatory sequence;
d) interacts with DNA-polymerase;
e) assures termination of transcription.

198) CM. Particularities of mitochondrial genome:
a) contains 22 genes for tRNA and 13 genes for rRNA;
b) represents circular molecules;
c) is inherited through the maternal line;
d) there are no introns in the mitochondrial genes;
e) each gene contains a promoter.

199) CM. Structure of eukaryotic genes:
a) usually structural genes form monocistronic transcription units;
b) each I-st class gene is transcribed separately;
c) transcribed region may contain introns and exons;
d) tRNA genes have the same structure as mRNA genes;
e) all of genes contain an equal number of introns.

200) CM. Ribosomal genes:
a) are transcribed only by RNA-polymerase I;
b) are transcribed by RNA-polymerases I and III;
c) transcription units contain some genes;
d) are present in a single copy per genom;
e) are distributed in different chromosomes.

201) CM The operon:
a) is the transcription unit of the mitochondrial genom;
b) its transcribed region contains introns and exons;
c) contains genes from a specific metabolic pathway;
d) represents a lot of genes, a single promoter and a single terminator;
e) is characteristic for bacterial cell.

202) CS Which of the following is not shared by transcription?
a) it is a step of gene expression in prokaryotic cells;
b) it represents the duplication of the genetic information encoded in DNA;
c) it is a step of gene expression in eukaryotic cells;
d) it represents the process of complementary synthesis of RNA;
e) takes place in nucleus.

203) CS In eukaryotes transcription takes place in:
a) nucleus;
b) cytoplasm;
c) Golgi bodies;
d) plasma membrane;
e) nuclear envelope.

204) CS When does take place transcription?
a) during interphase;
b) in S-phase only;
c) in mitosis;
d) in meiosis;
e) in G2-phase only.

205) CS Transcription:
a) is the synthesis of DNA from a DNA template;
b) is a synthesis of a protein from RNA template;
c) occurs only in prokaryotic cells;
d) occurs only in eukaryotic cells;
e) non of the above.

206) CS Eukaryotic mRNA is synthesized by:
a) RNA-polymerase I;
b) RNA-polymerase II;
c) RNA-polymerase III;  
d) DNA-polymerase;  
e) Taq-polymerase.

207) CS Which of the following is not a step in the modification of eukaryotic RNA?  
a) addition of 7-methylguanosine cap;  
b) addition of poly-A tail;  
c) binding of the ribosomes;  
d) splicing;  
e) elimination of introns.

208) CS Which of the following is not necessary for transcription?  
a) dNTP;  
b) NTP;  
c) RNA-polymerase;  
d) DNA molecule;  
e) specific transcription factors.

209) CS Which of the following is not a common characteristic of the transcription in prokaryotes and eukaryotes?  
a) it is a step of gene expression;  
b) it is a process of complementary synthesis of RNA from a DNA template;  
c) it takes place in nucleus;  
d) it begins at the "Start +1" point;  
e) it is done by RNA-polymerase.

210) CS Which of the following is necessary for transcription of the I-st class genes?  
a) mtRNA-polymerase;  
b) prokaryotic RNA-polymerase;  
c) DNA-polymerase I;  
d) RNA-polymerase II;  
e) non of the above.

211) CS What is the function of cap?  
a) to assure the stability of 3' end of RNA;  
b) participates in passing of mRNA through nuclear envelope;  
c) removing of introns;  
d) to provide a site of recognition for ribosome;  
e) sealing of exons.

212) CS Which of the following is encoded by III-rd class genes?  
a) 5,8S rRNA;  
b) polypeptide;  
c) 18S rRNA;  
d) tRNA;  
e) mRNA.

213) CM Which of the following are the components required for transcription?  
a) DNA molecule;  
b) DNA-polymerase;
c) NTP;
d) dNTP;
e) RNA-polymerase.

214) CM The steps of gene expression in prokaryotic cells:
a) activation and transcription of genes;
b) processing of RNAs;
c) export of RNAs from nucleus to cytoplasm;
d) translation of mRNA;
e) post-translational modification.

215) CM Which of the following are parts of mRNA in eukaryotes?
a) leading sequence;
b) exons;
c) AUG;
d) promoter;
e) stop-codon.

216) CM Functions of general transcription factors:
a) facilitate the interaction between promoter and RNA-polymerase;
b) unwind and rewind double helix of DNA;
c) assure termination of transcription;
d) decondensation of chromatin;
e) bind specific to promoter, indicating the active one.

217) CM Functions of specific transcription factors:
a) assure termination of transcription;
b) bind specific to promoter;
c) decondensation of chromatin;
d) unwind and rewind double helix of DNA;
e) prevent premature removing of RNA-polymerase from template.

218) CM Which of the following participate in initiation of transcription?
a) TATA-box;
b) TFIID;
c) RNA-polymerase;
d) DNA-polymerase;
e) factor rho.

219) CM Processing of mRNA:
a) it is a step of gene expression in prokaryotes;
b) it is a step of gene expression in eukaryotes;
c) it takes place in cytoplasm;
d) modification of introns and removing of exons;
e) modification of the RNA ends and removing of introns.

220) CM The steps of processing are:
a) polyadenilation;
b) elongation;
c) capping;
d) transcription;
e) splicing.

221) CM  Which of the following are involved in splicing?
a) enzymes U₁-U₆;
b) introns;
c) promoter;
d) snRNA;
e) terminator.

222) CM  Constitutive splicing:
a) all exons are removed from pre-mRNA;
b) exons are sealed in the same sequence as in gene;
c) all introns are removed from pre RNA;
d) some exons only remain in mRNA;
e) only some of introns are removed.

223) CM  Alternative splicing:
a) exons are sealed in the same sequence as in gene;
b) all introns are removed from pre mRNA;
c) all exons are removed from pre mRNA;
d) only some of introns are removed;
e) some exons only remain in mRNA.

224) CM  The I-st class genes:
a) encode for mRNA;
b) encode for 5,18S, 28S;
c) primary transcript is 45 RNA;
d) are located in nucleolus;
e) may have several hundred copies.

225) CM  Which of the following describe the transcription in prokaryotes?
a) several genes may be grouped together;
b) genes are monocistronic;
c) unit of transcription is called operon;
d) mRNA is polycistronic;
e) none of the above.

226) CS  Which of the following is primary transcript of the I-st class genes?
a) mRNA;
b) tRNA;
c) 5S RNA;
d) 45S RNA;
e) 18S RNA.

227) CM  Which of the following are not primary transcripts of the I-st class genes?
a) mRNA;
b) tRNA;
c) 5S RNA;
d) 18S RNA;
228) **CM** Which of the following are **not** common characteristics of transcription in both prokaryotic and eukaryotic cells?

a) it takes place in nucleus;
b) DNA as a template;
c) dNTP as a monomers;
d) three classes of RNA-polymerases;
e) it is followed by processing.

229) **CM** RNA-polymerase I:

a) is the most active polymerase;
b) it works in nucleolus;
c) it works in cytoplasm;
d) it is presented in prokaryotic cells;
e) it produces rRNA 5, 18S, 28S.

230) **CM** RNA-polymerase II:

a) the most active polymerase;
b) it participate in transcription of structural genes;
c) it works in cytoplasm;
d) it is presented in prokaryotic cells;
e) it produces mRNA and snRNAs.

231) **CM** RNA-polymerase III:

a) the most active polymerase;
b) it works in nucleoplasme;
c) it synthesis snRNA;
d) it works in cytoplasm;
e) it produces tRNAs and rRNA 5S.

232) **CM** Transcribed region of structural genes consists of:

a) promoter;
b) leading sequence;
c) exons;
d) introns;
e) terminator.

233) **CS** Which of the following features is **not** shared by genetic code?

a) consists of triplets of bases;
b) universal;
c) overlapping;
d) redundant;
e) not overlapping.

234) **CS** Translation:

a) is a step of processing;
b) takes place in nucleus;
c) uses DNA as a template;
d) protein synthesis;
e) amino acid synthesis.

235) CS Ribosomes:
  a) consist of DNA and proteins;
  b) are active in nucleus and mitochondria;
  c) in eukaryotes are formed in cytoplasm;
  d) represent the place of protein biosynthesis;
  e) have 2 membranes.

236) CS Which of the following enzymes participates in translation?
  a) primase;
  b) aminoacyl-tRNA-synthetase;
  c) ARN-polymerase;
  d) topoisomerase;
  e) helicase.

237) CS What is formed in result of translation?
  a) functional protein;
  b) polypeptide chain;
  c) lipoprotein;
  d) mRNA;
  e) cDNA.

238) CS Translation is:
  a) decoding of genetic information in mRNA;
  b) synthesis of mRNA;
  c) semiconservative synthesis of DNA;
  d) modification of genetic material;
  e) elimination of introns.

239) CS How many codons does contain the translated part of mRNA, that encodes polypeptide consisted of 500 amino acids?
  a) 1500;
  b) 501;
  c) 250;
  d) 50;
  e) 150.

240) CS tRNA provides the transport of:
  a) mRNA from the nucleus into cytoplasm;
  b) amino acids from the nucleus into cytoplasm;
  c) amino acids from the cytoplasm into nucleus;
  d) amino acids to the ribosomes;
  e) amino acids to the mitochondria.

241) CS Which of the following is formed as result of translation?
  a) primary transcript;
  b) mRNA;
  c) polypeptide;
  d) cDNA;
242) **CS** One triplet encodes for:
   a) a gene;
   b) a protein;
   c) an amino acid;
   d) a pentose;
   e) a mRNA.

243) **CM** What are the functions of tRNA?
   a) it is a template;
   b) transports amino acids to the ribosomes;
   c) structural role;
   d) acts as adaptor molecule;
   e) decoding of the genetic information.

244) **CS** How many variants of tRNA may be in a cell?
   a) 64;
   b) 20;
   c) 4;
   d) 61;
   e) 100.

245) **CM** Which of the following statements about aminoacyl-tRNA-synthetases are correct?
   a) they participate in translocation of ribosome;
   b) there are 20 types of this enzyme in cell;
   c) they sort the tRNAs and amino acids into corresponding sets;
   d) each synthetase recognizes a single amino acid;
   e) the catalytic domain includes the sites for ATP, amino acid and tRNA.

246) **CM** Which of the following participate in initiation of translation?
   a) ribosome;
   b) met-tRNA;
   c) other tRNA;
   d) mRNA;
   e) transcription factors.

247) **CM** Which of the following participate in elongation of translation?
   a) tRNA;
   b) 20 types of amino acids;
   c) mRNA;
   d) release factors;
   e) Na$^+$ and K$^+$.

248) **CM** Which of the following participate in termination of translation?
   a) tRNA;
   b) releasing factors;
   c) mRNA;
   d) met-tRNA;
   e) factor of translocation.
249) **CM** What are the active sites of ribosome?
   a) P-site;
   b) site for binding ATP;
   c) A-site;
   d) R-site;
   e) stop codon.

250) **CM** Which of the following molecules do participate in translation?
   a) mRNA;
   b) tRNA;
   c) ribosome;
   d) aminoacyl tRNA synthetase;
   e) ARN-polymerase.

251) **CM** Ribosome consist of:
   a) tRNA;
   b) proteins;
   c) rRNAs;
   d) Fe$^{+}$;
   e) Cu$^{2+}$.

252) **CM** Which of the following are the components of the large subunit of ribosome?
   a) 5S RNA;
   b) 5,8S RNA;
   c) 18S RNA;
   d) 28S RNA;
   e) 45S RNA.

253) **CM** Which of the statements listed below describe the initiation of translation?
   a) synthesis of RNA;
   b) formation of "aminoacyl-tRNA" complex;
   c) associations of ribosome subunits;
   d) degradation of GTP in GDP+P;
   e) activation of amino acids.

254) **CS** Which of the following cells may be used for obtaining of DNA?
   a) erythrocytes;
   b) all cells with nucleus;
   c) all somatic cells;
   d) blood platelets (thrombocytes);
   e) red blood cells.

255) **CS** Restriction enzymes:
   a) are used in PCR;
   b) recognize the single-strand DNA;
   c) recognize and cut double-strand DNA;
   d) are presented in eukaryotes only;
   e) may be of one type only.
256) **CS** What is the importance of restriction enzymes?

- **a)** degradation of own DNA;
- **b)** participate in formation of chemical bonds;
- **c)** initiate the DNA synthesis;
- **d)** they are used to obtain DNA fragments;
- **e)** participate in DNA repair.

257) **CS** cDNA represents:

- **a)** cell DNA;
- **b)** DNA consisting of introns;
- **c)** DNA without introns;
- **d)** genomic DNA;
- **e)** hybrid molecule of DNA.

258) **CS** Which of the following participates in cDNA synthesis?

- **a)** Taq-polymerase;
- **b)** revers-transcriptase;
- **c)** primase;
- **d)** telomerase;
- **e)** topoisomerase.

259) **CS** Which of the following is not necessary for PCR?

- **a)** DNA as a template;
- **b)** synthetic primers;
- **c)** dNTP;
- **d)** RNA-polymerase;
- **e)** Taq-polymerase.

260) **CS** Which of the following can't be used as a host for DNA cloning?

- **a)** bacterial cells;
- **b)** animal cells;
- **c)** plasmid;
- **d)** vegetal cells;
- **e)** yeast cells.

261) **CS** Restriction fragments:

- **a)** have always the same length;
- **b)** are formed in result of DNA cleavage by restriction enzymes;
- **c)** each fragment consists of one gene;
- **d)** are single-strand;
- **e)** contain exons only.

262) **CM** Which of the following are used as a vector?

- **a)** genomic DNA;
- **b)** cDNA;
- **c)** plasmids;
- **d)** viral DNA;
- **e)** BAC.

263) **CM** Steps of cloning *in vivo*:
a) cleavage of DNA;
b) cleavage of vector;
c) insertion of exogenous DNA into a vector molecule;
d) annealing of the primers;
e) denaturation of the DNA by heating.

264) CM  cDNA:
a) is formed in result of revers-transcription;
b) has exons only;
c) is a copy of eukaryotic gene;
d) is a copy of mRNA;
e) is used to identify genes.

265) CM  Which of the following are not steps of DNA cloning in vitro?
a) denaturation of the DNA by heating;
b) cleavage of DNA;
c) annealing of the primers;
d) extension;
e) hybridization with labeled probe.

266) CM  What are the ways of increasing the membrane permeability in DNA cloning techniques?
a) treatment of the host cell with buffer solution;
b) treatment of the host cell by heating;
c) treatment of the host cell by restriction enzymes;
d) carry out a short-term physical pressure on the cell;
e) treatment of the host cell with ligase.