OLIVERA MILOŠEVIĆ-DJORDJEVIĆ

BIOLOGY TEST QUESTIONS

for the preparation of the entrance exam at the Faculty of Medical Sciences

FACULTY OF MEDICAL SCIENCES

UNIVERSITY OF KRAGUJEVAC

CONTENTS

CELL BIOLOGY

1. The source of energy in animal cells is:
   1) sucrose
   2) cellulose
   3) glycogen
   4) starch
   5) galactose

2. According to their chemical nature, enzymes are:
   1) lipids
   2) proteins
   3) glycolipids
   4) nucleic acids
   5) carbohydrates

3. Amino acids differ from each other:
   1) only by carboxyl group
   2) by amino group and R residue
   3) by R residue and carboxyl group
   4) by carboxyl and amino group
   5) only by R residue

4. How many carbon atoms are included in the composition of monosaccharide, which is a component of ribonucleotide:
   1) 3
   2) 4
   3) 5
   4) 6
   5) more than 6

5. An organelle presents in a prokaryotic and eukaryotic cell is:
   1) lysosome
   2) Golgi apparatus
   3) peroxisome
   4) ribosome
   5) mitochondria

6. In bacteria, the hereditary basis is:
   1) linear DNA
   2) RNA only
   3) DNA or RNA
   4) circular DNA
   5) protein

7. Ions transport against the concentration gradient is:
   1) active transport
   2) passive transport

3) endocytosis
4) exocytosis
5) facilitated diffusion

8. Exocytosis is:
1) input of liquid into the cytoplasm of the cell
2) input of solids into the cytoplasm of the cell
3) expulsion of ingredients from the cell
4) input of bacteria into the cell
5) selective input of substances into the cell

9. Ribosomes and messenger RNA together form a structure called:
1) polypeptide
2) polynucleotide
3) polyploidy
4) polyribosome
5) nucleolus

10. The Golgi apparatus is morphologically similar and functionally most closely related to:
1) endoplasmic reticulum
2) chloroplasts
3) vacuoles
4) peroxisomes
5) mitochondria

11. Intracellular decomposition of substances is performed in:
1) primary lysosome
2) Golgi apparatus
3) polyribosome
4) residual body
5) secondary lysosome

12. Microtubules:
1) enable the contraction of muscle cells
2) represent components of the cytoskeleton
3) are built from protein actin
4) form pseudopodia in amoeba
5) represent sites of protein synthesis

13. In the telophase of mitosis, the chromosome contains:
1) two chromatids
2) one DNA molecule
3) two DNA molecules
4) twice the amount of DNA molecules than at the beginning of mitosis
5) one strand of DNA

14. During meiosis, homologous chromosomes are paired in:
1) interphase of the first meiotic division

2) prophase of the first meiotic division
3) metaphase of the first meiotic division
4) anaphase of the first meiotic division
5) telophase of the first meiotic division

15. The number of chromosomes in the daughter cell formed by the first meiotic division compared to the mother cell is:
    1) unchanged
    2) reduced to half
    3) two times greater
    4) four times greater
    5) four times smaller

16. At the end of the interphase of the first meiotic division:
    1) the amount of DNA molecules is doubled
    2) the amount of DNA molecules is reduced to half
    3) the number of chromosomes is reduced to half
    4) the number of chromosomes is doubled
    5) the amount of DNA molecules is four times greater

17. In which phase of cellular respiration ATP forms:
    1) the mobilization phase
    2) oxidative phosphorylation
    3) oxidative degradation
    4) phase of coenzyme re-oxidation
    5) phase of terminal coenzyme oxidation

18. The first phase of glucose degradation, that happens in the cytoplasm, is:
    1) Calvin cycle
    2) Krebs cycle
    3) glycolysis
    4) hemolysis
    5) dehydrogenation

19. The Krebs cycle in eukaryotes takes place in:
    1) peroxisomes
    2) lysosomes
    3) mitochondria
    4) cytoplasm
    5) extracellular space

20. The first reaction in photosynthesis is:
    1) oxidation of the acceptor
    2) reduction of chlorophyll
    3) oxidation of chlorophyll
    4) ATP reduction
    5) reduction of oxygen

ORGAN SYSTEMS

1. In humans, the digestion of carbohydrates begins in:
   1) mouth
   2) esophagus
   3) stomach
   4) duodenum
   5) small intestine

2. How many major salivary glands does human have:
   1) one pair
   2) two pairs
   3) three pairs
   4) four pairs
   5) five

3. Which pancreatic enzyme takes apart fats into fatty acids and glycerol:
   1) amylase
   2) pepsin
   3) lipase
   4) trypsinogen
   5) chymotrypsinogen

4. A four-chambered heart have:
   1) only mammals
   2) amphibians and birds
   3) all reptiles and mammals
   4) birds and mammals
   5) amphibians and mammals

5. A normal heart rate (75 beats/minute) initiates:
   1) thyroxine
   2) adrenaline
   3) sinoatrial (SA) node
   4) sympathetic nervous system
   5) noradrenaline

6. The slowing of the heart rate initiates:
   1) sympathetic nervous system
   2) noradrenaline
   3) AV node
   4) adrenaline
   5) thyroxine

7. In humans, gas exchange through the membrane of the alveoli happens by:
   1) simple diffusion
   2) facilitated diffusion
   3) active transport

4) endocytosis
5) osmosis

8. The centers for regulation of respiration are located in:
1) lung wall
2) medulla oblongata
3) cerebellum
4) adenohypophysis
5) thoracic segment of the spinal cord

9. In pulmonary capillaries:
1) oxyhemoglobin is formed
2) oxygen is consumed
3) oxyhemoglobin releases oxygen
4) carbon dioxide is formed
5) energy is created

10. A bundle of capillaries located in the renal capsule is called:
1) collecting duct
2) loop of Henle
3) collection cup
4) glomerulus
5) renal pelvis

11. Primary urine is formed in:
1) loop of Henle
2) proximal tubule
3) collecting ducts
4) renal capsule
5) distal tubule

12. The urine of healthy people does NOT contain:
1) glucose
2) ammonia
3) urea
4) uric acid
5) creatinine

13. Photosensitive receptors, cones and rods are located in:
1) cornea
2) choroid
3) iris
4) retina
5) lens

14. The middle ear is connected to the oral cavity via:
1) inner ear
2) Corti's organ

3) Eustachian tube
4) semicircular canals
5) auditory canal

15. The long extension of the nerve cell body is:
1) asterocyte
2) neuron
3) axon
4) dendrite
5) dendron

16. The main components of the limbic system are:
1) epithalamus, olfactory cortex and hippocampus
2) thalamus, hippocampus, hypothalamus and amygdala
3) red nucleus, amygdala and substantia nigra
4) olfactory cortex, thalamus and red nucleus
5) hippocampus, hypophysis, substantia nigra and pineal gland

17. A role in the formation and storage of memory has:
1) hypothalamus
2) hippocampus
3) medulla oblongata
4) cerebellum
5) midbrain

18. Diuresis is prevented by the hormone:
1) of pancreas
2) of epiphysis
3) of adenohypophysis
4) from neurohypophysis
5) of thyroid

19. Hormones of the endocrine part of the pancreas are:
1) glucagon and aldosterone
2) oxytocin and aldosterone
3) insulin and oxytocin
4) insulin and glucagon
5) calcitonin and renin

20. Estrogen and progesterone are synthesized in the ovary by the influence of:
1) adrenocorticotropic hormone
2) gonadotropic hormones
3) hormones of the neurohypophysis
4) thyrotropic hormones
5) metabolic hormones of the adenohypophysis

DEVELOPMENTAL BIOLOGY

1. The recombination of genetic material between non-sister chromatids of homologous chromosomes occurs in:
   1) ootids
   2) oogonia
   3) primary oocytes
   4) secondary oocytes
   5) first polar body

2. In women, primary oocytes continue the first meiotic division:
   1) at the end of organogenesis
   2) at the end of fetogenesis
   3) immediately after birth
   4) upon reaching sexual maturity, cyclically
   5) during the first year of life

3. Which of the following cells has a diploid (2n) number of chromosomes:
   1) ootid
   2) primary oocyte
   3) first polar body
   4) secondary oocyte
   5) second polar body

4. How many chromosomes does the first polar body have if the secondary oocyte has 20 chromosomes:
   1) 0
   2) 5
   3) 10
   4) 20
   5) 40

5. How many functional cells are formed in the process of spermatogenesis from one primary spermatocyte:
   1) 1
   2) 2
   3) 3
   4) 4
   5) 5

6. Which cells divide by the first meiotic division:
   1) spermatidses
   2) spermatogonies
   3) primary spermatocytes
   4) secondary spermatocytes
   5) spermatozoa

7. In which part of the sperm are hydrolytic enzymes located:
   1) nucleus
   2) acrosome
   3) the neck
   4) nucleolus
   5) on the tip of the tail

8. If a primary spermatocyte has 96 DNA molecules, how many DNA molecules will a secondary spermatocyte have:
   1) 12
   2) 24
   3) 36
   4) 48
   5) 96

9. Sperm capacitation is a process that happens in:
   1) epididymis
   2) spermatogenesis
   3) spermiogenesis
   4) the female genital tract
   5) egg cell

10. What protects the egg cell from the penetration of a numerously spermatozoa in the fertilization process:
   1) layer of follicular cells
   2) layer of vitelline granules
   3) first polar body
   4) fertilization envelope
   5) plasmalemma

11. In mammals, the blastula is called:
   1) blastocyst
   2) blastodisc
   3) blastocoele
   4) blastopore
   5) blastoderm

12. Bilateral symmetry of the embryo is established since:
   1) the beginning of cleavage
   2) blastula
   3) gastrula
   4) organogenesis
   5) fetogenesis

13. What is formed during gastrulation from the endoderm:
   1) the notochord
   2) the intestinal tube

3) the neural tube
4) the notochord and intestinal tube
5) the neural tube and intestinal tube

14. In organogenesis what is formed from the mesoderm:
    1) nervous system
    2) intestinal epithelium
    3) internal skeleton
    4) skin
    5) all skin derivatives

15. In humans, the yolk sac has a role in:
    1) nutrition of the embryo
    2) depositing urine
    3) respiration and nutrition of the embryo
    4) formation of the first blood cells
    5) protection the embryo

16. What structure is formed as an outgrowth of the intestinal tube of the embryo:
    1) yolk sac
    2) amnion
    3) chorion
    4) allantois
    5) placenta

17. The human placenta is _____, and according to the shape and the surface by which it is connected to the uterus, it is _____.

    1) choriovitelline; zonal
    2) choriovitelline; discoidal
    3) choriovitelline; diffuse
    4) chorioallantoic; discoidal
    5) chorioallantoic; cotyledonary

18. The temporary organ in the mother's uterus which connects the tissue of the mother and the fetus is:
    1) amnion
    2) chorion
    3) placenta
    4) allantois
    5) yolk sac

19. Allantois do NOT possess:
    1) amniotes
    2) reptiles
    3) birds
    4) terrestrial mammals
    5) anamniotes

20. What is formed from the external layer of cells of the blastocysts:
    1) yolk sac ectoderm
    2) yolk sac mesoderm
    3) chorion
    4) amnion
    5) allantois

GENETICS

1. If both alleles are expressed in the heterozygous phenotype, that alleles are:
    1) completely dominant
    2) pleiotropic
    3) codominant
    4) completely recessive
    5) complementary

2. What is codominantly inherited:
    1) the shape of a pea grain
    2) the color of the yawning flower
    3) the color of the pea flower
    4) MN blood group
    5) the color of the wheat grain

3. Genes located on the same chromosome are inherited:
    1) dominant
    2) recessive
    3) linked (correlative)
    4) intermediate
    5) codominant

4. When crossing pea plants that have yellow (AA) and green (aa) grains, three genotypes are expected in the F2 generation in the ratio:
    1) 3:1
    2) 2:1:1
    3) 1:2:1
    4) 2:1:2
    5) 1:3

5. When there are 3n chromosomes in a human somatic cell, it is:
    1) polygeny
    2) polyploidy
    3) polymorphism
    4) aneuploidy
    5) trisomy

6. If a diploid gamete is fertilized with a normal gamete, the zygote is:
    1) trisomic

2) triploid
3) tetrasomic
4) tetraploid
5) aneuploid

7. When there are 47 chromosomes in the nucleus of a human somatic cell, it is:
1) trisomy
2) triploidy
3) polyploidy
4) duplication
5) hypodiploidy

8. Gene mutation that does NOT cause an amino acid change in the protein structure is called:
1) nonsense
2) silent
3) missense
4) neutral
5) frameshift

9. The set of genes (alleles) of all individuals in the population is called:
1) genotype
2) the genome
3) gene pool
4) gene map
5) gene family

10. The frequency of genotype *AA* in the population is:
1) $p^2 + 2pq$
2) p^2
3) $2pq + q^2$
4) q^2
5) $(p+q)^2$

11. The frequency of genotype *aa* in the population is:
1) $p^2 + 2pq$
2) p^2
3) $2pq + q^2$
4) q^2
5) $(p+q)^2$

12. The frequency of genotype *Aa* in the population is:
1) $(p + q)^2$
2) $p^2 + 2pq$
3) $p^2 + q^2$
4) $2pq$
5) p^2

13. What is inherited autosomal-recessively:
    1) albinism
    2) polydactyly
    3) hemophilia
    4) daltonism
    5) dwarf growth

14. What is inherited autosomal-dominantly:
    1) albinism
    2) polydactyly
    3) color blindness
    4) hemophilia
    5) Down syndrome

15. In recessive X-linked inheritance:
    1) women are sick more often than men
    2) men are sick more often than women
    3) mothers transmit the disease to their daughters
    4) fathers transmit the disease to their sons
    5) mutation on one X chromosome in women always causes disease

16. Sex chromosome aneuploidy results in:
    1) Down syndrome
    2) Turner syndrome
    3) hemophilia
    4) Huntington's disease
    5) daltonism

MOLECULAR BIOLOGY

1. Purine nitrogenous bases in the composition of nucleic acids are:
    1) adenine and cytosine
    2) adenine and guanine
    3) cytosine and guanine
    4) thymine and adenine
    5) guanine and thymine

2. Pyrimidine bases in the DNA molecule are:
    1) guanine and adenine
    2) adenine and thymine
    3) cytosine and guanine
    4) thymine and cytosine
    5) thymine and guanine

3. Pyrimidine bases in the RNA molecule are:
    1) adenine and thymine
    2) thymine and uracil
    3) uracil and guanine

4) uracil and cytosine
5) adenine and uracil

4. If in one part of the chain of the DNA molecule the order of the bases is ATCGC, the order of the bases in the same part of the opposite chain is:
   1) GCTCT
   2) TAGCG
   3) ATCGC
   4) AUGCG
   5) UAGCG

5. If thymine is represented by 25% in a DNA molecule segment, how much guanine is there in that segment:
   1) 25%
   2) 50%
   3) 60%
   4) 75%
   5) 90%

6. In the process of transcription, the segments of DNA is copied into:
   1) only mRNA
   2) only tRNA
   3) mRNA, tRNA and rRNA
   4) DNA molecules
   5) polypeptides

7. Molecule of mRNA encodes information for protein synthesis in a process which is called:
   1) translation
   2) transcription
   3) reverse transcription
   4) replication
   5) transposition

8. The secondary structure of proteins is maintained by:
   1) hydrogen bonds
   2) phosphodiester bonds
   3) disulfide bonds
   4) peptide bonds
   5) amide bonds

9. A structure formed by wrapping DNA molecule around a set of eight histone proteins is called:
   1) nucleolus
   2) nucleosome
   3) nucleoid
   4) nucleotide
   5) nucleoside

10. Transcription begins with the binding of the RNA polymerase enzyme to:
    1) promoter
    2) AUG codon
    3) GUG codon
    4) poly-A tail
    5) cap-region

11. Which mRNA is transcribed on a segment AATCCG of the DNA molecule:
    1) TTAGGC
    2) AATCCG
    3) UUAGGC
    4) TTUGGC
    5) AAUGGC

12. What number of nucleotides encodes one amino acid:
    1) one
    2) two
    3) three
    4) twenty
    5) sixty four

EVOLUTION

1. The first molecules on our planet that had the ability to replicate were:
    1) single-stranded DNA molecules
    2) RNA molecules
    3) proteins
    4) DNA and proteins
    5) phospholipids

2. The evolution of primates marked:
    1) the Precambrian Era
    2) the end of the Cambrian
    3) the middle of the Paleozoic
    4) the beginning of the Mesozoic
    5) the Cenozoic Era

3. The fundamental evolution unit is:
    1) population
    2) order
    3) genus
    4) class
    5) individua

4. Primates are:
    1) lemurs and lorises
    2) tarsiers

3) apes
4) humans
5) all of the above

5. ″Java man″ belongs to the species:
1) Australopithecine
2) *Homo erectus*
3) *Homo habilis*
4) *Homo neanderthalensis*
5) Denisovans

6. ″Peking man″ belongs to the species:
1) Australopithecine
2) *Homo erectus*
3) *Homo habilis*
4) *Homo neanderthalensis*
5) Denisovans

7. *Homo erectus* appeared almost 2 million years ago in:
1) China
2) Java island
3) Germany
4) Italy
5) Africa

8. Modern *Homo sapiens* originated from:
1) Africa
2) China
3) Java island
4) Germany
5) Galapagos

9. Cro-Magnon man belongs to the species:
1) Australopithecine
2) Dryopythecini
3) *Homo erectus*
4) *Homo habilis*
5) *Homo sapiens*

10. A significant improvement of tools and appearance of cave drawings are characteristics of:
1) Neanderthal culture
2) Cro-Magnon culture
3) Archaic man
4) Australopithecine
5) *Homo habilis* species

11. The species *Australopithecus africanus* lived:
1) in China

2) on Java island
3) in Africa
4) in Germany
5) on Galapagos

12. The oldest species of the genus *Homo* is:
    1) *Homo erectus*
    2) *Homo floresiensis*
    3) *Homo habilis*
    4) *Homo neanderthalensis*
    5) Cro-Magnon man