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NATIONAL UNIVERSITY OF PHARMACY

Ye.Ya. Levitin, A.O. Koval, O.S. Kryskiw, Ye.O. Tsapko

# INORGANIC CHEMISTRY TESTS COLLECTION

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Course \_\_\_\_\_ Group \_\_\_\_\_

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*Recommended by the CMC of the National University of Pharmacy  
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**Reviewer:** Prof. V.V. Bolotov (National University of Pharmacy)  
Prof. L.A. Toryanik (National University of Pharmacy)

**Ye.Ya. Levitin, A.O. Koval, O.S. Kryskiw, Ye.O. Tsapko**

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The test tasks for independent control and preparing for incoming express-control and increasing of the current rating and the list of questions and objectives for the final module control from Inorganic Chemistry are listed in this manual

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## 1. The Basic Concepts and Laws of Chemistry

<i>Question</i>	<i>Answer</i>
<p><b>1.</b> What is Avogadro's number and what is its value?</p> <p><b>A.</b> <math>6,02 \cdot 10^{23}</math> mole<sup>-1</sup> the number of structure particles, which 1 mole of substance consist</p> <p><b>B.</b> <math>6,02 \cdot 10^{22}</math> mole<sup>-1</sup> the number of structure particles, which 1 g of substance consist</p> <p><b>C.</b> <math>6,02 \cdot 10^{20}</math> mole<sup>-1</sup> the number of structure particles, which 1 g of substance consist</p> <p><b>D.</b> <math>6,02 \cdot 10^{19}</math> mole<sup>-1</sup> the number of structure particles, which 1 kg of substance consist</p> <p><b>E.</b> <math>6,02 \cdot 10^{21}</math> mole<sup>-1</sup> the number of structure particles, which 1 g anions of substance consist</p>	
<p><b>2.</b> In chemistry normal conditions mean such values of pressure and temperature:</p> <p><b>A.</b> <math>p=101,3</math> kPa; <math>T=273</math>K</p> <p><b>B.</b> <math>p=101,3</math> atm; <math>T=298</math>K</p> <p><b>C.</b> <math>p=760</math> mm Hg; <math>T=1000^{\circ}\text{C}</math></p> <p><b>D.</b> <math>p=1,013</math> Pa; <math>T=100^{\circ}\text{C}</math></p> <p><b>E.</b> <math>p=760</math> mm Hg; <math>T=250^{\circ}\text{C}</math></p>	
<p><b>3.</b> Mole is:</p> <p><b>A.</b> *Measure unit, which is used for fixing a unit of quantity in chemistry</p> <p><b>B.</b> Number of particles, which 1 g of any substance consist</p> <p><b>C.</b> 1/12 parts of mass of atom of an isotope of Carbon C</p> <p><b>D.</b> Number of molecules, which 22,4 l of gas consist in normal conditions</p> <p><b>E.</b> Number of particles, which 1 kg of any substance consist</p>	
<p><b>4.</b> Intermolecular hydrogen bonds doesn't effect on such physical property, as:</p> <p><b>A.</b> *Molecular mass</p> <p><b>B.</b> Boiling temperature</p> <p><b>C.</b> Solubility in water</p> <p><b>D.</b> Density of solution</p> <p><b>E.</b> Transformation from gas to liquid</p>	
<p><b>7.</b> What molecular mass does the unknown gas has, if its density to hydrogen is 15?</p> <p><b>A.</b> *30 g/mol</p> <p><b>B.</b> 7,5 g/mol</p> <p><b>C.</b> 15 g/mol</p> <p><b>D.</b> 45 g/mol</p> <p><b>E.</b> 60 g/mol</p>	
<p><b>8.</b> Equivalent mass sulphuric acid (<math>\text{MH}_2\text{SO}_4 = 98</math> g/mol) equal:</p> <p><b>A.</b> *49 g/mol</p> <p><b>B.</b> 98 g/mol</p> <p><b>C.</b> 32 g/mol</p> <p><b>D.</b> 196 g/mol</p> <p><b>E.</b> 25,5 g/mol</p>	

Question	Answer
<p><b>9.</b> In normal conditions 22,4 l is:</p> <p><b>A.</b> *Volume of <math>6,02 \cdot 10^{23}</math> gas molecules</p> <p><b>B.</b> Volume of 9 g H<sub>2</sub>O in steam</p> <p><b>C.</b> Volume of <math>3,01 \cdot 10^{23}</math> gas molecules</p> <p><b>D.</b> Volume of 22 g CO<sub>2</sub></p> <p><b>E.</b> Volume of 34 g NH<sub>3</sub></p>	
<p><b>10.</b> What volume of hydrogen will product in reaction of 2 mol of Zinc with sulphuric acid: <math>Zn + H_2SO_4 = ZnSO_4 + H_2 \uparrow</math></p> <p><b>A.</b> *44,8 l</p> <p><b>B.</b> 22,4 l</p> <p><b>C.</b> 11,2 l</p> <p><b>D.</b> 48 l</p> <p><b>E.</b> 33,6 l</p>	
<p><b>11.</b> 112 l of Nitrogen was used for synthesis of ammonium hydrate (normal conditions). What volume of hydrogen was used? <math>N_2 + 3H_2 = 2NH_3</math></p> <p><b>A.</b> *336 l</p> <p><b>B.</b> 67,2 l</p> <p><b>C.</b> 112 l</p> <p><b>D.</b> 224 l</p> <p><b>E.</b> 33,6 l</p>	
<p><b>12.</b> What molecular mass does the unknown gas has, if its density to hydrogen is 20 g/mol?</p> <p><b>A.</b> *40 g/mol</p> <p><b>B.</b> 10 g/mol</p> <p><b>C.</b> 20 g/mol</p> <p><b>D.</b> 30 g/mol</p> <p><b>E.</b> 50 g/mol</p>	
<p><b>13.</b> Equivalent mass of Calcium hydroxide (M<sub>Ca(OH)<sub>2</sub></sub> = 74 g/mol) equal:</p> <p><b>A.</b> *37 g/mol</p> <p><b>B.</b> 19 g/mol</p> <p><b>C.</b> 32 g/mol</p> <p><b>D.</b> 74 g/mol</p> <p><b>E.</b> 148 g/mol</p>	
<p><b>14.</b> Specify the equivalent for a compound NaHCO<sub>3</sub>:</p> <p><b>A.</b> *1 mol</p> <p><b>B.</b> 0.5 mol</p> <p><b>C.</b> 2 mol</p> <p><b>D.</b> 4 mol</p> <p><b>E.</b> 0.25 mol</p>	
<p><b>15.</b> For which substance the values of molar mass and equivalent mass are the same:</p> <p><b>A.</b> * HNO<sub>3</sub></p> <p><b>B.</b> CaCO<sub>3</sub></p> <p><b>C.</b> BaO</p> <p><b>D.</b> SO<sub>3</sub></p> <p><b>E.</b> Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub></p>	

## 2. Classes and Nomenclature of Inorganic Compounds

<i>Question</i>	<i>Answer</i>
<p>1. For which from the following acids the basis and the number of atoms of hydrogen in acid does not coincide:</p> <p>A. *H<sub>2</sub>[PO<sub>3</sub>H]            B. H<sub>3</sub>PO<sub>4</sub>            C. H<sub>4</sub>P<sub>2</sub>O<sub>7</sub>            D. HPO<sub>3</sub>            E. H<sub>2</sub>SO<sub>4</sub></p>	
<p>2. Specify the type of the salt (NH<sub>4</sub>)<sub>2</sub>Fe(SO<sub>4</sub>)<sub>2</sub>:</p> <p>A. *double            B. mixed            C. complex            D. neutral            E. acidic</p>	
<p>3. Which acid is monoprotic?</p> <p>A. hypophosphorous            B. orthophosphoric            C. diphosphoric            D. sulfurous            E. sulfuric</p>	
<p>4. Choose a non-saltforming oxide from the following compounds:</p> <p>A. *CO            B. SiO<sub>2</sub>            C. CO<sub>2</sub>            D. P<sub>2</sub>O<sub>3</sub>            E. SO<sub>2</sub></p>	
<p>5. Choose hypophosphoric acid from the following compounds:</p> <p>A. *H[PO<sub>2</sub>H<sub>2</sub>]            B. HPO<sub>3</sub>            C. H<sub>3</sub>PO<sub>4</sub>            D. H<sub>4</sub>P<sub>2</sub>O<sub>7</sub>            E. (HPO<sub>3</sub>)<sub>n</sub></p>	
<p>6. Choose a non-saltforming oxide from the following compounds:</p> <p>A. *N<sub>2</sub>O            B. CuO            C. P<sub>2</sub>O<sub>5</sub>            D. SO<sub>3</sub>            E. Na<sub>2</sub>O</p>	
<p>7. Choose the product of solving P<sub>2</sub>O<sub>3</sub> into water:</p> <p>A. *H<sub>2</sub>[PO<sub>3</sub>H]            B. H<sub>3</sub>PO<sub>4</sub>            C. H<sub>4</sub>P<sub>2</sub>O<sub>7</sub>            D. (HPO<sub>3</sub>)<sub>n</sub>            E. H<sub>3</sub>P</p>	

<i>Question</i>	<i>Answer</i>
<p><b>8.</b> Which of the following is the salt of orthoacid:</p> <p>A. *NaH<sub>2</sub>PO<sub>4</sub>            B. Na<sub>2</sub>[PO<sub>3</sub>H]            C. KMnO<sub>4</sub>            D. Na<sub>2</sub>SO<sub>3</sub>S            E. NaAsO<sub>2</sub></p>	
<p><b>9.</b> The chemical elements form simple and complex compounds. Specify the simple compound.</p> <p>A. *P<sub>4</sub>            B. PH<sub>3</sub>            C. P<sub>4</sub>O<sub>6</sub>            D. P<sub>4</sub>O<sub>10</sub>            E. H<sub>3</sub>PO<sub>4</sub></p>	
<p><b>10.</b> Which of the following oxides is the anhydride of nitric acid:</p> <p>A. *N<sub>2</sub>O<sub>5</sub>            B. N<sub>2</sub>O<sub>4</sub>            C. N<sub>2</sub>O            D. NO            E. NO<sub>3</sub></p>	
<p><b>11.</b> Which of the following is the salt of methaacid:</p> <p>A. *Na<sub>2</sub>SiO<sub>3</sub>            B. Na<sub>4</sub>SiO<sub>4</sub>            C. Na<sub>3</sub>AlO<sub>3</sub>            D. K<sub>4</sub>P<sub>2</sub>O<sub>7</sub>            E. K<sub>4</sub>PbO<sub>4</sub></p>	
<p><b>12.</b> For the determination of some medicines the solution of sulfuric and perchloric acids is used. Specify the oxides which are anhydrides of these acids:</p> <p>A. *SO<sub>3</sub>, Cl<sub>2</sub>O<sub>7</sub>            B. SO<sub>2</sub>, Cl<sub>2</sub>O            C. SO<sub>3</sub>, ClO<sub>2</sub>            D. SO<sub>2</sub>, Cl<sub>2</sub>O<sub>7</sub>            E. SO<sub>3</sub>, Cl<sub>2</sub>O<sub>6</sub></p>	
<p><b>13.</b> Which from the following acids corresponds to Cl<sub>2</sub>O oxide:</p> <p>A. *HClO            B. HClO<sub>3</sub>            C. HClO<sub>2</sub>            D. HClO<sub>4</sub>            E. HCl</p>	
<p><b>14.</b> Which of the following oxides is the anhydride of nitrous acid:</p> <p>A. *N<sub>2</sub>O<sub>3</sub>            B. N<sub>2</sub>O<sub>5</sub>            C. N<sub>2</sub>O<sub>4</sub>            D. NO            E. NO<sub>2</sub></p>	

<i>Question</i>	<i>Answer</i>
<p><b>15.</b> Which of the following oxides is the anhydride of perchloric acid:</p> <p>A. * <math>\text{Cl}_2\text{O}_7</math>            B. <math>\text{Cl}_2\text{O}</math>            C. <math>\text{ClO}_2</math>            D. <math>\text{Cl}_2\text{O}_3</math>            E. <math>\text{Cl}_2\text{O}_6</math></p>	
<p><b>16.</b> Which from the following acids corresponds to <math>\text{Cl}_2\text{O}_7</math> oxide:</p> <p>A. * <math>\text{HClO}_4</math>            B. <math>\text{HClO}</math>            C. <math>\text{HClO}_2</math>            D. <math>\text{HCl}</math>            E. <math>\text{HClO}_3</math></p>	
<p><b>17.</b> Manganese and chlorine demonstrate the most similar properties when they have the following oxidation number:</p> <p>A. * +7            B. +3            C. +2            D. +4            E. 0</p>	
<p><b>18.</b> The correct formula of hypobromous acid is:</p> <p>A. * <math>\text{HBrO}</math>            B. <math>\text{HBr}</math>            C. <math>\text{HBrO}_2</math>            D. <math>\text{HBrO}_3</math>            E. <math>\text{HBrO}_4</math></p>	
<p><b>19.</b> In the reaction of amphoteric metals with the exes of solution of alkalis the following compounds are formed:</p> <p>A. * hydroxo-complexes            B. oxides            C. hydroxides            D. neutral salts            E. basic salts</p>	
<p><b>20.</b> Compounds of chlorine are used as a disinfectant. What formula corresponds to hypochlorous acid:</p> <p>A. * <math>\text{HClO}</math>            B. <math>\text{HClO}_4</math>            C. <math>\text{HClO}_2</math>            D. <math>\text{HClO}_3</math>            E. <math>\text{HCl}</math></p>	
<p><b>21.</b> Amphoteric compounds react with:</p> <p>A. * acids and bases            B. only with acids            C. only with bases            D. only with acidic oxides            E. only with basic oxides</p>	



### 3. Chemical Kinetics and Chemical Equilibrium. Catalysis

<i>Question</i>	<i>Answer</i>
<p><b>1.</b> Principle of Le-Chatelier'e enables to control of chemical reaction in a laboratory, and in industry. Specify, which from the processes must be care at the higher pressure</p> <p><b>A.</b> * <math>3\text{H}_2(\text{g}) + \text{N}_2(\text{g}) \leftrightarrow 2\text{NH}_3(\text{g})</math>  <b>B.</b> <math>\text{Fe}(\text{s}) + \text{H}_2\text{O}(\text{g}) \leftrightarrow \text{FeO}(\text{s}) + \text{H}_2(\text{g})</math>  <b>C.</b> <math>\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \leftrightarrow 2\text{NO}(\text{g})</math>  <b>D.</b> <math>\text{C}(\text{s}) + \text{O}_2(\text{g}) \leftrightarrow \text{CO}_2(\text{g})</math>  <b>E.</b> <math>\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \leftrightarrow 2\text{HCl}(\text{g})</math></p>	
<p><b>2.</b> Specify the unit for the rate of chemical reaction?</p> <p><b>A.</b> * <math>\text{mol} \cdot \text{L}^{-1} \text{s}^{-1}</math>  <b>B.</b> <math>\text{mol} \cdot \text{ml}/\text{s}^{-1}</math>  <b>C.</b> <math>\text{mol} \cdot \text{m}^3/\text{s}^{-1}</math>  <b>D.</b> <math>\text{mol} \cdot \text{L}^{-1}/\text{min}^{-1}</math>  <b>E.</b> <math>\text{mol} \cdot \text{m}^2/\text{min}^{-1}</math></p>	
<p><b>3.</b> At dissolution of salt in water the temperature of solution decreases. This is a process:</p> <p><b>A.</b> *endothermic  <b>B.</b> exothermic  <b>C.</b> isobaric  <b>D.</b> adiabatic  <b>E.</b> isochoric</p>	
<p><b>4.</b> How many times is needed to increase the pressure in the reaction  <math>\text{NO} + \text{O}_2 = 2\text{NO}_2</math> to increase the speed of <math>\text{NO}_2</math> formation 8 times?</p> <p><b>A.</b> *2  <b>B.</b> 5  <b>C.</b> 20  <b>D.</b> 50  <b>E.</b> 100</p>	
<p><b>5.</b> What is the law define the rate of chemical reaction?</p> <p><b>A.</b> *mass action  <b>B.</b> Van't-Hoff  <b>C.</b> Henry  <b>D.</b> Raule  <b>E.</b> Mendeleev's periodic law</p>	
<p><b>6.</b> The reaction under the equation  <math>2\text{NO}_2 = \text{N}_2\text{O}_4 + \text{Q}</math>, is:</p> <p><b>A.</b> *exothermic reaction of combination  <b>B.</b> endothermic reaction of decombination  <b>C.</b> exothermic reaction of decombination.  <b>D.</b> endothermic reaction of changes  <b>E.</b> exothermic reaction of displaces</p>	

<i>Question</i>	<i>Answer</i>
<p><b>7.</b> For the reaction  <math>2\text{H}_2\text{S}_{(g)} + 3\text{O}_{2(g)} = 2\text{SO}_{2(g)} + 2\text{H}_2\text{O}_{(g)}</math>; <math>\Delta H &lt; 0</math>  Specify the factor which does not shift the equilibrium to the right:  <b>A.</b> * increase the temperature of the system  <b>B.</b> increases the concentration of <math>\text{H}_2\text{S}</math>.  <b>C.</b> decrease the concentration of <math>\text{SO}_2</math>.  <b>D.</b> increase of the pressure  <b>E.</b> decrease of the temperature</p>	
<p><b>8.</b> How many times the speed of the reaction  <math>\text{Fe}_2\text{O}_{3(s)} + 3\text{H}_2 = 2\text{Fe} + \text{H}_2\text{O}</math> if <math>V = \text{const}</math>  increases if the concentration of <math>\text{H}_2</math> increases 2  times:  <b>A.</b> *8 times  <b>B.</b> 2 times  <b>C.</b> 4 times  <b>D.</b> 16 times  <b>E.</b> 6 times</p>	
<p><b>9.</b> Speed of what reactions increases if the  temperature is increased?  <b>A.</b> *endothermic  <b>B.</b> exothermic  <b>C.</b> anyone  <b>D.</b> red-ox reaction  <b>E.</b> catalytic</p>	
<p><b>10.</b> The law of mass action describes the  dependence of rate of chemical reaction on:  <b>A.</b> *the concentration of reactants  <b>B.</b> areas of surface of clashing of reactive  compounds  <b>C.</b> the nature of compounds  <b>D.</b> temperature of the system  <b>E.</b> the presence of catalyst</p>	
<p><b>11.</b> How affects solubility of gases in a liquid if  the temperature tend to increase?  <b>A.</b> *decrease  <b>B.</b> increase  <b>C.</b> does not change  <b>D.</b> to become unlimited  <b>E.</b> increase and after does not change</p>	
<p><b>12.</b> The compounds of the aluminous nature,  which are produced by the cages of living  organisms and considerably increase the speed of  biochemical reactions, are -  <b>A.</b> *enzymes  <b>B.</b> ferromagnetic  <b>C.</b> ferrites  <b>D.</b> fullerenes  <b>E.</b> ferrates</p>	
<p><b>13.</b> What is the correct equilibrium constant</p>	

<i>Question</i>	<i>Answer</i>
<p>expression for the reaction below  <math>3\text{H}_{2(\text{g})} + \text{N}_{2(\text{g})} \leftrightarrow 2\text{NH}_{3(\text{g})}</math></p> <p>A. <math>* K = \frac{[\text{NH}_3]^2}{[\text{H}_2]^3 \cdot [\text{N}_2]}</math></p> <p>B. <math>K = \frac{[\text{H}_2]^3 + [\text{N}_2]}{[\text{NH}_3]^2}</math></p> <p>C. <math>K = \frac{[\text{H}_2]^3[\text{N}_2]}{[\text{NH}_3]^2}</math></p> <p>D. <math>K = \frac{[\text{NH}_3]^2}{[\text{H}_2]^3 + [\text{N}_2]}</math></p> <p>E. <math>K = \frac{[2\text{NH}_3]^2}{[3\text{H}_2]^3[\text{N}_2]}</math></p>	
<p>14. What is the correct equilibrium constant expression for the reaction below  <math>2\text{NO}_{(\text{g})} + \text{O}_{2(\text{g})} = 2\text{NO}_{2(\text{g})}</math></p> <p>A. <math>* K = \frac{[\text{NO}_2]^2}{[\text{NO}]^2[\text{O}_2]}</math></p> <p>B. <math>K = \frac{[\text{NO}]^2 + [\text{O}_2]}{[\text{NO}]^2}</math></p> <p>C. <math>K = \frac{[\text{NO}]^2[\text{O}_2]}{[\text{NO}]^2}</math></p> <p>D. <math>K = \frac{[\text{NO}_2]^2}{[\text{NO}]^2 + [\text{O}_2]}</math></p> <p>E. <math>K = \frac{[2\text{NO}_2]^2}{[2\text{NO}]^2[\text{O}_2]}</math></p>	
<p>15. How many times the speed of the reaction  <math>2\text{CO} + \text{O}_2 = 2\text{CO}_2</math>  increases, if the initial concentration of reagents increases in 5 times?</p> <p>A. *increases in 125 times</p> <p>B. increases in 5 times</p> <p>C. increases in 25 times</p> <p>D. increases in 175 times</p> <p>E. increases in 625 times</p>	

## 4. Atomic Properties And The Periodic Table

<i>Question</i>	<i>Answer</i>
<p><b>1.</b> The maximal oxidation state of element as a rule is equal:</p> <p><b>A.</b> *to the number of group in the periodic table  <b>B.</b> to the number of subgroup in the periodic table  <b>C.</b> to the number of period  <b>D.</b> to the number of row  <b>E.</b> to the difference of positive oxidation state and date 8</p>	
<p><b>2.</b> What is the difference between the large periods and small periods of elements?</p> <p><b>A.</b> *presence of d and f- elements.  <b>B.</b> presence of s- elements  <b>C.</b> presence of inert gases.  <b>D.</b> presence of metals.  <b>E.</b> presence of nonmetals</p>	
<p><b>3.</b> All elements of periodic system can be classified on s-, p-, d-, and f-electronic families. Which of the specified elements belong only to p – electronic family?</p> <p><b>A.</b> * Cl, S, N  <b>B.</b> Ag, Mg, O  <b>C.</b> Al, Pt, N  <b>D.</b> Na, Ca, Fe  <b>E.</b> Fe, Cu, Cr</p>	
<p><b>4.</b> Atomic and ionic radii in the row O – S – Se – Te are:</p> <p><b>A.</b> *increased  <b>B.</b> decreased  <b>C.</b> decreased and after increased  <b>D.</b> increased and after decreased  <b>E.</b> not changed</p>	
<p><b>5.</b> Which alkali metal has the largest ionization energy:</p> <p><b>A.</b> *Li  <b>B.</b> K  <b>C.</b> Na  <b>D.</b> Rb  <b>E.</b> Cs</p>	
<p><b>6.</b> All elements of periodic system can be classified on s-, p-, d-, and f-electronic families. Which of the specified elements belong only to s – electronic family?</p> <p><b>A.</b> *K, Ca, Ba  <b>B.</b> S, P, Cl  <b>C.</b> Be, Mg, S  <b>D.</b> Mn, Br, Mo  <b>E.</b> P, S, Cr</p>	

<i>Question</i>	<i>Answer</i>
<p><b>7.</b> Specify the correct electron configuration for carbon in the excited state:</p> <p><b>A.</b> <math>*1s^22s^12p^3</math>  <b>B.</b> <math>1s^22s^22p^2</math>  <b>C.</b> <math>1s^22s^22p^0</math>  <b>D.</b> <math>1s^22s^22p^4</math>  <b>E.</b> <math>1s^22s^22p^6</math></p>	
<p><b>8.</b> All elements of periodic system can be classified on <i>s</i>-, <i>p</i>-, <i>d</i>-, and <i>f</i>-electronic families. Which of the specified elements belong only to <i>p</i>-electronic family?</p> <p><b>A.</b> *P  <b>B.</b> Cu  <b>C.</b> Fe  <b>D.</b> Mg  <b>E.</b> K</p>	
<p><b>9.</b> All elements of periodic system can be classified on <i>s</i>-, <i>p</i>-, <i>d</i>-, and <i>f</i>-electronic families. Which of the specified elements belong only to <i>s</i> – electronic family?</p> <p><b>A.</b> *K, Ca, Sr  <b>B.</b> S, P, Cl  <b>C.</b> Be, Mg, Al  <b>D.</b> Mn, Br, Mo  <b>E.</b> P, S, Cr</p>	
<p><b>10.</b> All elements of periodic system can be classified on <i>s</i>-, <i>p</i>-, <i>d</i>-, and <i>f</i>-electronic families. Which of the specified elements belong only to <i>p</i>-electronic family?</p> <p><b>A.</b> *Br, O, P  <b>B.</b> Cl, Ca, O  <b>C.</b> N, Al, Cd  <b>D.</b> K, Ca, Ni  <b>E.</b> Fe, Cu, F</p>	
<p><b>11.</b> All elements of periodic system can be classified on <i>s</i>-, <i>p</i>-, <i>d</i>-, and <i>f</i>-electronic families. Which of the specified elements belong only to <i>p</i> – electronic family?</p> <p><b>A.</b> *S, P, Cl  <b>B.</b> K, Ca, Sc  <b>C.</b> Be, Mg, Al  <b>D.</b> Mn, Br, Mo  <b>E.</b> P, S, Cr</p>	
<p><b>12.</b> Specify the oxidation state of sulfur that has the octet of electrons on the outermost level</p> <p><b>A.</b> *-2  <b>B.</b> +2  <b>C.</b> +4  <b>D.</b> +6  <b>E.</b> 0</p>	

<i>Question</i>	<i>Answer</i>
<p><b>13.</b> On the base of electronic structure of the atom <math>^{17}_{35}\text{Cl}</math> specify the number of neutrons in it.</p> <p>A. *18            B. 52            C. 10            D. 17            E. 35</p>	
<p><b>14.</b> The atomic number of chemical element is:</p> <p>A. *the number of protons in the nuclear of atom.            B. the number of neutrons in the nuclear of atom.            C. the number of nucleons in the nuclear of atom            D. the number of protons and neutrons in the nuclear of atom            E. the mass of atomic nuclear.</p>	
<p><b>15.</b> What is the correct electron configuration for ion <math>\text{Fe}^{3+}</math>, if the electron configuration for iron atom is <math>[\text{Ar}]3d^6 4s^2</math></p> <p>A. * <math>[\text{Ar}] 3d^5 4s^0</math>            B. <math>[\text{Ar}] 3d^5 4s^1 4p^1</math>            C. <math>[\text{Ar}] 3d^3 4s^2</math>            D. <math>[\text{Ar}] 3d^3 4s^1 4p^1</math>            E. <math>[\text{Ar}] 3d^4 4s^1</math></p>	
<p><b>16.</b> Specify the element with the electronic configuration <math>[\text{Ar}]4s^2 3d^8</math></p> <p>A. *Ni            B. Cu            C. Zn            D. Pt            E. Mn</p>	
<p><b>17.</b> What is the correct electron configuration for atom <math>^{29}\text{Cu}</math></p> <p>A. * <math>[\text{Ar}] 3d^{10} 4s^1</math>            B. <math>[\text{Ar}] 3d^9 4s^2</math>            C. <math>[\text{Ar}] 3d^6 4s^2</math>            D. <math>[\text{Ar}] 3d^8 4s^2</math>            E. <math>[\text{Ar}] 3d^7 4s^2</math></p>	
<p><b>18.</b> What is the correct electron configuration for sulfur atom in the oxidation state -2?</p> <p>A. * <math>3s^2 3p^6</math>            B. <math>3s^2 3p^2</math>            C. <math>3s^2</math>            D. <math>3s^2 3p^4</math>            E. <math>3s^2 3p^3</math></p>	
<p><b>19.</b> What is the electronic configuration of valence electrons corresponds to an element of 4-th period of the VI group of main sub-group:</p> <p>A. * <math>4s^2 4p^4</math>            B. <math>4s^1 3d^5</math>            C. <math>6s^2 6p^2</math>            D. <math>6s^2 5d^2</math>            E. <math>3s^2 3p^4</math></p>	

<i>Question</i>	<i>Answer</i>
<p><b>20.</b> Specify the electronic configuration of chlorine atom in the valence VII (<math>_{17}\text{Cl}</math>):</p> <p><b>A.</b> <math>1s^2 2s^2 2p^6 3s^1 3p^3 3d^3</math></p> <p><b>B.</b> <math>1s^2 2s^2 2p^6 3s^2 3p^5</math></p> <p><b>C.</b> <math>1s^2 2s^2 2p^6 3s^2 3p^4 3d^1</math></p> <p><b>D.</b> <math>1s^2 2s^2 2p^6 3s^2 3p^3 3d^2</math></p> <p><b>E.</b> <math>1s^2 2s^2 2p^6 3s^2 3p^6</math></p>	
<p><b>21.</b> All elements of periodic system can be classified on <i>s</i>-, <i>p</i>-, <i>d</i>-, and <i>f</i>-electronic families. Which of the specified elements belong only to <i>p</i> – electronic family?</p> <p><b>A.</b> *P, O, S</p> <p><b>B.</b> Na, P, Cl</p> <p><b>C.</b> Ca, Mg, Fe</p> <p><b>D.</b> K, Br, Ba</p> <p><b>E.</b> Be, Ca, S</p>	

## 5. Chemical Bond And Structure Of Molecules

<i>Question</i>	<i>Answer</i>
<p>1. Specify the type of chemical bond in the molecule of hydrogen</p> <p>A. *covalent nonpolar            B. covalent polar            C. hydrogen            D. metallic            E. ionic</p>	
<p>2. What is the type of chemical bond between the water molecules:</p> <p>A. *hydrogen            B. covalent            C. covalent and ionic            D. ionic            E. metallic</p>	
<p>3. What property of covalent bond predetermines the spatial structure of molecules?</p> <p>A. *direction            B. saturation            C. polarity            D. polarization            E. energy</p>	
<p>4. Specify the angle between the orbitals in <math>sp^2</math>- hybridization:</p> <p>A. *<math>120^\circ</math>            B. <math>180^\circ</math>            C. <math>109^\circ</math>            D. <math>90^\circ</math>            E. <math>104,5^\circ</math></p>	
<p>5. Which of the choices has covalent polar bond?</p> <p>A. *HCl<sub>(g)</sub>            B. NaBr            C. CaCl<sub>2</sub>            D. I<sub>2</sub>            E. O<sub>2</sub></p>	
<p>6. Identical valence in hydrogen compound and in a higher oxide is exposed by an element:</p> <p>A. *carbon            B. phosphorus            C. selenium            D. bromine            E. argon</p>	
<p>7. Which of the choices has covalent nonpolar bond?</p> <p>A. *N<sub>2</sub>            B. CO<sub>2</sub>            C. AlCl<sub>3</sub>            D. H<sub>2</sub>S            E. NaCl</p>	



<i>Question</i>	<i>Answer</i>
<p><b>8.</b> Which of the choices has only ionic bond?</p> <p>A. *Na<sub>2</sub>S            B. NH<sub>4</sub>Cl            C. HCl            D. CH<sub>3</sub>COOH            E. PH<sub>3</sub></p>	
<p><b>9.</b> Which of the choices has ionic and covalent bond?</p> <p>A. *NH<sub>4</sub>NO<sub>3</sub>            B. H<sub>2</sub>S            C. N<sub>2</sub>O<sub>5</sub>            D. N<sub>2</sub>            E. NH<sub>3</sub></p>	
<p><b>10.</b> Which of the choices has only covalent polar bond?</p> <p>A. *HCl            B. KClO            C. Na<sub>2</sub>S            D. CH<sub>3</sub>COOK            E. NH<sub>4</sub>Cl</p>	
<p><b>11.</b> Which of the choices has ionic and covalent bond?</p> <p>A. *Na<sub>2</sub>SO<sub>4</sub>            B. NaCl            C. CaCl<sub>2</sub>            D. CH<sub>3</sub>COOH            E. NH<sub>3</sub></p>	
<p><b>12.</b> Which of the choices has covalent nonpolar bond?</p> <p>A. *H<sub>2</sub>            B. KCl            C. NH<sub>4</sub>Cl            D. KI            E. H<sub>2</sub>S</p>	
<p><b>13.</b> Which of the choices has covalent polar bond?</p> <p>A. *HCl            B. NaCl            C. NH<sub>4</sub>Cl            D. O<sub>2</sub>            E. CH<sub>3</sub>COOK</p>	
<p><b>14.</b> Specify the type of chemical bond in the molecule of sodium chloride</p> <p>A. *ionic            B. covalent nonpolar            C. hydrogen            D. covalent polar            E. metallic</p>	

<i>Question</i>	<i>Answer</i>
<p><b>15.</b> Electronegativity in the row F, O, N, Cl increases. Specify the molecule that has the most polar chemical bond?</p> <p>A. *CIF            B. OF<sub>2</sub>            C. Cl<sub>2</sub>O            D. NCl<sub>3</sub>            E. NF<sub>3</sub></p>	
<p><b>16.</b> What is the type of hybridization of orbital in the methane molecule?</p> <p>A. *sp<sup>3</sup>            B. sp<sup>2</sup>            C. sp            D. dsp<sup>2</sup>            E. sp<sup>3</sup>d<sup>2</sup></p>	
<p><b>17.</b> For which molecules is not possess hydrogen bond?</p> <p>A. *CH<sub>4</sub>            B. NH<sub>3</sub>            C. HF            D. H<sub>2</sub>O            E. C<sub>2</sub>H<sub>5</sub>OH</p>	
<p><b>18.</b> What is the maximal valence of fluorine?</p> <p>A. *1            B. 7            C. 2            D. 5            E. 3</p>	
<p><b>19.</b> What is the structure of water molecule?</p> <p>A. *angle            B. line            C. square            D. cube            E. octahedral</p>	
<p><b>20.</b> What is the maximal valence of Nitrogen taking into account the donor-acceptor mechanism of formation of covalent bond?</p> <p>A. *4            B. 1            C. 2            D. 3            E. 5</p>	
<p><b>21.</b> The molecule of carbon (II) oxide has a very high energy of chemical bond (E = 1071kJ/mol). It is caused by:</p> <p>A. *the triple bond between carbon and oxygen            B. covalent bond            C. ionic bond            D. the high polarity of the bond            E. hydrogen bond</p>	

<i>Question</i>	<i>Answer</i>
<p><b>22.</b> Taking into account ability of iodine to dissolve in non-polar solvents, specify the type of chemical bond in the iodine molecule I<sub>2</sub></p> <p><b>A.</b> *covalent nonpolar  <b>B.</b> ionic  <b>C.</b> covalent polar  <b>D.</b> metallic  <b>E.</b> intermolecular bonding</p>	
<p><b>23.</b> The molecule BF<sub>3</sub> has an triangular structure. Specify the type of hybridization of atomic orbital of boron:</p> <p><b>A.</b> *sp<sup>2</sup>  <b>B.</b> sp<sup>3</sup>  <b>C.</b> sp  <b>D.</b> dsp<sup>2</sup>  <b>E.</b> sp<sup>2</sup>d</p>	
<p><b>24.</b> Specify the type of chemical bond in the chlorine molecule</p> <p><b>A.</b> *covalent nonpolar  <b>B.</b> ionic  <b>C.</b> hydrogen  <b>D.</b> covalent polar  <b>E.</b> coordination</p>	
<p><b>25.</b> Specify the most polar and stable compounds of hydrogen with the elements of V-A group:</p> <p><b>A.</b> *NH<sub>3</sub>  <b>B.</b> PH<sub>3</sub>  <b>C.</b> AsH<sub>3</sub>  <b>D.</b> SbH<sub>3</sub>  <b>E.</b> BiH<sub>3</sub></p>	
<p><b>26.</b> Hydrogen compounds of which from the elements can form the hydrogen bonds?</p> <p><b>A.</b> *F  <b>B.</b> C  <b>C.</b> Si  <b>D.</b> P  <b>E.</b> I</p>	
<p><b>27.</b> Specify a valence of carbon atom in the molecule carbon(II) oxide</p> <p><b>A.</b> *3  <b>B.</b> 4  <b>C.</b> 2  <b>D.</b> 1  <b>E.</b> - 4</p>	
<p><b>28.</b> Specify the molecule in which the oxidation degree is equal to zero and the valence is equal to one?</p> <p><b>A.</b> *H<sub>2</sub>  <b>B.</b> HCl  <b>C.</b> NH<sub>3</sub>  <b>D.</b> N<sub>2</sub>  <b>E.</b> .SO<sub>3</sub></p>	

<i>Question</i>	<i>Answer</i>
<p><b>29.</b> The ionic bond in the NaCl define:</p> <p><b>A.</b> *The ability of the solution current electricity.</p> <p><b>B.</b> Plasticity.</p> <p><b>C.</b>Heat Conductivity.</p> <p><b>D.</b>Opacity.</p> <p><b>E.</b> Conductivity</p>	
<p><b>30.</b> Intermolecular hydrogen bond does not influence on such physical property of matter, as:</p> <p><b>A.</b> *molecular mass</p> <p><b>B.</b> boiling temperature</p> <p><b>C.</b> solubility in the water</p> <p><b>D.</b>density of solution</p> <p><b>E.</b> transformation of gas on a liquid</p>	
<p><b>31.</b> Specify the compounds of nitrogen with the valence IV:</p> <p><b>A.</b> *NH<sub>4</sub>Cl</p> <p><b>B.</b>NH<sub>3</sub></p> <p><b>C.</b>NO</p> <p><b>D.</b>HNO<sub>2</sub></p> <p><b>E.</b> N<sub>2</sub></p>	
<p><b>32.</b> What is the name for chemical bond which appears due to electrostatic attraction of the oppositely charged ions?</p> <p><b>A.</b> *Ionic</p> <p><b>B.</b> polar covalent</p> <p><b>C.</b> nonpolar covalent</p> <p><b>D.</b> donor-acceptor</p> <p><b>E.</b> hydrogen</p>	

## 6. Solution

<i>Question</i>	<i>Answer</i>
<p><b>1.</b> The amount of the dissolved substance, that is contained in a 1 liter of solution determines:</p> <p><b>A.</b> *molar concentration  <b>B.</b> mass percent  <b>C.</b> equivalent concentration  <b>D.</b> molar part  <b>E.</b> molal concentration</p>	
<p><b>2.</b> In the pharmaceutical analysis, as titrante the 0.1 M solution of hydrochloric acid is used. What volume of this acid can be prepared from 100 ml 1 M of solution of HCl?</p> <p><b>A.</b> *1000 ml  <b>B.</b> 50 ml  <b>C.</b> 200 ml  <b>D.</b> 2000 ml  <b>E.</b> 5000 ml</p>	
<p><b>3.</b> For preparation of 200 g of 10 % solution of the potassium iodide must be taken:</p> <p><b>A.</b> *20 g KI  <b>B.</b> 2 g KI  <b>C.</b> 0.2 g KI  <b>D.</b> 10 g KI  <b>E.</b> 4 g KI</p>	
<p><b>4.</b> For preparation of 50 g of hypertensive solution of the sodium chloride with mass percent 10% must be taken:</p> <p><b>A.</b> *5 g NaCl  <b>B.</b> 0.5 g NaCl  <b>C.</b> 1 g NaCl  <b>D.</b> 25 g NaCl  <b>E.</b> 50 g NaCl</p>	
<p><b>5.</b> In the 0.1 M solution of which acids the most concentration of cation of hydrogen are present?</p> <p><b>A.</b> *H<sub>2</sub>SO<sub>4</sub>  <b>B.</b> HCl  <b>C.</b> H<sub>2</sub>CO<sub>3</sub>  <b>D.</b> CH<sub>3</sub>COOH  <b>E.</b> H<sub>2</sub>SO<sub>3</sub></p>	
<p><b>6.</b> In 0.1 M solution of which compounds is the smallest concentration of ions?</p> <p><b>A.</b> *CH<sub>3</sub>COOH  <b>B.</b> HCl  <b>C.</b> CaCl<sub>2</sub>  <b>D.</b> H<sub>2</sub>SO<sub>4</sub>  <b>E.</b> NaNO<sub>3</sub></p>	

<i>Question</i>	<i>Answer</i>
<p><b>7.</b> At dissolution of salt in water the temperature of the solution is decreased. What is the process:</p> <p><b>A.</b> *endothermic  <b>B.</b> exothermic  <b>C.</b> isobaric  <b>D.</b> adiabatic  <b>E.</b> isochoric</p>	
<p><b>8.</b> For preparation of 1 L 0.1 M of sulfuric acid solution (<math>M(\text{H}_2\text{SO}_4) = 98 \text{ g/mol}</math>) must be taken:</p> <p><b>A.</b> *9.8g <math>\text{H}_2\text{SO}_4</math>  <b>B.</b> 980g NaCl  <b>C.</b> 0.098g NaCl  <b>D.</b> 49g NaCl  <b>E.</b> 98g NaCl</p>	
<p><b>9.</b> In the pharmaceutical analysis, as titrate the 0.1 M solution of hydrochloric acid is used. What volume of this acid can be prepared from 100 ml 0.5 M of solution of HCl?</p> <p><b>A.</b> *500 ml  <b>B.</b> 50 ml  <b>C.</b> 200 ml  <b>D.</b> 1000 ml  <b>E.</b> 5000 ml</p>	
<p><b>10.</b> For preparation of 500 g 10 % of sodium hydroxide solution must be taken:</p> <p><b>A.</b> *50 g  <b>B.</b> 0.5 g  <b>C.</b> 5 g  <b>D.</b> 10 g  <b>E.</b> 25 g</p>	
<p><b>11.</b> For preparation of 500 g of hypertensive solution of the sodium chloride with mass percent 10% must be taken:</p> <p><b>A.</b> *50g NaCl  <b>B.</b> 0.5 g NaCl  <b>C.</b> 25g NaCl  <b>D.</b> 75g NaCl  <b>E.</b> 150g NaCl</p>	
<p><b>12.</b> Solubility of gases in water at the increase of temperature:</p> <p><b>A.</b> *Decrease  <b>B.</b> Does not change  <b>C.</b> Increase  <b>D.</b> At first is increased, and then decreased  <b>E.</b> Decreased at first, and then is increased</p>	

## 7. Theory Of Electrolytic Dissociation

<i>Question</i>	<i>Answer</i>
<p><b>1.</b> Specify pH of 0.005 M solution of the sulphuric acid?</p> <p><b>A.</b> *2  <b>B.</b> 0  <b>C.</b> 1  <b>D.</b> 3  <b>E.</b> 4</p>	
<p><b>2.</b> Which of the following oxyacids is stronger?</p> <p><b>A.</b> * perchloric acid  <b>B.</b> chlorous acid  <b>C.</b> hypochlorous acid  <b>D.</b> chloric acid  <b>E.</b> - -</p>	
<p><b>3.</b> Which pairs of ions can be simultaneously found in the solution:</p> <p><b>A.</b> *<math>\text{Fe}^{3+}</math>, <math>\text{Cl}^-</math>  <b>B.</b> <math>\text{Ba}^{2+}</math>, <math>\text{SO}_4^{2-}</math>  <b>C.</b> <math>\text{Fe}^{2+}</math>, <math>\text{OH}^-</math>  <b>D.</b> <math>\text{Fe}^{3+}</math>, <math>\text{OH}^-</math>  <b>E.</b> <math>\text{Ag}^+</math>, <math>\text{Cl}^-</math></p>	
<p><b>4.</b> Which pairs of ions can be simultaneously found in the solution:</p> <p><b>A.</b> *<math>\text{Al}(\text{NO}_3)_3</math> and HCl  <b>B.</b> <math>\text{Ba}(\text{OH})_2</math> and <math>\text{CO}_2</math>  <b>C.</b> NaOH and <math>\text{P}_2\text{O}_5</math>  <b>D.</b> <math>\text{CuSO}_4</math> and <math>\text{BaCl}_2</math>  <b>E.</b> <math>\text{AgNO}_3</math> and HCl</p>	
<p><b>5.</b> In what from the resulted solutions is the pH = 0?</p> <p><b>A.</b> *1M HCl  <b>B.</b> 0.1M HCl  <b>C.</b> 0.1M KOH  <b>D.</b> 1M <math>\text{H}_3\text{PO}_4</math>  <b>E.</b> 1M <math>\text{Ba}(\text{OH})_2</math></p>	
<p><b>6.</b> The concentration of the <math>[\text{H}^+]</math> in the equation for calculation pH is expressed in:</p> <p><b>A.</b> *Mol/L  <b>B.</b> Mol/<math>\text{sm}^3</math>  <b>C.</b> Mol  <b>D.</b> Mol/kg  <b>E.</b> in molar stake</p>	
<p><b>7.</b> In solution the <math>[\text{OH}^-] = 1 \times 10^{-6}</math> mol/L. What is the pH of solution?</p> <p><b>A.</b> *8.  <b>B.</b> 6.  <b>C.</b> 1  <b>D.</b> 7  <b>E.</b> 4</p>	

Question	Answer
<p><b>8.</b> Which of the following electrolytes are only weak:</p> <p><b>A.</b> *NH<sub>3</sub> · H<sub>2</sub>O, CH<sub>3</sub>COOH  <b>B.</b> NH<sub>4</sub>Cl, NH<sub>3</sub> · H<sub>2</sub>O  <b>C.</b> CH<sub>3</sub>COOH, CH<sub>3</sub>COONa  <b>D.</b> HCl, AgCl  <b>E.</b> AgCl, NH<sub>4</sub>Cl</p>	
<p><b>9.</b> Which variant of record of expression for the solubility product constant is correct for the calcium orthophosphate?</p> <p><b>A.</b> * <math>K_{sp} [Ca_3(PO_4)_2] = [Ca^{2+}]^3 \cdot [PO_4^{3-}]^2</math>  <b>B.</b> <math>K_{sp} [Ca_3(PO_4)_2] = [Ca^{2+}] \cdot [PO_4^{3-}]</math>  <b>C.</b> <math>K_{sp} [Ca_3(PO_4)_2] = [Ca^{2+}]^3 + [PO_4^{3-}]^2</math>  <b>D.</b> <math>K_{sp} [Ca_3(PO_4)_2] = [Ca_3(PO_4)_2] / [Ca^{2+}]^3</math>  <b>E.</b> <math>K_{sp} [Ca_3(PO_4)_2] = [Ca^{2+}]^3 + [PO_4^{3-}]^2</math></p>	
<p><b>10.</b> Use the values of the K<sub>sp</sub>, specify, in which from the reactions it is possible completer to precipitate cations Ca<sup>2+</sup> from the solution</p> <p><b>A.</b> * <math>Ca^{2+} + 2F^- = CaF_2</math>    <math>K_{sp} [CaF_2] = 4.0 \times 10^{-11}</math>  <b>B.</b> <math>Ca^{2+} + SO_4^{2-} = CaSO_4</math>    <math>K_{sp}[CaSO_4] = 9.1 \times 10^{-8}</math>  <b>C.</b> <math>Ca^{2+} + CO_3^{2-} = CaCO_3</math>    <math>K_{sp}[CaCO_3] = 4.8 \times 10^{-9}</math>  <b>D.</b> <math>Ca^{2+} + C_2O_4^{2-} = CaC_2O_4</math>    <math>K_{sp}[CaC_2O_4] = 3.8 \times 10^{-9}</math>  <b>E.</b> <math>Ca^{2+} + CrO_4^{2-} = CaCrO_4</math>    <math>K_{sp}[CaCrO_4] = 2.3 \times 10^{-2}</math></p>	
<p><b>11.</b> Between solutions of what compounds irreversible process is possible:</p> <p><b>A.</b> *Fe<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> + NaOH  <b>B.</b> CaCl<sub>2</sub> + NaOH  <b>C.</b> Ca(OH)<sub>2</sub> + NaCl  <b>D.</b> FeCl<sub>3</sub> + Na<sub>2</sub>SO<sub>4</sub>  <b>E.</b> Fe<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> + NaCl</p>	
<p><b>12.</b> If to dispose in the order of decreasing of pH aqueous solutions with identical molar concentration of substances such row will go out:</p> <p><b>A.</b> *NaOH, NH<sub>3</sub>, CH<sub>3</sub>COOH, HCl, H<sub>2</sub>SO<sub>4</sub>  <b>B.</b> H<sub>2</sub>SO<sub>4</sub>, HCl, NaOH, CH<sub>3</sub>COOH, NH<sub>3</sub>  <b>C.</b> CH<sub>3</sub>COOH, HCl, NaOH, NH<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub>  <b>D.</b> HCl, H<sub>2</sub>SO<sub>4</sub>, NH<sub>3</sub>, CH<sub>3</sub>COOH, NaOH  <b>E.</b> NH<sub>3</sub>, CH<sub>3</sub>COOH, NaOH, HCl, H<sub>2</sub>SO<sub>4</sub></p>	
<p><b>13.</b> What pairs of ions can not be simultaneously found in aqueous solution:</p> <p><b>A.</b> *H<sup>+</sup> and CO<sub>3</sub><sup>2-</sup>  <b>B.</b> Na<sup>+</sup> and SO<sub>4</sub><sup>2-</sup>  <b>C.</b> K<sup>+</sup> and OH<sup>-</sup>  <b>D.</b> Ca<sup>2+</sup> and HCO<sup>-</sup>  <b>E.</b> Ag<sup>+</sup> and NO<sub>3</sub><sup>-</sup></p>	
<p><b>14.</b> What constant of dissociation of polyprotic acid always have anymore values?</p> <p><b>A.</b> * First  <b>B.</b> Second  <b>C.</b> Third  <b>D.</b> Fourth  <b>E.</b> Last</p>	



Question	Answer
<p><b>15.</b> Specify pairs of electrolytes the reaction between which in aqueous solution is impossible:</p> <p><b>A.</b> *NaBr and KOH  <b>B.</b> Na<sub>2</sub>S and HCl  <b>C.</b> K<sub>2</sub>CO<sub>3</sub> and H<sub>2</sub>SO<sub>4</sub>  <b>D.</b> Fe(NO<sub>3</sub>)<sub>3</sub> and NaOH  <b>E.</b> NaCl and AgNO<sub>3</sub></p>	
<p><b>16.</b> Specify the concentration of hydroxide ion in the solution, if pOH = 9</p> <p><b>A.</b> *10<sup>-9</sup>  <b>B.</b> 10<sup>-3</sup>  <b>C.</b> 10<sup>-1</sup>  <b>D.</b> 10<sup>-5</sup>  <b>E.</b> 10<sup>-7</sup></p>	
<p><b>17.</b> For which of the pairs of electrolytes the net ionic equation: H<sup>+</sup> + OH<sup>-</sup> = H<sub>2</sub>O is corresponded</p> <p><b>A.</b> *KOH and HNO<sub>3</sub>  <b>B.</b> NaOH and H<sub>2</sub>S  <b>C.</b> NH<sub>3</sub> · H<sub>2</sub>O and HCl  <b>D.</b> NH<sub>3</sub> · H<sub>2</sub>O and H<sub>2</sub>CO<sub>3</sub>  <b>E.</b> NH<sub>3</sub> · H<sub>2</sub>O and CH<sub>3</sub>COOH</p>	
<p><b>18.</b> The degree of dissociation of the ammonia hydrate:</p> <p>NH<sub>3</sub>·H<sub>2</sub>O <math>\rightleftharpoons</math> NH<sub>4</sub><sup>+</sup> + OH<sup>-</sup> is increased at:</p> <p><b>A.</b> *Dilution of the solution. .  <b>B.</b> Cooling of the solution.  <b>C.</b> Concentration of solution.  <b>D.</b> Addition of the ammonium salt.  <b>E.</b> Addition of the alkali</p>	
<p><b>19.</b> Solubility of the saturated aqueous solution (AgCl and BaSO<sub>4</sub>) is characterized by the special constant, designated K<sub>sp</sub> which is named:</p> <p><b>A.</b> Solubility product constant.  <b>B.</b> Constant of hydrolysis.  <b>C.</b> Degree of dissociation.  <b>D.</b> Coefficient of adsorption.  <b>E.</b> Degree of hydrolysis.</p>	
<p><b>20.</b> What is the [H<sup>+</sup>] in pure water?</p> <p><b>A.</b> 10<sup>-7</sup> mol/L  <b>B.</b> 10<sup>-14</sup> mol/L  <b>C.</b> 10<sup>-1</sup> mol/L  <b>D.</b> 10<sup>-3</sup> mol/L  <b>E.</b> 10<sup>-10</sup> mol/L</p>	
<p><b>21.</b> What is the pH in 0.001 M solution of HCl?:</p> <p><b>A.</b> *3  <b>B.</b> 0  <b>C.</b> 10  <b>D.</b> 7  <b>E.</b> 5</p>	

<i>Question</i>	<i>Answer</i>
<p><b>22.</b> What compound contains there most amounts of the ions in 0.1 M solution?</p> <p><b>A.</b> *Na<sub>3</sub>PO<sub>4</sub>  <b>B.</b> KCl  <b>C.</b> HCl  <b>D.</b> MgCl<sub>2</sub>  <b>E.</b> H<sub>2</sub>SO<sub>4</sub></p>	
<p><b>23.</b> Which of the following bases is weak electrolyte?</p> <p><b>A.</b> * Mg(OH)<sub>2</sub>  <b>B.</b> Ca(OH)<sub>2</sub>  <b>C.</b> Ba(OH)<sub>2</sub>  <b>D.</b> NaOH  <b>E.</b> KOH</p>	
<p><b>24.</b> Which from the following solutions has most osmotic pressure?</p> <p><b>A.</b> * 1 % solution of FeCl<sub>3</sub>  <b>B.</b> 1% solution of NaCl  <b>C.</b> 1% solution of glucose  <b>D.</b> 1% solution of saccharoses  <b>E.</b> 1 % solution of albumen</p>	
<p><b>25.</b> Which of the acids below is weak electrolyte?</p> <p><b>A.</b> *H<sub>3</sub>BO<sub>3</sub>  <b>B.</b> HNO<sub>3</sub>  <b>C.</b> HCl  <b>D.</b> HBr  <b>E.</b> H<sub>2</sub>SO<sub>4</sub></p>	
<p><b>26.</b> What is the pH in 0.01 M solution of HCl?</p> <p><b>A.</b> * 2  <b>B.</b> 3  <b>C.</b> 5  <b>D.</b> 4  <b>E.</b> 6</p>	
<p><b>27.</b> How the dihydrogenphosphate-ion (H<sub>2</sub>PO<sub>4</sub><sup>-</sup>) is dissociated?</p> <p><b>A.</b> * By two step, on each is partial  <b>B.</b> By one step – fully  <b>C.</b> By two step: by first step – fully, by second is partial  <b>D.</b> By one step – is partial  <b>E.</b> By two step: by first step – is partial, by second fully</p>	
<p><b>28.</b> What is the pH in 0.001 M solution of KOH?</p> <p><b>A.</b> * 11  <b>B.</b> 13  <b>C.</b> 10  <b>D.</b> 12  <b>E.</b> 9</p>	

Question	Answer
<p><b>29.</b> In which of the 0.1 M solution of the following acids is most concentration of Hydrogen ions?</p> <p><b>A.</b> *HCl  <b>B.</b> HCN  <b>C.</b> H<sub>2</sub>CO<sub>3</sub>  <b>D.</b> CH<sub>3</sub>COOH  <b>E.</b> H<sub>2</sub>SO<sub>3</sub></p>	
<p><b>30.</b> pH of 0.05 M solution of H<sub>2</sub>SO<sub>4</sub> is equal:</p> <p><b>A.</b> * 1  <b>B.</b> 2  <b>C.</b> 5  <b>D.</b> 4  <b>E.</b> 3</p>	
<p><b>31.</b> What is the pH in 0.1 M solution of HCl?</p> <p><b>A.</b> *1  <b>B.</b> 0  <b>C.</b> 2  <b>D.</b> 3  <b>E.</b> 4</p>	
<p><b>32.</b> pH of 0.005 M solution of Ba(OH)<sub>2</sub> is equal:</p> <p><b>A.</b> * 12  <b>B.</b> 13  <b>C.</b> 10  <b>D.</b> 11  <b>E.</b> 9</p>	
<p><b>33.</b> The solution with a mass percent of the NaCl 0.95% is used for considerable losses of blood. Specify the reaction of the given solution:</p> <p><b>A.</b> Neutral (pH = 7)  <b>B.</b> Acidic (pH &lt; 7)  <b>C.</b> basic (pH &gt; 7)  <b>D.</b> Strong acidic (pH = 1)  <b>E.</b> Strong basic (pH = 12)</p>	
<p><b>34.</b> What ions are found most in aqueous solution of orthophosphoric acid?</p> <p><b>A.</b> * H<sup>+</sup>  <b>B.</b> H<sub>2</sub>PO<sub>4</sub><sup>-</sup>  <b>C.</b> HPO<sub>4</sub><sup>2-</sup>  <b>D.</b> PO<sub>4</sub><sup>3-</sup>  <b>E.</b> OH<sup>-</sup></p>	
<p><b>35.</b> pH of the solution is equal 4. Calculate [H<sup>+</sup>] (mol/L):</p> <p><b>A.</b> 10<sup>-4</sup>  <b>B.</b> 4  <b>C.</b> 10<sup>-10</sup>  <b>D.</b> 10  <b>E.</b> 10<sup>2</sup></p>	

<i>Question</i>	<i>Answer</i>
<p><b>36.</b> Specify, which from the resulted aqueous solutions with identical molar concentrations, worse conducts an electric current?</p> <p><b>A.</b> * solution of cyanic (HCN) acid <b>B.</b> solution of potassium cyanide <b>C.</b> solution of sulphuric acid <b>D.</b> solution of potassium hydroxide <b>E.</b> solution of potassium sulphate</p>	
<p><b>37.</b> To decrease concentration in water <math>\text{OH}^-</math>, it is needed to add:</p> <p><b>A.</b> *Acid <b>B.</b> Sodium nitrate <b>C.</b> Alkali <b>D.</b> Ammonia <b>E.</b> Water</p>	

## 8. Hydrolysis Of Salts

<i>Question</i>	<i>Answer</i>
<p><b>1.</b> The product of hydrolysis of which from the following salts is basic salt?</p> <p><b>A.</b> *FeSO<sub>4</sub>  <b>B.</b> NaCl  <b>C.</b> K<sub>2</sub>CO<sub>3</sub>  <b>D.</b> NH<sub>4</sub>Cl  <b>E.</b> KBr</p>	
<p><b>2.</b> Specify, which from the following salts is the subject to the hydrolysis:</p> <p><b>A.</b> * NaF  <b>B.</b> NaCl  <b>C.</b> KI  <b>D.</b> LiBr  <b>E.</b> KI</p>	
<p><b>3.</b> Specify, which from the following salts is not the subject to the hydrolysis:</p> <p><b>A.</b> *KI  <b>B.</b> ZnSO<sub>4</sub>  <b>C.</b> KNO<sub>2</sub>  <b>D.</b> Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>  <b>E.</b> CrCl<sub>3</sub></p>	
<p><b>4.</b> The basic component of medicine (bismuth nitrate basic) there is the bismuth oxide-nitrate BiONO<sub>3</sub>, which is produced by reaction Bi(NO<sub>3</sub>)<sub>3</sub> with:</p> <p><b>A.</b> H<sub>2</sub>O  <b>B.</b> HCl  <b>C.</b> HNO<sub>3</sub>  <b>D.</b> Cl<sub>2</sub>  <b>E.</b> SnCl<sub>2</sub></p>	
<p><b>5.</b> Specify, what salt can not be got in the aqueous solution?</p> <p><b>A.</b> Al<sub>2</sub>S<sub>3</sub>  <b>B.</b> FeSO<sub>4</sub>  <b>C.</b> Na<sub>2</sub>S  <b>D.</b> AlCl<sub>3</sub>  <b>E.</b> Cr<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub></p>	
<p><b>6.</b> As the result of hydrolysis of magnesium silicide (Mg<sub>2</sub>Si) the following compound are appeared:</p> <p><b>A.</b> * silane and magnesium hydroxide  <b>B.</b> silane and magnesium oxide  <b>C.</b> coordination compound  <b>D.</b> silicon, magnesium oxide and hydrogen  <b>E.</b> silicon (IV) oxide, magnesium oxide and hydrogen</p>	

<i>Question</i>	<i>Answer</i>
<p><b>7.</b> Specify, what the salt can not be got in the aqueous solution?</p> <p><b>A.</b> * <math>\text{Cr}_2\text{S}_3</math>  <b>B.</b> <math>\text{K}_3\text{PO}_4</math>  <b>C.</b> <math>\text{NaNO}_3</math>  <b>D.</b> <math>\text{FeCl}_3</math>  <b>E.</b> <math>\text{NH}_4\text{Cl}</math></p>	
<p><b>8.</b> Which from the following nitrates would occurs of the hydrolysis?</p> <p><b>A.</b> * <math>\text{NH}_4\text{NO}_3</math>  <b>B.</b> <math>\text{Sr}(\text{NO}_3)_2</math>  <b>C.</b> <math>\text{NaNO}_3</math>  <b>D.</b> <math>\text{KNO}_3</math>  <b>E.</b> <math>\text{Ba}(\text{NO}_3)_2</math></p>	
<p><b>9.</b> Specify, which from the following salts is not the subject to the hydrolysis:</p> <p><b>A.</b> * <math>\text{KI}</math>  <b>B.</b> <math>\text{KNO}_2</math>  <b>C.</b> <math>\text{CrCl}_3</math>  <b>D.</b> <math>\text{Al}_2(\text{SO}_4)_3</math>  <b>E.</b> <math>\text{FeSO}_4</math></p>	
<p><b>10.</b> Some antibiotics can be collapsed in acidic solution. Which from the following salts is incompatible with such antibiotics in the liquid solution?</p> <p><b>A.</b> * <math>\text{NH}_4\text{Cl}</math>  <b>B.</b> <math>\text{CaCl}_2</math>  <b>C.</b> <math>\text{KI}</math>  <b>D.</b> <math>\text{Na}_3\text{PO}_4</math>  <b>E.</b> <math>\text{Na}_2\text{CO}_3</math></p>	
<p><b>11.</b> Specify, which from the following salts as a result of hydrolysis is formed basic solution:</p> <p><b>A.</b> * <math>\text{K}_2\text{S}</math>  <b>B.</b> <math>\text{NaBr}</math>  <b>C.</b> <math>\text{Ca}(\text{NO}_3)_2</math>  <b>D.</b> <math>\text{Al}_2\text{S}_3</math>  <b>E.</b> <math>\text{BaSO}_4</math></p>	
<p><b>12.</b> The hydrolysis reaction of which salt proceeds up to the end?</p> <p><b>A.</b> * <math>\text{Al}_2\text{S}_3</math>  <b>B.</b> <math>\text{CuSO}_4</math>  <b>C.</b> <math>\text{Na}_2\text{CO}_3</math>  <b>D.</b> <math>\text{K}_2\text{S}</math>  <b>E.</b> <math>\text{Zn}(\text{NO}_3)_2</math></p>	
<p><b>13.</b> Specify, which from the following salts is the subject to the irreversible hydrolysis:</p> <p><b>A.</b> * <math>\text{Cr}_2\text{S}_3</math>  <b>B.</b> <math>\text{Al}_2(\text{SO}_4)_3</math>  <b>C.</b> <math>\text{Cr}(\text{NO}_3)_3</math>  <b>D.</b> <math>\text{KNO}_3</math>  <b>E.</b> <math>\text{Na}_3\text{PO}_4</math></p>	

<i>Question</i>	<i>Answer</i>
<p><b>14.</b> Which of the salt has a next expression for calculation of hydrolysis constant <math>K_h = K_w/(K_a \times K_b)</math>?</p> <p>A. * <math>\text{CH}_3\text{COONH}_4</math>            B. <math>\text{FeCl}_3</math>            C. <math>\text{NH}_4\text{Cl}</math>            D. <math>\text{CH}_3\text{COONa}</math>            E. <math>\text{Li}_3\text{PO}_4</math></p>	
<p><b>15.</b> Which from the following salts as a result of hydrolysis gives an alkaline solution?</p> <p>A. * <math>\text{Na}_2\text{CO}_3</math>            B. <math>\text{KCl}</math>            C. <math>\text{AlCl}_3</math>            D. <math>\text{NaNO}_3</math>            E. <math>\text{Cr}_2(\text{SO}_4)_3</math></p>	
<p><b>16.</b> Which of the salt has a next expression for calculation of hydrolysis constant <math>K_h = K_w/K_b</math>?</p> <p>A. * <math>\text{NH}_4\text{Cl}</math>            B. <math>\text{LiNO}_3</math>            C. <math>\text{Na}_2\text{CO}_3</math>            D. <math>\text{K}_3\text{PO}_4</math>            E. <math>\text{K}_2\text{SO}_4</math></p>	
<p><b>17.</b> Which from the following salts as a result of hydrolysis gives an acidic solution?</p> <p>A. * <math>\text{Fe}(\text{NO}_3)_3</math>            B. <math>\text{K}_2\text{CO}_3</math>            C. <math>\text{NaI}</math>            D. <math>\text{K}_3\text{PO}_4</math>            E. <math>\text{BaCl}_2</math></p>	
<p><b>18.</b> Which of the salt has a next expression for calculation of hydrolysis constant <math>K_h = K_w/K_a</math>?</p> <p>A. * <math>\text{NaCN}</math>            B. <math>\text{Na}_2\text{SO}_4</math>            C. <math>(\text{NH}_4)_2\text{SO}_4</math>            D. <math>(\text{NH}_4)_3\text{PO}_4</math>            E. <math>\text{CH}_3\text{COONH}_4</math></p>	
<p><b>19.</b> Specify, which from the following salts is not the subject to the hydrolysis:</p> <p>A. * <math>\text{Ba}(\text{NO}_3)_2</math>            B. <math>\text{ZnCl}_2</math>            C. <math>\text{KNO}_2</math>            D. <math>\text{K}_2\text{HPO}_4</math>            E. <math>\text{AlCl}_3</math></p>	
<p><b>20.</b> Among the following salts specify the salt, the aqueous solution of which is acidic:</p> <p>A. * <math>\text{ZnSO}_4</math>            B. <math>\text{Na}_2\text{B}_4\text{O}_7</math>            C. <math>\text{Na}_3\text{PO}_4</math>            D. <math>\text{NaCl}</math>            E. <math>\text{K}_2\text{SO}_3</math></p>	

<i>Question</i>	<i>Answer</i>
<p><b>21.</b> Which from the following salts as a result of hydrolysis gives the basic salt?</p> <p><b>A.</b> *AlCl<sub>3</sub>  <b>B.</b> AgNO<sub>3</sub>  <b>C.</b> Na<sub>2</sub>CO<sub>3</sub>  <b>D.</b> BaI<sub>2</sub>  <b>E.</b> KNO<sub>2</sub></p>	
<p><b>22.</b> Specify, which from the following salts is not the subject to the hydrolysis:</p> <p><b>A.</b> *K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>  <b>B.</b> Cr<sub>2</sub>(CO<sub>3</sub>)<sub>3</sub>  <b>C.</b> KCrO<sub>2</sub>  <b>D.</b> CrCl<sub>3</sub>  <b>E.</b> Cr<sub>2</sub>S<sub>3</sub></p>	
<p><b>23.</b> Which from the following salts as a result of hydrolysis gives the basic salt?</p> <p><b>A.</b> *Cr<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>  <b>B.</b> K<sub>2</sub>CO<sub>3</sub>  <b>C.</b> AgNO<sub>3</sub>  <b>D.</b> CaCO<sub>3</sub>  <b>E.</b> Na<sub>2</sub>SO<sub>4</sub></p>	
<p><b>24.</b> Specify, which from the following salts is not the subject to the hydrolysis:</p> <p><b>A.</b> *Ca(NO<sub>3</sub>)<sub>2</sub>  <b>B.</b> ZnCl<sub>2</sub>  <b>C.</b> CuSO<sub>4</sub>  <b>D.</b> NaNO<sub>2</sub>  <b>E.</b> NH<sub>4</sub>Cl</p>	
<p><b>25.</b> What salt needs to be dissolved in water, to increase concentration of Hydrogen ion?</p> <p><b>A.</b> * ZnCl<sub>2</sub>  <b>B.</b> Na<sub>2</sub>CO<sub>3</sub>  <b>C.</b> NaCl  <b>D.</b> K<sub>3</sub>PO<sub>4</sub>  <b>E.</b> K<sub>2</sub>SO<sub>4</sub></p>	
<p><b>26.</b> Specify the colour of phenolphthalein in the solution of sodium sulfide.</p> <p><b>A.</b> *Crimson (dark pink)  <b>B.</b> Colourless  <b>C.</b> Dark blue  <b>D.</b> Yellow  <b>E.</b> Green</p>	
<p><b>27.</b> Specify, which from the following salts is not the subject to the hydrolysis:</p> <p><b>A.</b> * K<sub>2</sub>SO<sub>4</sub>  <b>B.</b> K<sub>2</sub>SO<sub>3</sub>  <b>C.</b> AlBr<sub>3</sub>  <b>D.</b> CuSO<sub>4</sub>  <b>E.</b> MnCl<sub>2</sub></p>	



<i>Question</i>	<i>Answer</i>
<p><b>28.</b> What salt needs to be dissolved in water, to increase concentration of Hydrogen ion:</p> <p>A. *ZnCl<sub>2</sub>            B. NaNO<sub>3</sub>            C. KCl            D. Na<sub>3</sub>CO<sub>2</sub>            E. Na<sub>2</sub>S</p>	
<p><b>29.</b> For which of the salt the next expression of hydrolysis constant is corresponds <math>K_h = K_w / K_b</math>.</p> <p>A. * CuSO<sub>4</sub>            B. KCN            C. CH<sub>3</sub>COONa            D. (NH<sub>4</sub>)<sub>2</sub>S            E. NaCl</p>	
<p><b>30.</b> The solution with a mass percent of the NaCl 0.95% is used for considerable losses of blood. Specify the reaction of the given solution:</p> <p>A. *Neutral (pH = 7)            B. Acidic (pH &lt; 7)            C. Basic (pH &gt; 7)            D. Strong acidic (pH = 1)            E. Strong basic (pH = 12)</p>	
<p><b>31.</b> For which of the salt the next expression of hydrolysis constant is corresponds <math>K_h = K_w / (K_a \times K_b)</math>?</p> <p>A. * (NH<sub>4</sub>)<sub>2</sub>S            B. NaCN            C. Fe(NO<sub>3</sub>)<sub>3</sub>            D. Li<sub>2</sub>S            E. NH<sub>4</sub>Cl</p>	
<p><b>32.</b> Which from the following salts as a result of hydrolysis gives an acidic solution?</p> <p>A. * Ammonium chloride            B. Ammonium carbonate            C. Sodium chloride            D. Sodium carbonate            E. Sodium sulphate</p>	
<p><b>33.</b> The hydrolysis reaction of which salt proceeds up to the end?</p> <p>A. * Cr<sub>2</sub>S<sub>3</sub>            B. Na<sub>2</sub>S            C. CuS            D. AlCl<sub>3</sub>            E. KCl</p>	
<p><b>34.</b> Some medicines are prepared by hydrolysis of corresponding basic salts. Specify, which from the following salts is not the subject to the hydrolysis:</p> <p>A. * K<sub>2</sub>SO<sub>4</sub>            B. NaHCO<sub>3</sub>            C. AlCl<sub>3</sub>            D. Bi(NO<sub>3</sub>)<sub>3</sub>            E. Na<sub>2</sub>SO<sub>3</sub></p>	

<i>Question</i>	<i>Answer</i>
<p><b>35.</b> Specify the salt, solution of which has the alkaline reaction:</p> <p><b>A.</b> *Na<sub>2</sub>S <b>B.</b> Na<sub>2</sub>SO<sub>4</sub> <b>C.</b> KCl <b>D.</b> CuCl<sub>2</sub> <b>E.</b> FeCl<sub>3</sub></p>	
<p><b>36.</b> The good soluble in water salts occur of hydrolysis. Which from the following salts is the subject to the</p> <p><b>A.</b> *ZnCl<sub>2</sub> <b>B.</b> K<sub>2</sub>SO<sub>4</sub> <b>C.</b> NaNO<sub>3</sub> <b>D.</b> CaI<sub>2</sub> <b>E.</b> BaCl<sub>2</sub></p>	
<p><b>37.</b> What substance is got at action H<sub>2</sub>O on PCl<sub>5</sub>?</p> <p><b>A.</b> *HCl + H<sub>3</sub>PO<sub>4</sub> <b>B.</b> HCl + H<sub>2</sub>[PO<sub>3</sub>H] <b>C.</b> Cl<sub>2</sub> + H<sub>3</sub>PO<sub>4</sub> <b>D.</b> P<sub>2</sub>O<sub>3</sub> + HCl <b>E.</b> P<sub>2</sub>O<sub>5</sub> + HCl</p>	

## 9. Oxidation-Reduction Reaction

Question	Answer
<p>1. Specify the reaction which is impossible:</p> <p>A. *<math>\text{KCl} + \text{Br}_2 \rightarrow \text{KBr} + \text{Cl}_2</math>.</p> <p>B. <math>\text{KI} + \text{Br}_2 \rightarrow \text{KBr} + \text{I}_2</math></p> <p>C. <math>\text{NaBr} + \text{Cl} \rightarrow \text{NaCl} + \text{Br}_2</math></p> <p>D. <math>\text{NaI} + \text{Cl}_2 \rightarrow \text{NaCl} + \text{I}_2</math></p> <p>E. <math>\text{KCl} + \text{I}_2 \rightarrow \text{KI} + \text{Cl}_2</math></p>	
<p>2. In the pharmaceutical analysis oxidation-reduction reactions are used widely. Which of the following reactions is oxidizing-reduction?</p> <p>A. *<math>\text{Zn} + \text{H}_2\text{SO}_4 = \text{ZnSO}_4 + \text{H}_2</math></p> <p>B. <math>\text{CuSO}_4 + 2\text{NaOH} = \text{Cu}(\text{OH})_2 + \text{Na}_2\text{SO}_4</math></p> <p>C. <math>\text{NH}_4\text{OH} + \text{HCl} = \text{NH}_4\text{Cl} + \text{H}_2\text{O}</math></p> <p>D. <math>\text{H}_2\text{CO}_3 = \text{CO}_2 + \text{H}_2\text{O}</math></p> <p>E. <math>\text{KBr} + \text{AgNO}_3 = \text{AgBr} + \text{KNO}_3</math></p>	
<p>3. On the basis of values oxidizing - reduction potentials of some reactions of Manganese, specify reaction, where Manganese is the strongest oxidizing agent:</p> <p>A. * <math>\text{MnO}_4^- + 8\text{H}^+ + 5\text{e} = \text{Mn}^{2+} + 4\text{H}_2\text{O};</math>  <math>E^\circ = 1.51\text{B}</math></p> <p>B. <math>\text{MnO}_4^- + 4\text{H}_2\text{O} + 3\text{e} = \text{Mn}(\text{OH})_4 + 4\text{OH}^- ;</math>  <math>E^\circ = 0.57\text{B}</math></p> <p>C. <math>\text{MnO}_4^- + \text{e} = \text{MnO}_4^{2-}</math> (basic solution);  <math>E^\circ = 0.54\text{B}</math></p> <p>D. <math>\text{MnO}_4^{2-} + 4\text{H}_2\text{O} + 2\text{e} = \text{Mn}(\text{OH})_4 + 4\text{OH}^- ;</math>  <math>E^\circ = 0.71\text{B}</math></p> <p>E. <math>\text{MnO}_2 + 4\text{H}^+ + 2\text{e} = \text{Mn}^{2+} + 2\text{H}_2\text{O};</math>  <math>E^\circ = 1.28\text{B}</math></p>	
<p>4. On the basis of values oxidizing - reduction potentials of some reactions of Chlorine , specify</p> <p>A. * <math>\text{HClO} + \text{H}^+ + 2\text{e} \rightarrow \text{Cl}^- + \text{H}_2\text{O};</math>  <math>E^\circ = 1.49\text{B}</math></p> <p>B. <math>\text{Cl}_2 + 2\text{e} \rightarrow 2\text{Cl}^- ; E^\circ = 1.36\text{B}</math></p> <p>C. <math>\text{ClO}^- + \text{H}_2\text{O} + 2\text{e} \rightarrow \text{Cl}^- + 2\text{OH}^- ;</math>  <math>E^\circ = 0.94\text{B}</math></p> <p>D. <math>\text{ClO}_3^- + 6\text{H}^+ + 6\text{e} \rightarrow \text{Cl}^- + 3\text{H}_2\text{O}; E^\circ = 1.45\text{B}</math></p> <p>E. <math>\text{ClO}_4^- + 8\text{H}^+ + 8\text{e} \rightarrow \text{Cl}^- + 4\text{H}_2\text{O}; E^\circ = 1.38\text{B}</math></p>	
<p>5. Molar mass of equivalent of oxidizing agent is equal</p> <p>A. * molar mass divided by a number of the added electrons</p> <p>B. molar mass divided by a number of the loss electrons</p> <p>C. molar mass divided by acidity of oxidizing agent</p> <p>D. molar mass divided by polyprotic of oxidizing agent</p> <p>E. molar mass divided by valence of oxidizing agent</p>	

Question	Answer
<p><b>6.</b> Specify the oxidizing-reduction pair, to which <math>I_2/2I^-</math> is reducing agent <math>E^\circ [I_2/2I^-] = 0.54V</math></p> <p><b>A.</b> * <math>Cl_2 \rightarrow 2Cl^-</math> <math>E^\circ = 1.36V</math></p> <p><b>B.</b> <math>SO_4^{2-} \rightarrow S</math> <math>E^\circ = 0.45V</math></p> <p><b>C.</b> <math>Sn^{2+} \rightarrow Sn^{4+}</math> <math>E^\circ = 0.15V</math></p> <p><b>D.</b> <math>2S_2O_3^{2-} \rightarrow S_4O_6^{2-}</math> <math>E^\circ = 0.09V</math></p> <p><b>E.</b> <math>2H^+ \rightarrow H_2</math> <math>E^\circ = 0.00V</math></p>	
<p><b>7.</b> Among the following acids choose oxidizing agent:</p> <p><b>A.</b> * <math>HNO_3</math></p> <p><b>B.</b> <math>HCl</math></p> <p><b>C.</b> <math>H_2SO_3</math></p> <p><b>D.</b> <math>H_2CO_3</math></p> <p><b>E.</b> <math>H_2S</math></p>	
<p><b>8.</b> Which from the following elements has only positive oxidation states?</p> <p><b>A.</b> *Magnesium.</p> <p><b>B.</b> Phosphorus.</p> <p><b>C.</b> Sulphur.</p> <p><b>D.</b> Nitrogen.</p> <p><b>E.</b> Arsenic.</p>	
<p><b>9.</b> Which from the following substances has oxidizing-reduction duality?</p> <p><b>A.</b> *<math>Na_2SO_3</math></p> <p><b>B.</b> <math>KMnO_4</math></p> <p><b>C.</b> <math>H_2S</math></p> <p><b>D.</b> <math>K_2Cr_2O_7</math></p> <p><b>E.</b> <math>NH_3</math></p>	
<p><b>10.</b> Specify, what condition oxidizing-reduction reaction occur in direct direction:</p> <p><b>A.</b> *<math>E_{ok}^0 &gt; E_{red}^0</math></p> <p><b>B.</b> <math>E_{ok}^0 &lt; E_{red}^0</math></p> <p><b>C.</b> <math>E_{ok}^0 = E_{red}^0</math></p> <p><b>D.</b> <math>E_{ok}^0 &gt; 0</math></p> <p><b>E.</b> <math>E_{ok}^0 &lt; 0</math></p>	
<p><b>11.</b> Oxidizing properties of uncombined halogens increase on the line:</p> <p><b>A.</b> *<math>I_2, Br_2, Cl_2, F_2</math></p> <p><b>B.</b> <math>F_2, Cl_2, Br_2, I_2</math></p> <p><b>C.</b> <math>Br_2, I_2, Cl_2, F_2</math></p> <p><b>D.</b> <math>Br_2, F_2, I_2, Cl_2</math></p> <p><b>E.</b> <math>I_2, Cl_2, Br_2, F_2</math></p>	
<p><b>12.</b> Define, what process is the process of oxidation?</p> <p><b>A.</b> *<math>2Cl^- \rightarrow Cl_2</math></p> <p><b>B.</b> <math>2ClO^- \rightarrow Cl_2</math></p> <p><b>C.</b> <math>ClO_3^- \rightarrow ClO^-</math></p> <p><b>D.</b> <math>Cl_2 \rightarrow 2Cl^-</math></p> <p><b>E.</b> <math>ClO_3^- \rightarrow Cl_2</math></p>	

<i>Question</i>	<i>Answer</i>
<p><b>13.</b> Which from the following substances has only oxidizing properties?</p> <p><b>A.</b> *K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>  <b>B.</b> Na<sub>2</sub>SO<sub>3</sub>  <b>C.</b> HCl  <b>D.</b> FeSO<sub>4</sub>  <b>E.</b> KI</p>	
<p><b>14.</b> Which of Manganese substances has oxidizing-reduction duality?</p> <p><b>A.</b> *MnO<sub>2</sub>  <b>B.</b> Mn<sub>2</sub>O<sub>7</sub>  <b>C.</b> MnO  <b>D.</b> KMnO<sub>4</sub>  <b>E.</b> MnSO<sub>4</sub></p>	
<p><b>15.</b> Which from the following substances has oxidizing-reduction duality?</p> <p><b>A.</b> *SO<sub>2</sub>  <b>B.</b> SO<sub>3</sub>  <b>C.</b> CO<sub>2</sub>  <b>D.</b> PbO<sub>2</sub>  <b>E.</b> CrO<sub>3</sub></p>	
<p><b>16.</b> Substance, in which nitrogen can be only oxidizing agent :</p> <p><b>A.</b> *HNO<sub>3</sub>  <b>B.</b> HNO<sub>2</sub>  <b>C.</b> NH<sub>3</sub>  <b>D.</b> NO<sub>2</sub>  <b>E.</b> N<sub>2</sub>O</p>	
<p><b>17.</b> Which from the following substances has only oxidizing properties?</p> <p><b>A.</b> *K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>  <b>B.</b> K<sub>2</sub>SO<sub>3</sub>  <b>C.</b> HBr  <b>D.</b> FeSO<sub>4</sub>  <b>E.</b> KI</p>	
<p><b>18.</b> Which from the following substances has oxidizing-reduction duality?</p> <p><b>A.</b> * H<sub>2</sub>O<sub>2</sub>  <b>B.</b> SO<sub>3</sub>  <b>C.</b> PbO<sub>2</sub>  <b>D.</b> CrO<sub>3</sub>  <b>E.</b> Mn<sub>2</sub>O<sub>7</sub></p>	
<p><b>19.</b> Which from the following substances has only reduction properties?</p> <p><b>A.</b> * Na<sub>2</sub>S  <b>B.</b> Na<sub>2</sub>SO<sub>3</sub>  <b>C.</b> Na<sub>2</sub>SO<sub>4</sub>  <b>D.</b> Na<sub>2</sub>S<sub>2</sub>O<sub>7</sub>  <b>E.</b> Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub></p>	

<i>Question</i>	<i>Answer</i>
<p><b>20.</b> What represents in this transformation <math>\text{Mn}^0 \rightarrow \text{Mn}^{2+}</math>?</p> <p><b>A.</b> * oxidation  <b>B.</b> reduction  <b>C.</b> oxidation- reduction  <b>D.</b> decrease of oxidation state  <b>E.</b> neutralization</p>	
<p><b>21.</b> In the oxidizing-reduction reactions the potassium permanganate <math>\text{KMnO}_4</math> is an oxidizing agent only. In acidic solution crimson (dark pink) colour becomes colourless. Specify the product of the reduction <math>\text{MnO}_4^-</math> ion in acidic solution:</p> <p><b>A.</b> * <math>\text{Mn}^{2+}</math>  <b>B.</b> <math>\text{MnO}_2</math>  <b>C.</b> <math>\text{MnO}_4^{2-}</math>  <b>D.</b> <math>\text{Mn}(\text{OH})_2</math>  <b>E.</b> <math>\text{Mn}(\text{OH})_4</math></p>	
<p><b>22.</b> The medicine - hydrogen peroxide <math>\text{H}_2\text{O}_2</math> contains the atom of oxygen in an intermediate degree oxidation state -1. Specify what properties it shows in oxidizing-reductions reactions:</p> <p><b>A.</b> *oxidizing-reduction duality  <b>B.</b> only oxidizing properties  <b>C.</b> only reduction properties  <b>D.</b> is solution for the reaction  <b>E.</b> has not oxidizing-reduction properties</p>	
<p><b>23.</b> Depending on the terms of occur oxidizing-reduction reactions, a permanganate-ion can be reduced to <math>\text{Mn}^{2+}</math>, <math>\text{Mn}^{4+}</math>, <math>\text{MnO}_4^{2-}</math>. What acidity of the solution is needed, that a permanganate-ion be reduced to the compounds of <math>\text{Mn}^{2+}</math>?</p> <p><b>A.</b> * acidic  <b>B.</b> weak basic  <b>C.</b> neutral  <b>D.</b> basic  <b>E.</b> weak acidic</p>	
<p><b>24.</b> Potassium permanganate <math>\text{KMnO}_4</math> in the reaction with hydrogen peroxide in acidic solution has only properties:</p> <p><b>A.</b> * oxidizing properties  <b>B.</b> reduction properties  <b>C.</b> is the reactions of disproportionation  <b>D.</b> oxidizing and reduction agent  <b>E.</b> has not oxidizing-reduction properties</p>	
<p><b>25.</b> Potassium permanganate <math>\text{KMnO}_4</math> is used in the medical practice as an antiseptic medicine. Specify, what chemical properties <math>\text{KMnO}_4</math> determine its antiseptic properties.</p> <p><b>A.</b> *Oxidizing  <b>B.</b> Acidic  <b>C.</b> Basic  <b>D.</b> Reducing  <b>E.</b> Ability to decompose at heating</p>	

<i>Question</i>	<i>Answer</i>
<p><b>26.</b> Specify, which from the substances of Manganese has only oxidizing properties?</p> <p><b>A.</b> *KMnO<sub>4</sub>  <b>B.</b> K<sub>2</sub>MnO<sub>4</sub>  <b>C.</b> MnO<sub>2</sub>  <b>D.</b> MnSO<sub>4</sub>  <b>E.</b> Mn(OH)<sub>2</sub></p>	
<p><b>27.</b> What chemical formula and colouring has product of reduction of potassium permanganate in the neutral solution?</p> <p><b>A.</b> *MnO<sub>2</sub>, brown  <b>B.</b> MnO<sub>2</sub>, green  <b>C.</b> K<sub>2</sub>MnO<sub>4</sub>, green  <b>D.</b> K<sub>2</sub>MnO<sub>4</sub>, violet  <b>E.</b> MnSO<sub>4</sub>, colourless</p>	
<p><b>28.</b> What represents in this transformation <math>\text{MnO}_4^- \rightarrow \text{MnO}_2</math> ?</p> <p><b>A.</b> * reduction in neutral solution  <b>B.</b> oxidation in acidic solution  <b>C.</b> reduction in acidic solution  <b>D.</b> oxidation in basic solution</p>	
<p><b>29.</b> Substance, in which nitrogen can be only reducing agent :</p> <p><b>A.</b> * NH<sub>3</sub>  <b>B.</b> N<sub>2</sub>H<sub>4</sub>  <b>C.</b> NH<sub>2</sub>OH  <b>D.</b> NO  <b>E.</b> NO<sub>2</sub></p>	
<p><b>30.</b> Substance, in which sulphur can be only oxidizing agent:</p> <p><b>A.</b> * H<sub>2</sub>SO<sub>4</sub>  <b>B.</b> SO<sub>2</sub>  <b>C.</b> H<sub>2</sub>SO<sub>3</sub>  <b>D.</b> S  <b>E.</b> Na<sub>2</sub>S</p>	
<p><b>31.</b> Substance, in which sulphur has oxidizing-reduction duality:</p> <p><b>A.</b> * SO<sub>2</sub>  <b>B.</b> H<sub>2</sub>S  <b>C.</b> K<sub>2</sub>SO<sub>4</sub>  <b>D.</b> Na<sub>2</sub>S  <b>E.</b> H<sub>2</sub>SO<sub>4</sub></p>	
<p><b>32.</b> Substance, in which nitrogen has oxidizing-reduction duality:</p> <p><b>A.</b> * NO<sub>2</sub>  <b>B.</b> N<sub>2</sub>O<sub>5</sub>  <b>C.</b> NH<sub>3</sub>  <b>D.</b> HNO<sub>3</sub>  <b>E.</b> NH<sub>4</sub>Cl</p>	

<i>Question</i>	<i>Answer</i>
<p><b>33.</b> Substance, in which nitrogen can be only oxidizing agent :</p> <p>A. * <math>\text{N}_2\text{O}_5</math>  <b>B.</b> <math>\text{NO}</math>  <b>C.</b> <math>\text{NO}_2</math>  <b>D.</b> <math>\text{N}_2\text{O}_3</math>  <b>E.</b> <math>\text{N}_2\text{O}_4</math></p>	
<p><b>34.</b> Sulphur in the oxidation state +4 can be:</p> <p>A. * oxidizing and reduction agent  <b>B.</b> only oxidizing agent.  <b>C.</b> only reduction agent.  <b>D.</b> has not oxidizing-reduction properties.  <b>E.</b> oxidizing agent only with strong reducing agents</p>	
<p><b>35.</b> In the pharmaceutical analysis as an oxidizing agent potassium dichromate is used. What amount of electrons dichromate-ion are gain and what is the oxidation states of Chromium after reduction?</p> <p>A. *6, +3  <b>B.</b>3, +3  <b>C.</b>3, +4  <b>D.</b>4, +2  <b>E.</b>8, +2</p>	
<p><b>36.</b> Potassium dichromate <math>\text{K}_2\text{Cr}_2\text{O}_7</math> is used as oxidizing agent in the acidic solution. Specify the product of the reduction <math>\text{Cr}_2\text{O}_7^{2-}</math> - ion in acidic solution:</p> <p>A. * <math>\text{Cr}^{3+}</math>  <b>B.</b> <math>\text{Cr}(\text{OH})_3</math>  <b>C.</b> <math>\text{Cr}(\text{OH})_2</math>  <b>D.</b> <math>[\text{Cr}(\text{OH})_6]^{3-}</math>  <b>E.</b> <math>\text{Cr}_2\text{O}_3</math></p>	
<p><b>37.</b> Which of the following reactions is oxidizing-reduction?</p> <p>A. * <math>\text{Zn} + \text{CuSO}_4 = \text{ZnSO}_4 + \text{Cu}</math>  <b>B.</b> <math>\text{CuSO}_4 + 2\text{NaOH} = \text{Cu}(\text{OH})_2 + \text{Na}_2\text{SO}_4</math>  <b>C.</b> <math>\text{NH}_4\text{OH} + \text{HCl} = \text{NH}_4\text{Cl} + \text{H}_2\text{O}</math>  <b>D.</b> <math>\text{H}_2\text{CO}_3 = \text{CO}_2 + \text{H}_2\text{O}</math>  <b>E.</b> <math>\text{KBr} + \text{AgNO}_3 = \text{AgBr} + \text{KNO}_3</math></p>	
<p><b>38.</b> One of the types of oxidizing-reduction reactions is the reactions of disproportionation. Which from the following reactions is the reaction of disproportionation?</p> <p>A. * <math>\text{ClO}_2 + \text{H}_2\text{O} = \text{HClO}_2 + \text{HClO}_3</math>  <b>B.</b> <math>\text{Cl}_2\text{O} + \text{H}_2\text{O} = 2\text{HClO}</math>  <b>C.</b> <math>\text{Cl}_2\text{O}_7 + \text{H}_2\text{O} = 2\text{HClO}_4</math>  <b>D.</b> <math>\text{I}_2\text{O}_5 + \text{H}_2\text{O} = 2\text{HIO}_3</math>  <b>E.</b> <math>\text{Br}_2\text{O} + \text{H}_2\text{O} = 2\text{HBrO}</math></p>	



<i>Question</i>	<i>Answer</i>
<p><b>39.</b> Specify, in which halogens oxidizing properties are most expressed:</p> <p><b>A.</b> *F<sub>2</sub></p> <p><b>B.</b> I<sub>2</sub></p> <p><b>C.</b> Br<sub>2</sub></p> <p><b>D.</b> Cl<sub>2</sub></p> <p><b>E.</b> Cl<sub>2</sub> and Br<sub>2</sub></p>	
<p><b>40.</b> Iron in the oxidation state +6 is an oxidation agent only, as:</p> <p><b>A.</b> * it has the greatest oxidation state</p> <p><b>B.</b> it has 5 electrons on the external electronic levels</p> <p><b>C.</b> is disposed in the VIIIB group</p> <p><b>D.</b> is d-element</p> <p><b>E.</b> is disposed in a fourth period</p>	

## 10. Coordination Compounds

<i>Question</i>	<i>Answer</i>
<p>1. Pharmacopoeia of Ukraine recommends as reagent <math>\text{Na}_2[\text{Fe}(\text{CN})_5\text{NO}]</math>. Specify the oxidation state of the central atom in the coordination compound</p> <p>A. *+3            B. 0            C. +1            D. +2            E. +6</p>	
<p>2. Which from the compounds is nonelectrolyte?</p> <p>A. * <math>[\text{Fe}(\text{CO})_5]</math>            B. <math>\text{Na}_3[\text{Co}(\text{NO}_2)_6]</math>            C. HCN            D. <math>\text{H}_2\text{O}</math>            E. NaOH</p>	
<p>3. Specify the oxidation state of the central atom in the coordination compound <math>[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]\text{Cl}</math></p> <p>A. *+3            B. 0            C. +2            D. +4            E. +6</p>	
<p>4. Specify the cation coordination compound:</p> <p>A. * <math>[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]\text{Cl}</math>            B. <math>\text{H}_2[\text{PtCl}_6]</math>            C. <math>\text{Na}_3[\text{Co}(\text{NO}_2)_6]</math>            D. <math>\text{K}_3[\text{Fe}(\text{CN})_6]</math>            E. <math>\text{Na}_2[\text{Fe}(\text{CN})_5\text{NO}]</math></p>	
<p>5. Specify the oxidation state of the central atom in the coordination compound <math>\text{H}_2[\text{PtCl}_6]</math></p> <p>A. *+4            B. 0            C. +2            D. +3            E. +6</p>	
<p>6. Specify the acidic complex?</p> <p>A. * <math>\text{K}_4[\text{CoF}_6]</math>            B. <math>[\text{Fe}(\text{CO})_5]</math>            C. <math>[\text{Cr}(\text{NH}_3)_6]\text{Cl}_3</math>            D. <math>[\text{Cr}(\text{H}_2\text{O})_4]\text{Cl}_2</math>            E. <math>\text{Na}_2[\text{Zn}(\text{OH})_4]</math></p>	
<p>7. Specify the oxidation state of the central atom in the coordination compound <math>\text{Na}_3[\text{Ag}(\text{S}_2\text{O}_3)_2]</math></p> <p>A. *+1            B. 0            C. +2            D. +4            E. +3</p>	

<i>Question</i>	<i>Answer</i>
<p><b>8.</b> Chlorophyll is the green pigment of the plants - is the coordination compound. Specify an central ion in it:</p> <p><b>A.</b> *<math>\text{Mg}^{2+}</math>  <b>B.</b> <math>\text{Fe}^{3+}</math>  <b>C.</b> <math>\text{Mn}^{2+}</math>  <b>D.</b> <math>\text{Fe}^{2+}</math>  <b>E.</b> <math>\text{Ni}^{2+}</math></p>	
<p><b>9.</b> Specify the oxidation state of the central atom in the coordination compound <math>\text{K}_3[\text{Fe}(\text{CN})_6]</math>:</p> <p><b>A.</b> *+3  <b>B.</b> +2  <b>C.</b> +1  <b>D.</b> +4  <b>E.</b> +6</p>	
<p><b>10.</b> Copper (II) hydroxide forms with alkalis the coordination compounds in which a copper has a coordinating number:</p> <p><b>A.</b> *4  <b>B.</b> 5  <b>C.</b> 6  <b>D.</b> 3  <b>E.</b> 2</p>	
<p><b>11.</b> Specify the central atom for the coordination compound <math>\text{K}_2[\text{HgI}_4]</math>:</p> <p><b>A.</b> *<math>\text{Hg}^{2+}</math>  <b>B.</b> <math>\text{K}^+</math>  <b>C.</b> <math>\text{I}^-</math>  <b>D.</b> <math>\text{HgI}_4^{2-}</math>  <b>E.</b> <math>\text{K}_2[\text{HgI}_4]</math></p>	
<p><b>12.</b> Hem (a structural part of hemoglobin) is coordination compound of iron. What type of coordination compound does it belong to?</p> <p><b>A.</b> * chelate complex  <b>B.</b> acidic complex  <b>C.</b> aqua complex  <b>D.</b> cation complex  <b>E.</b> hydroxo complex</p>	
<p><b>13.</b> Specify the coordination compound in which the oxidation state of the central atom is equal to +3</p> <p><b>A.</b> *<math>\text{K}_3[\text{Fe}(\text{CN})_6]</math>  <b>B.</b> <math>[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]</math>  <b>C.</b> <math>\text{K}_2[\text{Mn}(\text{CN})_4]</math>  <b>D.</b> <math>\text{K}_2[\text{PtCl}_4]</math>  <b>E.</b> <math>[\text{Ag}(\text{NH}_3)_2]\text{NO}_3</math></p>	

<i>Question</i>	<i>Answer</i>
<p><b>14.</b> Cyanocobaltamine (vitamin B12) is coordination Compound of cobalt. To what type of complex compounds. What type of coordination compound does it belong to?</p> <p><b>A.</b> *chelate complex  <b>B.</b> acidic complex  <b>C.</b> aqua complex  <b>D.</b> cation complex  <b>E.</b> hydroxo complex</p>	
<p><b>15.</b> Specify the formulae of compounds <math>\text{PtCl}_4 \cdot 6\text{NH}_3</math>, if the coordination number of Pt (IV) is equal to 6?</p> <p><b>A.</b> * <math>[\text{Pt}(\text{NH}_3)_6]\text{Cl}_4</math>  <b>B.</b> <math>[\text{Pt}(\text{NH}_3)_6]\text{Cl}_2</math>  <b>C.</b> <math>[\text{Pt}(\text{NH}_3)_4]\text{Cl}_4</math>  <b>D.</b> <math>[\text{Pt}(\text{NH}_3)_6]\text{Cl}_3</math>  <b>E.</b> <math>[\text{Pt}(\text{NH}_3)_2]\text{Cl}_4</math></p>	
<p><b>16.</b> The coordination compound <math>[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]</math> produces cis- and trans isomers. Specify the type of isomerism for this compound</p> <p><b>A.</b> * geometrical  <b>B.</b> coordination  <b>C.</b> hydrate  <b>D.</b> ionization  <b>E.</b> optical</p>	
<p><b>17.</b> The salt has the structure <math>\text{PtCl}_4 \cdot 4\text{NH}_3</math>. Salt <math>\text{AgNO}_3</math> besieges from the solution of this complex a half of the chloride ions. Which from the formulas corresponds to the given complex:</p> <p><b>A.</b> * <math>[\text{Pt}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}_2</math>  <b>B.</b> <math>[\text{Pt}(\text{NH}_3)_4\text{Cl}_4]</math>  <b>C.</b> <math>[\text{Pt}(\text{NH}_3)_4]\text{Cl}_4</math>  <b>D.</b> <math>[\text{Pt}(\text{NH}_3)_4\text{Cl}]\text{Cl}_3</math>  <b>E.</b> <math>[\text{Pt}(\text{NH}_3)_4\text{Cl}_3]\text{Cl}</math></p>	
<p><b>18.</b> Specify the coordination compound, that exposes antitumor activity</p> <p><b>A.</b> * <math>[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]</math>  <b>B.</b> <math>[\text{Co}(\text{NH}_3)_5\text{NO}_3]\text{Cl}_2</math>  <b>C.</b> <math>\text{Na}_4[\text{Sn}(\text{OH})_3\text{Cl}_3]</math>  <b>D.</b> <math>[\text{Cu}(\text{NH}_3)_4(\text{SCN})_2]</math>  <b>E.</b> <math>\text{K}_2\text{Na}[\text{Co}(\text{NO}_2)_6]</math></p>	
<p><b>19.</b> Specify the coordination compound, where Pt(IV) is the central atom:</p> <p><b>A.</b> * <math>[\text{Pt}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}_2</math>  <b>B.</b> <math>\text{K}_2[\text{PtCl}_4]</math>  <b>C.</b> <math>\text{Ba}[\text{Pt}(\text{CN})_4]</math>  <b>D.</b> <math>[\text{Pt}(\text{NH}_3)_4](\text{NO}_3)_2</math>  <b>E.</b> <math>[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]</math></p>	

Question	Answer
<p><b>20.</b> Coordination number of iron in the potassium hexacyanoferrate (II) <math>K_4[Fe(CN)_6]</math>, is equal:</p> <p>A. *6            B. 2            C. 4            D. 3            E. 8</p>	
<p><b>21.</b> Specify the type of mechanism of chemical bond production in the coordination compounds:</p> <p>A. *donor-acceptor            B. ionic            C. covalent            D. hydrogen            E. metallic</p>	
<p><b>22.</b> Using the values of the instability constants indicate the most stable complex ion:</p> <p>A. * <math>[Fe(CN)_6]^{3-}</math> <math>K_{in} = 1 \times 10^{-31}</math>            B. <math>[Ag(CN)_2]^-</math> <math>K_{in} = 1 \times 10^{-21}</math>            C. <math>[Ag(NH_3)_2]^+</math> <math>K_{in} = 5.89 \times 10^{-8}</math>            D. <math>[N(CN)_4]^{2-}</math> <math>K_{in} = 1 \times 10^{-22}</math>            E. <math>[Co(NH_3)_6]^{2+}</math> <math>K_{in} = 4.07 \times 10^{-5}</math></p>	
<p><b>23.</b> Some medicines are coordination compounds. Specify which of the ligand is bidentate.</p> <p>A. *oxalato            B. hydroxo            C. ammine            D. chloro            E. aqua</p>	
<p><b>24.</b> Specify which of the ligand is bidentate</p> <p>A. *ethylenediamine            B. rodano            C. cyano            D. pyridine            E. hydroxo</p>	
<p><b>25.</b> Specify, by what is determined the geometrical structure of coordination compounds?</p> <p>A. * by the type of orbital hybridization of central atom            B. by the oxidation state of central atom            C. by the number of ligands            D. by the charge of coordination sphere            E. by the coordination number of the central atom</p>	
<p><b>26.</b> What is the ion formed in the reaction of <math>CuSO_4</math> with the exes of ammonia in the aqueous solution:</p> <p>A. * <math>[Cu(NH_3)_4]^{2+}</math>            B. <math>CuOH^+</math>            C. <math>[Cu(NH_3)_2]^+</math>            D. <math>[Cu(OH)NH_3]^+</math>            E. <math>[Cu(H_2O)_4]^{2+}</math></p>	

<i>Question</i>	<i>Answer</i>
<p><b>27.</b> Coordination number of the central atom is:</p> <p><b>A.</b> *the number of chemical bonds between the central ion and the ligands</p> <p><b>B.</b> the oxidation state of central ion</p> <p><b>C.</b> the charge of ligand</p> <p><b>D.</b> the number of molecules and ions in the coordination compounds except the central atom</p> <p><b>E.</b> -</p>	
<p><b>28.</b> Specify the oxidation state of the central atom in the coordination compound <math>\text{H}[\text{AuCl}_4]</math>.</p> <p><b>A.</b> *+3</p> <p><b>B.</b> 0</p> <p><b>C.</b> +1</p> <p><b>D.</b> +2</p> <p><b>E.</b> +4</p>	

## 11. p-Elements Of Third And Fourth Groups

<i>Question</i>	<i>Answer</i>
<p>1. Carbon exists as three simple matters: diamond, graphite, carbine. To each of them the certain structures correspond in dependence from the type of hybridization of atomic orbital of carbon. What type of hybridization will realize carbon in allotropy modification - graphite?</p> <p>A. *<math>sp^2</math>            B. <math>sp^3</math>            C. <math>sp</math>            D. <math>sp^3d^2</math>            E. <math>dsp^3</math></p>	
<p>2. The salts of carbonic acid are widely used in medicine at the disease of stomach and intestine. Specify the salt that has the name drinkable soda:</p> <p>A. * <math>NaHCO_3</math>            B. <math>Na_2CO_3</math>            C. <math>K_2CO_3</math>            D. <math>Ca(HCO_3)_2</math>            E. <math>CaCO_3</math></p>	
<p>3. Choose the oxide that does not react with water:</p> <p>A. *<math>SiO_2</math>            B. <math>K_2O</math>            C. <math>CaO</math>            D. <math>CrO_3</math>            E. <math>N_2O_5</math></p>	
<p>4. Specify the salt that has the name drinkable soda:</p> <p>A. *<math>NaHCO_3</math>            B. <math>Na_2CO_3</math>            C. <math>K_2CO_3</math>            D. <math>Na_2CO_3 \cdot 10H_2O</math>            E. <math>CaCO_3</math></p>	
<p>5. Choose the oxide that does not react with water:</p> <p>A. *<math>SiO_2</math>            B. <math>CO_2</math>            C. <math>CaO</math>            D. <math>Cl_2O_7</math>            E. <math>CrO_3</math></p>	
<p>6. To the solutions of the given salts acid was added. What case is the selection of gas in?</p> <p>A. *<math>Na_2CO_3</math>.            B. <math>K_2SO_4</math>.            C. <math>CuSO_4</math>.            D. <math>Na_2SiO_3</math>.            E. <math>Ca_3(PO_4)_2</math>.</p>	

<i>Question</i>	<i>Answer</i>
<p><b>7.</b> Choose the oxide that does not react with water:</p> <p><b>A.</b> *CO  <b>B.</b> CaO  <b>C.</b> CO<sub>2</sub>  <b>D.</b> CrO<sub>3</sub>  <b>E.</b> Cl<sub>2</sub>O<sub>7</sub></p>	
<p><b>8.</b> Temporal hardness of water is conditioned by a presence in natural water of next salts of calcium and magnesium:</p> <p><b>A.</b> *hydrogen carbonates  <b>B.</b> sulfates  <b>C.</b> chlorides  <b>D.</b> nitrates  <b>E.</b> phosphates</p>	
<p><b>9.</b> Indicate the toxic compound:</p> <p><b>A.</b> *CO  <b>B.</b> CO<sub>2</sub>  <b>C.</b> (NH<sub>2</sub>)<sub>2</sub>CO  <b>D.</b> SiO<sub>2</sub>  <b>E.</b> Na<sub>2</sub>SiO<sub>3</sub></p>	
<p><b>10.</b> By the presence of what salts in water the conditioned temporal hardness of water?</p> <p><b>A.</b> * Mg(HCO<sub>3</sub>)<sub>2</sub> and Ca(HCO<sub>3</sub>)<sub>2</sub>.  <b>B.</b> KHCO<sub>3</sub> and Ca(HCO<sub>3</sub>)<sub>2</sub>.  <b>C.</b> KHCO<sub>3</sub> and NaHCO<sub>3</sub>.  <b>D.</b> CaCO<sub>3</sub> and MgCO<sub>3</sub>  <b>E.</b> Na<sub>2</sub>SO<sub>4</sub> and CaSO<sub>4</sub>.</p>	
<p><b>11.</b> At admission CO<sub>2</sub> through water solution of sodium carbonate will appear:</p> <p><b>A.</b> *sodium hydrogen carbonate  <b>B.</b> sodium hydroxide  <b>C.</b> sodium carbonate  <b>D.</b> carbonic acid  <b>E.</b> sodium oxide</p>	
<p><b>12.</b> Natural water always contains the dissolved salts. Which from the following salts can predetermine temporal hardness of water?</p> <p><b>A.</b> * Mg(HCO<sub>3</sub>)<sub>2</sub>  <b>B.</b> NaCl  <b>C.</b> CaCl<sub>2</sub>  <b>D.</b> MgCl<sub>2</sub>  <b>E.</b> Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub></p>	
<p><b>13.</b> The p- elements of IV group are carbon, silicon, tin, lead. Specify the changes of metallic properties in the row C – Si – Ge – Sn – Pb:</p> <p><b>A.</b> *increase  <b>B.</b> decreased  <b>C.</b> without change  <b>D.</b> at first decrease, then increase  <b>E.</b> at first increase, then decrease</p>	



Question	Answer
<p><b>14.</b> Lithium carbonate <math>\text{Li}_2\text{CO}_3</math> is applied in medicine for a prophylaxis and medical treatment of psychoses of a different origin. With which from the following compounds it can react:</p> <p><b>A.</b> *HCl  <b>B.</b> NaCl  <b>C.</b> <math>\text{LiNO}_3</math>  <b>D.</b> <math>\text{KNO}_3</math>  <b>E.</b> KCl</p>	
<p><b>15.</b> Boric acid exposes weak disinfectant properties. Its alcoholic solutions are used in ophthalmology, dermatology and cosmetic. What electrolyte <math>\text{H}_3\text{BO}_3</math> is:</p> <p><b>A.</b> *weak  <b>B.</b> strong  <b>C.</b> mean  <b>D.</b> slightly soluble  <b>E.</b> non-soluble</p>	
<p><b>16.</b> Sodium hydrogen carbonate is used in medicine at different diseases, which are accompanied by acidosis. Under the reaction of sodium hydrogen carbonate with hydrochloric acid the following gas will be produced:</p> <p><b>A.</b> * <math>\text{CO}_2</math>  <b>B.</b> CO  <b>C.</b> <math>\text{H}_2</math>  <b>D.</b> <math>\text{Cl}_2</math>  <b>E.</b> <math>\text{CH}_4</math></p>	
<p><b>17.</b> Water with high hardness useless for the pharmacy. Which from the following compounds can be used for reduction of hardness of water?</p> <p><b>A.</b> *<math>\text{Na}_2\text{CO}_3</math>, NaOH  <b>B.</b> <math>\text{CaCO}_3</math>, <math>\text{Ca}(\text{OH})_2</math>  <b>C.</b> <math>\text{Na}_3\text{PO}_4</math>, <math>\text{CaCl}_2</math>  <b>D.</b> <math>\text{MgSO}_4</math>, <math>\text{H}_2\text{SO}_4</math>  <b>E.</b> <math>\text{Na}_2\text{CO}_3</math>, NaCl</p>	
<p><b>18.</b> Specify empiric formula of medicinal preparation - borax.</p> <p><b>A.</b> *<math>\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}</math>  <b>B.</b> <math>\text{NaBO}_2</math>  <b>C.</b> <math>\text{Na}_3\text{B}</math>  <b>D.</b> <math>\text{B}(\text{OC}_2\text{H}_5)_3</math>  <b>E.</b> <math>\text{B}_2\text{H}_6</math></p>	
<p><b>19.</b> Specify the choice with silicon acid production:</p> <p><b>A.</b> *under the action of hydrochloric acid on the sodium silicate  <b>B.</b> under the action of water on the silicon dioxide  <b>C.</b> under the heating of silicon  <b>D.</b> under the action of silicon dioxide on the alkaline  <b>E.</b> under the action of hydrochloric acid on the silicon dioxide</p>	

<i>Question</i>	<i>Answer</i>
<p><b>20.</b> Which from the following species is correct for silicate acid:</p> <p><b>A.</b> *does not posses red-ox properties  <b>B.</b> soluble in water  <b>C.</b> does not release CO<sub>2</sub> from the solution of carbonates  <b>D.</b> it is strong acid  <b>E.</b> it can be formed under the dilution of SiO<sub>2</sub> in the water</p>	
<p><b>21.</b> For determination of CO<sub>2</sub> in the air the following compound can be used:</p> <p><b>A.</b> * aqua solution of Ca(OH)<sub>2</sub>  <b>B.</b> aqua solution of NaOH  <b>C.</b> CaO  <b>D.</b> Fe(OH)<sub>2</sub>  <b>E.</b> solid NaOH</p>	
<p><b>22.</b> Sodium hydrogen carbonate is used in medicine at acidosis. Under the reaction of sodium hydrogen carbonate with hydrochloric acid the following gas will be produced:</p> <p><b>A.</b> *CO<sub>2</sub>  <b>B.</b> NH<sub>3</sub>  <b>C.</b> Cl<sub>2</sub>  <b>D.</b> CO  <b>E.</b> H<sub>2</sub></p>	
<p><b>23.</b> The process of digestion of glass is the reaction of fluoride acid with:</p> <p><b>A.</b> * SiO<sub>2</sub>  <b>B.</b> Si  <b>C.</b> SiO  <b>D.</b> H<sub>2</sub>SiO<sub>3</sub>  <b>E.</b> SiF<sub>4</sub></p>	
<p><b>24.</b> Which from the salts, that is the component of "Carlovar's salt", that is used as a mean purgative, can react with diluted sulfuric acid?</p> <p><b>A.</b> * NaHCO<sub>3</sub>  <b>B.</b> Na<sub>2</sub>SO<sub>4</sub>  <b>C.</b> NaCl  <b>D.</b> K<sub>2</sub>SO<sub>4</sub>  <b>E.</b> KCl</p>	
<p><b>25.</b> Specify carbides:</p> <p><b>A.</b> *CaC<sub>2</sub> and Al<sub>4</sub>C<sub>3</sub>  <b>B.</b> CS<sub>2</sub> and CaC<sub>2</sub>  <b>C.</b> CH<sub>4</sub> and Al<sub>4</sub>C<sub>3</sub>  <b>D.</b> CaCO<sub>3</sub> and CaC<sub>2</sub>.  <b>E.</b> SiC and CH<sub>4</sub></p>	
<p><b>26.</b> Sodium hydrogen carbonate is used as:</p> <p><b>A.</b> * antiacidic mean  <b>B.</b> diuretic mean  <b>C.</b> purgative mean  <b>D.</b> holecogochoginniy mean  <b>E.</b> depressant mean</p>	

<i>Question</i>	<i>Answer</i>
<p><b>27.</b> Ordinary glass has composition which approximately is expressed by a formula:</p> <p><b>A.</b> *<math>\text{Na}_2\text{O} \cdot \text{CaO} \cdot 6\text{SiO}_2</math></p> <p><b>B.</b> <math>\text{SiO}_2</math></p> <p><b>C.</b> <math>\text{Na}_2\text{SiO}_3</math></p> <p><b>D.</b> <math>\text{Na}_2\text{SiO}_5</math></p> <p><b>E.</b> <math>\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}</math></p>	
<p><b>28.</b> The mechanism of toxic action of lead compounds is:</p> <p><b>A.</b> *bonding with SH – group of ferments system</p> <p><b>B.</b> forming of met-hemoglobin in blood</p> <p><b>C.</b> decreasing of pH value of blood</p> <p><b>D.</b> increasing of osmotic pressure of blood</p> <p><b>E.</b> decreasing of osmotic pressure of blood</p>	
<p><b>29.</b> Sodium hydrogen carbonate is used in medicine at acidosis. Specify the type of this compound:</p> <p><b>A.</b> *acidic salt</p> <p><b>B.</b> mean salt</p> <p><b>C.</b> neutral salt</p> <p><b>D.</b> basic salt</p> <p><b>E.</b> oxosalt</p>	
<p><b>30.</b> From carbonates stable to heating is:</p> <p><b>A.</b> *sodium carbonate</p> <p><b>B.</b> silver carbonate</p> <p><b>C.</b> calcium carbonate</p> <p><b>D.</b> magnesium carbonate</p> <p><b>E.</b> copper (II) carbonate</p>	

## 12. p-Elements Of Fifth Group

<i>Question</i>	<i>Answer</i>
<p>1. With which from the following substances very diluted nitric acid reacts without formation of gaseous products of reaction?</p> <p>A. *Mg            B. Cu            C. P            D. Pb            E.S</p>	
<p>2. As a result of reaction of mercury excess with diluted nitric acid the following gas will escape:</p> <p>A. *NO            B. N<sub>2</sub>            C. N<sub>2</sub>O            D. NH<sub>3</sub>            E. -</p>	
<p>3. Liquid ammonia – is a water solution of ammonium with mass percent:</p> <p>A. *10%            B. 3%            C. 5%            D. 15%            E. 8%</p>	
<p>4. Under the reaction of HNO<sub>3</sub> with the metals the different products are produced depending on activity of metal and concentration of acid. What is the reduction product of nitrogen at the reaction of very diluted nitric acid with magnesium:</p> <p>A. *NH<sub>4</sub><sup>+</sup>            B. N<sub>2</sub>            C. N<sub>2</sub>O            D. NO            E. NO<sub>2</sub></p>	
<p>5. If concentrated nitric acid HNO<sub>3</sub> react with copper, it can be reduced to the following compound:</p> <p>A. *NO<sub>2</sub>            B. O            C. N<sub>2</sub>O            D. N<sub>2</sub>            E. NH<sub>4</sub>NO<sub>3</sub></p>	
<p>6. What is the metal reduces the nitrogen of diluted nitric acid from oxidation state +5 to – 3?</p> <p>A. *Mg            B. Pt            C. Cu            D. Ag            E. Pb</p>	

<i>Question</i>	<i>Answer</i>
<p>7. Choose the metal that does not react with concentrated nitric acid:</p> <p>A. *Al            B. Cu            C. Mg            D. K            E.</p>	
<p>8. A very dilute nitric acid is maximally reduced by active metals with forming:</p> <p>A. *NH<sub>4</sub>NO<sub>3</sub>            B. N<sub>2</sub>O            C. N<sub>2</sub>            D. NO<sub>2</sub>            E. NO</p>	
<p>9. Choose the metal that does not react with concentrated nitric acid HNO<sub>3</sub>:</p> <p>A. *Fe            B. Co            C. Mn            D. Ca            E. K</p>	
<p>10. Gold does not dissolve in:</p> <p>A. *nitric acid            B. hot selenic acid            C. liquid solution of cyanides on the air            D. aqua regia            E.-</p>	
<p>11. Nitric acid is a very strong oxidizing agent. It can destroy fabrics of plants and animals and it can oxidize almost all metals and non-metals. The concentrated nitric acid does not react with:</p> <p>A. *gold            B. phosphorus            C. copper            D. magnesium            E. sulfur</p>	
<p>12. From the following equations indicate the reaction that shows the ability of nitric acid to enter into the reaction of exchange:</p> <p>A. *CaCO<sub>3</sub> + 2HNO<sub>3</sub> = Ca(NO<sub>3</sub>)<sub>2</sub> + CO<sub>2</sub> + H<sub>2</sub>O            B. 5HNO<sub>3</sub> + 3P + 12H<sub>2</sub>O = 3H<sub>3</sub>PO<sub>4</sub> + 2NO            C. Cu<sub>2</sub>O + 6HNO<sub>3</sub> = 2Cu(NO<sub>3</sub>)<sub>2</sub> + 2NO<sub>2</sub> + 3H<sub>2</sub>O            D. 4Ca + 10HNO<sub>3</sub> = 4Ca(NO<sub>3</sub>)<sub>2</sub> + N<sub>2</sub>O + 5H<sub>2</sub>O            E. Cu + 4HNO<sub>3</sub> = Cu(NO<sub>3</sub>)<sub>2</sub> + 2NO<sub>2</sub> + 2H<sub>2</sub>O</p>	
<p>13. Choose the metal that does not react with nitric acid:</p> <p>A. *Pt            B. Ca            C. Cu            D. Mg            E. Pb</p>	

<i>Question</i>	<i>Answer</i>
<p>14. Choose the metal that does not react with concentrated nitric acid:</p> <p><b>A.</b> *Cr  <b>B.</b> Na  <b>C.</b> Mg  <b>D.</b> Cu  <b>E.</b> Zn</p>	
<p>15. What is maximal valency of nitrogen in consideration of donor-acceptor mechanism of covalent bond?</p> <p><b>A.</b> * 4  <b>B.</b> 1  <b>C.</b> 2  <b>D.</b> 3  <b>E.</b> 5</p>	
<p>16. Under the action of ammonium on the acids the salts of ammonium are produced. What are the properties this process characterizes:</p> <p><b>A.</b> * to attract the hydrogen-ion  <b>B.</b> reducing  <b>C.</b> acidic  <b>D.</b> oxidizing  <b>E.</b> undergoing hydrolysis</p>	
<p>17. Nitrogen produces some oxides: <math>N_2O</math>, <math>NO</math>, <math>N_2O_3</math>, <math>NO_2</math>, <math>N_2O_5</math>. The acidic oxides are:</p> <p><b>A.</b> *<math>N_2O_3</math>, <math>NO_2</math>, <math>N_2O_5</math>  <b>B.</b> <math>N_2O_3</math>, <math>N_2O_5</math>, <math>N_2O</math>  <b>C.</b> <math>N_2O</math>, <math>NO</math>, <math>NO_2</math>  <b>D.</b> <math>N_2O</math>, <math>N_2O_3</math>, <math>N_2O_5</math>  <b>E.</b> <math>NO</math>, <math>N_2O_3</math>, <math>N_2O_5</math></p>	
<p>18. What are the properties has the solution of ammonium into water:</p> <p><b>A.</b> *reducing and weak base.  <b>B.</b> oxidizing and weak base  <b>C.</b> reducing and acid  <b>D.</b> oxidizing and acid  <b>E.</b> oxidizing and strong base</p>	
<p>19. Specify the gaseous mixture that forms into the air during a thunderstorm:</p> <p><b>A.</b> *<math>O_3</math>, <math>NO_2</math>  <b>B.</b> <math>CO</math>, <math>NO_2</math>  <b>C.</b> <math>CO</math>, <math>NO</math>  <b>D.</b> <math>CO</math>, <math>O_3</math>  <b>E.</b> <math>N_2O</math>, <math>CO</math></p>	
<p>20. Which of the compounds does not involved with solution of alkaline?</p> <p><b>A.</b> *<math>NH_3</math>  <b>B.</b> <math>H_2S</math>  <b>C.</b> <math>HCl</math>  <b>D.</b> <math>Cl_2</math>  <b>E.</b> <math>CO_2</math></p>	

<i>Question</i>	<i>Answer</i>
<p>21. Which of the acids has the nitrogen atom as the only oxidizing agent?</p> <p>A. *HNO<sub>3</sub>            B. HCl            C. H<sub>2</sub>SO<sub>3</sub>            D. H<sub>2</sub>CO<sub>3</sub>            E. H<sub>2</sub>S</p>	
<p>22. Silver nitrate is applied in ophthalmology as a mean bactericidal. AgNO<sub>3</sub> can be produced under the reaction of following compounds:</p> <p>A. *Ag + HNO<sub>3</sub>            B. Ag + KNO<sub>3</sub>            C. AgCl + NaNO<sub>3</sub>            D. Ag<sub>2</sub>O + KNO<sub>3</sub>            E. AgCl + NH<sub>4</sub>NO<sub>3</sub></p>	
<p>23. Which of the following compounds has the nitrogen atom in the minimal oxidation state?</p> <p>A. *NH<sub>3</sub>            B. HNO<sub>2</sub>            C. HNO<sub>3</sub>            D. N<sub>2</sub>O<sub>5</sub>            E. NO<sub>2</sub></p>	
<p>24. Among the given nitrates indicate the salt undergoing hydrolysis</p> <p>A. *NH<sub>4</sub>NO<sub>3</sub>            B. Sr(NO<sub>3</sub>)<sub>2</sub>            C. NaNO<sub>3</sub>            D. KNO<sub>3</sub>            E. Ba(NO<sub>3</sub>)<sub>2</sub></p>	
<p>25. Which of the following compounds has the nitrogen atom as the only oxidizing agent?</p> <p>A. *N<sub>2</sub>O<sub>5</sub>            B. NO            C. NO<sub>2</sub>            D. N<sub>2</sub>O<sub>3</sub>            E. N<sub>2</sub>O<sub>4</sub></p>	
<p>26. Sodium nitrite is used in medicine as a vasodilating drug against stenocardia. NaNO<sub>2</sub> acts as reducer with the following compounds:</p> <p>A. *KMnO<sub>4</sub>            B. H<sub>2</sub>S            C. NH<sub>3</sub>            D. KI            E. NaHCO<sub>3</sub></p>	
<p>27. Specify the compound in which nitrogen atom has oxidation-reduction duality:</p> <p>A. *NO<sub>2</sub>            B. N<sub>2</sub>O<sub>5</sub>            C. NH<sub>3</sub>            D. HNO<sub>3</sub>            E. NH<sub>4</sub>Cl</p>	

<i>Question</i>	<i>Answer</i>
<p><b>28.</b> Which of the following compounds has the nitrogen atom as the only oxidizing agent?</p> <p>A. * <math>\text{HNO}_3</math>            B. <math>\text{HNO}_2</math>            C. <math>\text{NH}_3</math>            D. <math>\text{NO}_2</math>            E. <math>\text{N}_2\text{O}</math></p>	
<p><b>29.</b> Specify the compound of nitrogen in the oxidation state <math>-2</math>?</p> <p>A. * <math>\text{N}_2\text{H}_4</math>            B. <math>\text{NH}_3</math>            C. <math>\text{NO}</math>            D. <math>\text{N}_2\text{O}</math>            E. <math>\text{NO}_2</math></p>	
<p><b>30.</b> Nitrogen (I) oxide (<math>\text{N}_2\text{O}</math>) is applied for inhalation narcosis. It is obtained by heating of:</p> <p>A. * <math>\text{NH}_4\text{NO}_3</math>            B. <math>\text{NH}_4\text{NO}_2</math>            C. <math>\text{Cu}(\text{NO}_3)_2</math>            D. <math>\text{NH}_4\text{OH}</math>            E. <math>\text{NaNO}_3</math></p>	
<p><b>31.</b> Which of the following compounds has the nitrogen atom as the only reducing agent?</p> <p>A. * <math>\text{NH}_3</math>            B. <math>\text{N}_2\text{H}_4</math>            C. <math>\text{NH}_2\text{OH}</math>            D. <math>\text{NO}</math>            E. <math>\text{NO}_2</math></p>	
<p><b>32.</b> The presence of arsenic in the compounds used in pharmacy is determined by Marsh's reaction. The compound of arsenic with hydrogen is formed. What is the oxidation state of arsenic in this compound?</p> <p>A. * <math>-3</math>            B. <math>+3</math>            C. <math>+5</math>            D. <math>-5</math>            E. <math>+1</math></p>	
<p><b>33.</b> What the compounds are produced under the reaction of <math>\text{H}_2\text{O}</math> and <math>\text{PCl}_5</math>:</p> <p>A. * <math>\text{HCl} + \text{H}_3\text{PO}_4</math>            B. <math>\text{HCl} + \text{H}_2[\text{PO}_3\text{H}]</math>            C. <math>\text{Cl}_2 + \text{H}_3\text{PO}_4</math>            D. <math>\text{P}_2\text{O}_3 + \text{HCl}</math>            E. <math>\text{P}_2\text{O}_5 + \text{HCl}</math></p>	



<i>Question</i>	<i>Answer</i>
34. Sodium hydrogen arsenate $\text{Na}_2\text{HAsO}_4 \cdot 7\text{H}_2\text{O}$ Is applied in medicine as general health-improving and tonic drug. What type of salts does it relate to? <b>A.</b> * acid salt <b>B.</b> neutral salt <b>C.</b> base salt <b>D.</b> double salt <b>E.</b> mixed salt	
35. The oxidation state of phosphorus atom into phosphoric acid is equal: <b>A.</b> *+5 <b>B.</b> -3 <b>C.</b> +1 <b>D.</b> +3 <b>E.</b> +4	
36. The main component of medicines (bismuth (III) hydroxonitrate) is oxonitrate of bismuth (III) that can be formed under the reaction with: <b>A.</b> * $\text{H}_2\text{O}$ <b>B.</b> $\text{HCl}$ <b>C.</b> $\text{HNO}_3$ <b>D.</b> $\text{Cl}_2$ <b>E.</b> $\text{SnCl}_2$	
37. The oxidation state of phosphorus atom into $\text{H}[\text{PO}_2\text{H}_2]$ is equal: <b>A.</b> *+1 <b>B.</b> +4 <b>C.</b> +5 <b>D.</b> +3 <b>E.</b> -3	
38. Which compound is the most stable? <b>A.</b> * $\text{NH}_3$ <b>B.</b> $\text{PH}_3$ <b>C.</b> $\text{AsH}_3$ <b>D.</b> $\text{SbH}_3$ <b>E.</b> $\text{BiH}_3$	
39. What is the oxidation state of phosphorus atom into phosphorous acid: <b>A.</b> *+3 <b>B.</b> -3 <b>C.</b> +1 <b>D.</b> +4 <b>E.</b> +5	
40. Specify the compound of hydrogen with the elements of V-th group that is the most polar and the most stable: <b>A.</b> * $\text{NH}_3$ <b>B.</b> $\text{PH}_3$ <b>C.</b> $\text{AsH}_3$ <b>D.</b> $\text{SbH}_3$ <b>E.</b> $\text{BiH}_3$	

<i>Question</i>	<i>Answer</i>
<p>41. Under the heating of orthophosphoric acid the diphosphoric acid is formed. Specify the formulae of diphosphoric acid.</p> <p><b>A.</b> *<math>\text{H}_4\text{P}_2\text{O}_7</math>  <b>B.</b> <math>\text{HPO}_3</math>  <b>C.</b> <math>\text{H}[\text{H}_2\text{PO}_2]</math>  <b>D.</b> <math>\text{H}_2[\text{HPO}_3]</math>  <b>E.</b> <math>\text{H}_3\text{PO}_4</math></p>	
<p>42. Slightly toxic oxide of nitrogen (exhilarant gas) is applied in medicine for anesthesia at surgical operations. Specify this oxide:</p> <p><b>A.</b> * <math>\text{N}_2\text{O}</math>  <b>B.</b> <math>\text{NO}</math>  <b>C.</b> <math>\text{N}_2\text{O}_3</math>  <b>D.</b> <math>\text{NO}_2</math>  <b>E.</b> <math>\text{N}_2\text{O}_5</math></p>	
<p>43. The dissociation of dihydrogen phosphate-ion has:</p> <p><b>A.</b> * two step, partly  <b>B.</b> one step, almost  <b>C.</b> two step: first-almost, second-partly  <b>D.</b> one step, partly  <b>E.</b> two step: first-partly, second-almost</p>	
<p>44. Which from the following oxides is it possible to use as drying out mean?</p> <p><b>A.</b> *<math>\text{P}_2\text{O}_5</math>  <b>B.</b> <math>\text{CuO}</math>  <b>C.</b> <math>\text{Fe}_2\text{O}_3</math>  <b>D.</b> <math>\text{CO}_2</math>  <b>E.</b> <math>\text{Al}_2\text{O}_3</math></p>	

### 13. p-Elements Of The Sixth Group

<i>Question</i>	<i>Answer</i>
<p>1. Which of the following compound is used for the qualitative identification of ozone?</p> <p>A. *KI            B. I<sub>2</sub>            C. H<sub>2</sub>O<sub>2</sub>            D. H<sub>2</sub>SO<sub>4</sub>            E. KMnO<sub>4</sub></p>	
<p>2. If concentrated sulfuric acid react with non-active metal, it can be reduced to the following compound:</p> <p>A. *SO<sub>2</sub>            B. S            C. H<sub>2</sub>S            D. H<sub>2</sub>S<sub>2</sub>O<sub>3</sub>            E. SO<sub>3</sub></p>	
<p>3. Which of the compound is selected in the process of qualitative determination of ozone?</p> <p>A. *iodine            B. fluorine            C. chlorine            D. bromine            E. nitrogen</p>	
<p>4. Hydrogen peroxide H<sub>2</sub>O<sub>2</sub> has the atom of oxygen in the oxidation state -1. Hydrogen peroxide in the oxidation-reduction reaction possesses:</p> <p>A. * oxidation-reduction duality            B. only oxidation properties            C. only reduction properties            D. is a medium for reaction            E. don't react in red-ox reaction</p>	
<p>5. The test of gas contains ozone. Specify the solution of what compound change the color at admission through it of ozone:</p> <p>A. * KI            B. Na<sub>2</sub>SO<sub>4</sub>            C. Mg(NO<sub>3</sub>)<sub>2</sub>            D. HgCl<sub>2</sub>            E. H<sub>3</sub>PO<sub>4</sub></p>	
<p>6. Medicinal preparation of hydrogen peroxide possesses antibacterial properties. Specify the compound appearing at the catalytic decomposition of H<sub>2</sub>O<sub>2</sub> and due to this compound hydrogen peroxide has biological activity:</p> <p>A. *O<sub>2</sub>            B. H<sub>2</sub>            C. H<sub>2</sub>O            D. NaOH            E. Na<sub>2</sub>O<sub>2</sub></p>	

Question	Answer
<p>7. Specify the compound of oxygen with positive oxidation state:</p> <p>A. *OF<sub>2</sub>            B. CO<sub>2</sub>            C. H<sub>2</sub>O<sub>2</sub>            D. KO<sub>2</sub>            E. KO<sub>3</sub></p>	
<p>8. Oleum is named:</p> <p>A. *the solution of SO<sub>3</sub> in sulfuric acid            B. the solution of SO<sub>2</sub> in sulfuric acid            C. the product of reaction of SO<sub>3</sub> and H<sub>2</sub>O            D. the solution of hydrogen sulfide in sulfuric acid            E. the solution of sulfur in sulfuric acid</p>	
<p>9. Which from the following reaction is used in submarine boats for the regeneration of air?</p> <p>A. *2Na<sub>2</sub>O<sub>2</sub> + 2CO<sub>2</sub> = 2Na<sub>2</sub>CO<sub>3</sub> + O<sub>2</sub>            B. 2KMnO<sub>4</sub> = K<sub>2</sub>MnO<sub>4</sub> + MnO<sub>2</sub> + O<sub>2</sub>            C. 2KClO<sub>3</sub> = 2KCl + 3O<sub>2</sub>            D. 2NaNO<sub>3</sub> = 2NaNO<sub>2</sub> + O<sub>2</sub>            E. 2H<sub>2</sub>O<sub>2</sub> = 2H<sub>2</sub>O + O<sub>2</sub></p>	
<p>10. The solution of SO<sub>3</sub> in 100% sulfuric acid is named:</p> <p>A. *oleum            B. "aqua regia"            C. hydrofluoric acid            D. oleic acid            E. Caro's acid</p>	
<p>11. Under the reaction of acids with thiosulfate the following compounds are formed:</p> <p>A. * S and SO<sub>2</sub>            B. H<sub>2</sub>SO<sub>3</sub>            C. H<sub>2</sub>S and S            D. SO<sub>3</sub>            E. H<sub>2</sub>SO<sub>4</sub></p>	
<p>12. Which of the hydrogen compounds with elements of VIA group is the most stable?</p> <p>A. * H<sub>2</sub>O            B. H<sub>2</sub>S            C. H<sub>2</sub>Se            D. H<sub>2</sub>Te            E. H<sub>2</sub>Po</p>	
<p>13. The diluted sulfuric acid reacts:</p> <p>A. *with metals that dispose before the hydrogen in the row of standard electrode potentials            B. with alkaline metals only            C. with metals and nonmetals            D. with nonmetals only            E. with metals that dispose after the hydrogen in the row of standard electrode potentials</p>	

<i>Question</i>	<i>Answer</i>
<p><b>14.</b> Under the thermal decomposition of potassium permanganate in the laboratory the following compound can be obtained:</p> <p><b>A.</b> *O<sub>2</sub>  <b>B.</b> H<sub>2</sub>  <b>C.</b> KOH  <b>D.</b> H<sub>2</sub>O<sub>2</sub>  <b>E.</b> Mn(OH)<sub>2</sub></p>	
<p><b>15.</b> Sulfuric acid can form the salts:</p> <p><b>A.</b> *sulfates and hydrogensulfates  <b>B.</b> sulfates and hydrogensulfites  <b>C.</b> sulfides and hydrogensulfides  <b>D.</b> sulfides  <b>E.</b> sulfites</p>	
<p><b>16.</b> Specify disulfuric acid:</p> <p><b>A.</b> * H<sub>2</sub>S<sub>2</sub>O<sub>7</sub>  <b>B.</b> H<sub>2</sub>S<sub>2</sub>O<sub>5</sub>  <b>C.</b> H<sub>2</sub>S<sub>2</sub>O<sub>8</sub>  <b>D.</b> H<sub>2</sub>S  <b>E.</b> H<sub>2</sub>S<sub>4</sub>O<sub>6</sub></p>	
<p><b>17.</b> The product of reaction of sodium thiosulfate with iodine is:</p> <p><b>A.</b> * sodium iodide and sodium tetrathionate  <b>B.</b> sodium iodide and sodium hydrogensulfate  <b>C.</b> sodium sulfate and hydroiodic acid  <b>D.</b> sodium iodide and sodium sulfate  <b>E.</b> sodium iodide and sulfuric acid</p>	
<p><b>18.</b> The concentrated sulfuric acid does not react with iron under room temperature because of:</p> <p><b>A.</b> *the insoluble oxide layer appears on the surface of iron  <b>B.</b> iron is an active metal  <b>C.</b> iron is the d-element  <b>D.</b> iron is the element of VIII B group  <b>E.</b> iron is the element of fourth period</p>	
<p><b>19.</b> Specify the product of oxidizing reaction of sodium thiosulfate with iodine:</p> <p><b>A.</b> * Na<sub>2</sub>S<sub>4</sub>O<sub>6</sub>  <b>B.</b> S + H<sub>2</sub>SO<sub>4</sub>  <b>C.</b> S + Na<sub>2</sub>SO<sub>4</sub>  <b>D.</b> Na<sub>2</sub>S + H<sub>2</sub>SO<sub>4</sub>  <b>E.</b> Na<sub>2</sub>SO<sub>4</sub> + H<sub>2</sub>SO<sub>4</sub></p>	
<p><b>20.</b> Specify the compound in which sulfur atom can be reducing agent only:</p> <p><b>A.</b> *H<sub>2</sub>S  <b>B.</b> SO<sub>2</sub>  <b>C.</b> SO<sub>3</sub>  <b>D.</b> H<sub>2</sub>SO<sub>3</sub>  <b>E.</b> H<sub>2</sub>SO<sub>4</sub></p>	

<i>Question</i>	<i>Answer</i>
<p><b>21.</b> Specify the compound in which sulfur atom can be reducing agent only:</p> <p>A. *H<sub>2</sub>S            B. SO<sub>2</sub>            C. SO<sub>3</sub>            D. H<sub>2</sub>SO<sub>3</sub>            E. H<sub>2</sub>SO<sub>4</sub></p>	
<p><b>22.</b> The concentrated sulfuric acid does not react without heating with:</p> <p>A. *iron            B. phosphorus            C. sulfur            D. mercury            E. carbon</p>	
<p><b>23.</b> Which of the following compounds has the sulfur atom as the only oxidizing agent</p> <p>A. *H<sub>2</sub>SO<sub>4</sub>            B. SO<sub>2</sub>            C. H<sub>2</sub>SO<sub>3</sub>            D. S            E. Na<sub>2</sub>S</p>	
<p><b>24.</b> The diluted sulfuric acid does not react with:</p> <p>A. *Ag            B. Fe            C. Zn            D. Ca            E. Mg</p>	
<p><b>25.</b> Specify the compound in which sulfur atom has oxidation-reduction duality:</p> <p>A. *SO<sub>2</sub>            B. H<sub>2</sub>S            C. K<sub>2</sub>SO<sub>4</sub>            D. Na<sub>2</sub>S            E. H<sub>2</sub>SO<sub>4</sub></p>	
<p><b>26.</b> Choose the compound with peroxide group:</p> <p>A. * H<sub>2</sub>SO<sub>5</sub>            B. H<sub>2</sub>SO<sub>3</sub>            C. Na<sub>2</sub>S<sub>4</sub>O<sub>6</sub>            D. K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>            E. Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub></p>	
<p><b>27</b> Sulfur (IV) oxide is a constituent part of one of the most harmful environment pollutants called toxic smog. When dissolved in water, sulphur (IV) oxide forms the following acid:</p> <p>A. *sulphurous            B. sulphuric            C. hydrosulphuric            D. thiosulphuric            E. tetrathiosulphuric .</p>	

<i>Question</i>	<i>Answer</i>
<p><b>28.</b> Which of the following compound produces the dark blue painting of ether layer under the qualitative reaction:</p> <p><b>A.*</b> H<sub>2</sub>O<sub>2</sub>  <b>B.</b> Cl<sub>2</sub>  <b>C.</b> Na<sub>2</sub>HPO<sub>4</sub>  <b>D.</b> MnSO<sub>4</sub>  <b>E.</b> FeSO<sub>4</sub></p>	
<p><b>29.</b> H<sub>2</sub>O<sub>2</sub> can take part in the following reaction, except:</p> <p><b>A.</b> *hydrogen production  <b>B.</b> oxygen production  <b>C.</b> like reducing agent  <b>D.</b> like oxidizing agent  <b>E.</b> disproportionation reaction</p>	
<p><b>30.</b> Sulfur in the oxidation state +4 can be:</p> <p><b>A.*</b>oxidizer and reducer  <b>B.</b> only oxidizing agent  <b>C.</b> only reducing agent  <b>D.</b> can't react in the red-ox reaction  <b>E.</b> oxidizer with strong reducer only</p>	
<p><b>31.</b> Under normal conditions oxygen does not react with the following elements, except:</p> <p><b>A. *Mg</b>  <b>B.</b> Au  <b>C.</b> Ne  <b>D.</b> N<sub>2</sub>  <b>E.</b> Cl<sub>2</sub></p>	
<p><b>32.</b> Specify the compound that can be only the reducing agent:</p> <p><b>A.*</b>Na<sub>2</sub>S;  <b>B.</b> Na<sub>2</sub>SO<sub>3</sub>;  <b>C.</b> Na<sub>2</sub>SO<sub>4</sub>;  <b>D.</b> Na<sub>2</sub>S<sub>2</sub>O<sub>7</sub>.  <b>E.</b> Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub></p>	
<p><b>33.</b> Specify why sodium thiosulfate can not be use in the acidic solution:</p> <p><b>A.*</b> it decomposes with precipitation of sulfur  <b>B.</b> the hydrolysis increase  <b>C.</b> the hydrolysis decrease  <b>D.</b> the S<sub>4</sub>O<sub>6</sub><sup>2-</sup> ion is formed  <b>E.</b> it oxidizes to SO<sub>4</sub><sup>2-</sup> ion</p>	
<p><b>34.</b> Sodium thiosulfate is used in medicine as a toxicide, anti-inflammatory and desensitizing agent. Which formula corresponds to this compound?</p> <p><b>A. *Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub></b>  <b>B.</b> Na<sub>2</sub>S<sub>2</sub>O<sub>5</sub>  <b>C.</b> Na<sub>2</sub>SO<sub>3</sub>  <b>D.</b> Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub>  <b>E.</b> NaHSO<sub>4</sub></p>	

## 14. p-Elements Of Seventh Group

<i>Question</i>	<i>Answer</i>
<p><b>1.</b> In the row of acids HF – HCl – HBr – HI:</p> <p><b>A.</b> *the stable of molecule decreases and the force of acids increases</p> <p><b>B.</b> the stable of molecule increases and the force of acids increases</p> <p><b>C.</b> the stable of molecule decreases and the force of acids decreases</p> <p><b>D.</b> the stable of molecule increases and the force of acids decreases</p> <p><b>E.</b> the power of acids does not change</p>	
<p><b>2.</b> At compare of oxoacids of chlorine by the force and by the oxidizing properties it is possible to do the conclusion - with the increase of oxidation state of chlorine:</p> <p><b>A.</b> *oxidizing property decreases and power of acids increases</p> <p><b>B.</b> oxidizing property and power of acids decrease</p> <p><b>C.</b> oxidizing property and power of acids increase</p> <p><b>D.</b> oxidizing property increases and power of acids decreases</p> <p><b>E.</b> oxidizing property and power of acids do not change</p>	
<p><b>3.</b> The bleaching powder is used as a disinfectant. What formula corresponds to it:</p> <p><b>A.</b> *CaOCl<sub>2</sub></p> <p><b>B.</b> CaCl<sub>2</sub></p> <p><b>C.</b> CaCO<sub>3</sub></p> <p><b>D.</b> MgCO<sub>3</sub></p> <p><b>E.</b> NaOCl</p>	
<p><b>4.</b> From the hydrogen halogenide acides the strongest acid is:</p> <p><b>A.</b> *hydroiodic acid</p> <p><b>B.</b> hydrofluoric acid</p> <p><b>C.</b> hydrochloric acid</p> <p><b>D.</b> hydrobromic acid</p> <p><b>E.</b> -</p>	
<p><b>5.</b> The bleaching powder is used as a disinfectant. What formula corresponds to it:</p> <p><b>A.</b> *CaOCl<sub>2</sub>.</p> <p><b>B.</b> Ca(OCl)<sub>2</sub></p> <p><b>C.</b> Ca(ClO<sub>4</sub>)<sub>2</sub>.</p> <p><b>D.</b> CaCl<sub>2</sub></p> <p><b>E.</b> Ca(ClO<sub>3</sub>)<sub>2</sub></p>	
<p><b>6.</b> The strongest among the oxoacids is:</p> <p><b>A.</b> *perchloric acid</p> <p><b>B.</b> chloric acid</p> <p><b>C.</b> hypochlorous acid</p> <p><b>D.</b> chlorous acid</p> <p><b>E.</b> - -</p>	



<i>Question</i>	<i>Answer</i>
<p><b>7.</b> What is the type of bleaching powder <math>\text{CaOCl}_2</math>?</p> <p><b>A.</b> *mixed  <b>B.</b> mean  <b>C.</b> acidic  <b>D.</b> basic  <b>E.</b> double</p>	
<p><b>8.</b> The strongest oxidizing agent among the oxoacids of chlorine is:</p> <p><b>A.</b> *hypochlorous acid  <b>B.</b> perchloric acid  <b>C.</b> chloric acid  <b>D.</b> chlorous acid  <b>E.</b> - -</p>	
<p><b>9.</b> <math>\text{CaOCl}_2</math> under the name “bleaching powder” is used as:</p> <p><b>A.</b> *disinfectant  <b>B.</b> hemostatic  <b>C.</b> antipyretic  <b>D.</b> astringent mean  <b>E.</b> cardiogenic</p>	
<p><b>10.</b> Sodium fluoride is the component of preparations, that apply at medical treatment of tooth decay. Which from the following compounds can react with NaF:</p> <p><b>A.</b> *<math>\text{H}_2\text{SO}_4</math>  <b>B.</b> <math>\text{CO}_2</math>  <b>C.</b> <math>\text{NaCl}</math>  <b>D.</b> <math>\text{KI}</math>  <b>E.</b> <math>\text{CH}_3\text{COOH}</math></p>	
<p><b>11.</b> Disinfection action of bleaching powder is related to:</p> <p><b>A.</b> * producing of <math>\text{HClO}</math> under the action of bleaching powder on <math>\text{CO}_2</math> of moistly air  <b>B.</b> producing of <math>\text{CaCO}_3</math> under the action of bleaching powder on <math>\text{CO}_2</math> of moistly air  <b>C.</b> producing of <math>\text{CaCl}_2</math> under the action of bleaching powder on <math>\text{CO}_2</math> of moistly air  <b>D.</b> producing of <math>\text{Ca(OH)}_2</math> under the action of bleaching powder on <math>\text{CO}_2</math> of moistly air  <b>E.</b> producing of <math>\text{HCl}</math> under the action of bleaching powder on <math>\text{CO}_2</math> of moistly air</p>	
<p><b>12.</b> One of the types of oxidizing-reduction reactions is the reaction of disproportionation. Which from the following reactions is the reaction of disproportionation?</p> <p><b>A.</b> *<math>\text{ClO}_2 + \text{H}_2\text{O} = \text{HClO}_2 + \text{HClO}_3</math>  <b>B.</b> <math>\text{Cl}_2\text{O} + \text{H}_2\text{O} = 2\text{HClO}</math>  <b>C.</b> <math>\text{Cl}_2\text{O}_7 + \text{H}_2\text{O} = 2\text{HClO}_4</math>  <b>D.</b> <math>\text{I}_2\text{O}_5 + \text{H}_2\text{O} = 2\text{HIO}_3</math>  <b>E.</b> <math>\text{Br}_2\text{O} + \text{H}_2\text{O} = 2\text{HBrO}</math></p>	

<i>Question</i>	<i>Answer</i>
<p><b>13.</b> Great chemical activity of fluorine due to:</p> <p><b>A.</b> * high durability of bonds which fluorine forms with other elements</p> <p><b>B.</b> high durability of bond F-F</p> <p><b>C.</b> small electronegativity</p> <p><b>D.</b> big size of atom of fluorine</p> <p><b>E.</b> weak durability of bonding of fluorine with other elements</p>	
<p><b>14.</b> Choose the compounds which appear at admission of chlorine through cold concentrated solution of KOH:</p> <p><b>A.</b> *KCl, KClO, H<sub>2</sub>O</p> <p><b>B.</b> KCl, KClO<sub>3</sub>, H<sub>2</sub>O</p> <p><b>C.</b> KCl, H<sub>2</sub>O</p> <p><b>D.</b> KClO<sub>3</sub>, KClO, H<sub>2</sub>O</p> <p><b>E.</b> KClO<sub>3</sub>, H<sub>2</sub>O</p>	
<p><b>15.</b> Hydrogen fluoride in compare with other halogenides has the greatest temperature of boiling. This property due to:</p> <p><b>A.</b> *hydrogen bonding</p> <p><b>B.</b> covalent polar bonding</p> <p><b>C.</b> covalent non-polar bonding</p> <p><b>D.</b> ionic bonding</p> <p><b>E.</b> metallic bonding</p>	
<p><b>16.</b> Choose the compounds which appear at admission of chlorine through hot concentrated solution of KOH:</p> <p><b>A.</b> *KCl, KClO<sub>3</sub>, H<sub>2</sub>O.</p> <p><b>B.</b> KCl, H<sub>2</sub>O.</p> <p><b>C.</b> KCl, ClO<sub>2</sub>, H<sub>2</sub>O.</p> <p><b>D.</b> KCl, Cl<sub>2</sub>O<sub>7</sub>, H<sub>2</sub>O.</p> <p><b>E.</b> KCl, KClO<sub>2</sub>, H<sub>2</sub>O</p>	
<p><b>17.</b> The properties of hypochlorous acid (HClO) are:</p> <p><b>A.</b> *weak acid, strong oxidizing agent</p> <p><b>B.</b> strong acid, strong oxidizing agent</p> <p><b>C.</b> strong acid, weak oxidizing agent</p> <p><b>D.</b> weak acid, weak oxidizing agent</p> <p><b>E.</b> weak acid, has no red-ox properties</p>	
<p><b>18.</b> Under the reaction of chlorine with water will be formed:</p> <p><b>A.</b> *HClO + HCl</p> <p><b>B.</b> HClO + Cl<sub>2</sub>O<sub>7</sub></p> <p><b>C.</b> HClO + HClO<sub>2</sub></p> <p><b>D.</b> HClO + HClO<sub>3</sub></p> <p><b>E.</b> HClO + HClO<sub>4</sub></p>	

<i>Question</i>	<i>Answer</i>
<p><b>19.</b> Reduction properties in the row Cl – Br – I:</p> <p><b>A.</b> * increase  <b>B.</b> decrease  <b>C.</b> don't change  <b>D.</b> bromine is a stronger reducing agent than chlorine  <b>E.</b> don't have red-ox properties -</p>	
<p><b>20.</b> Chlorine under action of hot aqua solution of KOH:</p> <p><b>A.</b> *forms KCl and KClO<sub>3</sub>  <b>B.</b> decomposes alkaline with O<sub>2</sub> realizing  <b>C.</b> does not react  <b>D.</b> forms KCl and KClO  <b>E.</b> forms KClO<sub>3</sub> and KClO<sub>4</sub></p>	
<p><b>21.</b> Oxidizing properties of free halogens increase in a row:</p> <p><b>A.</b> *I<sub>2</sub>, Br<sub>2</sub>, Cl<sub>2</sub>, F<sub>2</sub>  <b>B.</b> F<sub>2</sub>, Cl<sub>2</sub>, Br<sub>2</sub>, I<sub>2</sub>  <b>C.</b> Br<sub>2</sub>, I<sub>2</sub>, Cl<sub>2</sub>, F<sub>2</sub>  <b>D.</b> Br<sub>2</sub>, F<sub>2</sub>, I<sub>2</sub>, Cl<sub>2</sub>  <b>E.</b> I<sub>2</sub>, Cl<sub>2</sub>, Br<sub>2</sub>, F<sub>2</sub></p>	
<p><b>22.</b> Indicate the oxidizing process:</p> <p><b>A.</b> *2Cl<sup>-</sup> --&gt;Cl<sub>2</sub>.  <b>B.</b> 2ClO<sup>-</sup> --&gt;Cl<sub>2</sub>.  <b>C.</b> ClO<sub>3</sub><sup>-</sup> --&gt;ClO<sup>-</sup>.  <b>D.</b> Cl<sub>2</sub> --&gt;2Cl<sup>-</sup>.  <b>E.</b> ClO<sub>3</sub><sup>-</sup> --&gt; Cl<sub>2</sub>.</p>	
<p><b>23.</b> Chlorine is obtained in industry:</p> <p><b>A.</b> *electrolysis of molten NaCl  <b>B.</b> reaction MnO<sub>2</sub> with concentrated HCl  <b>C.</b> reaction of KMnO<sub>4</sub> with concentrated HCl  <b>D.</b> decomposition of HClO  <b>E.</b> reaction of PbO<sub>2</sub> with diluted HCl</p>	
<p><b>24.</b> Specify the compound that is named slaked lime:</p> <p><b>A.</b> *Ca(OH)<sub>2</sub>.  <b>B.</b> CaO.  <b>C.</b> CaCO<sub>3</sub>.  <b>D.</b> CaCl<sub>2</sub>.  <b>E.</b> CaO<sub>2</sub>.</p>	
<p><b>25.</b> Chlorine can not react directly with:</p> <p><b>A.</b> *oxygen  <b>B.</b> sodium  <b>C.</b> water  <b>D.</b> phosphorus  <b>E.</b> zinc</p>	
<p><b>26.</b> Specify the mineral acid that can not be kept in a glass:</p> <p><b>A.</b> * HF  <b>B.</b> HCl  <b>C.</b> HBr  <b>D.</b> HI  <b>E.</b> H<sub>2</sub>SO<sub>4</sub></p>	

<i>Question</i>	<i>Answer</i>
<p><b>27.</b> Bromine and iodine can not react with:</p> <p>A. *oxygen            B. alkalis            C. zinc            D. phosphorus            E. sodium</p>	
<p><b>28.</b> Specify the reaction that impossible</p> <p>A. *<math>KCl + Br_2 \rightarrow KBr + Cl_2</math>.            B. <math>KI + Br_2 \rightarrow KBr + I_2</math>            C. <math>NaBr + Cl \rightarrow NaCl + Br_2</math>            D. <math>NaI + Cl_2 \rightarrow NaCl + I_2</math>            E. <math>KCl + I_2 \rightarrow KI + Cl_2</math></p>	
<p><b>29.</b> Which from halogenide acids is contained in a human organism?</p> <p>A. * HCl            B. HClO            C. HClO<sub>4</sub>            D. HBrO            E. HI</p>	
<p><b>30.</b> Under the reaction of SO<sub>2</sub> with chlorine sulphuryl chloride is formed. Specify the formula of sulphuryl chloride:</p> <p>A. * SO<sub>2</sub>Cl<sub>2</sub>            B. SO<sub>2</sub>            C. S<sub>2</sub>Cl<sub>2</sub>            D. SCl<sub>2</sub>            E. SCl<sub>4</sub></p>	
<p><b>31.</b> Hydrochloric acid can not react with the following metals:</p> <p>A. *Cu, Ag            B. Mg, Cr            C. Fe, Co            D. Zn, Mg            E. Na, Ca</p>	
<p><b>32.</b> Specify the strongest oxidizing agent from the halogens:</p> <p>A. *F<sub>2</sub>            B. I<sub>2</sub>            C. Br<sub>2</sub>            D. Cl<sub>2</sub>            E. Cl<sub>2</sub> и Br<sub>2</sub></p>	
<p><b>33.</b> Diluted hydrochloric acid was added to a solution. A white curdled precipitate was formed. This is the evidence of presence of following ions:</p> <p>A. *silver            B. ammonium            C. iron(II)            D. barium            E. iodine</p>	

## 15. d-Elements Of Sixth And Seventh Groups

Question	Answer
<p>1. Permanganate-ion can reduce to <math>Mn^{2+}</math>, <math>Mn^{4+}</math>, <math>MnO_4^{2-}</math> under the different types of medium of red-ox reaction. Choose the type of medium in which the product of reduction is <math>Mn^{2+}</math>:</p> <p>A. *acidic            B. slightly basic            C. neutral            D. basic            E. slightly acidic</p>	
<p>2. What case the given transformation <math>[Cr(OH)_6]^{3-} \rightarrow CrO_4^{2-}</math> corresponds to?</p> <p>A. *oxidation in the basic solution            B. oxidation in the acidic solution            C. reduction in the acidic solution            D. reduction in the neutral solution            E. reduction in the basic solution</p>	
<p>3. Choose the compound of manganese that has oxidation-reduction duality</p> <p>A. * <math>MnO_2</math>            B. <math>Mn_2O_7</math>            C. <math>MnO</math>            D. <math>KMnO_4</math>            E. <math>MnSO_4</math></p>	
<p>4. What case the given transformation <math>MnO_4^- \leftrightarrow MnO_2</math> corresponds to?</p> <p>A. * reduction in the neutral solution            B. oxidation in the acidic solution            C. reduction in the acidic solution            D. oxidation in the basic solution            E. reduction in the basic solution</p>	
<p>5. Qualitative reaction for determination of Cr(VI) compounds is origination of chromium oxide-diperoxide that stains ether layer with blue. What is formula of this chromium compound:</p> <p>A. *<math>CrO_5</math>            B. <math>CrO_3</math>            C. <math>Cr_2O_3</math>            D. <math>CrO</math>            E. <math>H_2CrO_2</math></p>	
<p>6. Daily necessity of chromium is 5-10mg for human organism. It takes part in stabilization of structure of nucleic acids and some enzymes. What case the given transformation <math>Cr^{3+} \rightarrow Cr_2O_7^{2-}</math> corresponds to?</p> <p>A. *oxidation in the acidic solution            B. oxidation in the basic solution            C. reduction in the acidic solution            D. reduction in the neutral solution            E. reduction in the basic solution</p>	

<i>Question</i>	<i>Answer</i>
<p><b>7.</b> Specify the compounds of chromium that has amphoteric properties:</p> <p><b>A.</b> *Cr<sub>2</sub>O<sub>3</sub>  <b>B.</b> CrO  <b>C.</b> Cr(OH)<sub>2</sub>  <b>D.</b> CrO<sub>3</sub>  <b>E.</b> K<sub>2</sub>CrO<sub>4</sub></p>	
<p><b>8.</b> Change of acid-base properties in the compounds MnO -- MnO<sub>2</sub> -- Mn<sub>2</sub>O<sub>7</sub> answers to the following regularity:</p> <p><b>A.</b> *acid properties become stronger  <b>B.</b> basic properties become stronger  <b>C.</b> acid-base properties stay unchanged  <b>D.</b> acid properties diminish  <b>E.</b> - -</p>	
<p><b>9.</b> Potassium dichromate is applied as oxidant in pharmacy analysis. What number of electrons is joined by dichromate ion and what degree of oxidation chromium is reduced:</p> <p><b>A.</b> *6, +3  <b>B.</b> 3, +3  <b>C.</b> 3, +4  <b>D.</b> 4, +2  <b>E.</b> 8, +2</p>	
<p><b>10.</b> Chromium is a microelements. It takes part in the process of carbohydrate exchange of glucose. Change of acid-base properties in the compounds CrO - Cr<sub>2</sub>O<sub>3</sub> - CrO<sub>3</sub> corresponds to the following regularity:</p> <p><b>A.</b> *acidic properties increase  <b>B.</b> basic properties increase  <b>C.</b> acid-base properties don't change  <b>D.</b> acidic properties decrease  <b>E.</b> -</p>	
<p><b>11.</b> Specify the basic oxide:</p> <p><b>A.</b> *MnO  <b>B.</b> MnO<sub>2</sub>  <b>C.</b> Mn<sub>2</sub>O<sub>7</sub>  <b>D.</b> Cr<sub>2</sub>O<sub>3</sub>  <b>E.</b> CrO<sub>3</sub></p>	
<p><b>12.</b> Potassium permanganate KMnO<sub>4</sub> is an oxidizing agent. Under this reaction in a sour environment raspberry solution is discolored. What is the product of reduction of MnO<sub>4</sub><sup>-</sup> - ion in acidic medium:</p> <p><b>A.</b> * Mn<sup>2+</sup>  <b>B.</b> MnO<sub>2</sub>  <b>C.</b> MnO<sub>4</sub><sup>2-</sup>  <b>D.</b> Mn(OH)<sub>2</sub>  <b>E.</b> Mn(OH)<sub>4</sub></p>	

<i>Question</i>	<i>Answer</i>
<p><b>13.</b> Which of the following oxides is the anhydride of permanganic acid</p> <p>A. * <math>\text{Mn}_2\text{O}_7</math>            B. <math>\text{Mn}_3\text{O}_4</math>            C. <math>\text{Mn}_2\text{O}_3</math>            D. <math>\text{MnO}_2</math>            E. <math>\text{MnO}</math></p>	
<p><b>14.</b> Potassium dichromate <math>\text{K}_2\text{Cr}_2\text{O}_7</math> is applied as oxidant in acidic medium. What is the product of reduction of dichromate-ion <math>\text{Cr}_2\text{O}_7^{2-}</math> under these conditions:</p> <p>A. * <math>\text{Cr}^{3+}</math>            B. <math>\text{Cr}(\text{OH})_3</math>            C. <math>\text{Cr}(\text{OH})_2</math>            D. <math>[\text{Cr}(\text{OH})_6]^{3-}</math>            E. <math>\text{Cr}_2\text{O}_3</math></p>	
<p><b>15.</b> Using the values of the red-ox potentials of the following reactions indicate the transformation of manganese as the strongest oxidizing agent:</p> <p>A. * <math>\text{MnO}_4^- + 8\text{H}^+ + 5\text{e} = \text{Mn}^{2+} + 4\text{H}_2\text{O}</math>; <math>E^\circ = 1,51\text{V}</math>            B. <math>\text{MnO}_4^- + 4\text{H}_2\text{O} + 3\text{e} = \text{Mn}(\text{OH})_4 + 4\text{OH}^-</math>; <math>E^\circ = 0,57\text{V}</math>            C. <math>\text{MnO}_4^- + \text{e} = \text{MnO}_4^{2-}</math> (basic solution); <math>E^\circ = 0,54\text{V}</math>            D. <math>\text{MnO}_4^{2-} + 4\text{H}_2\text{O} + 2\text{e} = \text{Mn}(\text{OH})_4 + 4\text{OH}^-</math>; <math>E^\circ = 0,71\text{V}</math>            E. <math>\text{MnO}_2 + 4\text{H}^+ + 2\text{e} = \text{Mn}^{2+} + 2\text{H}_2\text{O}</math>; <math>E^\circ = 1,28\text{V}</math></p>	
<p><b>16.</b> Potassium permanganate in the red-ox reaction with hydrogen peroxide possesses:</p> <p>A. *oxidizing agent            B. reduction agent            C. disproportionate            D. oxidation-reduction duality            E. does not act as the oxidizing agent</p>	
<p><b>17.</b> Under the reduction of potassium permanganate in the neutral solution the following compound will be produced:</p> <p>A. * <math>\text{MnO}_2</math>            B. <math>\text{K}_2\text{MnO}_4</math>            C. <math>\text{MnO}</math>            D. <math>\text{MnSO}_4</math>            E. <math>\text{Mn}(\text{OH})_2</math></p>	

## 16. d-Elements Of Eighth Group

<i>Question</i>	<i>Answer</i>
<p>1. In the pharmaceutical analysis an iron (III) chloride is applied. Under which from the following reactions it is possible to obtain this compound:</p> <p>A. * <math>\text{Fe}(\text{OH})_3 + \text{HCl} \rightarrow</math>            B. <math>\text{Fe} + \text{HCl} \rightarrow</math>            C. <math>\text{Fe}(\text{NO}_3)_3 + \text{HCl} \rightarrow</math>            D. <math>\text{Fe}_2(\text{SO}_4)_3 + \text{HCl} \rightarrow</math>            E. <math>\text{Fe}_2\text{O}_3 + \text{Cl}_2 \rightarrow</math></p>	
<p>2. Iron (III) hydroxide is formed under the reaction:</p> <p>A. * <math>\text{FeCl}_3 + 3 \text{NaOH}</math>.            B. <math>\text{Fe}_2\text{O}_3 + 3 \text{NaOH}</math>.            C. <math>\text{FeCl}_3 + 3 \text{H}_2\text{O}</math>.            D. <math>\text{Fe}_2\text{O}_3 + 3 \text{H}_2\text{O}</math>.            E. <math>\text{Fe} + 3 \text{NaOH}</math>.</p>	
<p>3. Specify the type of the reactions applied for quality determination of the cation <math>\text{Fe}^{3+}</math>:</p> <p>A. * complex formation            B. sedimentation            C. hydrolysis            D. red-ox            E. neutralization</p>	
<p>4. The iron compound <math>\text{K}_4[\text{Fe}(\text{CN})_6]</math> is the reactant on:</p> <p>A. * <math>\text{Fe}^{3+}</math> ions            B. <math>\text{Fe}^{2+}</math> ions            C. <math>\text{Ca}^{2+}</math> ions            D. <math>\text{FeO}_4^{2-}</math> ions            E. <math>\text{FeO}_2^-</math> ions</p>	
<p>5. Qualitative analysis of iron (III) sulfate is possible to determine, using the solutions which contain the ions:</p> <p>A. * <math>\text{SCN}^-</math>, <math>\text{Ba}^{2+}</math>            B. <math>\text{SO}_4^{2-}</math>, <math>\text{Cu}^{2+}</math>            C. <math>\text{Cl}^-</math>, <math>\text{Ag}^+</math>            D. <math>\text{OH}^-</math>, <math>\text{Al}^{3+}</math>            E. <math>\text{Cl}^-</math>, <math>\text{Ba}^{2+}</math></p>	
<p>6. Iron atom possesses different oxidation degrees. The highest oxidation degree is:</p> <p>A. * +6            B. +8            C. +3            D. +4            E. +2</p>	



<i>Question</i>	<i>Answer</i>
<p><b>7.</b> Iron in the degree of oxidation +6 is an oxidant only, because:</p> <p><b>A.</b> *it is the highest oxidation degree  <b>B.</b> iron has 5 electrons on the outermost level  <b>C.</b> iron is VIIIB group element  <b>D.</b> iron is d-element  <b>E.</b> iron is the element of 4 period</p>	
<p><b>8.</b> Iron (II) sulfate is a component of medications which apply at medical treatment of anemia. Which from the following compounds <math>\text{FeSO}_4</math> reacts with:</p> <p><b>A.</b> *<math>\text{KMnO}_4</math>  <b>B.</b> <math>\text{HCl}</math>  <b>C.</b> <math>\text{CO}_2</math>  <b>D.</b> <math>\text{FeCl}_2</math>  <b>E.</b> <math>\text{NaCl}</math></p>	
<p><b>9.</b> What compound of iron can not be selected in the free state:</p> <p><b>A.</b> *<math>\text{H}_2\text{FeO}_4</math>  <b>B.</b> <math>\text{K}_3[\text{Fe}(\text{CN})_6]</math>  <b>C.</b> <math>\text{K}_2\text{FeO}_4</math>  <b>D.</b> <math>\text{FeCl}_3</math>  <b>E.</b> <math>\text{FeO}</math></p>	
<p><b>10.</b> Among the following compounds find the compound which does not exist in the free state:</p> <p><b>A.</b> * <math>\text{H}_2\text{FeO}_4</math>  <b>B.</b> <math>\text{Fe}(\text{OH})_2</math>  <b>C.</b> <math>\text{Fe}(\text{OH})_3</math>  <b>D.</b> <math>\text{FeO}</math>  <b>E.</b> <math>\text{Fe}_2\text{O}_3</math></p>	
<p><b>11.</b> Presence of the following ion of d-elements in solution can be exploited by means of <math>\text{K}_4[\text{Fe}(\text{CN})_6]</math></p> <p><b>A.</b> *<math>\text{Fe}^{3+}</math>  <b>B.</b> <math>\text{Fe}^{2+}</math>  <b>C.</b> <math>\text{Zn}^{2+}</math>  <b>D.</b> <math>\text{Cr}^{3+}</math>  <b>E.</b> <math>\text{Cu}^{2+}</math></p>	
<p><b>12.</b> A pharmacist, releasing preparations to the patient, must warn that such food stuffs, as eggs and milk hinder to the process of mastering:</p> <p><b>A.</b> *iron  <b>B.</b> cobalt  <b>C.</b> chromium  <b>D.</b> manganese  <b>E.</b> nitrogen</p>	
<p><b>13.</b> At incineration of brazil (<math>\text{FeS}_2</math>), appears:</p> <p><b>A.</b> *<math>\text{Fe}_2\text{O}_3 + \text{SO}_2</math>  <b>B.</b> <math>\text{Fe}_2\text{O}_3 + \text{SO}_3</math>  <b>C.</b> <math>\text{Fe}_2\text{O}_3 + \text{CO}_2</math>  <b>D.</b> <math>\text{Fe}_2\text{O}_3 + \text{CO}</math>  <b>E.</b> <math>\text{Fe}_2\text{O}_3 + \text{H}_2\text{S}</math></p>	

## 17. d-Elements Of First And Second Groups

<i>Question</i>	<i>Answer</i>
<p>1. Silver things become black on air, as a result of the reaction with:</p> <p>A. *H<sub>2</sub>S            B. SO<sub>2</sub>            C. SO<sub>3</sub>            D. CO<sub>2</sub>            E. N<sub>2</sub></p>	
<p>2. Gold dissolves in hot solution of this acid:</p> <p>A. *H<sub>2</sub>SeO<sub>4</sub>            B. HNO<sub>3</sub>            C. HCl            D. H<sub>2</sub>SO<sub>4</sub>            E. HClO<sub>4</sub></p>	
<p>3. Silver nitrate is used in ophthalmology as a bactericidal agent and a antiinflammation agent. AgNO<sub>3</sub> can be produced in the reaction of this two substances:</p> <p>A. *Ag + HNO<sub>3</sub>            B. AgCl + NH<sub>4</sub>NO<sub>3</sub>            C. Ag + KNO<sub>3</sub>            D. Ag<sub>2</sub>O + KNO<sub>3</sub>            E. AgCl + NaNO<sub>3</sub></p>	
<p>4. Which metal doesn't oxidize on air even during ignition?</p> <p>A. *Gold            B. Sodium            C. Zinc            D. Calcium            E. Barium</p>	
<p>5. Metal, that exist in nature in virgin condition:</p> <p>A. *Gold            B. Sodium            C. Lead            D. Calcium            E. Aluminium</p>	
<p>6. The solution of ZnSO<sub>4</sub> is used in pharmacy as eye drops. While storing it is hydrolysed producing:</p> <p>A. * basic salt            B. mean salt            C. acidic salt            D. complex salt            E. oxosalt</p>	

<i>Question</i>	<i>Answer</i>
<p><b>7.</b> Copper(II) sulfate is used in ophthalmology, urology, gynecology. Specify the compound, which is formed in the reaction of ammonium hydroxide excess with copper (II) sulfate</p> <p><b>A.</b> * <math>[\text{Cu}(\text{NH}_3)_4]\text{SO}_4</math>  <b>B.</b> <math>[\text{Cu}(\text{NH}_3)_2]\text{OH}</math>  <b>C.</b> <math>\text{CuO}</math>  <b>D.</b> <math>[\text{Cu}(\text{OH}_2)_4]\text{SO}_4</math>  <b>E.</b> <math>(\text{CuOH})_2\text{SO}_4</math></p>	
<p><b>8.</b> After adding of a diluted solution of hydrochloric acid to the analyzable solution white curdy precipitate was produced. What ions should the solution have according to this?</p> <p><b>A.</b> *Silver  <b>B.</b> Ammonium  <b>C.</b> Iron (II)  <b>D.</b> Barium  <b>E.</b> Iodine</p>	
<p><b>9.</b> This reaction is impossible in water solution:</p> <p><b>A.</b> * <math>\text{Cu} + 2\text{HCl} = \text{CuCl}_2 + \text{H}_2</math>  <b>B.</b> <math>\text{Sn} + \text{H}_2\text{SO}_4 = \text{SnSO}_4 + \text{H}_2</math>  <b>C.</b> <math>\text{Zn} + 2\text{HCl} = \text{ZnCl}_2 + \text{H}_2</math>  <b>D.</b> <math>2\text{Al} + 6\text{NaOH} + 6\text{H}_2\text{O} = 2\text{Na}_3[\text{Al}(\text{OH})_6] + 3\text{H}_2</math>  <b>E.</b> <math>2\text{Na} + \text{H}_2\text{O} = 2\text{NaOH} + \text{H}_2</math></p>	
<p><b>10.</b> Which of the given metals doesn't react with diluted solution of sulphuric acid?</p> <p><b>A.</b> *Cu  <b>B.</b> Fe  <b>C.</b> Zn  <b>D.</b> Al  <b>E.</b> Mn</p>	
<p><b>11.</b> Hydrogen tetrachloroaurat (III) is produced in the reaction:</p> <p><b>A.</b> * <math>\text{Au} + \text{HNO}_3(\kappa) + \text{HCl}(\kappa)</math>  <b>B.</b> <math>\text{Au} + \text{HCl}</math>  <b>C.</b> <math>\text{Au} + \text{HNO}_3</math>  <b>D.</b> <math>\text{Au} + \text{H}_2</math>  <b>E.</b> <math>\text{Au} + \text{Cl}_2</math></p>	

## EXAM TEST

### Questions for the final module control №1

1. Give a definition to chemical bond. List the type of chemical bond.
2. Give a definition to chemical bond energy and bond length. List the properties of covalent bond.
3. Give a definition to hydrogen bonds. Use electronegativity data determine type of chemical bonds in molecule:  $\text{NH}_3$ ,  $\text{K}_2\text{S}$ ,  $\text{I}_2$ .
4. Use valence bond method for the explaining the mechanism of formation of chemical bond in a molecule  $\text{BF}_3$  and in the ion  $\text{BF}_4^-$ .
5. Select the coefficients by electron-ionic method:



6. Select the coefficients by electron-ionic method:



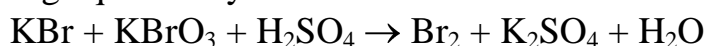
7. Complete the reaction equation and balance the following equation by the half-reaction method. Determine the type of the oxidation-reduction reaction.



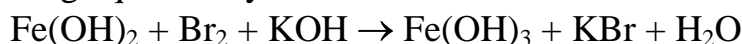
8. Complete the reaction equation and balance it by the half-reaction method:



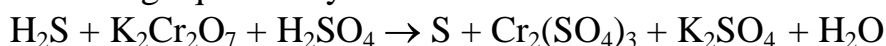
9. Balance the following equation by the half-reaction method:



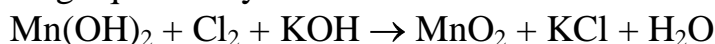
10. Balance the following equation by the half-reaction method:



11. Balance the following equation by the half-reaction method:



12. Balance the following equation by the half-reaction method:



13. Balance the following equation by the half-reaction method:



14. Write hydrolysis equation of  $\text{NH}_4\text{I}$  in ionic and molecular forms.

15. Write hydrolysis equation only for I step:  $\text{Na}_2\text{CO}_3$  in ionic and molecular forms.

16. Write hydrolysis equation of  $\text{NaCN}$  in ionic and molecular forms.

17. Write hydrolysis equation only for I step:  $\text{Na}_2\text{SO}_3$  in ionic and molecular forms.

18. Write hydrolysis equation of  $\text{CH}_3\text{COONH}_4$  in ionic and molecular forms.

19. Write hydrolysis equation only for I step:  $\text{K}_2\text{S}$  in ionic and molecular forms.

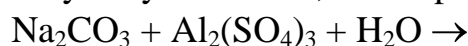
20. Write hydrolysis equation of  $\text{CH}_3\text{COONa}$  in ionic and molecular forms.

21. Write hydrolysis equation only for I step:  $\text{K}_2\text{CO}_3$  in ionic and molecular forms.

22. Write reaction of combined hydrolysis of salts, which proceed up to the end



23. Write reaction of combined hydrolysis of salts, which proceed up to the end



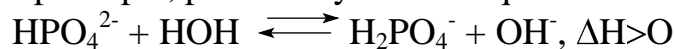
24. How many grams of potassium hydroxide and water are required to prepare 400 g of a 10% by mass potassium hydroxide solution?

25. Calculate the molarity of a solution containing 0.49 g of sulfuric acid in 100mL of solution.
26. How many grams of sodium hydroxide and water are required to prepare 2 kg of a 10% by mass sodium hydroxide solution?
27. Calculate the molarity of a solution prepared by dissolving 11.5 g of solid sodium hydroxide in enough water to make 1.50 L of solution.
28. A solution of sulfuric acid contains 86 g of sulfuric acid per liter of solution. Calculate the normality and molarity of this solution.
29. Some solution is prepared by mixing the 100g of sodium chloride and 1 kg of water. What is the mass percent of the solution?
30. How many grams of copper (II) sulfate are needed to prepare 500 mL of 0.1 N solution?
31. Some solution is prepared by mixing 15g of potassium chloride and 70g of water. What is the mass percent of the solution?
32. How many grams of sodium carbonate are needed to prepare 250 mL of 0.1 N solution?
33. Some solution is prepared by mixing 30g of sodium bromide and 70g of water. What is the mass percent of the solution?
34. How many grams of calcium carbonate are needed to prepare 300mL of 0.1 N solution?
35. Calculate the % ionization of acetic acid in 1.0 M  $\text{CH}_3\text{COOH}$ .  $K_a = 1.75 \times 10^{-5}$ .
36. The aqueous solution is at a temperature of  $25^\circ\text{C}$ . What is the  $[\text{H}^+]$  of a solution for which  $[\text{OH}^-] = 1.5 \times 10^{-6} \text{ M}$ ?
37. What is the pH of the solution 0.05 M HCl?
38. Calculate the molar solubility (S) of AgBr.  $K_{sp} = 6 \times 10^{-13}$ .
39. Calculate the % ionization of acetic acid in 0.10 M  $\text{CH}_3\text{COOH}$ .  $K_a = 1.75 \times 10^{-5}$
40. The aqueous solution is at a temperature of  $25^\circ\text{C}$ . What is the  $[\text{H}^+]$  of a solution for which  $[\text{OH}^-] = 6.3 \times 10^{-3} \text{ M}$ ?
41. What is the pH of the solution 0.02 M  $\text{HNO}_3$ ?
42. Calculate the molar solubility (S) of  $\text{BaSO}_4$ .  $K_{sp} = 1.1 \times 10^{-10}$ .
43. Calculate the % ionization of acetic acid in 0.001 M  $\text{CH}_3\text{COOH}$ .  
 $K_a = 1.75 \times 10^{-5}$ .
44. The aqueous solution is at a temperature of  $25^\circ\text{C}$ . What is the  $[\text{OH}^-]$  of a solution for which  $[\text{H}^+] = 4.2 \times 10^{-9} \text{ M}$ ?
45. What is the pH of the solution 0.01 M  $\text{H}_2\text{SO}_4$ ?
46. Calculate the molar solubility (S) of  $\text{Ag}_2\text{CrO}_4$ .  $K_{sp} = 1.1 \times 10^{-12}$ .
47. The aqueous solution is at a temperature of  $25^\circ\text{C}$ . What is the  $[\text{H}^+]$  of a solution for which  $[\text{OH}^-] = 1.5 \cdot 10^{-6} \text{ M}$ ?
48. What is the  $[\text{H}^+]$  of a 0.1 M solution of NaOH in water at  $25^\circ\text{C}$ ?
49. What is the pH of the solution 0.05 M HCl?
50. Calculate the % ionization of acetic acid in 1.0 M  $\text{CH}_3\text{COOH}$ .
51. Calculate  $[\text{H}^+]$  in 0.2 M  $\text{H}_2\text{S}$  if  $K_{a1} = 1.1 \cdot 10^{-7}$ .

52. Write a solubility product constant expression ( $K_{sp}$ ) for the saturated aqueous solution  $BaSO_4$ .

53. Calculate the molar solubility ( $S$ ) of  $AgBr$ .

54. Using Le Chatelier's principle, predict any shift in equilibrium in the system:



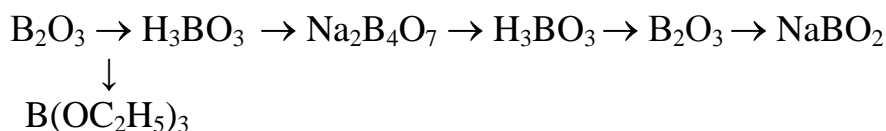
a) basing

b) the temperature is decreased

55. Among the given compounds indicate salts undergoing hydrolysis:  $KNO_3$ ,  $MgCl_2$ ,  $Cr_2S_3$ ,  $NaNO_3$ ,  $K_2S$ . Write hydrolysis equations for these salts in ionic and molecular forms.

## Questions for the final module control №2

1. With the help of equation of reactions you will carry out the following transformations:



2. Write balanced equations to represent:

a) The complete and noncomplete neutralization of  $H_2SO_{4(aq)}$  with  $NH_{3(aq)}$ .

a. The dissolving of  $Ag$  in  $HNO_{3(conc.)}$ .

b. The reaction of hot  $HNO_{3(conc.)}$  with carbon.

c.  $P_{4(s)} + 6Cl_{2(g)} \rightarrow$

d.  $P_{4(s)} + 10Cl_{2(g)} \rightarrow$

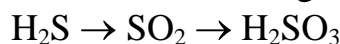
e.  $P_2O_{5(s)} + H_2O \rightarrow$

f.  $P_2O_{5(s)} + 2H_2O \rightarrow$

g.  $P_2O_{5(s)} + 3H_2O \rightarrow$

3. Write the reaction equation for qualitative identification of sulphide ion ( $S^{2-}$ ), of sulfate ion ( $SO_4^{2-}$ ), of thiosulphate ion ( $S_2O_3^{2-}$ ).

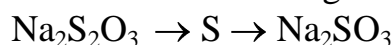
4. Write down the reaction equations for the following changes:



5. Complete the reaction equations and select the coefficients by electron-ionic method:

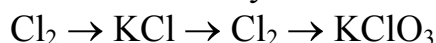


6. Write down the reaction equations for the following changes:

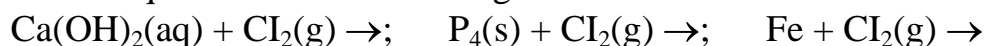


7. Write the reaction equation for qualitative identification of thiosulphate ion ( $S_2O_3^{2-}$ ).

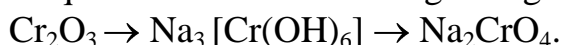
8. With the help of equation of reactions you will carry out the following transformations:



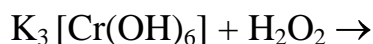
9. Write balanced equation for the following reactions:



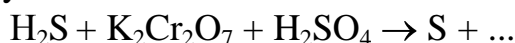
10. Write down the reaction equations for the following changes:



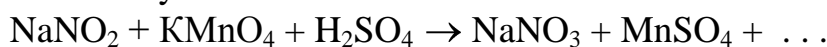
11. Select the coefficients by electron-ionic method:



12. Select the coefficients by electron-ionic method:



13. Select the coefficients by electron-ionic method:



14. Select the coefficients by electron-ionic method:



15. Write down the reaction equations for the following changes:



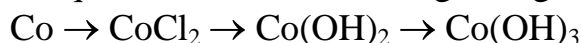
16. Write down the reaction equations for the following changes:



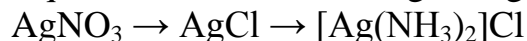
17. Select the coefficients by electron-ionic method:



18. Write down the reaction equations for the following changes:



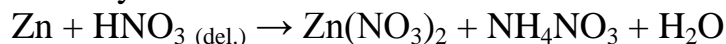
19. Write down the reaction equations for the following changes:



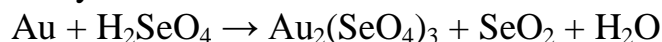
20. Write down the equation for secondary dissociation of complex ion:  $[\text{AuCl}_4]^-$ .

21. Write the expressions of general instability constant.

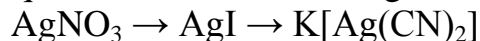
22. Select the coefficients by electron-ionic method:



23. Select the coefficients by electron-ionic method:



24. Write down the reaction equations for the following changes:

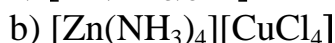


25. Write ionic and molecular equations for the reaction of hydrolysis of zinc sulphate. Indicate pH of the medium.

26. Draw an orbital diagram to represent bonding in the complex ion:  $[\text{Co}(\text{NH}_3)_6]^{3+}$ . Would you expect this complex ion to be diamagnetic or paramagnetic? Explain.

27. Write equations for primary (initial) and secondary dissociation of complex compound:  $[\text{Zn}(\text{NH}_3)_4]\text{SO}_4$ . Write the expression for its general instability constant.

28. Indicate what type of isomerism may be found in each of the following cases:



29. Draw an orbital diagram to represent bonding in the complex ion:  $[\text{CoF}_6]^{3-}$ .

Would you expect this complex ion to be diamagnetic or paramagnetic? Explain.

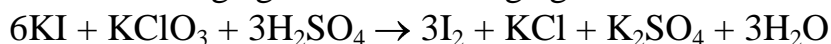
30. Write equations for primary (initial) and secondary dissociation of complex compound:  $[\text{Cu}(\text{NH}_3)_4]\text{Cl}_2$ . Write the expression for its general instability constant.

31. Give the traditional name of the following compounds:  $[\text{Cr}(\text{OH}_2)_5\text{Cl}]\text{Cl}_2$ ,  $\text{K}_2\text{Cr}_2\text{O}_7$ . Determine the chromium oxidation number.

32. Write the reaction equation for qualitative identification of copper(II) cation.

33. Illustrate amphoteric properties of chromium (III) oxide with the appropriate reaction equations.

34. Determine the type of the following oxidation-reduction reaction. Calculate the equivalent mass of the oxidizing agent and reducing agent:



35. Calculate the pH of the solution 0.05 M  $\text{H}_2\text{SO}_4$ ?

36. Write ionic-molecular equations for the reaction of hydrolysis of compound:  $\text{NaCH}_3\text{COO}$ . Indicate the acidity of medium of solution.

37. Calculate the mass of chromium (III) chloride to prepare 1L of 0.1M solution.  $M(\text{CrCl}_3) = 158.5 \text{ g/mol}$ .

38. Write down the reaction equations for the following changes:

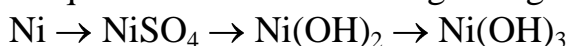


39. Write equations for primary (initial) and secondary dissociation of complex compound:  $\text{K}_4[\text{Fe}(\text{CN})_6]$ . Write the expression for its general instability constant.

40. Calculate the molar solubility (S) of  $\text{CuS}$  ( $K_{\text{SP}}\text{CuS} = 6.3 \times 10^{-36}$ ).

41. A solution of potassium dichromate contains 86 g of the salt per liter of solution. Calculate the normality and molarity of this solution.

42. Write down the reaction equations for the following changes:

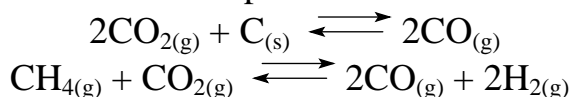


43. Write the reaction equation for qualitative identification of hydrogen peroxide. Draw the graphic formula of hydrogen peroxide. Indicate the oxidation number of oxygen.

44. Calculate hydrolysis constant of sodium hydrophosphate ( $\text{Na}_2\text{HPO}_4$ )

$$K_{\text{I}(\text{H}_3\text{PO}_4)} = 7.11 \times 10^{-3}, \quad K_{\text{II}(\text{H}_3\text{PO}_4)} = 6.34 \times 10^{-8}, \quad K_{\text{III}(\text{H}_3\text{PO}_4)} = 2.11 \times 10^{-13}.$$

45. Write forward and reverse reactions expressions of rate for the following systems:



46. Write down the expression of barium chromate solubility product. Indicate the conditions of formation  $\text{BaCrO}_4$  precipitate.

47. Write equations for primary (initial) and secondary dissociation of complex compound:  $\text{K}[\text{Ag}(\text{CN})_2]$ . Write the expression for its general instability constant.

48. Calculate the molarity of a solution prepared by dissolving 11.5 g of solid sodium hydroxide in enough water to make 1.50 L of solution.

49. Write ionic-molecular equations for the reactions of co-hydrolysis of  $\text{AlCl}_3$  and  $\text{K}_2\text{CO}_3$ .

51. Calculate the molar solubility (S) of  $\text{Ag}_2\text{CO}_3$  ( $K_{\text{SP}}\text{Ag}_2\text{CO}_3 = 8.1 \times 10^{-12}$ ).

52. Write the reaction equation for qualitative identification of thiosulphate ion and sulfite ion.

53. Write the equation of quality identification of Iron (III) -ion.

54. What is the type of hybridization has the cation of chromium in the following complex ion:  $[\text{Cr}(\text{OH})_6]^{3-}$

55. Indicate the application of IIIA –VIIA groups elements in pharmacy and medicine.

56. Indicate the application of VIB-VIIIB group elements in pharmacy and medicine.

57. Indicate the application of the I-B and II-B elements compounds in pharmacy and medicine. Write the reaction equation for qualitative identification of mercury(II) cation.



Навчальне видання

**ЛЕВІТІН Євген Якович**  
**КОВАЛЬ Алла Олександрівна**  
**КРИСЬКІВ Олег Степанович**  
**ЦАПКО Євген Олександрович**

# **НЕОРГАНІЧНА ХІМІЯ**

## **Збірник тестів**

Навчальний посібник для студентів вищих фармацевтичних закладів освіти  
та фармацевтичних факультетів медуніверситетів

*Англійською мовою*

За редакцією  
професора Є.Я. ЛЕВІТІНА

Відповідальний за випуск Є.Я. Левітін

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