



**Департамент за езиково и
специализирано обучение**

4002 Пловдив, бул. „В. Априлов“ №15А
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**Department of Languages and
Specialised Training**

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phone: 00359 32 602 888
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NATURAL SCIENCES SECTION

Chemistry syllabus

For

**Medicine, Dental Medicine and Pharmacy
foreign students in preparatory class**

Accepted – 21.10.2019



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**Subject:
Chemistry**

Type of the subject:
Compulsory

Level of education:
Preparatory class

Types of class:
Lectures and seminars

Duration:
Two semesters

Faculty hours:
128

Teaching facilities:
Power point presentations, tests

Types of grading:
Tests, colloquiums, final test

Formation of the final grade:
Final test, written and oral exam

Aspects of the grade formation:
Minimal grade after colloquiums, formation of the final grade after exam

Exam:
Yes /test, written exam/.

State exam:
Not required

Tutor:
Senior teacher from the Natural Sciences Section

Department: Natural Sciences Section, Department of languages and specialized training



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Annotation

The syllabus contents general, inorganic and organic chemistry topics to provide necessary background for first year medicine, dental medicine and pharmacy students. The Chemistry Syllabus is designed to allow students to work individually and with others and interactive activities that are related to theoretical concepts in the course. It is expected that students will apply investigative and problem-solving skills, effectively communicate scientific information and appreciate the contribution that a study of chemistry makes to their understanding of the world. The syllabus places greater emphasis on the understanding and application of chemical concepts and principles and different learning styles and needs, so that students will develop skills that will be of long term value in an increasingly technological world, rather than focusing on large quantities of factual information. In addition, it encourages the use of various teaching and learning strategies while at the same time catering to multiple intelligences.

SYLLABUS AIMS

The overarching aim of the Chemistry Curriculum is to provide chemistry-related learning experiences for students to develop scientific literacy. The broad aims of the Chemistry Curriculum are to enable students to:

- develop interest in chemistry;
- construct and apply knowledge of chemistry, and appreciate the relationship between chemistry and other disciplines;
- appreciate and understand the evolutionary nature of science;
- develop skills for specific terms in chemistry;
- develop the ability to think scientifically, critically and creatively, and solve problems individually and collaboratively in chemistry-related contexts;
- discuss science-related issues using the language of chemistry;
- solving tests and colloquiums in the middle of semester;
- pass successfully final exam.

Assessment objectives

The assessment objectives listed below reflect those parts of the syllabus aims that will be assessed in the examination.

Candidates should be able to demonstrate at the final exam knowledge with understanding in relation to:

- scientific phenomena, facts, laws, definitions, concepts, theories;
- scientific vocabulary, terminology, conventions (including symbols, quantities and units);
- scientific quantities and their determination



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• scientific and technological applications with their social, economic and environmental implications

• reasoned explanations for phenomena, patterns and relationships.

Candidates should be able to:

• handle information, distinguishing the relevant from the extraneous

• analyse and evaluate information so as to identify patterns, report trends and draw inferences • construct arguments to support hypotheses or to justify a course of action

• apply knowledge, including principles, to new situations

• to understand scientific texts and to integrate Information and Communication Technology tools and skills into the teaching and learning of chemical concepts.

Syllabus 2019 – 2020 г.

Subject	Exams	Faculty hours		Faculty hours per semester	
	Semester	Total	Lectures Seminars	I	II
Chemistry	I	128			6

PROGRAM

Introductory course

№	TOPIC	Faculty hours	Date
1.	Chemical elements. Names and symbols of chemical elements. Atoms. Atomic structure fundamentals	2	
2.	Chemical compounds. Chemical formulas. Molecules. Ions	2	



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3.	Classification and nomenclature of inorganic compounds – oxides and hydroxides	2	
4.	Classification and nomenclature of inorganic compounds – acids and salts	2	
5.	Chemical properties of the compounds. Types of chemical reactions	4	
6.	Seminar	2	
7.	Test	2	

total: 16 h

Inorganic chemistry course

№	Topic	Faculty hours	Date
1.	The composition and structure of the atom. Atomic characteristics – I_e , F , χ	2	
2.	Chemical bond. Covalent bonding – single and multiple, polar and non-polar. Co-ordinate (dative covalent) bonding. Ionic bonding. Intermolecular bonding – hydrogen bonds	4	
3.	Chemical kinetics. Reaction rates. Factors affecting reaction rates – concentration and temperature. Activation energy.	4	
4.	Catalysis – definition, types. Mechanism of catalysis. Enzymatic catalysis	2	
5.	Chemical equilibria – definition. Open and closed systems, Reversible reactions. The equilibrium constant. Le Chatelier's principle - the effect of concentration, temperature and pressure on equilibrium	4	



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6.	Seminar	2	
7.	Dispersion. Types of dispersions. Disperse systems. Colloidal solutions. Solutions and solubility. Types of concentration – percentage, molar, and molal. Stoichiometric calculations	4	
8.	Electrolytes and non-electrolytes. Dissociation degree. Strong and weak electrolytes	2	
9.	Acids and bases - Arrhenius theory. Dissociation of water. Ionic product of water. pH	2	
10.	Salts. Hydrolysis of salts. Types of salts – acidic, basic, and neutral. Double salts. Coordination compounds – definition, structure, stability constant	2	
11.	Redox reactions. Oxidizing and reducing agent, substance reduced and oxidized, oxidation and reduction	2	
12.	Seminar	2	
13.	Inorganic chemistry colloquium	2	

TOTAL: 34 h

Organic chemistry course

№	TOPIC	Faculty hours	Date
14.	Structural theory. Types of carbon chain	2	
15.	Alkanes – definition, homologue series, nomenclature, and isomers	2	
16.	Alkanes – chemistry of the carbon atom. Hybridization of the carbon atom - sp^3 . σ - and π - bonding in organic compounds. Chemical properties – substitution reactions, oxidation	2	



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17.	Alkenes – definition, homologue series, nomenclature, and isomers	2	
18.	Alkenes – hybridization of the carbon atom $-sp^2$. Chemical properties – addition reactions, oxidation, polymerization	2	
19.	Alkynes – definition, homologue series, nomenclature, and isomers. Hybridization of the carbon atom $-sp$. Chemical properties – addition reactions, and oxidation	4	
20.	Benzene – structure and chemical properties. Hybridization of the carbon atom $-sp^2$. Electrophilic substitution S_E -reactions	2	
21.	Arenes – definition, isomers, structure and chemical properties. Orientation effect in substituted benzenes	2	
22.	Seminar	2	
23.	Test	2	
24.	Alcohols – definition, types, nomenclature, and isomers. Phenols	2	
25.	Alcohols and phenols – chemical properties	2	
26.	Carbonyls – definition, types (aldehydes, ketones), nomenclature, and isomers	2	
27.	Carbonyls – chemical properties. Nucleophilic addition, Addition-elimination	2	
28.	Seminar	2	
29.	Test	2	
30.	Carboxylic acids – definition, types, nomenclature, and isomers	2	
31.	Monocarboxylic acids – structure and chemical properties. Dissociation. Preparation of salts	2	



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32.	Carboxylic acids derivatives - acyl chlorides, anhydrides, amides and nitriles	2	
33.	Carboxylic acids derivatives - esters. Lipids – structure, types, and biological function	2	
34.	Hydroxycarboxylic acids – definition, nomenclature, classification, and isomers. Structures of lactic acid, tartaric acid, citric acid, and malic acid	2	
35.	Aromatic hydroxycarboxylic acids. Salicylic acid – structure and chemical properties. Salicylic acid derivatives and their application in medicine and pharmacy	2	
36.	Oxocarboxylic acid – structure and chemical properties. Pyruvic and acetoacetic acid	2	
37.	Amines – definition, types, nomenclature, and isomers	2	
38.	Amines – structure and chemical properties	2	
39.	Seminar	2	
40.	Test	2	
41.	Amino acids – definition, types, nomenclature, and isomers. α -amino acids – structures	2	
42.	Amino acids – structure and chemical properties	2	
43.	Carbohydrates – definition and classification. Monosaccharides – structure and types	2	
44.	Chemical properties of glucose and fructose	2	
45.	Disaccharides - types. Polysaccharides – starch, cellulose, and glycogen	2	
46.	Seminar	2	
47.	Test	2	
48.	Revision	2	
49.	Revision	2	



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48.	Revision	2	
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TOTAL: 78 h



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Lectures and Seminars 2019-2020

First semester - 9 weeks, 6 faculty hours each /54 faculty hours /

Lesson - Seminar №1 - 2 faculty hours

Chemical elements. Names and symbols of chemical elements. Atoms. Atomic structure fundamentals. Protons, electrons, neutrons.

Lesson - Seminar № 2 - 2 faculty hours

Chemical compounds. Chemical formulas. Molecules. Ions.

Lesson - Seminar № 3 - 2 faculty hours

Chemical compounds – allotropy, valence, oxidation number.

Lesson - Seminar № 4 - 2 faculty hours

Classification and nomenclature of inorganic compounds – oxides and hydroxides.

Lesson - Seminar № 5 - 2 faculty hours

Classification and nomenclature of inorganic compounds – acids and salts.

Lesson - Seminar № 6 - 2 faculty hours

Chemical properties of the chemical compounds. Definition. The law of conservation of mass.

Lesson - Seminar № 7 - 2 faculty hours

Chemical reaction – types. Synthesis, Decomposition, Single replacement, Double replacement, Homogeneous and heterogeneous reactions, exo- and endothermic reactions, reversible and irreversible reactions.

Lesson - Seminar № 8 - 2 faculty hours

Test

Lecture № 9 - 2 faculty hours

The composition and structure of the atom. Atomic characteristics – l_e , F , χ .

Lecture № 10 - 4 faculty hours

Chemical bond. Covalent bonding – single and multiple, polar and non-polar. Co-ordinate (dative covalent) bonding. Ionic bonding. Intermolecular bonding – hydrogen bonds.

Lecture № 11 - 4 faculty hours

Chemical kinetics. Reaction rates. Factors affecting reaction rates – concentration. Examples of homogeneous and heterogeneous reaction.



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Lecture № 12 - 2 faculty hours

Chemical kinetics. Reaction rates. Factors affecting reaction rates – temperature. Activation energy.

Lecture № 13 - 2 faculty hours

Catalysis – definition, types. Mechanism of catalysis. Enzymatic catalysis.

Lecture № 14 - 4 faculty hours

Chemical equilibria – definition. Open and closed systems, Reversible reactions. The equilibrium constant. Le Chatelier's principle - the effect of concentration, temperature and pressure on equilibrium.

Seminar № 15 - 2 faculty hours

Lecture № 16 - 4 faculty hours

Dispersion. Types of dispersions. Disperse systems. Colloidal solutions. Solutions and solubility. Types of concentration – percentage, molar, and molal. Stoichiometric calculations.

Lecture № 17 - 2 faculty hours

Electrolytes and non-electrolytes. Dissociation degree. Strong and weak electrolytes.

Lecture № 18 - 2 faculty hours

Acids and bases - Lewis theory. Dissociation of water. Ionic product of water. pH.

Lecture № 19 - 2 faculty hours

Salts. Hydrolysis of salts. Types of salts – acidic, basic, and neutral. Double salts. Coordination compounds – definition, structure, stability constant.

Lecture № 20 - 2 faculty hours

Redox reactions. Oxidizing and reducing agent, substance reduced and oxidized, oxidation and reduction.

Seminar № 21 -2 faculty hours

Lesson № 22– 2 faculty hours

Inorganic chemistry colloquium

**Second semester - 16 weeks
16 weeks /74/ faculty hours**

Lecture № 23 - 2 faculty hours

Structural theory. Types of carbon chain



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Lecture № 24 - 2 faculty hours

Alkanes – definition, homologue series, nomenclature, and isomers

Lecture № 25 - 2 faculty hours

Alkanes –Chemical properties – substitution reactions, oxidation. Hybridization of the carbon atom- sp^3

Lecture № 26 - 2 faculty hours

Alkenes – definition, homologue series, nomenclature, and isomers

Lecture № 27 - 2 faculty hours

Alkenes –Chemical properties – addition reactions, oxidation, polymerization. Hybridization of the carbon atom- sp^2

Lecture № 28 - 4 faculty hours

Alkynes – definition, homologue series, nomenclature, and isomers. Chemical properties – addition reactions, and oxidation

Lecture № 29 - 2 faculty hours

Benzene – structure and chemical properties. Electrophilic substitution SE-reactions

Lecture № 30- 2 faculty hours

Arenes – definition, isomers, structure and chemical properties. Orientation effect in substituted benzenes

Seminar № 31 -2 faculty hours

Lesson № 32 - 2 faculty hours

Test

Lecture № 33 - 2 faculty hours

Alcohols – definition, types, nomenclature, and isomers. Phenols

Lecture № 34 - 2 faculty hours

Alcohols and phenols – chemical properties

Lecture № 35 - 2 faculty hours

Carbonyls – definition, types (aldehydes, ketones), nomenclature, and isomers

Lecture № 36 - 2 faculty hours

Carbonyls – chemical properties. Nucleophilic addition, Addition-elimination

Seminar № 37 -2 faculty hours

Lesson № 38 - 2 faculty hours

Test



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Lecture № 39 - 2 faculty hours

Carboxylic acids – definition, types, nomenclature, and isomers

Lecture № 40 - 2 faculty hours

Monocarboxylic acids – structure and chemical properties. Dissociation. Preparation of salts

Lesson № 41 - 2 faculty hours

Seminar

Lecture № 42 - 2 faculty hours

Carboxylic acids derivatives - acyl chlorides, anhydrides, amides and nitriles

Lecture № 43 - 2 faculty hours

Carboxylic acids derivatives - esters. Lipids – structure, types, and biological function

Lecture № 44 - 2 faculty hours

Hydroxycarboxylic acids – definition, nomenclature, classification, and isomers. Structures of lactic acid, tartaric acid, citric acid, and malic acid

Lecture № 45 - 2 faculty hours

Aromatic hydroxycarboxylic acids. Salicylic acid – structure and chemical properties. Salicylic acid derivatives and their application in medicine and pharmacy

Lecture № 46 - 2 faculty hours

Oxocarboxylic acid – structure and chemical properties. Pyruvic and acetoacetic acid

Lecture № 47 - 4 faculty hours

Amines – definition, types, nomenclature, and isomers. Amines – structure and chemical properties

Lesson № 48 - 2 faculty hours

Seminar

Lesson № 49 - 2 faculty hours

Test

Lecture № 50 - 2 faculty hours

Amino acids – definition, types, nomenclature, and isomers. α -amino acids – structures. Amino acids – structure and chemical properties

Lecture № 51 - 2 faculty hours

Carbohydrates – definition and classification. Monosaccharides – structure and types

Lecture № 52 - 2 faculty hours

Chemical properties of glucose and fructose

Lecture № 53 - 2 faculty hours

Disaccharides - types. Polysaccharides – starch, cellulose, and glycogen



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Lesson № 54 - 2 faculty hours

Seminar

Lesson № 55 - 2 faculty hours

Test

Lesson № 56 - 2 faculty hours

Revision

Lesson № 57 - 2 faculty hours

Revision



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Curriculum 2019 – 2020

1. Chemical bond. Covalent bonding – single and multiple, polar and non-polar. Co-ordinate (dative covalent) bonding. Ionic bonding. Intermolecular bonding – hydrogen bonds
2. Chemical kinetics. Reaction rates. Factors affecting reaction rates – concentration and temperature. Activation energy
3. Catalysis – definition, types. Mechanism of catalysis. Enzymatic catalysis
4. Dispersion. Types of dispersions. Disperse systems. Colloidal solutions. Solutions and solubility. Types of concentration – percentage, molar, and molal. Stoichiometric calculations
5. Electrolytes and non-electrolytes. Dissociation degree. Strong and weak electrolytes
6. Acids and bases - Lewis theory. Dissociation of water. Ionic product of water. pH
7. Salts. Hydrolysis of salts. Types of salts – acidic, basic, and neutral. Double salts. Coordination compounds – definition, structure, stability constant
8. Redox reactions. Oxidizing and reducing agent, substance reduced and oxidized, oxidation and reduction
9. Structural theory. Types of carbon chain
10. Isomerism. Types – chain (structural), positional, oxo-enol tautomers, functional, metamers, ring-chain, stereoisomers – geometrical and optical
11. Chemistry of the carbon atom. Hybridization of the carbon atom - sp , sp^2 , sp^3 . σ - and π - bonding in organic compounds
12. Alkanes, alkenes, alkynes – definition, homologue series, nomenclature, and isomers. Chemical properties
13. Benzene – structure and chemical properties. Chemical properties. Orientation effect in substituted benzenes
14. Alcohols – definition, types, nomenclature, and isomers. Phenols.
15. Alcohols and phenols – chemical properties
16. Carbonyls – definition, types (aldehydes, ketones), nomenclature, and isomers



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17. Carbonyls – chemical properties. Nucleophilic addition, Addition-elimination
18. Carboxylic acids – definition, types, nomenclature, and isomers
19. Monocarboxylic acids – structure and chemical properties
20. Carboxylic acids derivatives - acyl chlorides, anhydrides, amides and nitriles
21. Carboxylic acids derivatives - esters. Lipids – structure, types, and biological function
22. Hydroxycarboxylic acids – definition, nomenclature, classification, and isomers. Structures of lactic acid, tartaric acid, citric acid, and malic acid
23. Aromatic hydroxycarboxylic acids. Salicylic acid – structure and chemical properties. Salicylic acid derivatives and their application in medicine and pharmacy
24. Oxocarboxylic acid – structure and chemical properties. Pyruvic and acetoacetic acid
25. Amines – definition, types, nomenclature, and isomers
26. Amines – structure and chemical properties
27. Amino acids – definition, types, nomenclature, and isomers. α -amino acids – structures
28. Amino acids – structure and chemical properties
29. Carbohydrates – definition and classification. Monosaccharides – structure and types
30. Structure of glucose and fructose. Types of representations.
31. Chemical properties of glucose and fructose
32. Disaccharides - types. Polysaccharides – starch, cellulose, and glycogen

Inorganic Chemistry Test - Example

1. Which one of the following compounds is most likely to be ionic?
 - a) HCl
 - b) H_2CO_3
 - c) CaCl_2



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2. If the reaction $A+B \leftrightarrow C+D$ is initially at equilibrium, and then more D is added:

- a) the reaction moves in the forward direction
- b) the reaction moves in the backward direction

3. After the establishment of chemical equilibrium, the forward and reverse reactions stop?

- a) True
- b) False

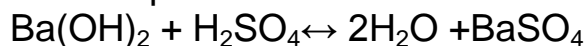
4. A catalyst is consumed in a chemical reaction:

- a) True
- b) False

5. At equilibrium, the concentration of the products is equal to the concentration of the reactants:

- a) True
- b) False

6. Write the equilibrium constant for the following reaction:



7. What effect does a catalyst have on:

- a) The mechanism of the reaction.....
- b) The activation energy of the reaction.....
- c) The stoichiometry of the reaction.....

(possible answers – increase, decrease, change, no change)

8. Write the general equation of the rate of chemical reactions.

.....



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9. Dispersed system with particle size between 1-100nm is called:

.....

10. Write the type of the given salt:

CH₃COONa -

CH₃COONH₄ -

NH₄Cl -

NaCl -

11. If the pH of a given solution is 3.45, this solution is :

a) neutral

b) acidic

b) basic

12. Complete the equations:

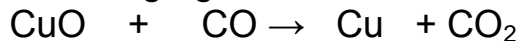
pH=

pOH=.....

13. Determine the oxidation number of all of the species present in the following compounds:

SO₃, CuO, NaH, KMnO₄, H₂CO₃, Cr₂O₇

14. For the following reaction, assign the oxidation numbers to each atom/ ion and balance it. Then identify which species is oxidized and which is reduced, and the oxidizing agent and the reducing agent:



..... is oxidized;is reduced

.....is the oxidizing agent;is the reducing agent

15. Calculate the concentration by mass of 35g NaOH dissolved in 750g water.

.....



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16. When 2g of KMnO_4 are dissolved into 100ml of solution, what molarity results? $M_r(\text{KMnO}_4)=158$

.....

17. Predict the formula of the ionic compound that forms from aluminum and oxygen.

- a) AlO
- b) Al_3O_2
- c) Al_2O_3
- d) AlO_2
- e) Al_2O

18. The correct name for K_2S is:

- a) potassium sulfate
- b) potassium disulfide
- c) potassium bisulfide
- d) potassium sulfide

19. Which one of the following compounds is copper (II) chloride?

- a) CuCl
- b) CuCl_2
- c) Cu_2Cl
- d) Cu_2Cl_3

20. Which of the following compounds is a strong acid?

- a) CaSO_4
- b) NaCl
- c) HNO_3
- d) NH_3



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Test 2 - Example

1. Answer the following questions :

What type of charge does a proton have?

What type of charge does a neutron have?

What type of charge does an electron have?

Which two subatomic particles are located in the nucleus of an atom?

2. If an atom has 35 protons in the nucleus, how many electrons will it have?

3. What is the atomic number if the atom has 5 protons?

4. What is the mass number if the atom has 5 protons and 6 neutrons?

5. How many protons are in the nucleus of an atom with atomic number of 15?

6. How many electrons are in the nucleus of an atom with an atomic number of 20?

7. What is the mass number of an atom with 3 protons, 4 neutrons, and 3 electrons?

8. How many neutrons are in the nucleus of an atom that has a mass number of 36 and an atomic number of 25?

9. How many electrons are in the nucleus of an atom that has a mass number of 36 and an atomic number of 25?

10. If you only the following information can you always determine what the element is? (Yes/No)

a) number of protons.....



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- b) number of neutrons.....
- c) number of electrons in a neutral atom.....
- d) number of electrons.....

11. Name the element which has the following number of particles:

- a) 2 electrons (neutral atom)
- b) 11 protons
- c) 12 electrons, 14 neutrons, 12 protons

12. Fill the missing items in the table:

Symbol	Atomic Number	Mass Number	Number of protons	Number of Electrons	Number of Neutrons
Na		23		11	
K		40		19	
			38	38	52
F	9				10
Ca		41		20	
Sn	50				72
Mg				12	14
H	1	2			
S		32			16
Fe	26				32
Al		27		13	
He	2	4			
Cr		53			29

13. Give the symbol of the elements below. Are they metals or nonmetals?

- a) Carbon
- b) Sodium
- c) Lithium



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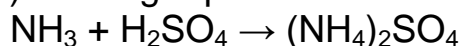
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- d) Oxygen
- e) Chlorine
- f) Boron

14. In the 1st 2 columns write the correct chemical formula, in the 2nd the correct name.

Name	Formula	Formula	Name
Aluminum Hydroxide		KBr	
Hydrochloric acid		CuCl ₂	
Copper (I) Iodide		H ₂ S	
Potassium Bromide		CuO	
Aluminum Oxide		AlCl ₃	
Aluminum(III) Sulfide		MgI ₂	
Sodium Chloride		NaBr	
Nitric acid		CaO	
Iron (III) Sulfate		CaCO ₃	
Iron (III) Sulfide		Fe ₂ O ₃	
Sodium Hydroxide		AgNO ₃	
Sulfuric Acid		Na ₂ SO ₄	
Potassium sulfate		KNO ₃	

15. Balance the reactions and indicate which type of chemical reaction (synthesis, decomposition, single-displacement, double-displacement or combustion) is being represented:





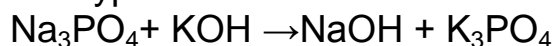
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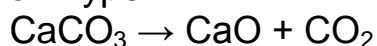
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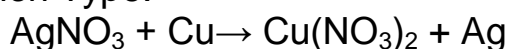
Reaction Type:



Reaction Type:



Reaction Type:



Reaction Type:

16. Write balanced equations for the following reactions:

- The reaction of nitric acid with potassium hydroxide.
- The reaction of copper (II) oxide with hydrogen to form copper metal and water.

17. Metals tend to _____ electrons and nonmetals tend to _____ electrons.

- gain, gain
- lose, lose
- lose, gain
- gain, lose
- neither, they keep their electrons

18. Anions tend to have a _____ charge and cations tend to have a _____ charge.

- positive, positive
- negative, negative
- positive, negative
- negative, positive
- neither, they are both neutral

19. Anions tend to be _____ and cations tend to be _____.

- metals, metals
- nonmetals, nonmetals



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- c) metals, nonmetals
- d) nonmetals, metals

20. _____ typically form ions with a 1^+ charge.

- a) Alkaline earth metals
- b) Halogens
- c) Alkali metals
- d) Transition metals

21. Which of the following compounds would you expect to be ionic?

- a) SF_6
- b) H_2O
- c) CO_3
- d) NH_3
- e) CaO

22. Which pair of elements is most likely to form an ionic compound with each other?

- a) barium, chlorine
- b) calcium, sodium
- c) oxygen, fluorine
- d) sulfur, carbon
- e) nitrogen, hydrogen

23. Predict the formula of the ionic compound that forms from aluminum and oxygen.

- a) AlO
- b) Al_3O_2
- c) Al_2O_3
- d) AlO_2
- e) Al_2O



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24. Which one of the following compounds is copper (I) chloride?

- a) CuCl
- b) CuCl_2
- c) Cu_2Cl
- d) Cu_2Cl_3
- e) Cu_3Cl_2

25. Strong and Weak Acids

Strong acid – one that.....in aqueous solution;

Weak base – one that.....in aqueous solution;