

МИНИСТЕРСТВО НАУКИ, ВЫСШЕГО ОБРАЗОВАНИЯ И
ИННОВАЦИЙ КЫРГЫЗСКОЙ РЕСПУБЛИКИ
ОШСКИЙ МЕЖДУНАРОДНЫЙ МЕДИЦИНСКИЙ УНИВЕРСИТЕТ
КАФЕДРА ЕСТЕСТВЕННО-ГУМАНИТАРНЫХ ДИСЦИПЛИН

“УТВЕРЖДЕНА”

На заседании кафедры протокол № _____

« _____ » _____ 2025 г.

Заведующий кафедрой, д.филос.н.доцент

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ФОНД ТЕСТОВЫХ ЗАДАНИЙ
для итогового контроля по дисциплине
«Биоорганическая химия»
на 2025-2027 учебный год
Направление: «560001 - Лечебное дело (GM)»

курс – 1, семестр – I

Наименование дисциплины	Всего	Кредит	Аудиторные занятия (60ч)		СРСП	СРС
			Лекции	Лабораторные		
Биоорганическая химия	120ч	4 кр	20 ч	28 ч	12	60 ч
Кол-во тестовых вопросов	320					

Составитель:

Иматали кызы К.,

Ош - 2025

- Which compounds enter addition reactions?
 - Unsaturated hydrocarbons;
 - Saturated hydrocarbons;
 - Aromatic hydrocarbons;
 - Alcohols;
- Which of the following are homologues?
 - Pentanoic acid and pentanedioic acid;
 - Butenedioic acid and butynedioic acid;
 - Butanoic acid and butanedioic acid;
 - Butanedioic acid and pentanedioic acid.
- What are the electronic effects of functional groups in the molecule of 4-hydroxybutanoic acid?
 - I; b) +M; c) +M, + I; d) -M, - I;
- What is the pH in lysine water solution
 - Basic; b) Acidic;
 - Neutral; d) Depends on conditions;
- Which reaction provides biological function of ATP?
 - Esterification; b) Hydrolysis;
 - Dehydration; d) Transamination;
- Which molecule contains pyrrole ring?
 - Nicotinic acid; b) Uric acid;
 - Adenine; d) Hemoglobine;
- π - π - conjugation has the structure:
 - pentadiene - 1.3 b) pentadiene - 1.4
 - butanoic acid; d) propanoic acid.
- Aromatic compounds are:
 - cyclohexane; b) cyclooctatetraene;
 - naphthalene; d) butadiene
- Energy of 2-chlorobutane in the eclipsed conformation more than gauche because in the eclipsed conformation:
 - the other configuration of the molecule;
 - the greater torsional stress;
 - increased Van der Waals repulsion.
 - the molecule another electronic structure;
- The product of hydration reaction of aconitoic (3-carboxypentyl-2-dioic) acid, flowing through Markovnikov rule (in vivo) is:
 - isocitric acid;
 - 3-hydroxy-3-carboxypentanedioic acid;
 - acetoacetic acid;
 - 2-hydroxy-3-carboxypentanedioic acid.
- Characteristic reaction for Benzene proceeds by following mechanisms:
 - A_N ; b) A_E ;
 - S_N ; d) S_E ;
- In initiation step:
 - generation of radicals.
 - the step where the products of the reaction are formed.
 - radicals are removed from the reaction mixture.
 - generation of ions
- By the alkaloid pyridine group include:
 - quinine; b) nicotine;
 - morphine; d) cocaine;
- Tautomeric transformations are possible for the following heterocyclic compounds:
 - furan; b) pyridine;
 - pyrrole; d) imidazole (1,3-diazole);
- Structure of D-glucose configuration corresponds to the number of stereoisomers:
 - four; b) eight;
 - sixteen d) thirtytwo;
- How many functional groups have D-glucose?
 - 1; b) 2;
 - 3; d) 4.
- Phenol is a compound:
 - acyclic; b) carbocyclic;
 - heterocyclic; d) saturated;
- 2-Isopropyl-5-methylcyclohexanol on carbon skeletal structure of the compound is:
 - carbocyclic; b) heterocyclic;
 - unsaturated and acyclic.; d) aromatic;
- Give the systematic IUPAC name to the following compound
 $NH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH(NH_2) - COOH$
 - 2,6-diaminohexanoic acid
 - 2,6-aminohexanoic acid
 - 1,5-diaminohexanoic acid
 - 3,6-diaminohexanoic acid
- There is sp^2 - hybrid atoms in molecule of:
 - butane b) propane;
 - pentane ; d) ethene
- p - π - conjugate has the structure:
 - acetic acid; b) 2-propenal
 - ethylene glycol; d) pyridine;
- The following compounds are not aromatic:
 - pyridine; b) cyclohexene-1;
 - anthracene; d) furan.
- The conformations of 1-chloropropane

- with a torsion angle of 60° and 300° are degenerate, because in these conformations the molecule have:
- same configuration;
 - same chemical structure;
 - different conformational structure;
 - same torsion, Van der Waals and angular stresses;
24. The weakest acid is:
- ethanamine;
 - ethanol;
 - phenol;
 - ethanoic acid;
25. Heterolytic cleavage of chemical bonds is possible for the following compounds:
- 2-chloropropane;
 - ethane;
 - Br_2 ;
 - benzene;
26. The product of the hydration of fumaric (butenedioic acid) in vivo is:
- citric acid;
 - malic acid;
 - 2-hydroxybutanoic acid;
 - 2,3-dihydroxybutanedioic acid;
27. To conduct methylation reaction of benzene are needed the following conditions:
- acid catalyst;
 - concentrated alkali (NaOH , KOH);
 - catalyst FeCl_3 .
 - ultraviolet radiation;
28. In propagation step:
- generation of radicals.
 - the step where the products of the reaction are formed.
 - radicals are removed from the reaction mixture.
 - generation of ions
29. Imidazole corresponds to the systematic name:
- 1,3-diazole;
 - azine;
 - 1,3-diazine;
 - azole;
30. Tautomerism possible for the heterocyclic compounds whose molecules are present at the same time the reaction centers:
- two acidic;
 - acidic and basic;
 - two major
 - basic and electrophilic;
31. Ability for nucleophilic substitution (S_N) in a series of reactions of compounds decreases from left to right:
- pyridine, pyrimidine, pyridazine;
 - pyrrole, oxazole, benzene;
 - pyridine, benzene, pyrimidine;
 - pyridazine, pyridine, benzene.
32. Carbon in organic compounds has a valence equal to ...
- IV
 - II
 - III
 - V.
33. Benzoic acid is a compound:
- acyclic;
 - carbocyclic;
 - aromatic;
 - heterocyclic;
34. 1,2,3-propanetriol is the compound of:
- heterofunctional;
 - aromatic;
 - unsaturated;
 - polyfunctional;
35. Give the systematic IUPAC name to the following compound
- $\text{HOOC} - \text{CH}_2 - \text{CH}(\text{OH}) - \text{CH}_2 - \text{COOH}$
- 3-hydroxypentanoic acid
 - hydroxypentanedioic acid
 - 3-hydroxypentanedioic acid
 - 2-hydroxypentanedioic acid
36. There is sp - hybrid atoms in molecule of:
- butyne
 - propane;
 - pentane ;
 - ethane
37. π - π - conjugation has the structure:
- $\text{CH}_2 = \text{CH} - \text{CH} = \text{CH}_2$
 - $\text{CH}_2 = \text{CH}_2$
 - $\text{CH}_2 = \text{CH} - \text{Cl}$
 - $\text{CH}_2 = \text{CH} - \text{O} - \text{CH} = \text{CH}_2$
38. In the functional group has a negative mesomeric effect in the compound of:
- ethanol;
 - glycerol;
 - acetone;
 - buten-2-ol;
39. The molecule 1,2 - dimethylcyclohexane has the maximum amount of energy, if:
- both methyl substituents in the equatorial bonds;
 - both methyl substituents in the axial connections;
 - one of the two substituents on the axial connection
 - the one of the two substituents on the equatorial bond;
40. The most strong acidic properties of the compound shown in:
- acetic acid;
 - propanoic acid;
 - 2-methylpropanoic acid;
 - 2,2,2-trichloroethanoic acid;
41. The nucleophilic reagents include:
- Na^+
 - $\text{C}_3\text{H}_7\text{NH}_2$, OH^- ;
 - ammonium ion;
 - CH_4 ;
42. The product of the reaction of hydration of 2-propenal is:
- 2-hydroxypropanal;
 - propanoic acid;
 - acetal;
 - 3-hydroxypropanal;
43. The product of bromination of phenol is:

- a) 2-bromophenol;
 b) 3-bromophenol;
 c) 2,4,6 tribromophenol;
 d) 3,3-dibromophenol;
44. In termination step:
 a) generation of radicals;
 b) the step where the products of the reaction are formed;
 c) radicals are removed from the reaction mixture;
 d) generation of ions;
45. Pyrimidine corresponds to the systematic name:
 a) diazole 1.3; b) 1,3-diazine;
 c) 1,4-diazepine; d) azine;
46. The basic properties of heterocyclic compounds are shown in their reactions:
 a) with bases;
 b) with acids;
 c) with bicarbonates;
 d) halogenated hydrocarbons;
47. The ability of the reactions of nucleophilic substitution (SN) is maximal among aromatic compounds, characterized by:
 a) the electronic structure of benzene;
 b) π -electron structure insufficient;
 c) the electronic structure of furan;
 d) π -electron structure of the excess;
48. D-glucose and L-glucose relate to each other as:
 a) enantiomers; b) diastereomers;
 c) epimers; d) anomers
49. Hexane is a compound:
 a) cyclic; b) carbocyclic;
 c) heterocyclic; d) saturated;
50. According to functional groups 4 - hydroxy - 3 - ethoxybenzaldehyde is:
 a) phenol, aldehyde, ether,
 b) acid, Na^+ ;
 c) ester;
 d) alcohol.
51. By the IUPAC nomenclature the following compound is:
 $\text{HC}\equiv\text{C} - \text{CH}_2 - \text{CH}_3$
 a) butyne-1 b) butyne-2
 c) butane d) butene
52. There is no sp - hybrid atoms in molecule of:
 a) butyne b) propyne;
 c) pentyne ; d) ethane
53. p- π - conjugate has the structure:
 a) $\text{CH}_2 = \text{CH} - \text{CH} = \text{CH}_2$
 b) $\text{CH}_2 = \text{CH}_2$
 c) $\text{CH}_2 = \text{CH} - \text{Cl}$
 d) $\text{CH}_2 = \text{CH} - \text{CH} = \text{CH} - \text{CH}_3$
54. In the functional group has a negative inductive effect only in compound of:
 a) phenol;
 b) acetic acid;
 c) methylphenylketone;
 d) ethanedioic acid;
55. The chiral molecule is:
 a) glycine (2-aminoethanoic acid);
 b) serine, (2-amino-3-hydroxypropanoic acid);
 c) aminoethanol;
 d) 1-butanol;
56. Electrophilic particles are:
 a) cations: H^+ , NO_2^+ , SO_3H^+ , Me^n+ ;
 2) molecules with lone electron pairs (Lewis bases)
 c) compounds with multiply bonds $>\text{C}=\text{C}<$, $-\text{C}\equiv\text{C}-$;
 d) anions: OH^- , Hal^- , HSO_3^- , RS^- ;
57. Electrophilic reagents are:
 a) NH_3 ; b) Br^+ , cation nitro;
 c) $\text{C}_2\text{H}_5\text{OH}$; d) ethanal.
58. For propene hydration reaction is necessary to establish the following conditions:
 a) anhydrous conditions;
 b) the ultraviolet radiation;
 c) acid catalyst;
 d) catalyst;
59. Product of mononitration of benzaldehyde is:
 a) 2-nitrobenzaldehyde;
 b) 3-nitrobenzaldehyde;
 c) 4-nitrobenzaldehyde;
 d) 3, 3-dinitrobenzaldegid;
60. Characteristic reaction for unsaturated compounds:
 a). radical substitution
 b) electrophilic addition
 c) electrophilic substitution
 d) nucleophilic substitution
61. Reactions of acetoacetic ester with bromine water and iron (III) chloride (FeCl_3) allow us to prove:
 a) p- π -conjugation;
 b) The keto-enol tautomerism of acetoacetic ester;
 c) π - π -conjugation in the molecule;
 d) ester group;
62. In reactions with bases under normal conditions of uric acid (2,6,8-

- trihydroxypurine) forms a salt:
- ammonium salts;
 - barbiturates;
 - the salts of nitrogenous bases;
 - acid and urate average;
63. The rate of electrophilic substitution reactions (S_E) is reduced to a series of compounds from left to right:
- pyridine, pyrrole, benzene;
 - benzene, pyrrole, pyridine;
 - benzene, pyridine, pyrrole;
 - pyrrole, benzene, pyridine.
64. D-glucose and D-galactose relate to each other as:
- enantiomers;
 - diastereomers;
 - structural isomers;
 - anomers
65. Ethylene is a compound:
- acyclic;
 - carbocyclic;
 - heterocyclic;
 - unsaturated;
66. How many functional groups have 2 – hydroxy - 4 – methyl benzoic acid?
- 1;
 - 2;
 - 3;
 - 4;
67. By the IUPAC nomenclature the following compound is; $H_3C - C \equiv C - CH_3$
- butyne-1
 - butyne-2
 - butane
 - butene
68. π - π – conjugation has the structure:
- propanoic acid.
 - pentadiene - 1.4
 - butanoic acid;
 - pentadiene - 1.3
69. All are electron withdrawing functional groups in the compounds:
- 2-aminoethanol-1;
 - 2-hydroxybenzoic acid;
 - 4-aminobenzoyl sulfonic acid.
 - 4-hydroxy-3-methoxybenzaldehyde;
70. The chiral molecule is:
- D - glucose ;
 - Glycerol
 - 2 - aminoethanol;
 - 2-hydroxypropane;
71. Nucleophiles are:
- cations: H^+ , NO_2^+ , SO_3H^+ , Me^{n+} ;
 - molecules with vacant orbitals (Lewis acids)
 - Molecules which contain atoms with low electron density;
 - anions: OH^- , Hal^- , HSO_3^- , RS^- ;
72. As a electrophilic substrate can serve the following compounds:
- ethanoic acid;
 - propene;
 - methanamine;
 - hydrochloric acid;
73. The product of the reaction of 1-butene and HBr is:
- 1 brombutan;
 - 2 brombutan;
 - butane;
 - 1,3-butadiene;
74. Product of monomethylation of benzoic acid is:
- 2- metilbenzoic acid;
 - 3- metilbenzoic acid;
 - 4-metilbenzoic acid;
 - 2,4,6-trimetilbenzoic acid;
75. Characteristic reaction for saturated compounds:
- radical substitution
 - electrophilic addition
 - electrophilic substitution
 - nucleophilic addition
76. Upon heating of lactic acid (2-hydroxypropanoic) are formed:
- anhydride and H_2O ;
 - H_2O and lactide;
 - lactam and H_2O ;
 - diketopiperazine and H_2O ;
77. The reaction of formation of salts with bases uric acid (2,6,8-trihydroxypurine) behaves like:
- monobasic acid;
 - dibasic acid;
 - tribasic acid;
 - can not form salts with bases;
78. Electrophilic substitution reactions (S_E) with a minimum flow rate from:
- toluene (methylbenzene);
 - pyrimidine (1,3-diazine
 - pyridine;
 - furan;
79. D-glucose and D-fructose are related to each other as:
- enantiomers;
 - diastereomers;
 - epimers;
 - structural isomers

80. By the IUPAC nomenclature the following compound is;
 $\text{H}_3\text{C} - \text{CH} = \text{CH} - \text{CH}_3$
 a) butyne-2 b) butene-1
 c) butane d) butene - 2
81. Butane is a compound:
 a) acyclic; b) carbocyclic;
 c) heterocyclic; d) saturated
82. There is sp^3 - hybrid atoms in molecule of:
 a) butyne b) propane;
 c) pentyne ; d) ethene
83. What is the kind of conjugation in the molecule of aniline (aminobenzene) between functional group and aromatic ring?
 a) p, π b) π, π c) p, p
 d) there is no conjugated system
84. In the functional group has a negative inductive effect only in compound of:
 a) phenol;
 b) ethanedioic acid;
 c) methylphenylketone;
 d) acetic acid;
85. 2-aminopropanoic acid has the following stereoisomers:
 a) 1; b) 2;
 c) 3; d) 4;
86. Nucleophiles are:
 a) H^+ b) NH_4^+ ,
 c) OH^- , d) Na^+
87. The characteristic reaction of alkenes is proceeding following mechanisms:
 a) A_E ; b) A_N
 c) S_E ; d) S_N ;
88. Carbocations are.....
 a) particles, which contain positively, charged carbon atoms.
 b) particles, which contain negatively, charged carbon atoms.
 c) particles, which contain unpaired electrons.
 d) particles, which contain positively and negatively, charged carbon atoms.
89. Characteristic reaction for aromatic compounds:
 a) radical substitution
 b) electrophilic addition
 c) electrophilic substitution
 d) nucleophilic substitution
90. The acidic properties of imidazole (1,3-diazole) expressed more than:
 a) barbituric acid;
 b) 2,4-dihydroxypyrimidine;
 c) sulfuric acid;
 d) pyrrole;
91. Electrophilic substitution reactions (S_E) with a maximum flow rate in most soft conditions the compounds:
 a) benzene and its homologues;
 b) π -excessive aromatic heterocyclic rings;
 c) alkanes and cycloalkanes;
 d) π -deficient aromatic heterocycles;
92. The reaction of hydrogen removal is called ...
 a) dehydrogenation b) hydrogenation
 c) dehydration d) hydration
93. Pyridine is a compound:
 a) acyclic; b) carbocyclic;
 c) heterocyclic; d) saturated;
94. 2-aminobutanoic acid is the compound of:
 a) heterofunctional; b) aromatic;
 c) unsaturated; d) polyfunctional;
95. There is sp^2 - hybrid atoms in molecule of:
 a) butene; b) propane;
 c) pentyne ; d) acetylene
96. $\text{p}-\pi$ - conjugate has the structure:
 a) ethylene glycol; b) 2-propenal;
 c) acetic acid; d) pyridine;
97. Newman projection formula is written to show the differences of:
 a) chemical structure of the compounds;
 b) conformations and configuration of the molecule;
 c) structural isomers;
 d) geometric structure;
98. 2, 3, 4-trihydroxybutanoic acid corresponds to the following stereoisomers:
 a) 6; b) 2;
 c) 9; d) 4;
99. Electrophilic particles are:
 a) H b) H^- c) H^+ d) Br^-
100. Alkane characterized by the following reaction:
 a) A_E ; b) A_N ;
 c) S_N ; d) S_R ;
101. The chlorination reaction of following compounds proceeds by a mechanism of radical substitution when exposed ultraviolet radiation:

- a) cyclohexane; b) benzene;
c) acetylene; d) 1,3-butadiene
102. Conjugated systems are :
a) Thermodynamically stable
b) Very reactive
c) Thermodynamically unstable
d) Very unreactive
103. Characteristic reaction for unsaturated compounds:
a) radical substitution
b) electrophilic addition
c) electrophilic substitution
d) nucleophilic substitution
104. The reaction, which released water, is
a) dehydrogenation b) hydrogenation
c) dehydration d) hydration
105. Cyclohexane is a compound:
a) acyclic; b) carbocyclic;
c) heterocyclic; d) saturated;
106. Furan is the compound of:
a) heterofunctional; b) heterocyclic;
c) unsaturated; d) polyfunctional;
107. There is sp - hybrid atoms in molecule of:
a) butene b) propane;
c) pentane ; d) acetylene
108. π - π - conjugation has the structure:
a) propanoic acid.
b) pentadiene - 1.4
c) butanoic acid;
d) butadiene - 1.3
109. Energy of propanol-1 in the anti-conformation is less than gauche conformation, because in the anti-conformation:
a) less angular tension;
b) configuration has changed;
c) decreased Van der Waals repulsion;
d) was less torsional stress;
110. The following conditions for the reaction of chlorination of butane are needed:
a) room temperature;
b) exposure to ultraviolet radiation (h ν);
c) cooling
d) catalyst $FeCl_3$;
111. A major product of reaction (equimolecular ratio of mixture) of 2-methylpentane with bromine (when exposed to ultraviolet radiation) is:
a) 1-bromo-2-methylpentane;
b) 2-bromo-2-methylpentane;
c) 1,2-dibromo-2-methylpentane;
d) 3-bromo-2-methylpentane;
112. Radicals are.....
a) particles, which contain positively, charged carbon atoms.
b) particles, which contain negatively, charged carbon atoms.
c) particles, which contain unpaired electrons.
d) particles, which contain positively and negatively, charged carbon atoms.
113. Characteristic reaction for saturated compounds:
a) radical substitution
b) electrophilic addition
c) electrophilic substitution
d) nucleophilic addition
114. The structure of 2-amino-3-methylbutanoic acid is a natural α -amino acid:
a) leucine; b) isoleucine;
c) valine; d) tyrosine;
115. Macromolecules peptides and proteins are constructed from residues:
a) α -amino acids;
b) oxocarboxylic acids;
c) β -amino acids;
d) γ -amino acids;
116. Pyrimidine nucleotide nitrogenous bases mentioned in the examples:
a) birbiturovaya acid; b) guanine;
c) thymine; d) adenine;
117. The lipids are:
a) low molecular weight well water-soluble substances;
b) high molecular weight (polymer) water-soluble substances;
c) bio polymers, low solubility in water;
d) low molecular weight insoluble substances;
118. Which compound enters addition reactions?
a) $CH_3-CH_2-NH_2$;
b) $CH_3-CH_2-CH_2-CH_3$;
c) CH_3-CH_2-OH ;
d) $CH_3-CH=CH-CH_2-CH_3$;
119. D-glucose and D-fructose are related to each other as:
a) enantiomers; b) diastereomers;
c) epimers; d) structural isomers
120. Under the action of strong oxidants in acid medium (dilute nitric acid) monosaccharides form:
a) gluconic acid;
b) glucaric acid;

- c) glucuronic acid;
d) glycolic acid;
121. The non-reducing disaccharide is:
a) D-glucose; b) amylopectin;
c) maltose; d) sucrose.
122. In the present structure of the cellulose glycosidic bonds:
a) Only β -(1 $\rightarrow$ 4);
b) α -(1 $\rightarrow$ 4) and α -(1 $\rightarrow$ 6);
c) β -(1 $\rightarrow$ 4) and α -(1 $\rightarrow$ 4);
d) β -(1 $\rightarrow$ 4), β -(1 $\rightarrow$ 3);
123. The primary structure of DNA is represented by:
a) linear polypeptide chain;
b) helical polysaccharide chain;
c) double-stranded polynucleotide of the structure;
d) structure of single-stranded polynucleotide;
124. The structure of 2-amino-3-hydroxybutanoic acid is a natural α -amino acid:
a) threonine; b) valine;
c) phenylalanine; d) tryptophan;
125. The isoelectric point of the tripeptide Ser-His-Asn is in the medium:
a) acidic; b) basic;
c) neutral; d) can not be determined.
126. Pyrimidine nucleotide nitrogenous bases mentioned in the examples:
a) uracil; b) uric acid;
c) adenine; d) guanine;
127. The reaction of adenine with nitrous acid is formed:
a) 2-amino-6-hydroxypurin;
b) 2,6-dihydroxypurin;
c) 2 hydroxypurin;
d) 6 hydroxypurin;
128. The lipids are classified according to their molecules to hydrolytic degradation:
a) α -amino acids, peptides and proteins;
b) saponifiable and unsaponifiable;
c) mono-, oligo- and polysaccharides;
d) nucleosides and nucleotides;
129. The products of fat hydrolysis in alkaline medium by heating are:
a) glycerol and salts, usually higher carboxylic acids (soap);
b) salt of a higher carboxylic acids and higher monohydric alcohol;
c) glycerol, higher carboxylic acid salts and phosphoric acid salts;
- d) salts of higher carboxylic acids and higher alcohol;
130. Parental steroids hydrocarbon group of female sex hormones are:
a) cardenolides; b) estrane;
c) cholestane; d) pregnan;
131. D-glucose and D-galactose relate to each other as:
a) enantiomers; b) diastereomers;
c) structural isomers; d) anomers;
132. The open form of D-glucose is a chemical nature:
a) Only an aldehyde;
b) Only polyhydric alcohol;
c) The aldehyde and polyhydric alcohol;
d) hemiacetal and polyhydric alcohol;
133. The structure of maltose is reflected in the title:
a) β -D-glyucopyranozil- (1 $\rightarrow$ 4)-D-glucopyranose;
b) α -D-glucopyranosyl-(1 $\rightarrow$ 4)-D-glucopyranose;
c) β -D-galactopyranosyl- (1 $\rightarrow$ 4) -D-glucopyranose;
d) δ -D-glucopyranosyl- (1 $\rightarrow$ 6) - β -D-glucopyranose;
134. In the present structure of glycogen glycoside bonds:
a) Only β -(1 $\rightarrow$ 4);
b) α -(1 $\rightarrow$ 4) and α -(1 $\rightarrow$ 6);
c) β -(1 $\rightarrow$ 4) and α -(1 $\rightarrow$ 4);
d) β -(1 $\rightarrow$ 4), β -(1 $\rightarrow$ 3);
135. In the dipeptide Ser-Arg in aqueous medium:
a) neutral; b) sour;
c) alkaline; d) weak
136. The structure of 2-amino-4-methylpentanoic acid is a natural α -amino acid:
a) isoleucine; b) glutamine;
c) cysteine; d) leucine;
137. According to the chemical nature of proteins and peptides are:
a) polyesters; b) polyamides;
c) polyglycosides; d) polynucleotides;
138. Qualitative reaction on the peptide bond:
a) ninhydrin; b) xantoprotein;
c) biuret; d) with formaldehyde;
139. The purine nucleotide nitrogenous bases mentioned in the examples:
a) guanine; adenine; b) uracil;
c) thymine; d) cytosine.
140. As part of the DNA complementary to

- thymine:
 a) adenine; b) cytosine;
 c) 1-N-methylguanine; d) guanine;
141. By the chemical nature saponified lipids are:
 a) isoprenoids;
 b) sterane derivatives (rutting);
 c) esters;
 d) polyamides;
142. Saponifiable lipids as esters can be hydrolyzed by heating:
 a) Only under acidic conditions;
 b) Only in alkaline medium;
 c) both in acidic and in alkaline medium;
 d) incorrect, hydrolysis is generally impossible,
143. In the context of the body saponifiable lipid oxidation in unsaturated acyl residues occurs by the mechanism:
 a) hydroxylation;
 b) peroxidation;
 c) β -enzymatic oxidation;
 d) oxidation under these conditions is absent;
144. Cyclohexane – is a parent structure for many natural compounds. What kind of substance is it?
 a) carbocyclic b) heterocyclic
 c) aromatic d) alkene
145. D-glucose and L-glucose relate to each other as:
 a) enantiomers; b) diastereomers;
 c) epimers; d) anomers;
146. Pyranose and / or furanose form D-glucose on the chemical nature, are:
 a) Only an aldehyde;
 b) Only ketone;
 c) Only a polyhydric alcohol;
 d) a polyhydric alcohol and a cyclic hemiacetal;
147. Which of the following are homologues?
 a) Propanal and butanal
 b) Propanal and propanol
 c) Propanal and propanoic acid
 d) Propanal and propanone
148. The structure of the lactose is reflected in the title:
 a) β -D-glucopyranosyl- (1 $\rightarrow$ 4) -D-glucopyranose;
 b) α -D-glucopyranosyl- (1 $\rightarrow$ 5) -D-glucopyranose;
 c) β -D-galactopyranosyl-(1 $\rightarrow$ 4)-D-glucopyranose;
 d) α -D-glucopyranosyl-(1 $\rightarrow$ 6)-D-glucopyranose;
149. In the present structure of heparin glycoside bonds:
 a) Only β - (1 $\rightarrow$ 4);
 b) α - (1 $\rightarrow$ 4) and α - (1 $\rightarrow$ 6);
 c) β - (1 $\rightarrow$ 4) and α - (1 $\rightarrow$ 4)
 d) β - (1 $\rightarrow$ 4), β - (1 $\rightarrow$ 3);
150. α -amino acids in reactions with aldehydes to form:
 a) substituted imines (reaction products of the amino group);
 b) carboxylic acid salt;
 c) esters (the reaction products of the carboxylic group);
 d) amine
151. The structure of 2-amino-3- (1H-3-indolyl) propionic acid is a natural α -amino acid:
 a) histidine; b) proline;
 c) tryptophan; d) aspartic acid;
152. The primary structure of the tetrapeptide prolylarginylserylglycine recorded in this example:
 a) Pro-Gly-Ser-Arg;
 b) Pro-Arg-Ser-Gly;
 c) Pro-Asp-Ser-Gly;
 d) Pro-Asp-Ser-Gln;
153. The types of bonds that establish α -helix peptides and proteins:
 a) ion; b) hydrogen;
 c) glycoside; d) peptide;
154. Lactim form uracil corresponds to the systematic name:
 a) 2,4-dihydroxy-5-methylpyrimidine;
 b) 4-amino-2-hydroxypyrimidine;
 c) 2,4-dihydroxypyrimidine;
 d) 6-aminopurine;
155. As part of the DNA guanine is complementary to:
 a) adenine; b) cytosine;
 c) thymine; d) 6-N-methyladenine;
156. By the chemical structure the following molecule unsaponifiable lipids are:
 a) esters; b) polyesters;
 c) polyamides; d) isoprenoids;
157. The mandatory components of the bilayer cell membranes due to their amphiphilic structure are:
 a) solid fats; b) glycerophospholipids.;

- c) waxes; d) terpenoids
158. Which bond undergoes homolytic fission preferentially?
a) covalent nonpolar b) covalent polar
c) ionic d) hydrogen
159. Structure of D-glucose configuration corresponds to the number of stereoisomers:
a) four; b) eight;
c) sixteen d) thirtytwo;
160. The configuration of the anomeric carbon atom at the α -anomer same configuration:
a) The second carbon atom in the molecule of a monosaccharide;
b) The last chiral center, defining a monosaccharide belonging to D- or L-series.
c) The penultimate chiral center in the molecule of a monosaccharide;
d) any chiral center;
161. Non stereoisomers (achiral molecule) the natural α -amino acid:
a) glutamine; b) isoleucine;
c) proline; d) glycine;
162. Amino-lactim form cytosine corresponds to the systematic name:
a) 2,4-dihydroxy-5-methylpyrimidine;
b) 4-amino-2-hydroxypyrimidine;
c) 2,4-dihydroxypyrimidine;
d) 6-aminopurine;
163. Hydrolysis of nucleoside occurs:
a) in water;
b) in an aqueous acid medium;
c) in an aqueous basic medium;
d) in concentrated solutions of bases;
164. Saponified lipids are classified into:
a) esters and isoprenoids
b) monomers and polymer compounds;
c) terpenes (terpenoids) and steroids;
d) simple and complex;
165. By the chemical nature glycerophospholipid are:
a) higher carboxylic acids;
b) polyhydric alcohols;
c) glycerol ethers, and higher monohydric alcohols;
d) esters of L-phosphatidic acid;
166. Most of the known terpenes and terpenoids:
a) compounds are not natural and synthetically obtained;
b) is a natural compound of animal origin;
c) This natural compound of vegetable origin;
d) prepared by modification of natural compounds;
167. What is the characteristic of aromatic system?
a) It is a closed conjugated system which carries $(4n + 2)$ electrons
b) It has flat cycle
c) It contains heteroatom
d) It is a heterocyclic compound
168. D-fructose may be classified as:
a) monosaccharide; b) polysaccharide;
c) aldohexoses; d) aldopentoza;
169. Only glycoside formed by the reaction of a monosaccharide from:
a) $C_2H_5-Cl / NaOH$;
b) C_2H_5-OH / HCl (dry);
c) S_2N_5SOCl ;
d) $C_3H_8NH_2 / HCl$ (dry);
170. D-glucose reaction gives "silver mirror" in the conditions:
a) Br_2 / H_2O ;
b) HNO_3 (dil.);
c) $Cu(OH)_2 / NaOH$, to;
d) $Ag(NH_3)_2OH$, to;
171. The structure of sucrose is reflected in the title:
a) β -D-glucopyranosyl- (1 $\rightarrow$ 4) -D-glucopyranose;
b) β -D-galactopyranosyl- (1 $\rightarrow$ 4) -D-glucopyranose;
c) α -D-glucopyranosyl- (1 $\rightarrow$ 6) -D-glucopyranose;
d) α -D-glucopyranosyl- (1 $\rightarrow$ 2) -D-fructofuranoside.
172. The secondary structure of amylose is:
a) sequence of residues α -D-glucopyranose linked α - (1 $\rightarrow$ 4) bond -glycoside;
b) helical conformation;
c) linear conformation;
d) β -structure (conformation of the folded sheet);
173. Phenylalanine- 2-amino-3-phenylpropanoic acid forms an ester by reaction with:
a) sulfuric acid;
b) ethanol in the presence of an acid catalyst;
c) sodium hydroxide;
d) formaldehyde;

174. The isoelectric point of the tripeptide Glu-Thr-Cys is in the medium:
 a) basic; b) neutral;
 c) acid; d) weakly basic;
175. β -sheet structure of macromolecular peptides and proteins in fixed space relation:
 a) peptide; b) disulfide;
 c) ion; d) hydrogen;
176. A more stable tautomeric form of guanine in a body is:
 a) lactim; b) imino-lactim;
 c) lactam; d) amino-lactam;
177. Unsaponifiable lipids are classified into:
 a) simple and complex lipids;
 b) fats, waxes, phospholipids;
 c) proteins and peptides;
 d) terpenes (terpenoids) and steroids.
178. For complex saponified lipids are:
 a) fats; b) glycerophospholipids;
 c) oil; d) steroids
179. The number of carbon atoms in the molecules of monoterpenes is:
 a) 5 b) 10 c) 15 d) 20
180. D-ribose can be classified as:
 a) oligosaccharide; b) monosaccharide;
 c) polysaccharide; d) aldohexoses;
181. The product was D-glucose with acetic anhydride should be classified as:
 a) ether; b) ester;
 c) acetal; d) hemiacetal and ether;
182. Maltose can be classified as:
 a) monosaccharide;
 b) reducing disaccharide;
 c) non-reducing disaccharide;
 d) oligopeptide;
183. The secondary structure of cellulose is:
 a) sequence of residues 1 α -D-glucopyranose linked α - (1 $\rightarrow$ 4) bond -glycoside;
 b) helical conformation;
 c) linear conformation;
 d) β -structure (conformation of the folded sheet);
184. The types of bonds that establish α -helix peptides and proteins:
 a) ion; b) hydrogen;
 c) glycoside; d) peptide;
185. The reaction employed for protection of carboxyl groups in the artificial peptide synthesis:
 a) esterification;
 b) salt formation;
 c) acylation carbobenzoxy chloride (benzyl chloroformate ester);
 d) acid hydrolysis;
186. To protect the α -amino group of the artificial peptide synthesis reaction is used:
 a) acid hydrolysis;
 b) salt formation
 c) acylation carbobenzoxy chloride;
 d) esterification with ethanol;
187. Adenine corresponds to the systematic name:
 a) 2,4-dihydroxy-5-methylpyrimidine;
 b) 4-amino-2-hydroxypyrimidine;
 c) 2,4-dihydroxypyrimidine;
 d) 6-aminopurine;
188. For complex saponified lipids include:
 a) terpenes and terpenoids;
 b) steroids;
 c) phospholipids;
 d) fats (solid fats and oils);
189. As part of the molecules of liquid fats (oils) are dominated by the remains:
 a) unsaturated fatty acids;
 b) stearic acid;
 c) palmitic acid;
 d) saturated fatty acids;
190. The number of carbon atoms in the molecules diterpenes is:
 a) 5; b) 10; c) 15; d) 20;
191. The repeating units of proteins are
 a) Glucose units b) Amino acids
 c) Fatty acids d) *Peptides
192. D-glucose can be classified as:
 a) monosaccharide;
 b) oligosaccharide;
 c) aldopentoza;
 d) polysaccharide;
193. When recovering D-xylose is produced:
 a) sorbitol; b) xylitol;
 c) acid; d) xylonic acid;
194. The lactose may be classified as:
 a) monosaccharide;
 b) reducing disaccharide;
 c) The non-reducing disaccharide;
 d) oligopeptide;
195. In response α -maltose with acetic anhydride is formed:
 a) mixture of α - and β -O-ethyl-maltoside;
 b) mixture of α and β -O-ethyl-D-glucopyranoside;
 c) octa ethyl-maltose;

- d) α -octa acethyl-maltose;
196. Blue complex with iodine forms:
 a) D-mannose; b) maltose;
 c) cellulose; d) starch;
197. As a result, α -amino acid reaction with nitrous acid ($\text{NaNO}_2 + \text{HCl}$), typically:
 a) amine salt is formed;
 b) diazonium salt is formed;
 c) nitrogen gas and alcohol is formed;
 d) N-nitro derivative is formed;
198. Upon heating β -amino acids commonly occurs:
 a) decarboxylation;
 b) The formation of lactones;
 c) formation conjugated unsaturated acid;
 d) The formation of diketopiperazine;
199. The isoelectric point of the tripeptide Met-Arg-Tyr is in the environment:
 a) acidic; b) basic
 c) weakly acidic; d) neutral;
200. Amino-lactim form guanine corresponds to the systematic name:
 a) 2,4-dihydroxy-5-methylpyrimidine;
 b) 4-amino-2-hydroxypyrimidine;
 c) 2,4-dihydroxypyrimidine;
 d) 2-amino-6-hydroxypurin
201. A more stable tautomeric form uracil in terms of the body is:
 a) lactim; b) imino-lactim;
 c) lactam; d) amino-lactam;
202. As part of the fat molecules of solid residues prevail:
 a) unsaturated fatty acids;
 b) oleic acid;
 c) linoleic acid;
 d) saturated fatty acids;
203. For the structure of saturated fatty acid molecules are characterized by the following features:
 a) sistema conjugated double bonds;
 b) double not conjugate relation, they are separated by sp^3 -hybrid carbon atom;
 c) zigzag conformation of the carbon chain;
 d) cis- configuration of each double bond;
204. The number of carbon atoms in the molecules tetraterpenes is:
 a) 20; b) 40;
 c) 60; d) 80;
205. β -carotene should be classified as:
 a) monoterpenes acyclic;
 b) bicyclic monoterpenes;
- c) diterpenes;
 d) tetraterpenes;
206. What is the heaviest of the twenty amino acids?
 a) Phenylalanine b) Tryptophan
 c) Tyrosine d) Histidine
207. Carbohydrates are classified into:
 a) monosaccharides, oligosaccharides, polysaccharide;
 b) pyrimidenes, purines, glucose;
 c) fatty acids, oils, triacylglycerols;
 d) nucleosides, nucleotides, polynucleotides;
208. Sucrose can be classified as:
 a) monosaccharide;
 b) oligopeptide;
 c) polysaccharide;
 d) non-reducing disaccharide.
209. The reaction product α -lactose with methyl iodide in an alkaline medium is:
 a) octa acethyl lactose;
 b) octa methyl lactose;
 c) lactobionic acid;
 d) mixture of α and β -O-methylmaltose;
210. D-Alanine and L-Alanine are technically known as
 a) anomers b) enantiomers
 c) epimers
 d) polymer
211. Which particle is carbocation?
 a) $(\text{CH}_3\text{-CH}_2)^+$;
 b) $(\text{CH}_3\text{-NH}_3)^+$;
 c) CH_3COO^- ;
 d) C_6H_6 ;
212. Which compound enters addition reactions?
 a) $\text{CH}_3\text{-CH=CH}_2$;
 b) $\text{CH}_3\text{-CH-CH}_3$;
 c) $\text{CH}_3\text{-CH}_2\text{-OH}$;
 d) $\text{CH}_3\text{-CH}_2\text{-NH}_2$;
213. Which reaction occurs with the breaking of π -bond:
 a) Exothermic; b) Substitution;
 c) Decomposition; d) Addition;
215. What are the intermediates in lipids peroxide oxidation?
 a) Free radicals; b) Cations;
 c) Anions; d) Atoms;
216. Which reaction is typical for aromatic hydrocarbons?
 a) Substitution; b) Addition;
 c) Decomposition; d) Neutralization
217. Electrophilic reagents are:

- a) Positively charged particles;
 - b) Particles having a pair of electrons on the external level;
 - c) Atoms or groups of atoms having unpaired electron;
 - d) Negatively charged particles.
218. In order for a reagent to behave as a nucleophile it must possess.
1. an overall positive charge
 2. an overall negative charge
 3. an unpaired electron
 4. an unshared pair of electrons
 5. π -bond
- a) 13 b) 245 c) 24 d) 45
219. Which of the following series contains only nucleophiles:
- a) AlCl_3 , BF_3 , NO_2^+ , NH_3
 - b) AlCl_3 , NH_3 , H_2O , I^-
 - c) AlCl_3 , BF_3 , H_2O , NH_3
 - d) NH_3 , H_2O , CN^- , I^-
220. Pyrrole is a compound:
- a) acyclic;
 - b) carbocyclic;
 - c) heterocyclic, and aromatic;
 - d) saturated;
221. Ethylene glycol is the compound of:
- a) heterofunctional;
 - b) aromatic;
 - c) unsaturated;
 - d) polyfunctional;
222. Give the systematic names to the following organic compounds:
 $\text{NH}_2 - \text{CH}_2 - \text{CH}_2 - \text{OH}$
- a) acetic acid
 - b) 1-aminoethanol-1
 - c) 2-aminoethanol-1
 - d) ethylene glycol
223. There is no sp^2 - hybrid atoms in molecule of:
- a) acetic acid
 - b) propanoic acid;
 - c) butane;
 - d) ethene
224. What are the products of primary alcohols oxidation?
- a) Aldehydes;
 - b) Saturated hydrocarbones;
 - c) Unaturated hydrocarbones;
 - d) Halogen derivatives;
225. Which compound participates in polymerization reaction?
- a) $\text{H}_2\text{C}=\text{CH}-\text{CH}=\text{CH}_2$;
 - b) $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CH}_3$;
 - c) $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{OH}$;
 - d) $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{NH}_2$
226. Which α -amino acid gives biogenic amine histamine on decarboxylation?
- a) Glycine;
 - b) Histidine;
 - c) Tyrosine;
 - d) Serine;
226. Xanthoprotein reaction is a qualitative reaction for:
- a) Peptide bond;
 - b) Sulfur containing amino acids;
 - c) Aromatic amino acids;
 - d) Dibasic amino acids.
227. Which reagent is needed to convert liquid lipid into solid fat?
- a); Sodium hydroxide solution;
 - b) Potassium permanganate solution;
 - c) Water with concentrated sulfuric acid;
 - d) Hydrogen
228. What are the products of basic hydrolysis of fats?
- a) Glycerine and soap;
 - b) Glycerine and carboxylic acid;
 - c) Water and carboxylic acid;
 - d) Glycerine and water;
229. What is the mechanism of imine formation from pyruvic acid and amine?
- a) Aldol condensation;
 - b) Nucleophilic substitution;
 - c) Nucleophilic addition;
 - d) Electrophilic substitution.
230. Amides are products of interaction of:
- a) Aldehydes with amines;
 - b) Acid chlorides with amines;
 - c) Carboxylic acids with amines;
 - d) Water with ammonia;
231. Which molecule contains pyridine ring?
- a) nicotinic acid; b) hemoglobine;
 - c) adenine; d) histidine;
232. Vitamin B1 (thiamin) – is a derivative of:
- a) pyridine; b) pyrrole;
 - c) imidazole; d) thiazole;
233. Vitamin B6 (pyridoxal phosphate) – is a derivative of:
- a) pyrrole; b) pyridine;
 - c) pyrimidine; d) purine;
234. Uric acid is the final product of nucleic acids catabolism. Uric acid - is a derivative of:
- a) purine; b) pyrimidine
 - c) pyrrole; d) pyridine;
235. Histidine and histamine are derivatives of imidazole;
- a) pyrrole; b) quinoline;
 - c) indole; d) pyridine
236. Which acid forms ester bond with hydroxyl group of monosaccharide in the

- composition of mononucleotide?
 a) Nitrous; b) Nitric;
 c) Phosphoric; d) Sulphurous.
237. Which is the most favorable conformation for kolamine (2-aminoethan-1-ol)?
 a) Staggered; b) Eclipsed;
 c) Gauche 60° ; d) Gauche 20° .
238. The strongest base is:
 a) 2-aminoethanol; b) ethanamine;
 c) methylamine; d) dimethylamine;
239. Homolytic cleavage of chemical bonds characteristic of the following compounds:
 a) HCl; b) Cl_2 , CH_4 ;
 c) Na^+ ; d) NaOH;
240. Which of the following processes yields in formation of DNA primary structure?
 a) Polycondensation of mononucleotides;
 b) Polymerization of mononucleotides;
 c) Isomerization of mononucleotides;
 d) Hydrolysis of mononucleotides;
241. Which of the following statements about salicylic acid is correct?
 a) Salicylic acid is a homofunctional compound.
 b) Salicylic acid is an inorganic compound.
 c) Salicylic acid is a heterofunctional compound.
 d) Salicylic acid is only used as a cosmetic ingredient.
242. Which of the following is a common use of aspirin?
 a) Treatment of high blood pressure
 b) Pain relief and anti-inflammatory effects
 c) Treatment of bacterial infections
 d) Prevention of hair loss
243. In heterofunctional compounds, the functional groups typically determine:
 a) The color of the compound.
 b) The physical properties and reactivity of the compound.
 c) The boiling point only.
 d) The density and mass.
244. Which of the following ketone bodies is the primary source of energy during prolonged fasting or starvation?
 a) Acetoacetate
 b) Acetone
 c) β -Hydroxybutyrate
 d) Pyruvate
245. Which of the following is the primary mechanism of action of aspirin?
 a) Inhibition of cyclooxygenase (COX) enzymes
 b) Inhibition of monoamine oxidase (MAO)
 c) Blockade of histamine receptors
 d) Activation of prostaglandin synthesis
246. Which of the following is NOT a catecholamine?
 a) Dopamine
 b) Norepinephrine
 c) Epinephrine
 d) Serotonin
247. During ketogenesis, which organ is primarily responsible for the production of ketone bodies?
 a) Brain
 b) Liver
 c) Kidney
 d) Muscle
248. Aspirin is commonly used to reduce fever and inflammation. Which of the following side effects is commonly associated with aspirin?
 a) Gastric ulcers
 b) Liver damage
 c) Hypoglycemia
 d) Respiratory depression
249. Which of the following is the precursor amino acid for the synthesis of catecholamines?
 a) Tyrosine
 b) Tryptophan
 c) Glutamine
 d) Phenylalanine
250. The coenzyme NAD^+ is involved in redox reactions in metabolic processes. It is classified as:
 a) Polyfunctional compound
 b) Heterofunctional compound
 c) Single-functional compound
 d) Non-functional compound
251. Which compound, important in the urea cycle, contains both an amino group and a carbamoyl group, making it a heterofunctional compound?
 a) Ornithine
 b) Citrulline
 c) Arginine
 d) Aspartate
252. Which of the following describes a heterofunctional compound?

- a) A compound containing only one functional group.
 - b) A compound that contains multiple identical functional groups.
 - c) A compound containing two or more different functional groups.
 - d) A compound with no functional groups.
253. Which of the following is an example of a heterofunctional compound?
- a) Methane
 - b) Acetone
 - c) Ethanol
 - d) Acetohydroxamic acid
254. Which of the following compounds is considered heterofunctional?
- a) Benzene
 - b) Acetylsalicylic acid (Aspirin)
 - c) Methanol
 - d) Butane
255. Which of the following compounds is an example of a heterofunctional organic molecule?
- a) Formaldehyde
 - b) Ethyl alcohol
 - c) 2-Acetamido-3-chloropropane
 - d) Octane
256. What is the primary use of Novocain (procaine) in clinical settings?
- a) Pain management through local anesthesia
 - b) Treatment of bacterial infections
 - c) Blood pressure regulation
 - d) Antipyretic effect
257. Which condition can lead to excessive production of ketone bodies?
- a) Hypothyroidism
 - b) Uncontrolled diabetes mellitus
 - c) Hyperthyroidism
 - d) Anemia
258. Which of the following is a polyfunctional compound involved in cellular metabolism?
- a) Glucose
 - b) ATP
 - c) Cholesterol
 - d) Acetyl-CoA
259. Which of the following compounds is considered heterofunctional in metabolism due to having both amine and carboxyl groups?
- a) Urea
 - b) Glutamate

- c) Glycogen
 - d) Lactate
260. The coenzyme NAD^+ is involved in redox reactions in metabolic processes. It is classified as:
- a) Polyfunctional compound
 - b) Heterofunctional compound
 - c) Single-functional compound
 - d) Non-functional compound
261. Which of the following compounds plays a critical role in the citric acid cycle and acts as both a donor and acceptor of acyl groups?
- a) Pyruvate
 - b) Acetyl-CoA
 - c) NADH
 - d) FADH_2
262. In amino acid metabolism, which polyfunctional compound is involved in both transamination and decarboxylation reactions?
- a) Pyruvate
 - b) Glutamate
 - c) Alanine
 - d) Aspartate
263. Which of the following molecules is both a carrier of electrons and a source of energy in metabolic processes?
- a) NAD^+
 - b) ATP
 - c) Coenzyme A
 - d) FAD.
264. A compound with both hydroxyl and carbonyl functional groups that plays an important role in the breakdown of glucose is:
- a) Glyceraldehyde-3-phosphate
 - b) Acetyl-CoA
 - c) Phosphoenolpyruvate
 - d) Glucose-6-phosphate
265. Which polyfunctional compound is used to transfer phosphate groups in metabolic reactions, such as phosphorylation of glucose?
- a) ATP
 - b) NADPH
 - c) Coenzyme A
 - d) Acetyl-CoA
266. Which of the following heterofunctional compounds is involved in the synthesis of nucleotides in cells?
- a) AMP
 - b) ATP
 - c) Phosphoenolpyruvate
 - d) NADH

267. Indole is a heterocyclic compound that consists of a benzene ring fused to which other ring structure?

- a) Pyrrole
- b) Imidazole
- c) Thiazole
- d) Tetrahydrofuran

268. Which of the following is a key feature of imidazole's structure?

- a) It contains a five-membered ring with two nitrogen atoms.
- b) It contains a six-membered ring with one nitrogen atom.
- c) It contains a six-membered ring with two oxygen atoms.
- d) It is composed of a five-membered ring with a sulfur atom.

269. Which compound is commonly found in the structure of biopolymers like heme and chlorophyll?

- a) Pyrrole
- b) Imidazole
- c) Thiazole
- d) Coumarin.

270. Which of the following properties is most associated with coumarin compounds?

- a) Strong aromaticity
- b) High fluorescence properties
- c) A pleasant odor and use in perfumes
- d) Strong acidity

271. Tetrapyrroles are a class of compounds that contain which kind of rings in their structure?

- a) Four six-membered carbon rings
- b) Four five-membered heterocyclic rings
- c) Four nitrogen-containing rings
- d) Four fused benzene rings

272. Which of the following is a common example of a tetrapyrrole?

- a) Hemoglobin
- b) Pyrrole
- c) Imidazole
- d) Thiazole

273. Which heterocyclic compound is known for being a precursor in the biosynthesis of histamine?

- a) Imidazole
- b) Pyrrole
- c) Coumarin
- d) Thiazole

274. Which of the following compounds contains a sulfur atom in its heterocyclic ring?

- a) Pyrrole
- b) Imidazole
- c) Thiazole
- d) Indole

275. Which of the following compounds is a key intermediate in the synthesis of certain drugs and natural products due to its strong fluorescence properties?

- a) Pyrrole
- b) Coumarin
- c) Tetrapyrroles
- d) Thiazole

276. Which of the following statements about tetrapyrroles is incorrect?

- a) They are involved in oxygen transport and storage in animals.
- b) They consist of four pyrrole rings linked together.
- c) They are typically colorless compounds.
- d) They are important for photosynthesis in plants.

277. What is the primary function of carbohydrates in the human body?

- a) To provide structural support for cells
- b) To act as a source of energy
- c) To aid in protein synthesis
- d) To regulate body temperature

278. What is the primary source of dietary fiber in the human diet?

- a) Proteins
- b) Carbohydrates
- c) Fats
- d) Vitamins

279. Which carbohydrate is commonly found in plant cell walls?

- a) Glucose
- b) Glycogen
- c) Cellulose
- d) Fructose

280. Which of the following is an example of an essential amino acid?

- a) Glutamine
- b) Glycine
- c) Valine
- d) Alanine

281. What is the function of amino acids in the body?

- a) They are primarily used for energy storage.
- b) They are the building blocks of proteins.
- c) They regulate blood sugar levels.
- d) They serve as the body's primary source of vitamins.

282. Which of the following is an example of a non-essential amino acid?

- a) Methionine
- b) Histidine
- c) Serine
- d) Leucine

283. What is the primary role of amino acids in protein synthesis?

- a) To produce energy
- b) To transport oxygen in the blood
- c) To form peptide bonds and build proteins
- d) To regulate enzyme activity

284. Which classification of amino acids includes those that can be synthesized by the human body?

- a) Essential amino acids
- b) Non-essential amino acids
- c) Branched-chain amino acids
- d) Aromatic amino acids

285. Which of the following amino acids is involved in the synthesis of neurotransmitters?

- a) Glutamine
- b) Proline
- c) Threonine
- d) Tyrosine

286. What is the primary function of lipids in the body?

- a) To provide structural support to cells
- b) To serve as a source of energy and store energy
- c) To regulate blood pressure
- d) To facilitate digestion

287. Which of the following is a major characteristic of lipids?

- a) They are water-soluble
- b) They contain carbon, hydrogen, and oxygen, but in different proportions than carbohydrates
- c) They are composed of amino acids
- d) They are not involved in energy storage

288. Which type of lipid is a major component of cell membranes?

- a) Triglycerides
- b) Phospholipids
- c) Cholesterol
- d) Waxes

289. Which of the following lipids is essential for the production of hormones and vitamin D?

- a) Phospholipids
- b) Triglycerides
- c) Cholesterol
- d) Waxes

290. What is the primary role of triglycerides in the body?

- a) To form cell membranes
- b) To store energy
- c) To regulate cholesterol levels
- d) To act as enzymes

291. Which of the following lipids is most commonly found in plants?

- a) Phospholipids
- b) Waxes
- c) Cholesterol
- d) Unsaturated fatty acids

292. What is the main function of waxes in organisms?

- a) To store energy
- b) To protect surfaces and prevent water loss
- c) To serve as a source of vitamins
- d) To act as hormones

293. Which of the following lipids are classified as simple lipids?

- a) Steroids
- b) Phospholipids
- c) Triglycerides
- d) Glycolipids

294. What is the primary function of nucleic acids in the body?

- a) To provide structural support to cells
- b) To store and transmit genetic information
- c) To aid in digestion
- d) To produce energy for muscle contraction

295. Which of the following types of RNA carries the genetic code from DNA to the ribosome for protein synthesis?

- a) mRNA
- b) rRNA
- c) tRNA
- d) miRNA

296. Which type of nucleic acid is found in the mitochondria and plays a role in cellular energy production?

- a) DNA
- b) mRNA
- c) tRNA
- d) rRNA

297. What is the main function of ribosomal RNA (rRNA)?

- a) To transport amino acids to the ribosome
- b) To decode the genetic information from mRNA
- c) To make up the structure of ribosomes, where protein synthesis occurs
- d) To carry genetic information from the nucleus to the cytoplasm

298. Which of the following is a key role of nucleic acids in medical genetics?

- a) Nucleic acids are involved in metabolic pathways only.
- b) Nucleic acids carry the instructions for making proteins, and mutations in these molecules can lead to genetic disorders.
- c) Nucleic acids help in the digestion and absorption of nutrients.
- d) Nucleic acids play no role in heredity.

299. Which of the following is a characteristic feature of proteins?

- a) Proteins are made up of sugars and lipids.
- b) Proteins are composed of one or more polypeptides folded into a specific three-dimensional structure.
- c) Proteins are used only for energy storage.
- d) Proteins contain only carbon and oxygen.

300. What is the primary structure of a protein?

- a) The sequence of amino acids in a polypeptide chain
- b) The coiled or pleated structure formed by hydrogen bonding
- c) The folding of the polypeptide into a three-dimensional shape
- d) The combination of multiple polypeptide chains

301. Which type of bond is responsible for maintaining the secondary structure of proteins?

- a) Ionic bonds
- b) Hydrogen bonds
- c) Disulfide bonds
- d) Peptide bonds

302. Which of the following describes the tertiary structure of a protein?

- a) The linear sequence of amino acids
- b) The folding of the polypeptide into a specific three-dimensional shape
- c) The arrangement of multiple polypeptide chains
- d) The regular folding into alpha-helices and beta-pleated sheets

303. Which of the following is NOT a function of proteins?

- a) Catalyzing biochemical reactions (enzymes)
- b) Transporting molecules across cell membranes
- c) Storing genetic information
- d) Providing structural support to cells and tissues

304. What is the classification of proteins based on their shape and structure?

- a) Simple proteins and conjugated proteins
- b) Structural proteins and functional proteins
- c) Fibrous proteins and globular proteins
- d) Primary and secondary proteins

305. Which of the following is an example of a fibrous protein?

- a) Hemoglobin
- b) Collagen
- c) Enzymes
- d) Insulin

306. What is the function of enzymes, which are a type of protein?

- a) They store genetic information
- b) They catalyze biochemical reactions by lowering the activation energy
- c) They provide structural support in the cell
- d) They transport oxygen in the blood

307. What are alkaloids?

- a) Plant-based carbohydrates
- b) Organic compounds derived from amino acids
- c) Naturally occurring inorganic substances
- d) Synthetic chemicals used in pharmaceuticals

308. What is a common characteristic of most alkaloids?

- a) They are typically acidic in nature
- b) They are used as industrial chemicals
- c) They have physiological effects on humans and animals
- d) They are always colorless and odorless

309. Alkaloids are primarily known for which of the following properties?

- a) Their ability to react with metals
- b) Their bitter taste and potential toxicity
- c) Their ability to produce sweet fragrances
- d) Their high solubility in water

310. Alkaloids are often used in medicine for which of the following purposes?

- a) To treat infections and pain
- b) To enhance the color of food
- c) To preserve fruits and vegetables
- d) To create synthetic fragrances

311. Which of the following alkaloids is known for its antimalarial properties?

- a) Morphine
- b) Quinine
- c) Theobromine
- d) Strychnine

312. What is the main effect of caffeine, an alkaloid found in coffee and tea?

- a) It acts as a depressant
- b) It acts as a stimulant
- c) It acts as an anesthetic
- d) It acts as a diuretic

313. What is the primary purpose of antibiotics?

- a) To treat viral infections
- b) To treat bacterial infections
- c) To treat fungal infections
- d) To boost the immune system

314. Which of the following is a common side effect of antibiotics?

- a) Increased energy
- b) Allergic reactions
- c) Weight loss
- d) Hair growth

315. Antibiotics are effective against which type of pathogens?

- a) Viruses
- b) Bacteria
- c) Fungi
- d) Protozoa

316. Which class of antibiotics is commonly used to treat tuberculosis (TB)?

- a) Tetracyclines
- b) Penicillins
- c) Rifamycins
- d) Aminoglycosides

317. What is antibiotic resistance?

- a) When antibiotics become more effective
- b) When bacteria evolve to resist the effects of antibiotics
- c) When antibiotics become toxic to humans
- d) When antibiotics fail to treat viral infections

318. Which of the following antibiotics is commonly used to treat urinary tract infections (UTIs)?

- a) Amoxicillin
- b) Ciprofloxacin
- c) Penicillin
- d) Erythromycin

319. What is the main reason why overuse and misuse of antibiotics can lead to antibiotic resistance?

- a) Antibiotics stop working immediately
- b) Bacteria can mutate and adapt to resist antibiotics
- c) Antibiotics only target healthy cells
- d) Antibiotics kill the immune cells

320. Which of the following is a common mechanism by which antibiotics work to fight bacterial infections?

- a) They stimulate the growth of bacteria
- b) They break down the cell walls of bacteria
- c) They enhance the immune system's ability to fight viruses
- d) They prevent the replication of human cells