

BIOLOGY:

1) What are the basic components of proteins?

- A) fatty acids
- B) polysaccharides
- C) lipids
- D) amino acids

2) What is the true statement about phagocytosis?

- A) it is an efflux of solid particles from cells
- B) it occurs only in bacteria
- C) it is import of solid particles into the cell
- D) it is import of liquid particles into the cell

3) What is synthesized on the rough endoplasmic reticulum?

- A) proteins
- B) oligosaccharides
- C) lipids
- D) polysaccharides

4) Which process takes place in lysosomes?

- A) cellular respiration
- B) cellular digestion
- C) synthesis of proteins
- D) synthesis of lipids

5) What is chromatin?

- A) overall extranuclear matter
- B) complex of proteins and DNA
- C) complex of proteins and RNA
- D) DNA and RNA

6) Which compounds are not part of ribonucleic acid (RNA):

- A) phosphate
- B) purines
- C) deoxyribose
- D) pyrimidines

7) What structural components are not part of cytoskeleton?

- A) microtubules
- B) actin filaments
- C) thylakoids
- D) intermediate filaments

8) Translation is the process of translating the sequence of a mRNA molecule into the:

- A) primary structure of protein
- B) primary structure of sugar
- C) primary structure of lipid
- D) primary structure of nucleic acid

9) Prokaryotic cells can be found in:

- A) bacteria
- B) plants
- C) protozoa
- D) animals

10) Mitosis is the process composed of four phases occurring in exact sequence:

- A) prophase - telophase - anaphase - metaphase
- B) prophase - anaphase - telophase - metaphase
- C) prophase - anaphase - metaphase - telophase
- D) prophase - metaphase - anaphase - telophase

11) Constricted central region, where the two chromatids are held together, is known as:

- A) centromere
- B) dictyosome
- C) telomere
- D) centrosome

12) Number of chromosomes in haploid cell of the human body is:

- A) 46
- B) 23
- C) 12
- D) 24

13) The set of all traits of organism is known as:

- A) genotype
- B) phenotype
- C) allele
- D) karyotype

14) Mother has blood group O and father has blood group A. What types of blood group can be found in their children?

- A) AB
- B) A, B
- C) O, A
- D) O, B

15) Offsprings from crossing of a dominant homozygote and a recessive homozygote are:

- A) homozygous dominant with a probability of 100%
- B) homozygous recessive with a probability of 50%
- C) heterozygous with a probability of 25%
- D) heterozygous with a probability of 100%

16) Typical alkaloidal plant family is:

- A) Lamiaceae
- B) Apiaceae
- C) Papaveraceae
- D) Asteraceae

17) Primary metabolites are present:

- A) in all plants
- B) in plant families Asteraceae, Apocynaceae
- C) in fungi
- D) only in roots of plants

18) Abscisic acid belongs to:

- A) plant hormones – stimulators
- B) secondary metabolites
- C) alkaloids
- D) plant hormones – inhibitors

19) Plants of Solanaceae family belong to the toxic plants because they contain:

- A) cardioactive glycosides
- B) proteins
- C) alkaloids
- D) terpenoids

20) Photosynthetic processes occur in:

- A) nucleus
- B) chloroplasts
- C) vacuoles
- D) mitochondria

21) What does not belong among photosynthetic pigments?

- A) carotenoids
- B) chlorophylls
- C) alkaloids
- D) xanthophylls

22) What does belong among plant hormones inhibitors?

- A) auxines
- B) ethylene
- C) morphine
- D) cytokinines

23) Plant family Lamiaceae is known for production of:

- A) essential oils
- B) fatty acids
- C) alkaloids
- D) sugar

24) What is rhizodermis?

- A) root epidermis
- B) rhizome pith
- C) root subepidermal tissue
- D) inner layer of primary cortex

25) Which organisms are heterotrophic?

- A) fungi and non-green plants
- B) green plants
- C) algae
- D) Cyanobacteria

26) Which blood vessel enters right atrium of the heart?

- A) superior vena cava
- B) coronary artery
- C) pulmonary artery
- D) portal vein

27) Cardiac output (amount of blood released from left ventricle in one minute) is:

- A) 200 l/min
- B) 5 ml/min
- C) 300 ml/min
- D) 5 l/min

28) Heart activity can be directly increased by:

- A) adrenalin
- B) parasympathetic nervous system
- C) acetylcholine
- D) cerebellum

29) Blood is physiologically produced in adults only in:

- A) heart
- B) blood vessels
- C) bone marrow
- D) liver

30) Physiological life span of erythrocytes is:

- A) 110 – 120 days
- B) 5 – 10 days
- C) 7 – 10 years
- D) 365 – 380 days

31) Which structure belongs to the lower respiratory tract?

- A) trachea
- B) paranasal sinuses
- C) nasopharynx
- D) nasal cavity

32) Which hormone is produced in adrenal glands?

- A) prolactin
- B) thyroxin
- C) testosterone
- D) aldosterone

33) Which enzyme participates on the protein digestion in small intestine?

- A) trypsin
- B) pepsin
- C) amylase
- D) lipase

34) Which hormone reduces glucose level in blood (hypoglycemic effect)?

- A) insulin
- B) acetylcholine
- C) gastrin
- D) glucagon

35) Which hormone is produced in thyroid gland?

- A) adrenalin
- B) insulin
- C) tyrosine
- D) thyroxin

36) Which substance is not physiologically presented in the final urine?

- A) urea
- B) water
- C) sodium
- D) glucose

37) Light sensitive elements rods and cones are located in:

- A) ciliary body
- B) retina
- C) choroid
- D) sclera

38) Which blood cells in the blood are at least in number:

- A) red blood cells
- B) white blood cells
- C) thrombocytes
- D) erythrocytes

39) Which of below mentioned blood cells do not contain nucleus (in physiological condition):

- A) macrophages
- B) erythrocytes
- C) T lymphocytes
- D) B lymphocytes

40) Physiological pH of blood is:

- A) 1.4 ± 0.04
- B) 7.4 ± 0.04
- C) 74 ± 0.04
- D) 10.4 ± 0.04

41) Which vessel delivers blood into the lungs?

- A) aorta
- B) pulmonary artery
- C) superior vena cava
- D) pulmonary veins

42) Breathing (respiratory) control center is located in the:

- A) lungs
- B) medulla oblongata
- C) cerebellum
- D) spinal cord

43) Which hormone decreases blood pressure?

- A) adrenalin
- B) acetylcholine
- C) noradrenalin
- D) aldosterone

44) Nephron is functional unit located in:

- A) liver
- B) kidney
- C) stomach
- D) lungs

45) Digestion of carbohydrates (sugars) starts in:

- A) stomach
- B) mouth cavity
- C) small intestine
- D) esophagus

46) Which of below mentioned parts is not a part of small intestine?

- A) duodenum
- B) colon
- C) jejunum
- D) ileum

47) Which enzyme participates on carbohydrates digestion?

- A) lipase
- B) amylase
- C) pepsin
- D) chymotrypsin

48) Insulin is produced in:

- A) liver
- B) Langerhans islet of pancreas
- C) Langerhans islet of stomach
- D) kidney

49) Bile is produced in:

- A) small intestine
- B) liver
- C) stomach
- D) pancreas

50) Nutrients are transported from small intestine to the liver by:

- A) aorta
- B) portal vein
- C) inferior vena cava
- D) hepatic artery

CHEMISTRY:

- 1) Dalton's atomic theory postulated that matter:
- A) is in continuous motion
 - B) is composed of small particles called atoms
 - C) can exist in three states – gas, liquid, and solid
 - D) changes in mass when heated to combustion

- 2) Indicate which of the following formulas is named incorrectly:
- A) P_4O_{10} tetraphosphorus decaoxide
 - B) SF_6 sulfur(VI) fluoride
 - C) FeSO_4 iron(III) sulfate
 - D) $\text{Ca}_3(\text{PO}_4)_2$ tricalcium bis(phosphate)

- 3) The formula of hydrogen peroxide is:
- A) H_2O_3
 - B) H_2O_2
 - C) H_2O_4
 - D) H_2O

- 4) Indicate which an element has the false element symbol:
- A) argon Ar
 - B) rhenium Re
 - C) lead Ld
 - D) manganese Mn

- 5) Which of the following is an incorrect statement?
- A) Na and Cs are in the same group in the periodic table
 - B) elements in the same period of the periodic table have similar properties
 - C) fluorine is classified as a nonmetallic element
 - D) most of the known chemical elements are classified as metals

- 6) Which of the following sets of quantum numbers is not allowed:
- A) $n = 3 \quad l = 2 \quad m_l = 0 \quad m_s = 1/2$
 - B) $n = 4 \quad l = 3 \quad m_l = -1 \quad m_s = -1/2$
 - C) $n = 3 \quad l = 1 \quad m_l = -1 \quad m_s = -1/2$
 - D) $n = 2 \quad l = 1 \quad m_l = -2 \quad m_s = 1/2$

7) Silicon has the following number of valence electrons:

- A) 2
- B) 5
- C) 8
- D) 4

8) The halogens (Group 17) all have valence shell structure:

- A) ns^2np^7
- B) ns^2np^8
- C) ns^2np^3
- D) ns^2np^5

9) The *d* subshell can accommodate, for any given principal quantum number, the following number of electrons:

- A) 5
- B) 6
- C) 10
- D) 14

10) Indicate which order of electronegativity is false:

- A) F > Cl > Br > I
- B) O > N > C
- C) O > S > Te
- D) O > F > N

11) Which of the following elements does not consist of diatomic molecules:

- A) oxygen
- B) chlorine
- C) helium
- D) nitrogen

12) Complete the following equation $\text{NH}_4^+ + \text{H}_2\text{O} \rightleftharpoons$

- A) $\text{NH}_3 + \text{H}_2\text{O}$
- B) $\text{NH}_4^+ + \text{OH}^-$
- C) $\text{NH}_2^- + \text{H}_2\text{O}$
- D) $\text{NH}_3 + \text{H}_3\text{O}^+$

13) Consider which of the following acids is the strongest Brønsted acid:

- A) HF
- B) HI
- C) HCl
- D) HBr

14) Choose compound in which the oxidation number (oxidation state) of hydrogen is -I:

- A) HI
- B) NaH
- C) H₂O₂
- D) HClO

15) Indicate metal which reacts according to the following reaction $2M + 2H_2O \rightarrow 2MOH + H_2$:

- A) Zn
- B) Na
- C) Fe
- D) Pt

16) The reaction products of the reaction $Cl_2 + NaOH \rightarrow$ are:

- A) NaCl + H₂O
- B) NaOCl + H₂O
- C) NaOCl + H₂
- D) NaOCl + NaCl + H₂O

17) Which of the following oxides has amphoteric behavior?

- A) SO₂
- B) Na₂O
- C) P₂O₅
- D) Al₂O₃

18) Indicate compound which is not oxidizing agent:

- A) nitric acid
- B) chlorine
- C) hydrogen
- D) sodium hypochlorite

19) Which of the following is oxidation-reduction reaction?

- A) $\text{Cl}_2 + 2\text{KI} \rightarrow \text{I}_2 + 2\text{KCl}$
- B) $\text{K}_2\text{SO}_4 + \text{Ba}(\text{NO}_3)_2 \rightarrow \text{BaSO}_4 + 2\text{KNO}_3$
- C) $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
- D) $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3$

20) Which of the following compounds contains ionic bonds?

- A) XeF_4
- B) CS_2
- C) H_2SO_4
- D) NaI

21) In a sample of hydrogen gas there are 4.92×10^{18} hydrogen atoms. How many methane molecules could be formed?

- A) 4.92×10^{18} molecules
- B) 4.92×10^4 molecules
- C) 1.23×10^{18} molecules
- D) $1.23 \times 10^{4.5}$ molecules

22) Determine the empirical formula of a compound that contains 89.7% bismuth and 10.3% oxygen. [AW of Bi is 209; AW of O is 16]

- A) BiO
- B) BiO_2
- C) Bi_2O
- D) Bi_2O_3

23) Aluminium chloride is prepared from hydrogen chloride gas and aluminum metal.
 $2\text{Al} + 6\text{HCl} \rightarrow 2\text{AlCl}_3 + 3\text{H}_2$

Suppose a reaction vessel contains 0.15 mol Al and 0.30 mol HCl. How many moles of AlCl_3 can be prepared from this mixture?

- A) 0.15 mol
- B) 0.30 mol
- C) 0.10 mol
- D) 0.50 mol

24) What volume of 12.4 M HCl would you need to make 500.0 mL of 3.50 M HCl?

- A) 500 mL
- B) 71 mL
- C) 141 mL
- D) 124 mL

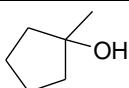
25) If 15.6 g NaCl is dissolved in water to make 275 mL of solution, what is the molarity of the solution? [MW of NaCl is 58.44 g/mol]

- A) 0.266 M
- B) 0.057 M
- C) 0.212 M
- D) 0.971 M

26) Multiple bonds in organic compounds can form elements:

- A) N, P, H, O
- B) S, Cl, O, Br
- C) C, N, O, P
- D) H, B, S, O

27)



The structure represents:

- A) secondary alcohol
- B) a substance that cannot be esterified
- C) aromatic alcohol
- D) a substance from which a halogen derivative can be prepared via a polar substitution

28) Configuration cannot be determined for

- A) Valine
- B) 4-Chlorobutan-1-ol
- C) Serine
- D) Glucose

29) Acetylene

- A) is released by reaction of carbanilide with water
- B) has acidic hydrogens
- C) is non-flammable
- D) has all three carbons in sp hybridization

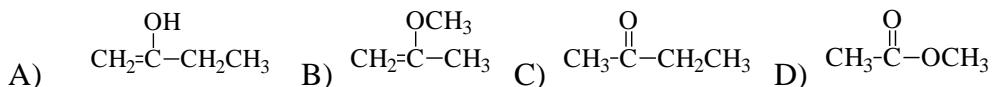
30) The reaction of benzene with acetyl chloride

- A) is feasible in the presence of a Lewis base
- B) provides the acetylated benzoic acid
- C) in the presence of AlCl₃ provides Friedel-Crafts acylation
- D) leads to the benzene acetylene preparation

31) Naphthalene

- A) is cycloalkane
- B) contains two saturated rings
- C) is aromatic
- D) doesn't undergo electrophilic substitution

32) Which of these compounds is not stable



33) Which of the following substances provides a stable salt in the aqueous solution:

- A) 2-Hydroxyethyl acetate
- B) Ethanol
- C) *tert*-Butanol
- D) Phenol

34) Which derivative of acetic acid is hydrolyzed most rapidly

- A) Acetamide
- B) Acetyl chloride
- C) Acetohydroxamic acid
- D) Acetic anhydride

35) Waxes are

- A) esters of glycerol and fatty acids
- B) compounds of higher fatty alcohols and tricarboxylic acids
- C) amides of higher fatty alcohols and higher fatty acids
- D) strongly lipophilic substances of plant and animal origin

36) A common feature of all the natural amino acids is that they have the absolute configuration:

- A) D, L
- B) d
- C) +
- D) L

37) $\text{CH}_3\text{CH}_2\text{SCH}_2\text{CH}_3$ is called

- A) thiol
- B) sulfone
- C) sulfide
- D) sulfite

38) Grignard compounds have

- A) lithium
- B) structural fluctuation
- C) always about 5% of carbonyl compounds
- D) magnesium

39) Which statement is true about the reaction?



- A) reversible
- B) nucleophilic substitution
- C) cannot undergo
- D) typical rearrangement

40) Benzoic acid is formed by

- A) addition of CO_2 on benzene ring
- B) addition of $-\text{COOH}$ on benzene ring
- C) oxidation of toluene
- D) reduction of phenol

41) Conversion of cyclohexanone to cyclohexanol is

- A) reduction
- B) oxidation
- C) elimination
- D) degradation

42) The basic building block of cell membranes are

- A) aminolipids
- B) glycolipids
- C) proteolipids
- D) phospholipids

43) The hydrolysis of fats is

- A) their reaction with soap
- B) their reaction with glycerol
- C) their reaction with alkali hydroxide
- D) enzymatic reactions occurring in the liver only

44) The core structure of steroids, cyclopentanoperhydrophenanthrene, is a hydrocarbon with the following number of rings

- A) 4
- B) 6
- C) 3
- D) 1

45) Genetic information is encoded in

- A) nucleosides
- B) nucleotides
- C) nucleic acids
- D) nucleic bases

46) Sugar molecule present in the DNA is

- A) ribose
- B) 2-deoxyribose
- C) 3-deoxyribose
- D) 4-deoxyribose

47) Bases in nucleic acids are bounded to each other by

- A) hydrogen bonds
- B) non-binding hydrophobic interactions
- C) covalent bonds
- D) ion interactions

48) Codon is

- A) a triplet of bases in mRNA molecule corresponding to a DNA triplet
- B) receptor of a steroid nature
- C) A roll of protein fiber from which silk is obtained by untangling
- D) base pairs in the molecule of rRNA corresponding to DNA doublets

49) The binding of substrate to the enzyme is most often

- A) reversible
- B) covalent
- C) irreversible
- D) metamorphic

50) Mark improper statement for sucrose

- A) it is disaccharide
- B) it is the beet sugar
- C) it contains fructose in molecule
- D) it is maltose