

**1. Conjugation is:**

- A) asexual reproduction of bacteria
- B) exchange of genetic material in bacteria
- C) reproduction of viruses
- D) exchange of genetic material mediated by viruses

**2. Latent viruses:**

- A) their RNA is incorporated in cellular genome
- B) are symbiotic
- C) their DNA is incorporated in cellular genome
- D) can not carry oncogenes

**3. Prions are:**

- A) products of brain degeneration
- B) protein particles
- C) cause of genetic mutation
- D) glycolipid particles

**4. The structure of bacteriophage contains:**

- A) head, tail, envelope
- B) head, base plate, flagellum
- C) head, flagellum, fibers
- D) head, tail, base plate, fibers

**5. Cell wall of Gram positive bacteria contains thick layer of:**

- A) peptidoglycan
- B) lipopolysaccharides
- C) carbohydrates
- D) lipoproteins

**6. Function of lysosomes is:**

- A) synthesis of enzymes
- B) intracellular digestion
- C) storage of proteins
- D) phagocytosis

**7. Euchromatin contains:**

- A) Barr bodies
- B) inactive genes
- C) repetitive sequences
- D) structural genes

**8. RNA processing of the primary transcript (pre-mRNA) includes:**

- A) polyadenylation of 3' end
- B) excision of exons
- C) methylation of introns
- D) splicing

**9. Gregor Mendel DID NOT observe inheritance pattern in one of these characters of peas:**

- A) flower color
- B) seed shape
- C) root length
- D) pod shape

**10. Assign the alignment of genes on the chromosome, if AB p=5%, BC p=3%, and AC p=2% (p = Morgan number):**

- A) ABC
- B) ACB
- C) BAC
- D) CAB

**11. Match the statement: "Determines phenotype in a heterozygote" with the term:**

- A) codominant allele
- B) recessive allele
- C) incomplete dominant allele
- D) complete dominant allele

**12. What is the physical basis of Mendel's laws?**

- A) the behavior of chromosomes during meiosis
- B) the behavior of chromosomes during mitosis
- C) the behavior of chromosomes during interphase
- D) the behavior of chromosomes during S phase

**13. How many chromatids are in the somatic cell during G<sub>2</sub> phase?**

- A) 23
- B) 46
- C) 92
- D) impossible to define

**14. How many Barr bodies you can find in cells of individuals with karyotype 47, XXX?**

- A) 0
- B) 1
- C) 2
- D) 3

**15. If a man with AB blood group marries a woman with O blood group, which blood groups would you expect in their children?**

- A) blood group A or blood group B
- B) blood group A or blood group O
- C) blood group B or blood group O
- D) blood group A or blood group B or blood group O

**16. Synthesis of extracellular matrix in bones is done by:**

- A) osteoblasts
- B) osteocytes
- C) osteoclasts
- D) osteopores

**17. Functions of epithelia include:**

- A) conduction, contraction
- B) absorption, secretion
- C) sensation, photosynthesis
- D) will control, respiration

**18. Nerve system develops from:**

- A) mesoderm
- B) endoderm
- C) ectoderm
- D) mesenchyme

**19. Aorta originates in:**

- A) right atrium
- B) right ventricle
- C) left ventricle
- D) left atrium

**20. Which process occurs in the small intestine?**

- A) absorption of nutrients
- B) production of bile
- C) taste sensation
- D) mixing of the chyme with hydrochloride acid

**21. Function of renal duct system is:**

- A) secretion of amino acids
- B) excretion of amino acids
- C) reabsorption of amino acids
- D) degradation of amino acids

**22. Oxytocin secretion, controlling milk release by the mammary glands, is regulated by:**

- A) negative feedback
- B) hypothalamus feedback
- C) pituitary feedback
- D) positive feedback

**23. A cell's membrane potential shifts from -70mV to -50mV. What changes in the cell's permeability could cause such a shift?**

- A) an increase in permeability to  $\text{Ca}^+$
- B) an increase in permeability to  $\text{Li}^+$
- C) an increase in permeability to  $\text{Mn}^+$
- D) an increase in permeability to  $\text{Na}^+$

**24. Supporting cells of CNS (glia) lining of central canal and ventricles are called:**

- A) astrocytes
- B) ependyma
- C) oligodendrocytes
- D) Schwann cells

**25. In CNS, primary motor cortex is located:**

- A) in frontal lobe
- B) in parietal lobe
- C) in temporal lobe
- D) in occipital lobe

**26. Focusing in the mammalian eye on nearby objects:**

- A) lens does not change
- B) lens becomes flatter
- C) lens becomes thicker and rounder
- D) lens becomes contract and smooth

**27. Which statement is NOT correct?**

- A) Undernourished persons have diets deficient in calories.
- B) Malnourished persons are missing one or more essential nutrients.
- C) Undernourished persons have diets deficient in dietary minerals.
- D) Malnourished persons have diets deficient in proteins.

**28. In population at equilibrium, on a gene with 2 alleles; the frequency of dominant allele is 70%, the frequency of recessive allele is 30%. What is the frequency of dominant phenotype?**

- A) 0.70
- B) 0.49
- C) 0.91
- D) 0.42

**29. In atmosphere there is ... of oxygen:**

- A) 21%
- B) 78%
- C) 2%
- D) 36%

**30. Which sequence of the pyramid of life in an ecosystem is correct?**

- A) solar energy – herbivores – plants – carnivores
- B) solar energy – carnivores – herbivores – plants
- C) solar energy – plants – carnivores – herbivores
- D) solar energy – plants – herbivores – carnivores

**1. The second most abundant cation of the intracellular fluid is magnesium. There are various forms of nutritional supplements that can bring magnesium to the human body: which of the following is a correct formula of such a supplement?**

- A)  $MgO_2$
- B)  $(H_2N-CH_2-COO)_2Mg$
- C)  $Mg_2O$
- D)  $H_2N-CH_2-COOMg$

**2. What is the correct formula of calcium phosphate?**

- A)  $CaPO_4$
- B)  $Ca_2(PO_4)_3$
- C)  $Ca_3(PO_4)_2$
- D)  $Ca(PO_4)_2$

**3. What is the correct name of  $HBrO$ ?**

- A) hypobromous acid
- B) hydrobromic acid
- C) bromous acid
- D) bromic acid

**4. Iron occurs in the human body mainly in two forms: as ferrous or ferric cations. Only the ferrous ion can be transported through the plasma membrane, it is the same form of iron as found in the structure of hemoglobin. The ferrous ion is**

- A)  $Fe(II)$
- B)  $Fe(III)$
- C)  $Fe(VI)$
- D)  $Fe(I)$

**5. What happens to the pH of a solution when  $CO_2$  is dissolved in water?**

- A) increases
- B) decreases
- C) remains the same
- D) becomes neutral

**6. Which of the following compounds is a strong acid?**

- A)  $CH_3COOH$
- B)  $H_2CO_3$
- C)  $HCl$
- D)  $NH_3$

**7. In the reaction  $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$ , which species is reduced?**

- A)  $Zn$
- B)  $Cu$
- C)  $SO_4$
- D)  $ZnSO_4$

**8. A catalyst in a reaction:**

- A) raises the activation energy of a reaction
- B) lowers the activation energy of a reaction
- C) increases the equilibrium constant
- D) decreases the equilibrium constant

**9. Choose the correct description of this chemical reaction:  $NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$**

- A) ammonia acts as an acid
- B) water acts as an acid
- C) ammonium acts as a conjugate base
- D) hydroxide acts as a conjugate acid

**10. Which of the following acids has been used for a neutralization of KOH if  $K_2HPO_4$  is the product?**

- A)  $H_2PO_4$
- B)  $HPO_4$
- C)  $H_4PO_4$
- D)  $H_3PO_4$

**11. What will be the pH of a 0.001M HCl solution after diluting it 100 times?**

- A) 3
- B) 4
- C) 5
- D) 6

**12. How many grams of NaOH are needed to prepare 1 liter of 0.5M NaOH solution? Molar mass of NaOH = 40 g/mol**

- A) 10 g
- B) 20 g
- C) 40 g
- D) 50 g

**13. The pH of the intracellular fluid is 7.0, which means that the concentrations of hydroxonium and hydroxide ions in the cytosol of cells are the following:**

- A) hydroxonium: 0 mol/l, hydroxide: 0 mol/l
- B) hydroxonium: 7 mol/l, hydroxide: 14 mol/l
- C) hydroxonium:  $10^{-7}$  mol/l, hydroxide:  $10^{-7}$  mol/l
- D) hydroxonium:  $10^{-7}$  mol/l, hydroxide: 0 mol/l

**14. 100 ml of a solution contains 2 g of sodium hydroxide. What is the molar concentration of sodium ions in the solution? Relative atomic masses ( $A_r$ ):  $A_r(Na) = 23$ ,  $A_r(O) = 16$ ,  $A_r(H) = 1$**

- A) 0.5 mol/l
- B) 0.23 mol/l
- C) 0.16 mol/l
- D) 0.05 mol/l

**15. The concentration of uric acid in patient's blood sample is 430 micromoles in one liter. This value is the same as**

- A) 43.0 mmol/l
- B) 0.430 nmol/l
- C) 0.430 mmol/l
- D) 43.0 nmol/l

**16. Esterification is a reaction between:**

- A) alcohol and acid
- B) alcohol and base
- C) acid and base
- D) alcohol and aldehyde

**17. Which of the following bonds is the most polar?**

- A) C-H
- B) O-H
- C) N-H
- D) C-C

**18. Which of the following molecules can form cis-trans isomers?**

- A) propene
- B) butenedioic acid
- C) 2-methylpropane
- D) benzene

**19. Which of the following statements is correct in the context of organic chemistry?**

- A) the most oxidized form of a carbon chain is the one that contains only single C-C bonds
- B) a carbon chain is more oxidized if it contains fewer hydrogen atoms
- C) hydrocarbons are in a higher oxidation state than hydrocarbon derivatives such as alcohols
- D) alkenes are more oxidized than alkynes of the same chain length

**20. Which of the following molecules is the least water soluble?**

- A) hexanedioic acid
- B) hexanoic acid
- C) hexyl alcohol
- D) cyclohexadiene

**21. Choose the pair of molecules which BOTH are classified as "secondary": amine and alcohol**

- A)  $\text{CH}_3\text{-CH}_2\text{-N}(\text{CH}_3)_2$  and  $\text{CH}_3\text{-CH}_2\text{-OH}$
- B)  $\text{CH}_3\text{-CH}_2\text{-NH-CH}_3$  and  $\text{CH}_3\text{-CH(OH)-CH}_3$
- C)  $\text{CH}_3\text{-NH-CH}_3$  and  $\text{CH}_3\text{-CH}_2\text{-OH}$
- D)  $\text{CH}_3\text{-CH}(\text{NH}_2)\text{-CH}_3$  and  $\text{CH}_3\text{-CH(OH)-CH}_3$

**22. Which of the following molecules can form a disulfide bond if oxidized?**

- A)  $\text{HOOC-CH}(\text{NH}_2)\text{-CH}_2\text{-SH}$
- B)  $\text{H}_2\text{N-CH}_2\text{-CH}_2\text{-SO}_3\text{H}$
- C)  $\text{CH}_3\text{-S-CH}_2\text{-CH}_3$
- D)  $\text{HOOC-CH}(\text{NH}_2)\text{-CH}_2\text{-CH}_2\text{-S-CH}_3$

**23. Choose the molecule with the lowest molar mass:**

- A) propanol
- B) propanone
- C) ethyl methyl ether
- D) propanoic acid

**24. Which of the following statements is NOT true about hydrocarbons called arenes? Arenes**

- A) contain one or more planar ring
- B) have delocalized pi-electrons
- C) differ in chemical reactivity from alkenes
- D) have either chair or boat conformation

**25. Choose the correct pair of a molecule and its name:**

- A) methanal is  $\text{CH}_3\text{CHO}$
- B) hexadecanoic acid is  $\text{CH}_3\text{-(CH}_2\text{)}_{14}\text{-COOH}$
- C) ethyl propyl ether is  $\text{CH}_3\text{-CH}_2\text{-C(O)-CH}_2\text{-CH}_3$
- D) butane-1,4-diamine is  $\text{H}_2\text{N-CH}_2\text{-CH}_2\text{-CH}_2\text{-NH-CH}_3$

**26. A molecule with a limited water solubility might require a protein carrier in the blood. Which of the following is most likely to be such a molecule?**

- A) pyruvic acid
- B) glucose
- C) cholesterol
- D) acetone

**27. Which type of a chemical bond is broken during the hydrolysis of ATP to ADP and phosphate?**

- A) ether bond
- B) ester bond
- C) glycosidic bond
- D) anhydride bond

**28. Which of the molecules contains the highest number of oxygen atoms?**

- A) sucrose
- B) fructose
- C) glucose
- D) ribose

**29. Which of the following molecules contains a chiral carbon and only two functional groups?**

- A) glycine
- B) serine
- C) lysine
- D) alanine

**30. The arrangement of heteroatoms -CO-NH- occurs in all of the following molecules EXCEPT**

- A) lactose
- B) uracil
- C) albumin
- D) insulin