FACULTY OF MEDICINE, MASARYK UNIVERSITY, BRNO

Admission test**:** **BIOLOGY A** Year: 2022

Name of applicant: .....

1. Cranially from the first lumbar vertebra are located
a) 19 vertebrae b) 8 cervical vertebrae c) 24 presacral vertebrae d) 15 vertebrae
e) none of the answers is correct

2. Which of the following is the largest organ of our body?
a) liver b) brain c) muscle d) skin e) none of the answers is correct

3. During the histology seminar of the first-year General medicine programme at the Faculty of Medicine, Masaryk University in Brno, a student observes the epithelium of human skin and sees that the cells are layered, flat and scaly. The sample is an example of:
a) simple squamous epithelium b) stratified squamous epithelium c) stratified cuboidal epithelium
d) stratified columnar epithelium e) none of the answers is correct

4. A 47-year-old man comes to the ambulance with the pain in his left knee appearing most often during skiing, walking down the stairs or hills or while squatting. What type of joint is the knee joint?
a) simple b) compound c) ball and socket d) plane e) none of the answers is correct

5. When examining the musculoskeletal system, physiotherapists can check the strength of the muscle acting on a joint. If one muscle contracts, the other relaxes. The biceps brachii muscle is a skeletal muscle lying on the anterior side of the arm, it functions (between others) as a flexor of the elbow joint. What is the general type of this muscle in relation to the triceps brachii muscle, which lies on the other (posterior) side of the arm and functions as an elbow joint extensor?
a) agonist b) antagonist c) synergist d) relaxer e) none of the answers is correct

6. Which of the following has the lowest pH optimum?
a) gastric secretion b) saliva c) pancreatic secretion d) bile e) none of the answers is correct

7. The vital capacity of the lungs expresses
a) the amount of inhaled and exhaled air at rest
b) the maximum amount of exhaled air after the maximum inhalation
c) the volume of air which, when inhaled, remains in the airways and does not reach the lungs
d) the maximum amount of exhaled air after a normal inhalation at a rest
e) none of the answers is correct

8. Indicate the correct sequence of organs or tissues in which sperm can pass in a healthy person
a) testis - epididymis - vas deferens - male urethra - female vagina - uterus - Fallopian tube
b) testis - epididymis - prostate - vas deferens - female urethra - female vagina - Fallopian tube - ovary
c) testis - vas deferens - epididymis - prostate - male urethra - female vagina - uterus - Fallopian tube
d) testis - epididymis - Fallopian tube - urethra - female uterus - female vagina - Fallopian tube - ovary
e) none of the answers is correct

9. Which hormone is produced by the placenta?
a) progesteron b) insulin c) melatonin d) glucagon e) none of the answers is correct

10. The tricuspid valve in the heart opens
a) at the beginning of systole b) during systole c) at the beginning of diastole
d) when the ventricles contract e) none of the answers is correct

11. Choose a correct statement about the blood
a) we count granulocytes to the blood (cellular) elements
b) the largest proportion of blood elements in the blood are leukocytes and platelets
c) platelet viability is about 120 days
d) an important component of blood plasma is, in addition to proteins, also glucose, the concentration of which in a healthy person is about 9% of the total volume e) none of the answers is correct

12. The posterior roots of the spinal nerves contain fibres
a) mixed, i.e. motor and sensory b) sensory, i.e. afferent c) motor, i.e. efferent
d) motor, i.e. centripetal e) none of the answers is correct

13. Choose a correct statement about the sympathetic nervous system
a) strengthens intestinal peristalsis b) causes secretion of saliva and digestive juices c) narrows the bronchi d) reduces blood flow in the skin and abdominal organs e) none of the answers is correct

14. Which scientists work contributed to our understanding of the causes of infectious diseases?
a) Thomas Hunt Morgan b) Louis Pasteur c) James Watson
d) Johan Gregor Mendel e) none of the answers is correct

15. The concentration of solutes in a red blood cell corresponds to 0.9 % NaCl. In which of the following solutions will red blood cells shrink most due to osmosis?
a) physiological saline solution b) 0.5% NaCl solution c) 1.5 % NaCl solution
d) pure water e) none of the answers is correct

16. Which of the following <u>IS NOT</u> part of a virus?
a) capsid b) centrosome c) nucleic acid d) envelope e) none of the answers is correct

17. In the following three columns, cell constituents, biochemical components and functions are listed. Which of the triads has a meaning?

a) Golgi apparatus	valin	synthesis of proteins
b) Endoplasmic reticulum	saccharose	synthesis of polysaccharides
c) microtubules	tubulin	muscle contraction
d) microfilaments	actin	cell movement

e) none of the triads is meaningful

18. Alpha cells in the pancreas produce peptide hormone glucagon. By using radioactively labelled amino acids, one can track the path of glucagon through the cytoplasm. Which of the following could be the path of the glucagon? (ER-endoplasmic reticulum)
a) rough ER → Golgi → vesicle → plasma membrane b) Golgi → rough ER → plasma membrane c) rough ER → lysosome → Golgi d) smooth ER →lysosome → plasma membrane
e) none of the answers is correct

19. Which of the following possesses a structure similar to a basal body?
a) centriole b) nucleosome c) centrosome d) ribosome e) none of the answers is correct

20. The process of capturing a substance or particle from outside the cell by engulfing it with the cell membrane is
a) osmosis b) endocytosis c) facilitated diffusion d) exocytosis e) none of the answers is correct

21. Picture shows chromosomes in eucaryotic cell. Recognise and name the phases of the cell cycle.

a) prophase b) metaphase c) anaphase d) telophase e) none of the answers is correct

22. Which of the following statements about the eukaryotic chromosome is correct?
a) It is composed of single-stranded linear molecule of DNA and histones.
b) It consists of a single circular molecule of double-stranded DNA.
c) It consists of a single circular molecule of double-stranded DNA and histones.
d) It consists of a single linear molecule of double-stranded DNA and histones.
e) none of the answers is correct

23. Fill in the correct term/s. After replication, one strand of the new DNA is from the old DNA, and one strand has been newly synthesized. This is known as _____.
a) transcription b) translation c) semi-conservative replication d) conservative replication
e) none of the answers is correct

24. Which one of the following statements is the most close to reality?
a) All codons code for amino acids. b) Ribosomes are composed of 3 different subunits.
c) The same genetic code is found in all organisms. d) Ribosomal RNA brings amino acids to the ribosome.
e) all the statements are correct

25. The main significance of mitosis is that
a) it causes genetic variation b) it causes transcription of DNA to RNA c) it reduces the number of chromosomes d) it ensures genetic identity of mother and daughter cells e) none of the answers is correct

26. Select the statement that most correctly describes meiosis.
a) During the prophase I crossing over takes place.
b) During anaphase I the chromatids separate and migrate to opposite poles of the spindle.
c) Telophase I results in the formation of two genetically identical haploid cells.
d) During the second division, the chromatids separate in metaphase II.
e) none of the answers is correct

27. Independent assortment of chromosomes occurs
a) during mitosis only b) during meiosis I only c) during meiosis II only
d) during all mitosis, meiosis I and meiosis II e) none of the answers is correct

28. Fill in the correct terms. Genes occur as alleles on chromosomes. If both alleles are the same, the organism is _____ for that allele. When one of a pair of alleles produces functional protein, and the other does not, the allele producing functional protein is called the _____ allele.
a) heterozygous, dominant b) heterozygous, recessive c) homozygous, dominant
d) homozygous, recessive e) none of the answers is correct

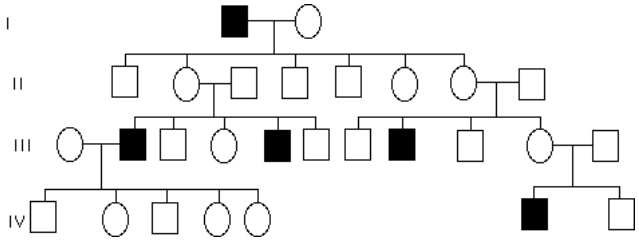
29. In sickle-cell disease, a single substitution of an 'A' by 'T' on the β-globin gene causes the resultant protein to have altered properties, but to be of normal size. Select the term that most accurately describes this type of mutation.
a) silent mutation b) missense mutation c) nonsense mutation d) frameshift mutation
e) none of the answers is correct

30. What is the function of exons?
a) regulation of gene expression b) initiation of replication c) coding for proteins
d) their function is not yet known e) none of the answers is correct

31. How many Barr bodies would you expect to find in cells of female with Turner´s syndrome?
a) none b) one c) two d) three e) none of the answers is correct

32. Cell has 2n chromosomes. If a pair of homologous chromosomes fails to separate during anaphase of meiosis I, what will be the chromosome number of the four resulting gametes?
a) n+1; n+1; n; n b) n+1; n+1; n-1; n-1 c) n+1; n-1; n; n d) n+1; n+1; n-1; n
e) none of the answers is correct

33. Inheritance of what genetic disorder does most probably show the pedigree chart given bellow?



a) X-linked recessive b) of X-linked dominant c) autosomal recessive d) autosomal dominant e) none of the answers is correct

34. An achondroplastic dwarf man with normal vision marries a colour-blind woman of normal height. The man´s father was 6 feet tall, and both woman´s parents were of average height. Achondroplastic dwarfism is autosomal dominant, blindness is X-linked recessive. What proportion of their male children would be colour-blind and normal height?

a) all b) none c) 1/4 d) 1/2 e) none of the answers is correct

35. In cats, black colour is caused by an X-linked allele; the other allele at this locus cases orange colour. The heterozygote is tortoise-shell. What kinds of offspring would you expect from the cross of black female and orange male?

a) tortoise-shell female; tortoise-shell male b) black female; orange male c) tortoise-shell female; black male
d) orange female; black male e) none of the answers is correct

36. In a cross of individuals with genotypes AaBbCc x AaBbCc, what is the probability of producing offspring with the genotype AABBCC?

a) 1/128 b) 1/64 c) 1/14 d) 1/8 e) none of the answers is correct

37. Sometimes, DNA of virus becomes part of the host DNA and remains in the host cell for a long period of time. This process is called the

a) cell cycle b) lysogenic cycle c) lytic cycle d) nitrogen cycle e) none of the answers is correct

38. Which one of the following statements is the most probable?

a) Antibiotics are used for treatment of both viral and bacterial infections.
b) *Claviceps purpurea* is pathogenic fungus in humans.
c) *Treponema pallidum* is a spirochete that causes syphilis.
d) Tse tse fly transmits leishmaniosis. e) none of the answers is correct

39. The causative agent of tuberculosis is

a) a protist b) a yeast c) a bacterium d) a virus e) none of the answers is correct

40. Human genome project (1990-2003) revealed that the human genome includes approximately following number of genes:

a) 13 000 b) 20 000 – 25 000 c) 30 000 – 40 000 d) 50 000 -100 000
e) none of the answers is correct