

 ASTANA MEDICAL UNIVERSITY	<i>NJSC "Astana Medical University"</i>	
	Department of General and Biological Chemistry	Стр 1 из 4


1. Basic Concepts: Element, Atom, Mole, Molar Mass, Molar Volume
2. Fundamental Laws of Chemistry: Law of Conservation of Mass, Law of Constant Composition, Avogadro's Law
3. Concept of Metals and Nonmetals. Simple and Complex Substances. Relative Atomic and Molecular Masses
4. Amount of Substance. Molar Mass. Calculation of Relative Molecular and Molar Masses of Simple and Complex Substances
5. Calculation of Mass Fraction of Elements in Compounds. Molar Mass, Mass, and Amount of Substance Based on Formulas
6. Calculation of the Number of Atoms and Molecules from Given Mass or Amount of Substance
7. Valency of Chemical Elements. Writing Formulas for Binary Compounds. Determining Valency and Oxidation State by Periodic Table Position
8. Physical and Chemical Processes. Chemical Reactions: Signs, Conditions, and Equation Writing
9. Types of Chemical Reactions: Exchange, Substitution, Addition, Decomposition
10. Structure of Atom: Electron Configuration, Structure of s-, p-, d- Elements
11. Periodic Law by D. I. Mendeleev. Periodic Table in Light of Atomic Theory
12. Characteristics of Elements and Their Properties Based on Their Position in the Periodic Table
13. Characteristics of Elements and Their Properties Based on Atomic Structure
14. Chemical Elements in Living and Non-Living Nature. Macro- and Microelements and Their Roles
15. Electronegativity of Atoms. Periodic Trends and Relation to Atomic Structure
16. Periodic Trends of Element Properties in Groups and Periods: Redox and Acid-Base Properties of Metals and Nonmetals, Oxides, Hydroxides, and Hydrogen Compounds
17. Covalent Bond: Polar and Nonpolar Types. Properties of Covalent Bonds
18. Covalent Bond via Donor-Acceptor Mechanism
19. Ionic Bond. Metallic Bond
20. Hydrogen Bond: Intermolecular and Intramolecular Types, Formation Mechanism, Importance
21. Dependence of Substance Properties on Type of Chemical Bond and Crystal Lattice
22. Oxygen: Element, Simple Substance. Uses and Production. Physical and Chemical Properties. Oxidation
23. Oxides: Nomenclature. Oxygen Allotropy, Ozone, and the Ozone Layer
24. Exothermic and Endothermic Reactions. Thermal Effects of Reactions. Thermochemical Equations
25. Hydrogen: Element, Simple Substance. Isotopes

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26. Properties, Uses, and Production of Hydrogen
27. Oxidation States. Determination from Formulas. Binary Compounds of Hydrogen
28. Oxidizers and Reducing Agents: Definitions, Examples, Redox Reactions
29. Composition, Properties, and Applications of Water. Water as a Solvent
30. Solutions: Mass Fraction of Solute, Molar Concentration
31. Solubility of Solids, Liquids, and Gases in Water. Crystalline Hydrates
32. Classification of Simple and Complex Inorganic Substances: Metals and Nonmetals
33. Alkali Metals: Elements, Simple Substances, Biological Roles of Elements and Compounds
34. Halogens: Elements, Simple Substances, Biological Roles of Elements and Compounds
35. Sodium and Its Compounds: Properties, Production, and Applications
36. Chlorine: Important Compounds, Properties, Production, and Applications
37. Oxides: Classification, Properties, and Production
38. Acids: Composition, Nomenclature, Classification, Properties, and Production
39. Indicators. Neutralization Reactions
40. Bases: Composition, Nomenclature, Classification, Properties, and Production
41. Salts: Composition, Nomenclature, Classification, Properties, and Production
42. Genetic Relationship Between Classes of Inorganic Substances
43. Electrolytes and Nonelectrolytes. Arrhenius Theory of Electrolytic Dissociation. Mechanism
44. Strong and Weak Electrolytes. Degree of Dissociation
45. Electrolytic Dissociation of Aqueous Solutions of Acids, Bases, and Salts. Dissociation of Polybasic Acids and Acid/Basic Salts
46. Ion Exchange Reactions and Their Conditions
47. Qualitative Reactions for Cations and Anions
48. Chemical Properties of Acid Solutions According to Electrolytic Dissociation Theory
49. Chemical Properties of Base Solutions According to Electrolytic Dissociation Theory
50. Chemical Properties of Salt Solutions According to Electrolytic Dissociation Theory
51. Salt Hydrolysis. Significance of Hydrolysis
52. Nonmetals and Their Most Important Compounds
53. Comparative Characteristics of Elements in Groups IV–VI. Electronegativity and Redox Properties of Nonmetals
54. General Properties and Production of Nonmetals: Sulfur, Its Compounds, Allotropes, Hydrogen Sulfide, Sulfur Oxides
55. Position of p-Elements in the Periodic Table and Atomic Structure Features

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56. Sulfuric Acid and Its Salts: Properties of Concentrated and Diluted Acid, Sulfate Ion Detection, Applications
57. Nitrogen: Important Compounds – Ammonia, Ammonium Salts, Nitrogen Oxides
58. Ammonia Production, Properties of Aqueous Ammonia and Ammonium Salts
59. Nitric Acid and Its Salts: Properties of Concentrated and Diluted Acid, Nitrate Ion Detection
60. Phosphorus: Key Compounds, Allotropes, Phosphorus(V) Oxide, Phosphoric Acid and Its Salts
61. Carbon and Its Compounds: Allotropes, Adsorption, Carbon Oxides, Carbonic Acid, Carbonates, Detection of Carbonate Ion
62. Silicon and Its Compounds: Silicates, Liquid Crystals
63. Halogens: Position in Periodic Table, Comparative Properties
64. Hydrogen Chloride, Hydrochloric Acid, Chlorides, Detection of Chloride Ion, Biological Role of Iodine in Humans
65. Metals and Their Most Important Compounds. Atomic Structure and Periodic Table Position
66. Position of s-Elements in Periodic Table. Atomic Structure and Comparison of Metallic and Reducing Properties
67. Sodium, Potassium, Magnesium, Calcium: Properties, Comparison, Production, Biological Role
68. Important Compounds of Na, K, Mg, Ca: Oxides, Hydroxides, Salts — Properties and Uses
69. Metallic Crystal Lattice. Metallic Bond. Electrochemical Series of Metals
70. Comparative Atomic Structure of Metals (Periods I–III)
71. Calcium: Compounds, Atomic Structure, Type of Hybridization
72. Water Hardness and Its Removal. Biological Role of Calcium
73. Aluminum and Its Compounds. Amphoteric Properties of Aluminum and Its Oxide. Applications
74. Position of d-Elements. Atomic Structure. Copper, Zinc: Role, Production, Physical and Chemical Properties
75. Iron and Its Compounds: Oxides, Hydroxides (Fe(II), Fe(III)), Properties. Genetic Relationships
76. Corrosion of Metals and Alloys: Types and Prevention
77. Important Compounds of Copper and Zinc: Oxides, Hydroxides, Properties
78. Important Compounds of Iron and Chromium: Oxides, Hydroxides, Properties
79. Methods of Obtaining Metals and Alloys
80. Genetic Relationships Between Nonmetals, Metals, and Their Compounds
81. Hybridization of Atomic Orbitals (sp , sp^2 , sp^3), Molecular Geometry. Determining Hybridization and Molecular Shape

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82. Dependence of Properties on Chemical, Electronic, and Spatial Structure. Atomic Influence in Molecules
83. Electrolysis of Molten and Aqueous Salt Solutions
84. Theory of Structure of Organic Compounds. Free Radicals. Relationship Between Organic and Inorganic Substances
85. Structure of the Carbon Atom in Organic Compounds. Orbital Hybridization (sp , sp^2 , sp^3), Molecular Shape, Bond Angles. Sigma and Pi Bonds. Hydrogen Bonds
86. Classification and Nomenclature of Organic Compounds. Functional Groups. Hydrocarbons, Oxygen- and Nitrogen-Containing Compounds. Homologs and Isomers. Importance of Organic Compounds in Nature and the Human Body
87. Alkanes: Homologous Series, General Formula, Methane Structure, Isomerism, Hybridization, Properties, Substitution Reactions
88. Alkenes: Homologous Series, General Formula, Ethylene Structure, Isomerism, Hybridization, Properties, Addition, Polymerization, and Oxidation Reactions
89. Alkadienes: Concept, General Formula, Hybridization, Isomerism, Physical Properties
90. Alkynes: Homologous Series, General Formula, Acetylene Structure, Hybridization, Isomerism, Properties, Production
91. Arenes: Benzene and Its Homologs. Structure and Characteristic Reactions
92. Oxygen-Containing Organic Compounds: Classification, Nomenclature, Alcohols, Structure, Properties. Polyhydric Alcohols and Their Detection
93. Phenol: Structure, Properties, Atomic and Group Influence, Detection, Applications
94. Aldehydes and Ketones: Structure, Homologous Series, Isomerism, Acetone and Formaldehyde — Properties, Production, Uses. Detection of Aldehydes
95. Carboxylic Acids: Molecular Structure, Carboxyl Group, Classification, Properties
96. Fats: Composition, Structure, Nomenclature, Classification, Properties
97. Carbohydrates: Mono-, Di-, Polysaccharides. Structure, Classification, Occurrence, Properties, Detection Reactions
98. Amines: Composition, Structure, Classification, Isomerism. Aromatic Amines (Aniline). Amino Acids: Structure, Properties, Nomenclature, Biological Role
99. Proteins: Composition, Structure, Properties. Protein Structures. Detection Reactions
100. Introduction to Nitrogen-Containing Heterocyclic Compounds (Pyrrole, Pyridine). Purine and Pyrimidine Bases. Nucleic Acids: Composition, Structure, Biological Roles of DNA and RNA.