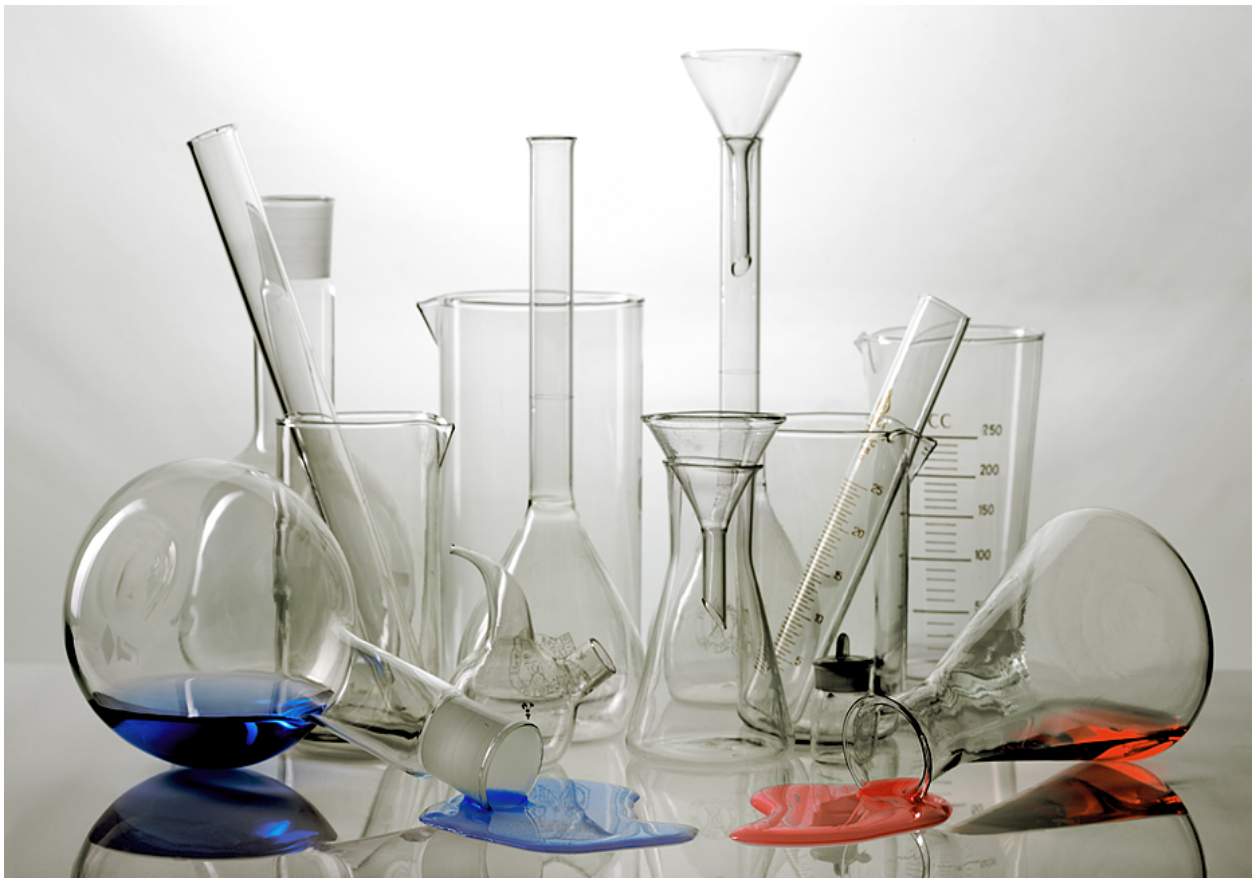
Vinnitsa National Pirogov Memorial Medical University
Biological and General Chemistry Department
Medical chemistry course

CONTROL TESTS

for practical lessons of medical chemistry for foreign students



Vinnitsa 2015

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CHEMISTRY

Group № _____ 20__
Country_____
Name_____

Did you study chemistry yes/no.
For how many years_____
What parts of chemistry did you study: inorganic chemistry yes/no, organic chemistry yes/no.
After I had finished to study chemistry _____ years/months passed.

The students who studied chemistry at their countries we ask to read attentively the question given below.

While answering the questions you should be attentive and don not be in a hurry. First of all try to remember all you have studied at home in chemistry and only then underline the answers you consider to be correct.

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Control test 1 "Initial knowledge"

Sample 1

1.Write the chemical reaction.

$Na_2O + SiO_2 \rightarrow$

$Ca(OH_2) + Cr_2O_3 \rightarrow$

$Ba(H_2PO_4) + Al_2(SO_4)_3 \rightarrow$

2.Write the dissociation equation of given electrolytes:

$H_2SO_4 \rightarrow$

$BaCl_2 \rightarrow$

$Cr(OH)Br_2 \rightarrow$

3.Depict the electronic structure of sodium atom and ion.

Sample 2

1.Write the chemical reaction.

$CaO + CO_2 \rightarrow$

$Ba(OH)_2 + SO_3 \rightarrow$

$Al(HSO_4)_3 + Na_3PO_4 \rightarrow$

2.Write the dissociation equation of given electrolytes:

$Ca(OH)_2 \rightarrow$

$Al_2(SO_4)_3 \rightarrow$

$KH_2PO_4 \rightarrow$

3.Depict the electronic structure of potassium atom and ion.

Sample 3

1.Write the chemical reaction.

$Ca(OH)_2 + NO_2 \rightarrow$

$NaH_2PO_4 + Ba(OH)_2 \rightarrow$

$BaHPO_4 + Cr_2(SO_4)_3 \rightarrow$

2.Write the dissociation equation of given electrolytes:

$Al(OH)_3 \rightarrow$

$CrCl_3 \rightarrow$

$NaHSO_4 \rightarrow$

3.Depict the electronic structure of iron atom and ion.

Sample 4

1.Write the chemical reaction.

$Mn_2O_7 + KOH \rightarrow$

$Ca_3(PO_4)_2 + H_3PO_4 \rightarrow$

$(NH_4)_3HP_2O_7 + Ca(HSO_4)_2 \rightarrow$

2.Write the dissociation equation of given electrolytes:

$H_3PO_4 \rightarrow$

$K_2SiO_3 \rightarrow$

$Al(OH)Cl_2 \rightarrow$

3.Depict the electronic structure of chlorine atom and ion.

Sample 5

1.Write the chemical reaction.

$P_2O_5 + Ca(OH)_2 \rightarrow$

$Cr_2O_3 + KHSO_4 \rightarrow$

$Ca(H_2PO_4)_2 + Al_2(CrO_4)_3 \rightarrow$

2.Write the dissociation equation of given electrolytes:

$H_2SO_3 \rightarrow$

$(NH_4)_4P_2O_7 \rightarrow$

$CuOHCL \rightarrow$

3.Depict the electronic structure of boron atom and ion.

Sample 6

1.Write the chemical reaction.

$NaOH + CrO_3 \rightarrow$

$KAlO_2 + H_2SO_4 \rightarrow$

$Na_2HPO_4 + Al(H_3P_2O_7)_3 \rightarrow$

2.Write the dissociation equation of given electrolytes:

$Ba(OH)_2 \rightarrow$

$K_3AsO_4 \rightarrow$

$NaHSO_3 \rightarrow$

3.Depict the electronic structure of carbone atom and ion.

Sample 7

1.Write the chemical reaction.

$Al_2O_3 + KOH \rightarrow$

$Mg(HCO_3)_2 + Ca(OH)_2 \rightarrow$

$(NH_4)_2HPO_4 + Cr(NO_3)_3 \rightarrow$

2.Write the dissociation equation of given electrolytes:

$Cr(OH)_3 \rightarrow$

$(NH_4)_2SO_4 \rightarrow$

$Na_3HP_2O_7 \rightarrow$

3.Depict the electronic structure of nitrogen atom and ion.

Sample 8

1.Write the chemical reaction.

$ZnO + CaO \rightarrow$

$Al_2(H_2P_2O_7)_3 + NH_4OH \rightarrow$

$Na_2CO_3 + Mg(H_2PO_4)_2 \rightarrow$

2.Write the dissociation equation of given electrolytes:

$Fe(OH)_3 \rightarrow$

$Ba(NO_3)_2 \rightarrow$

$Ca(H_2PO_4)_2 \rightarrow$

3.Depict the electronic structure of fluorine atom and ion.

Sample 9

1.Write the chemical reaction.

$Cr_2O_3 + NaOH \rightarrow$

$NH_4H_2PO_4 + Ca(OH)_2 \rightarrow$

$Ba(NO_3)_2 + Al_2(SO_4)_3 \rightarrow$

2.Write the dissociation equation of given electrolytes:

$H_2SiO_3 \rightarrow$

$Fe_2(SO_4)_3 \rightarrow$

$(NH_4)_2H_2P_2O_7 \rightarrow$

3.Depict the electronic structure of oxygen atom and ion.

Sample 10

1.Write the chemical reaction.

$BaO + Cl_2O \rightarrow$

$Ca(OH)_2 + N_2O_3 \rightarrow$

$Al_2(SO_4)_3 + (NH_4)_2HPO_4 \rightarrow$

2.Write the dissociation equation of given electrolytes:

$H_3AsO_4 \rightarrow$

$CrBr_3 \rightarrow$

$(CuOH)_2CO_3 \rightarrow$

3.Depict the electronic structure of magnesium atom and ion.

Control test 2 "s-elements, p-elements, biological role, application in medicine"

Sample 1

1.Write the electronic structure of sodium atom and ion.
2. Write the electronic structure of boron atom and B^{3+} ion.
3.Write the equations of the below given chain.

$$SO_2 \rightarrow SO_3 \rightarrow H_2SO_4 \rightarrow SO_2$$

4. Write the products and give the oxidation and reduction half-reactions for the following redox reactions. $H_2S + KMnO_4 + HNO_3 \rightarrow$

Sample 2

1.Write the electronic structure of lithium atom and ion.
2. Write the electronic structure of carbon atom and C^{4+} ion.
3.Write the equations of the below given chain.

$$Cl_2 \rightarrow NaClO \rightarrow NaCl \rightarrow AgCl$$

4. Write the products and give the oxidation and reduction half-reactions for the following redox reactions. $Cl_2 + Ca(OH)_2 \rightarrow$

Sample 3

1.Write the electronic structure of potassium atom and ion.
2. Write the electronic structure of nitrogen atom and N^{3+} ion.
3.Write the equations of the below given chain.

$$MgO \rightarrow MgCO_3 \rightarrow Mg(HCO_3)_2$$

4. Write the products and give the oxidation and reduction half-reactions for the following redox reactions. $CrCl_3 + Br_2 + KOH \rightarrow$

Sample 4

1.Write the electronic structure of lithium atom and ion.
2. Write the electronic structure of oxygen atom and O^{2-} ion.
3.Write the equations of the below given chain.

$$Na \rightarrow Na_2O \rightarrow Na_2O_2 \rightarrow NaCl$$

4. Write the products and give the oxidation and reduction half-reactions for the following redox reactions. $Cl_2 + KOH\ (t) \rightarrow$

Sample 5

1.Write the electronic structure of sodium atom and ion.
2. Write the electronic structure of fluorine atom and F^- ion.
3.Write the equations of the below given chain.

$$K \rightarrow K_2O \rightarrow KOH \rightarrow K_2SO_4 \rightarrow KCl$$

4. Write the products and give the oxidation and reduction half-reactions for the following redox reactions. $KI + K_2Cr_2O_7 + H_2SO_4 \rightarrow$

Sample 6

1.Write the electronic structure of potassium atom and ion.
2. Write the electronic structure of aluminium atom and Al^{3+} ion.
3.Write the equations of the below given chain.

$$N_2 \rightarrow NH_3 \rightarrow NO \rightarrow NO_2 \rightarrow HNO_2$$

4. Write the products and give the oxidation and reduction half-reactions for the following redox reactions. $KClO_3 + FeSO_4 + H_2O \rightarrow$

Sample 7

1.Write the electronic structure of rubidium atom and ion.

2. Write the electronic structure of silicon atom and Si^{4+} ion.

3.Write the equations of the below given chain.

$$Ca(HCO_3)_2 \rightarrow CaCO_3 \rightarrow CaO \rightarrow CaSO_4$$

4. Write the products and give the oxidation and reduction half-reactions for the following redox reactions. $HCl + K_2CrO_4 \rightarrow$

Sample 8

1.Write the electronic structure of cesium atom and ion.

2. Write the electronic structure of phosphorus atom and P^{3+} ion.

3.Write the equations of the below given chain.

$$I_2 \rightarrow HIO \rightarrow NaIO_2 \rightarrow I_2$$

4. Write the products and give the oxidation and reduction half-reactions for the following redox reactions. $H_2S + Cl_2 + H_2O \rightarrow$

Sample 9

1. Write the electronic structure of sulfur atom and S^{6+} ion..

2.Write the electronic structure of beryllium atom and ion.

3.Write the equations of the below given chain.

$$NH_3 \rightarrow NH_4OH \rightarrow NH_4Cl \rightarrow NH_3$$

4. Write the products and give the oxidation and reduction half-reactions for the following redox reactions. $KI + KClO_3 + H_2SO_4 \rightarrow$

Sample 10

1. Write the electronic structure of chlorine atom and Cl^- ion.

2.Write the electronic structure of sodium atom and ion.

3.Write the equations of the below given chain.

$$Fe_2(SO_4)_3 \rightarrow SO_3 \rightarrow Na_2SO_4 \rightarrow BaSO_4$$

4. Write the products and give the oxidation and reduction half-reactions for the following redox reactions. $HClO_4 + P_2O_3 \rightarrow$

Control test 3 "d-elements, biological role, application in medicine"

Sample 1

1. Write the electronic structure of zinc atom and Zn^{2+}ion.
2. Write the equations of the below given chain:

$$Fe\ Cl_3 \rightarrow Fe\ (OH)_3 \rightarrow KFeO_2 \rightarrow Fe_2\ (SO_4)_3$$

3. Write the products and give the oxidation and reduction half-reactions for the following redox reactions: $Cr_2(SO_4)_3 + KMnO_4 + KOH \rightarrow$

Sample 2

1. Write the electronic structure of copper atom and Cu^{2+}ion.
2. Write the equations of the below given chain:

$$Cr \rightarrow Cr\ (NO_3)_3 \rightarrow Na_2CrO_4 \rightarrow \rightarrow BaCrO_4$$

3. Write the products and give the oxidation and reduction half-reactions for the following redox reactions: $FeSO_4 + KMnO_4 + H_2SO_4 \rightarrow$

Sample 3

1. Write the electronic structure of scandium atom and Sc^{3+}ion.
2. Write the equations of the below given chain:

$$Fe \rightarrow Fe\ SO_4 \rightarrow Fe_3(PO_4)_2 \rightarrow Fe(OH)_2\ ;$$

3. Write the products and give the oxidation and reduction half-reactions for the following redox reactions: $CrCl_3 + Br_2 + KOH \rightarrow$

Sample 4

1. Write the electronic structure of titanium atom and Ti^{3+}ion.
2. Write the equations of the below given chain:

$$Cr\ Cl_3 \rightarrow Cr\ (OH)_3 \rightarrow KCrO_2 \rightarrow CrCl_3$$

3. Write the products and give the oxidation and reduction half-reactions for the following redox reactions: $CrCl_3 + H_2O_2 + KOH \rightarrow$

Sample 5

1. Write the electronic structure of vanadium atom and V^{5+}ion.
2. Write the equations of the below given chain:

$$Cr_2\ O_3 \rightarrow Cr_2(SO_4)_3 \rightarrow K_2CrO_4 \rightarrow Cr\ (OH)_3$$

3. Write the products and give the oxidation and reduction half-reactions for the following redox reactions: $K_2Cr_2O_7 + KI + H_2SO_4 \rightarrow$

Sample 6

1. Write the electronic structure of chromium atom and Cr^{2+}ion.
2. Write the equations of the below given chain:

$$Fe \rightarrow Fe\ Cl_2 \rightarrow Fe\ (OH)_2 \rightarrow Fe(OH)_3$$

3. Write the products and give the oxidation and reduction half-reactions for the following redox reactions: $FeSO_4 + KClO_3 + H_2O \rightarrow$

Sample 7

1. Write the electronic structure of manganese atom and Mn^{7+}ion.
2. Write the equations of the below given chain:

$$Fe \rightarrow Fe\ SO_4 \rightarrow Fe_2(SO_4)_3 \rightarrow Fe(OH)SO_4$$

3. Write the products and give the oxidation and reduction half-reactions for the following redox reactions: $K_2CrO_4 + HCl \rightarrow$

Sample 8

1. Write the electronic structure of iron atom and Fe^{3+}ion.
2. Write the equations of the below given chain:

$$Fe\ Cl_3 \rightarrow Fe\ (OH)_3 \rightarrow NaFeO_2 \rightarrow Fe_2\ (SO_4)_3$$

3. Write the products and give the oxidation and reduction half-reactions for the following redox reactions: $K_2Cr_2O_7 + H_2S + H_2SO_4 \rightarrow$

Sample 9

1. Write the electronic structure of cobalt atom and Co^{2+}ion.
2. Write the equations of the below given chain:

$$Cr \rightarrow Cr\ (NO_3)_3 \rightarrow Na_2CrO_4 \rightarrow \rightarrow BaCrO_4$$

3. Write the products and give the oxidation and reduction half-reactions for the following redox reactions: $Fe + H_2SO_4$ (conc.) (t) $\rightarrow$

Sample 10

1. Write the electronic structure of nickel atom and Ni^{2+}ion.
2. Write the equations of the below given chain:

$$Cr\ Cl_3 \rightarrow Cr\ (OH)_3 \rightarrow KCrO_2 \rightarrow CrCl_3$$

3. Write the products and give the oxidation and reduction half-reactions for the following redox reactions: $Fe + O_2 + H_2O \rightarrow$

Control test 4 "Formation of the complexes in biological systems"

Sample 1

I) How does the compound $K_4[Fe(CN)_6]$ can be called?
What is the charge of the central ion?
What is the charge of complex ion?
What is the coordination number?
Write the dissociation of the given complex.

II) How does the compound $[Cu(NH_3)_4]SO_4$ can be called?
What is the charge of the central ion?
What is the charge of complex ion?
What is the coordination number?
Write the dissociation of the given complex.

Sample 2

I) How does the compound $K_2[CoCl_4]$ can be called?
What is the charge of the central ion?
What is the charge of complex ion?
What is the coordination number?
Write the dissociation of the given complex.

II) How does the compound $[Ni(NH_3)_6]SO_4$ can be called?
What is the charge of the central ion?
What is the charge of complex ion?
What is the coordination number?
Write the dissociation of the given complex.

Sample 3

I) How does the compound $Na_3[AlF_6]$ can be called?
What is the charge of the central ion?
What is the charge of complex ion?
What is the coordination number?
Write the dissociation of the given complex.

II) How does the compound $[Zn(NH_3)_4]SO_4$ can be called?
What is the charge of the central ion?
What is the charge of complex ion?
What is the coordination number?
Write the dissociation of the given complex.

Sample 4

I) How does the compound $K[Al(OH)_4]$ can be called?
What is the charge of the central ion?
What is the charge of complex ion?
What is the coordination number?
Write the dissociation of the given complex.

II) How does the compound $[Ag(NH_3)_2]OH$ can be called?
What is the charge of the central ion?
What is the charge of complex ion?
What is the coordination number?
Write the dissociation of the given complex.

Sample 5

I) How does the compound $K_4[Fe(CN)_6]$ can be called?

What is the charge of the central ion?
What is the charge of complex ion?
What is the coordination number?
Write the dissociation of the given complex.

II) How does the compound $[Co(H_2O)_5]Cl_3$ can be called?
What is the charge of the central ion?
What is the charge of complex ion?
What is the coordination number?
Write the dissociation of the given complex.

Sample 6

I) How does the compound $Na_2[Zn(CN)_4]$ can be called?
What is the charge of the central ion?
What is the charge of complex ion?
What is the coordination number?
Write the dissociation of the given complex.

II) How does the compound $[Ni(NH_3)_6](OH)_2$ can be called?
What is the charge of the central ion?
What is the charge of complex ion?
What is the coordination number?
Write the dissociation of the given complex.

Sample 7

I) How does the compound $K_3[Fe(CN)_6]$ can be called?
What is the charge of the central ion?
What is the charge of complex ion?
What is the coordination number?
Write the dissociation of the given complex.

II) How does the compound $[Cr(H_2O)_6]Cl_3$ can be called?
What is the charge of the central ion?
What is the charge of complex ion?
What is the coordination number?
Write the dissociation of the given complex.

Sample 8

I) How does the compound $K_3[Al(OH)_6]$ can be called?
What is the charge of the central ion?
What is the charge of complex ion?
What is the coordination number?
Write the dissociation of the given complex.

II) How does the compound $[Zn(NH_3)_4]SO_4$ can be called?
What is the charge of the central ion?
What is the charge of complex ion?
What is the coordination number?
Write the dissociation of the given complex.

Sample 9

I) How does the compound $Na_2[Zn(OH)_4]$ can be called?
What is the charge of the central ion?
What is the charge of complex ion?
What is the coordination number?
Write the dissociation of the given complex.

II) How does the compound $[Ag(NH_3)_2]_2SO_4$ can be called?
What is the charge of the central ion?
What is the charge of complex ion?
What is the coordination number?
Write the dissociation of the given complex.

Sample 10

I) How does the compound $Cu_2[Fe(CN)_6]$ can be called?
What is the charge of the central ion?
What is the charge of complex ion?
What is the coordination number?
Write the dissociation of the given complex.
II) How does the compound $[Ag(NH_3)_2]OH$ can be called?
What is the charge of the central ion?
What is the charge of complex ion?
What is the coordination number?
Write the dissociation of the given complex.

Control test 5 "Methods of expressing concentration of solution"

Sample 1

1.What is the mass fraction of a solute in a solution?
2.How is calculated the equivalent factor of a salt?
3.How many grams of NaOH must be taken for preparation of 0.3 M solution in the volume of 2 L?
4.Calculate the mass fraction of a solute in a solution containing 4.5 g of the solute dissolved in 200 ml of water ($\rho = 1.07$).

Sample 2

1.What is the molar concentration?
2.What is the molality?
3. The concentration of $KMnO_4$ is 0.25 M. How many grams of it must be taken to prepare 3 L of the solution?
4. How many grams of oxalate $H_2C_2O_4$ must be taken to prepare 300 ml of the solution containing 5 % by mass of the solute ($\rho = 1.05$)?

Sample 3

1.What is the molarity of an equivalent?
2.How is calculated the equivalent factor of an acid?
3.How many grams of NaCl must be taken for preparation of the solution (volume is 3 L) with 10 %mass fraction of the solute ($\rho = 1,07$).?
4.How many grams of H_3PO_4 must be taken for preparation of 0.2 M solution in the volume of 5 L?

Sample 4

1.Write the equivalent law.
2.How is calculated the equivalent factor of a salt?
3.Calculate the molar concentration of H_2SO_4 equivalent knowing that 2L of solution contain 15 g of the solute.
4. How many grams of Na_2CO_3 must be taken for preparation of 2 % solution in the volume of 5 L?

Sample 5

1.What is the molar concentration?
2.How is calculated the equivalent factor of a salt?
3.How many grams of NaCl must be taken for preparation of 0.9 % solution in the volume of 3 L ($\rho = 1\ .03$).
4. How many grams of H_3PO_4 must be taken for preparation 1.5 M of the solution with the volume of 2 L?

Sample 6

1.What is the molar concentration?
2.How is calculated the equivalent factor of a base?
3. The mass fraction of NaOH is 10 %. What is the volume of water must be taken to prepare 2 M solution?
4. The solution is 0.1 M of $FeSO_4$. How many grams of $FeSO_4$ must be taken to prepare 2 L of its solution?

Sample 7

1.What is the molarity of the equivalent?
2.What is a mass fraction of a solution?

3.The mass fraction of HCl is 8.2 %. What is the molar concentration of the equivalent?
4.The molar concentration of NaOH is 0.1 M. How many grams of its must be used to prepare 2 L of the solution?

Sample 8

1.What is the molar concentration of the equivalent?
2. How is calculated the equivalent factor of an acid?
3.The molar concentration of NaOH is 0.3 M. How many grams of its must be used to prepare 2 L of the solution?
4.What is a mass fraction of a solute taking into account that 4.5 grams of it was dissolved in 200 ml of water ($\rho = 1,07$)?

Sample 9

1.What is the molality?
2. Write the equivalent law.
3. The concentration of $KMnO_4$ is 0.25 M. How many grams of it must be taken to prepare 3 L of the solution knowing that the determination is carried in acid medium?
4. How many grams of oxalate $H_2C_2O_4$ must be taken to prepare 300 ml of the solution containing 5 % by mass of the solute ($\rho = 1.05$)?

Sample 10

1.What is the molarity?
2.How is calculated the equivalent factor of an acid?
3.How many grams of NaCl must be taken to prepare the solution (volume is 3 L) with 10 % mass fraction of the solute ($\rho = 1,07$).?
4.How many grams of H_3PO_4 must be taken for preparation of 0.2 M solution in the volume of 5 L?

Control test 6 "Acid-base equilibrium in the organism. pH scale of biological liquids"

Sample 1

- What is the ionic product of water?
- What is pH of 0.001 M NaOH?
- What is the equation of pH calculation of the weak acids?
- What is pH of the solution if the equal volumes of 0.25 M HNO_3 and 0.1 M of NaOH were mixed?
- Calculate $[OH^-]$ if pH=3.24.

Sample 2

- What is pH of 0.0001 M sulfuric acid?
- What is the ionic product of water if pH=2?
- What is the active acidity?
- What is pH of NaOH (ρ=1, α=1) if 10 ml of its were added to 40 ml of water?
- What is the concentration of HCl if pH=0.7?

Sample 3

- What is pH of 0.001 M of nitric acid?
- What is the concentration of hydroxyl ions in the solution that has pH=11?
- What is the potential basedity?
- What is pH of 0.01 M acetic acid, $K_D=1.8*10^{-5}$?
- Calculate $[OH^-]$ if pH=8.3.

Sample 4

- What is pH of 0.1 M KOH solution?
- What is the alkalosis?
- What is pH of blood?
- What is pH of the solution after mixing 10 ml of 0.1 M HCl and 50 ml of water?
- Calculate $[H^+]$ if pH=6.47.

Sample 5

- What is pOH of 0.01 M HBr solution?
- What is the ionic product of water if pH=8
- How does pH change during alkalosis?
- What is pH of 5 % HCl solution if α=1?
- Calculate $[OH^-]$ if pH=10.52.

Sample 6

- What is pOH of 0.01 M $HClO_4$ solution (α=1)?
- What is the acidosis?
- What is the total basedity?
- Calculate $[H^+]$ if pH=6.52.

Sample 7

- What is pOH of 0.01 M HCl solution (α=1)?
- What is the concentration of hydroxyl ions in the solution that has pH=8?
- How do you calculate pH of the weak acid?
- What is pH of the solution if the equal volumes of 0.2 M H_3PO_4 and 0.7 M of NaOH were mixed?
- Calculate $[OH^-]$ if pH=2.18.

Sample 8

- What is pH of 0.1 M NaOH solution?
- What is pH if pOH=3?
- What is the ionic product of water if pH=6?
- What is pH of the solution after mixing 100 ml of 0.25 M H_2SO_4 and 50 ml of water?
- Calculate $[H^+]$ if pH=5.64.

Sample 9

- What is pOH of 0.1 M HCl solution ?
- What is the concentration of hydrogen ions in the solution that has pH=7?
- How do you calculate $[H^+]$ of the weak acid solution?
- What is pH of 0.01 M ammonium hydroxide solution if $K_D=8*10^{-5}$?
- Calculate $[OH^-]$ if pH=5.47.

Sample 10

- What is pH of 0.1 M NaOH solution?
- What is pH of 0.04 M NaOH solution if $\alpha=0.98$?
- Calculate $[OH^-]$ if pH=7.43.
- What is the acidosis?
- What is pH of 5 % HCl solution if $\alpha=1$?

Control test 7 "Volumetric analysis. Neutralization methods. Titration. Alkalimetry. Acidimetry."

Sample 1

1.White the equation of the neutralization methods. What are the compounds can be determined using this method?
2.What is a titrant?
3.What is the medium (pH) of the equivalent point at titration the strong acid by the strong base?
4.What is a titration curve?
5.What is an initial substance?
6.How many grams of oxalic acid must be dissolved in 100 grams of water to get 5 % solution?

Sample 2

1.What is the color of methyl orange in the basic medium?
2. What is the pH range of the point inflection titrating the strong base by strong acid and why?
3.What are the initial substances can be used for titration of sulfuric acid?
4.What is the mass fraction of boric acid in the solution if 10 g of it is dissolved in 1 L volumetric flask (ρ=1.12 g/ml)?
5.What is an analyte?
6.Preparation of an analyte?

Sample 3

1.What is the value of the equivalent point titrating the weak base by the strong acid?
2.Write the working standard solutions in acidimetry?
3.What is equivalency factor?
4.Preparation of a titrant?
5.The entity of an indicator theory.
6.What is the weight of NaOH dissolved in 500 ml volumetric flask knowing that 25 ml of the given solution was titrated by 50 ml of HCl (C_N=0.1 mol/L)?

Sample 4

1.Write the main equation of the neutralization method.
2.Write the interval of color changing of phenolphthalein.
3.What is the medium (pH) of the equivalent point at titration the weak acid by the strong base?
4.Preparation of the titrants.
5.What is the pH range of the titration jump in base standardization?
6.How many milliliters of 30 % of HCl solution (ρ=1.15 g/ml) are necessary to prepare 3 L of its solution with C_N=0.1 mol/L?

Sample 5

1.Which kind of the indicators is used for titration of the weak acid by the strong base and why?
2.How is correctly chosen an indicator?
3.What is a equivalence point?
4.How many milliliters of 50 % of sulfuric acid (ρ=1.4 g/ml) must be diluted in water to get 10 L of its solution (C_N=0.25 mol/L)?
5.Write the equation for calculation of the exact concentration using the titration data?
6.Calculate the weight of backing soda in 5 L of 5 % of the solution (ρ=1.05 g/ml).

Sample 6

1.What are the initial substances can be used in acidimetry?
2. Why does $Na_2B_4O_7*10H_2O$ can be used for the titration of an acid? Write the chemical equastion.

3. How is correctly chosen an indicator?
4. What is the medium (pH) of the equivalent point at titration the weak acid by the strong base?
5. Depict the titration graph of the strong acid by the strong base.
6. How many milliliters of 20 % of sulfuric acid (ρ=1.3 g/ml) must be diluted in water to get 5 L of its solution (C_N=0.1 mol/L)?

Sample 7

1. What is an acid-base titration curve?
2.What is a standard solution?
3. What is an equivalence point?
4. What is the medium (pH) of the equivalent point at titration the weak acid by the strong base?
5.The color of methyl orange at different pH?
6. How many milliliters of 30 % of sulfuric acid (ρ=1.15 g/ml) must be diluted in water to get 3 L of its solution (C_N=0.1 mol/L)?

Sample 8

1.Which are the conditions of the titrant choose?
2.Why does oxalate acid can be used for titration?
3. The color of methyl orange at different pH?
4.How many grams are necessary to prepare 2 L of oxalate acid solution with C_N=0.5 mol/L?
5. Depict the titration curve of the strong acid titrating by the strong base. What is an endpoint of titration? What is the pH range of the point inflection?
6. Write the interval of color changing of phenolphthalein?

Sample 9

1.Which are the conditions of the titrant choose?
2.What kind of an indicator is used in titration of the weak acid by the strong base?
3. What is an acid-base titration curve?
4. Why does oxalate acid can be used for titration?
5.How many milliliters of 50 % of sulfuric acid (ρ=1.4 g/ml) must be diluted in water to get 10 L of its solution (C_N=0.25 mol/L)?
6. Write the working standard solutions in acidimetry?

Sample 10

1.White the equation of the neutralization methods. What are the compounds can be determined using this method?
2.What is a titrant?
3.Which kind of the indicators is used for titration of the strong acid by the strong base and why?
4.What is a titration curve?
5.What is the mass fraction of boric acid (H_3BO_3) dissolving 10 g of it in 0.5 L of the solution (ρ=1.1 g/ml)?
6. Write the working standard solutions in acidimetry?

Control test 8 "Buffer systems, classification and mechanism"

Sample 1

1/ How do you calculate $[H^+]$ of the solutions?

a) a strong acid;
b) an acidic buffer system.

2/ Write the mechanism of the boric buffer action ($H_3BO_3 + Na_2B_4O_7$).

3/ Calculate the pH value of ammonium buffer containing 30 ml of 0.1 M NH_4OH and 70 ml of 0.1 M NH_4Cl ($K_D=1.8*10^{-5}$).

4/ What is the ratio of the acid and salt in phosphate buffer have to be taken to get pH=6.4 ($K_D=1.6*10^{-7}$)?

Sample 2

1/ How do you calculate $[H^+]$ of the solutions?

c) a strong acid;
d) an acidic buffer system.

2/ Write the mechanism of the protein buffer action (PtCOOH + PtCOOK).

3/ Calculate the pH value of hydrocarbonate buffer containing 30 ml of 0.15 M salt and 90 ml of 0.09 M acid ($K_D=3.3*10^{-7}$).

4/ What is the ratio of the acid and salt in phosphate buffer have to be taken to get pH=6.2 ($K_D=1.6*10^{-7}$)?

Sample 3

1/ How do you calculate $[H^+]$ of the solutions?

e) a weak acid;
f) a basic buffer system.

2/ Write the mechanism of the citrate-phosphate buffer action ($C_5H_7O_5COOH + Na_2HPO_4$).

3/ Calculate the pH value of the buffer system containing 50 ml of 0.2 M $NaHCO_3$ and 25 ml of 0.3 M H_2CO_3 ($K_D=4.4*10^{-7}$).

4/ What is the volume ratio of the phosphate buffer components have to be taken to get pH=9.2 ($K_D=1.8*10^{-7}$) knowing that the concentrations of the acid and salt is equaled to 0.1 M?

Sample 4

1/ How do you calculate $[H^+]$ of the solutions?

g) a strong base;
h) an acidic buffer system.

2/ Write the mechanism of the buffer action (HCOOH + HCOONa).

3/ Calculate the pH value of the phosphate buffer system containing 40 ml of 0.3 M Na_2HPO_4 and 80 ml of 0.1 M NaH_2PO_4 ($K_D=1.6*10^{-7}$).

4/ What is the ratio of the acid and salt in bicarbonate buffer have to be taken to get pH=5.76 ($K_D=3.3*10^{-7}$)?

Sample 5

1/ How do you calculate $[H^+]$ of the solutions?

i) a weak acid;
j) a basic buffer system.

2/ Write the mechanism of the protein buffer action.

3/ Calculate the pH value of the phosphate buffer system containing 20 ml of 0.1 M NH_4OH and 30 ml of 0.1 M NH_4Cl ($K_D=1.8*10^{-5}$).

4/ What is the volume ratio of the acetate buffer components have to be taken to get pH=5.5 ($K_D=1.8*10^{-5}$) knowing that the concentrations of the acid and salt is equaled to 0.2 M?

Sample 6

1/ How do you calculate $[H^+]$ of the solutions?

k) a strong acid;
l) an acidic buffer system.

2/ Write the mechanism of the ammonia buffer action.
3/ Calculate the pH value of the buffer system containing 70 ml of 0.2 M citrate ($C_5H_7O_5COONa$) and 60 ml of 0.15 M citric acid ($K_D=1.2*10^{-3}$).
4/ What is the ratio of the base and salt in ammonia buffer system have to be taken to get pH=9.5 ($K_D=1.8*10^{-5}$)?

Sample 7

1/ How do you calculate $[H^+]$ of the solutions?

m) a weak acid;
n) a basic buffer system.

2/ Write the mechanism of the hemoglobin buffer action.
3/ Calculate the pH value of the acetate buffer system containing 60 ml of 0.1 M salt and 40 ml of 0.1 M acid ($K_D=1.8*10^{-5}$).
4/ What is the ratio of the base and salt in ammonia buffer system have to be taken to get pH=8.7 ($K_D=1.8*10^{-5}$)?

Sample 8

1/ Write the Henderson Hasselbach equation.
2/ Write the mechanism of the protein buffer action.
3/ Calculate the pH value of the buffer system containing 40 ml of 0.1 M citrate ($C_5H_7O_5COOK$) and 60 ml of 0.1 M citric acid ($K_D=1.2*10^{-3}$).
4/ What is the volume ratio of the ammonia buffer components have to be taken to get pH=9 ($K_D=1.8*10^{-5}$) knowing that the concentrations of the acid and salt is equaled to 0.1 M?

Sample 9

1/ How do you calculate the active acidity of the solutions?

o) a strong acid;
p) an acidic buffer system.

2/ Write the mechanism of the protein buffer action (PtCOOH + PtCOOK).
3/ Calculate the pH value of the buffer system containing 150 ml of 0.1 M NH_4OH and 100 ml of 0.2 M NH_4NO_3 ($K_D=1.8*10^{-5}$).
4/ What is the ratio of the acid and salt in acetic buffer system have to be taken to get pH=4.4 ($K_D=1.8*10^{-5}$)?

Sample 10

1/ How do you calculate $[H^+]$ of the solutions?

q) a weak base;
r) a basic buffer system.

2/ Write the mechanism of the boric-phosphate buffer action ($KH_2BO_3 + Na_2B_4O_7$).
3/ Calculate the pH value of the buffer containing 40 ml of 0.3 M formic acid and 80 ml of 0.1 M sodium formate ($K_D=2*10^{-4}$).
4/ What is the volume ratio of the acetic buffer components have to be taken to get pH=5.3 ($K_D=1.8*10^{-5}$) knowing that the concentrations of the acid and salt is equaled to 0.2 M?

Control test 9 "Buffer capacity. The role of buffer solutions in biological systems"

Sample 1

1/What are the buffer systems?
2/What is the pH change of the phosphate buffer consisting of 100 ml of 0.1 M KH_2PO_4 and 100 ml of 0.3 M Na_2HPO_4 after adding 10 ml 0.2 M NaOH ($K_D=1.6*10^{-7}$)?
3/ 36 ml of 0.05 M HCl were spent for titration of 100 ml serum blood. pH of blood is changed to pH=7. Calculate the buffer capacity of the blood.

Sample 2

1/ What are the composition of bicarbonated buffer and the ratio of its components in the blood?
2/ What is the pH change of the bicarbonated buffer consisting of 7 ml of 0.1 M acid and 5 ml of 0.3 M salt after adding 2 ml 0.1 M NaOH ($K_D=4.4*10^{-7}$)?
3/ Calculate the buffer capacity of the ammonia buffer containing 60 ml of 0.15 M base and 40 ml 0.2 M salt. Taking into account that 10 ml of the given buffer solution were titrated by 5.5 ml 0.1 M HCl ($K_D=1.8*10^{-5}$)

Sample 3

1/ What is the composition of the basic buffer system? Write an example.
2/ What is the pH change of the acetate buffer consisting of 30 ml of 0.1 M acid and 70 ml of 0.2 M salt after adding 10 ml 0.1 M NaOH ($K_D=1.85*10^{-5}$)?
3/ Calculate the buffer capacity of the bicarbonate buffer containing 20 ml of 0.2 M acid and 40 ml 0.2 M salt. Taking into account that 10 ml of the given buffer solution were titrated by 7.5 ml 0.1 M HCl ($K_D=4.4*10^{-7}$).

Sample 4

1/ What is the buffer capacity? What is the value for the blood?
2/ What is the pH change of the phosphate buffer consisting of 30 ml of 0.15 M acid and 50 ml of 0.1 M salt after adding 10 ml 0.1 M NaOH ($K_D=1.6*10^{-7}$)?
3/ Calculate the buffer capacity of the acetate buffer with pH=4.7 taking into account that 10 ml of the given buffer solution were titrated by 5.2 ml 0.1 M NaOH.

Sample 5

1/ How do the factors influence by the buffer capacity?
2/ What is the pH change of the phosphate buffer consisting of 10ml of 0.1 M acid and 100 ml of 0.3 M salt after adding 10 ml 0.2 M NaOH ($K_D=1.6*10^{-7}$)?
3/ 36 ml of 0.05 M HCl were spent for titration of 100 ml serum blood. pH of blood is changed to pH=7. Calculate the buffer capacity of the blood.

Sample 6

1/ Why does not change the pH value of the basic buffer system after adding a tiny amount of HCl?
2/ What is the pH change of the ammonia buffer consisting of 40 ml of 0.1 M acid and 60 ml of 0.2 M salt after adding 20 ml 0.1 M HCl ($K_D=1.8*10^{-5}$)?
3/ Calculate the buffer capacity of the acetate buffer containing 20 ml of 0.2 M acid and 20 ml 0.2 M salt. Taking into account that 10 ml of the given buffer solution were titrated by 5.5 ml 0.1 M NaOH ($K_D=1.8*10^{-5}$).

Sample 7

1/ What is the composition of the phosphate buffer system?

2/ What is the pH change of the citrate buffer consisting of 40 ml of 0.1 M salt and 80 ml of 0.15 M acid after adding 20 ml 0.1 M NaOH ($K_D=1.2*10^{-3}$)?
3/ 8.6 ml of 0.1 M HCl were spent for titration of 10 ml of ammonia buffer with pH=7. Calculate the buffer capacity of the given buffer.

Sample 8

1/ Write the composition and Henderson-Hasselbach equation for the acidic buffer system.
2/ What is the pH change of the hydrocarbonated buffer system consisting of 7 ml of 0.1 M acid and 5 ml of 0.2 M salt after adding 2 ml 0.1 M NaOH ($K_D=4.4*10^{-7}$)?
3/ Calculate the buffer capacity of the ammonia buffer containing 60 ml of 0.1 M base and 40 ml 0.2 M salt. Taking into account that 10 ml of the given buffer solution were titrated by 5.5 ml 0.1 M HCl ($K_D=1.8*10^{-5}$).

Sample 9

1/ What is the buffer capacity? What is the value for the blood?
2/ What is the pH change of the bicarbonated buffer consisting of 7 ml of 0.1 M acid and 5 ml of 0.3 M salt after adding 2 ml 0.1 M NaOH ($K_D=4.4*10^{-7}$)?
3/ 8.6 ml of 0.1 M HCl were spent for titration of 10 ml of ammonia buffer with pH=7. Calculate the buffer capacity of the given buffer.

Control test 10 "Colligative properties of solutions. Osmosis."

Sample 1

1/What is the condition of the liquid freezing?
2/What is the freezing point of the solution containing 10 g of sodium chloride in 100 g of water knowing the dissociation degree of sodium chloride is 60 %?
3/What is the osmotic pressure of 18 % of sucrose at 20 °C if the solution density is 1,07 g/cm^3?

Sample 2

1/What is the osmotic pressure?
2/What is the boiling point of 5 % sucrose in water?
3/What is the osmotic pressure of 5 % $NaHCO_3$ solution that is used for the injection during acidosis (ρ=1.035, α=0.98)?

Sample 3

1/What is the effect of the hypertonic solution at the cell?
2/what is the oncotic pressure? It value of the blood.
3/What is the osmotic pressure of 40 % glucose solution that is used for the injection (ρ=1.6, t=37 °C, FW=180)?

Sample 4

1/White the van't Hoff equation for the electrolytes. Explain the parameters.
2/What are the colligative properties?
3/What is the osmotic pressure of 0.5 % KCl solution which is injected intravenous (ρ=1.04, α=0.98, t=37 °C)?

Sample 5

1/What is the osmosis?
2/What is the freezing point of 3 % glucose solution if Ecr=1.86?
3/What is the osmotic pressure of 0.9 % NaCl solution which is injected intravenous (ρ=1.09, α=0.98, t=37 °C)?

Sample 6

1/What is the turgor?
2/What is the freezing point depression of 6 % glucose solution (ρ=1.09)?
3/ What is the osmotic pressure of haemoglobin in water containing 124 g/L at 17 °C?

Sample 7

1/What does van't Hoff factor mean? What is the condition of the liquid boiling?
2/ What is the freezing point depression of the blood if P_{osm}=7.7 atm at 37 °C?
3/Detect the molar concentration of the glucose solution that is isotonic to the blood at 37 °C.

Sample 8

1/What is the plasmolysis of the cell?
2/Detect the formula weight (molecular weight) of the substance containing 29.5 g of it in 100 g of water if the freezing point depression is 1.6 °C.
3/How do you explain the laxative effect of 25 % $MgSO_4$ solution? Confirm your answer by correspondent calculations.

Sample 9

1/What is the boiling point evaluation?

2/Are the solutions of acetic acid and urea with the same molar concentration isotonic if FW = 60? Explain it?

Control-test 11 "Heat effects of the chemical direction of the processes."

Sample 1

1. What is isolated thermodynamic system?
2. What is the standard enthalpy formation?
3. Choose the correct answer. The extensive parameters of the system are
   a) the volume, mass; b) pressure, temperature; c)the concentration, potential.
4. Choose the correct answer. Exergonic systems in the human organism is
   a)glucose; b)ATP; c) glycogen.
5. Energy of the carbohydrates formation in human organism contains 4.1 kcal/g. Daily necessity of the female-student organism is 383 g of carbohydrates. Calculate the daily energy of carbohydrates for the female-student organism.

Sample 2

1. Write the I law of thermodynamics.
2. What is the exergonic reaction?
3. Choose the correct answer. The processes of vital functions are
   a) reversible; b) irreversible; c) in equilibrium.
4. Choose the correct answer. Chemical thermodynamics studies the thermodynamic properties of the substances depending on:
   a)the state, color, structure; b)the state, structure, energy;
   c) the state, structure, compositions.
5. Standard enthalpy formation of HCl equals -92.05 kJ/mol, HI equals -25.1 kJ/mol. Calculate the standard enthalpy change for the reaction $2HI + Cl_2 \rightarrow 2HCl + I_2$.

Sample 3

1. Explain Hess law.
2. What is 8H°?
3. Choose the correct answer. Gibbs free energy is
   a) _G= _H + T_S; b) _G= _H + T_Q; c) _G= _H – T_S
4. Choose the correct answer. In exergonic processes, heat is
   a) absorbed; b)released; c)unexchanged.
5. Standard enthalpy formation of NO equals -21.6 kcal/mol, NO_2 equals -7.43 kcal/mol. Calculate the standard enthalpy change for the reaction $2NO + O_2 \rightarrow 2NO_2$.

Sample 4

1. What is the closed thermodynamic system?
2. Write II law of thermodynamics.
3. Choose the correct answer. Entropy characterizes
a) disorder of a system; b)the particle aggregation of a system; c)work of a system.
4. Choose the correct answer. In endergonic processes, heat is
a) absorbed; b)released; c)unexchanged.
5. Energy of the proteins formation in human organism contains 4.1 kcal/g. Daily necessity of the male-student organism is 113 g of protein. Calculate the daily energy of proteins for the male-student organism.

Sample 5

1. What is the calorimetry?
2. Write the intensive parameters of a system.
3. Choose the correct answer. Thermochemical equation shows
a) the aggregative state of a system; b) enthalpy of a system; c) temperature.

4. Choose the correct answer. Enthalpy is
a) work of a system; b) heat of a system; c) the part of entropy.
5. Energy of the carbohydrates formation in human organism contains 4.1 kcal/g. Daily necessity of the male-student organism is 451 g of carbohydrates. Calculate the daily energy of carbohydrates for the male-student organism.

Sample 6

1. What is the open thermodynamic system?
2. Write I law of thermodynamics.
3. Choose the correct answer. Calorimetric method is used for determination of
   a) enthalpy; b) pressure; c) internal energy.
4. Choose the correct answer. Irreversible processes follow
   a) spontaneously; b) under pressure; c) at high temperature.
5. Energy of the fat formation in human organism contains 9.3 kcal/g. Daily necessity of the male-student organism is 106 g of carbohydrates. Calculate the daily energy of fat for the male-student organism.

Sample 7

1. What is the internal energy of a system?
2. What are the system, surrounding and universe in the thermodynamics?
3. Choose the correct answer. The human organism is
   a) open; b)closed; c) homogeneous.
4. Choose the correct answer. The reaction is in equilibrium when 8G is
   a)0; b)>0; c)<0.
5. Standard enthalpy formation of CO_2 equals -393.6 kJ/mol, H_2O equals -285.9 kJ/mol, $C_6H_{12}O_6$ is -1272.45 kJ/mol. Calculate the standard enthalpy change for the reaction $C_6H_{12}O_6 + O_2 \rightarrow CO_2 + H_2O$.

Sample 8

1. What is the thermodynamic system?
2. Write the extensive parameters of a system.
3. Choose the correct answer. The reaction is possible when
   a) _G=0; b) _G>0; c) _G<0.
4. Choose the correct answer. The units of enthalpy are
   a) kcal or kJ; b)kcal or W; c) J or V.
5. 100 g of cod (fish) contain 0.3 g of fat. The calorie content of 1 g of fat is 9.2 ккал. Calculate the calorie fat content of cod.

Sample 9

1. Write I law of thermodynamics.
2. What is endergonic process?
3. Choose the correct answer. Isothermal process follows at
   a) constant P; b) constant T; c) constant V.
4. Choose the correct answer. The spontaneous processes are
   a)irreversible; b) reversible; c) heterogeneous.
5. Energy of the fat formation in human organism contains 9.3 kcal/g. Daily necessity of the female-student organism is 90 g of carbohydrates. Calculate the daily energy of fat for the female-student organism.

Sample 10

1. What is the chemical thermodynamics?
2. What is entropy. What is the relation of Gibbs energy, enthalpy, entropy?
3. Choose the correct answer. Hess law states that the total enthalpy of the process depends on the initial and final states and

a)the pathway between the states; b) does not depend on the pathway between the states;
c) work of the system.

4. Choose the correct answer. The reaction is possible when

a) 8G=0; b) 8G>0; c) 8G<0

5. Energy of the carbohydrates formation in human organism contains 4.1 kcal/g. Daily necessity of the male-student organism is 451 g of carbohydrates. Calculate the daily energy of carbohydrates for the male-student organism.

Control-test 12 "Kinetics. Chemical equilibrium. Solubility product"

Sample 1.

1. Chose the correct answer. Rate of the chemical reaction is the change:
   a) pressure per unit of time;
   b) the concentration of the reactant per unit of time;
   c) the volume of the reactant per unit of time.
2. Chose the correct answer. In heterogeneous catalysis the reactants and the catalyst have:
   a) the same phase;
   b) the different phases;
   c) interacted at different temperatures.
3. What is the reaction rate change of $NO_{(gas)} + Cl_{2(gas)} \rightarrow NOCl_{(gas)}$ if the concentration of NO is increased in 3 times?
4. Write the equilibrium constant for the reaction $CO + O_2 \leftrightarrow CO_2$.
5. The substance precipitates when the concentration of its ions is:
   a)equal or lower SP; b) higher or lower SP; c) higher SP.
6. The chemical equilibrium is reached during the synthesis of ammonia at the following concentrations: nitrogen – 2.5 mol/L, hydrogen – 1.8 mol/L and ammonia – 3.6 mol/L. Calculate the equilibrium constant of the reaction.

Sample 2.

1. Chose the correct answer. How many molecules participate in monomolecular interaction?
   a) a molecule;
   b) two molecules;
   c) three molecules.
2. Chose the correct answer. The enzymatic catalysis is
   a) homogeneous;
   b) selective;
   c) thermostable.
3. Chose the correct answer. Accordingly to the mass action law the reaction rate is directly proportional to:
   a) the concentration product of the reactants;
   b) the ratio of the reactant's product;
   c) log of the reactant product.
4. Chose the correct answer. Accordingly to van't Hoff rule the increasing of temperature by 10 °C leads to the reaction rate
   a) decrease in 3-4 times;
   b) increase in 3-4 times;
   c) increase in 2-4 times.
5. The chemical equilibrium of the reaction $SO_3 \leftrightarrow SO_2 + O_2$ as the result of pressure decrease shifts in:
   a) left side; b) right side; c) does not shift.
6. Calculate SP of calcium oxalate if its solubility is $5.07 * 10^{-5}$ mol/L.

Sample 3.

1. Chose the correct answer. The activation energy is
   a) the maximum energy that is necessary to the reaction occurs;
   b) the minimum energy that is necessary to the reaction occurs;
   c) the average energy that is necessary to the reaction occurs.
2. Chose the correct answer. In acid-base catalysis the reaction rate is accelerated in the

presence of:

a) the free radicals;
b) protons;
c) the indicator.

3. Chose the correct answer. The reaction rate is depended on
   a) the volume of the substances;
   b) the heat capacity the substances;
   c) the concentration of the substances.
4. How does pressure decrease influence on the chemical equilibrium?
5. Thermodynamic condition of the chemical equilibrium.
6. Calculate the equilibrium constant of $I_2 + H_2 \leftrightarrow HI$ if equilibrium concentrations are 5.64 mol/L of HI, 0.12 mol/L of I_2 and 5.28 mol/L of H_2.

Sample 4.

1. Photochemical reaction is the reaction that gets the energy in the form:
   a) heat radiation;
   b)electromagnetic waves
   c) electric energy.
2. In homogeneous catalysis the reactants and the catalyst have:
   a) the same phase
   b) the different phases;
   c) the different pressure.
3. The reaction rate constant is the reaction rate at;
   a) the reactant concentration equal 1 mol/L;
   b) the reactant volume equal 22.4 L
   c) the reaction pressure at 101.3 kPa.
4. What is the solubility product?
5. The chemical equilibrium of the reaction $I_2 + H_2 \leftrightarrow KI - 8H$ as the result of pressure increase shifts in a)does not shift; b) in left side; c) in right side
6. Calculate SP of barium arsenate if its solubility is $2.04 * 10^{-8}$ mol/L.

Sample 5.

1. The enzymatic catalysis is
   a) thermolabeled;
   b) non-specific;
   c) influenced at the equilibrium constant.
2. The catalysts are the substances that
   a) accelerate the reaction rate;
   b) decrease the reaction rate;
   c) change the reaction rate.
3. The reaction rate is affected by
   a) nature of the substance, potential, volume;
   b) the mass, concentration, energy;
   c) nature of the substance, concentration, energy.
4. How does the reaction rate change if the temperature is accelerate in 20 °C ($\gamma = 2$)?
5. Irreversible reaction is accompanied the formation:
   a) of strong electrolyte;
   b) of complex compound;
   c) of weak electrolyte.

6. The chemical equilibrium is reached during the reaction $2A \leftrightarrow B$ at the following concentrations: A – 0.2 mol/L, B – 0.3 mol/L. Calculate the equilibrium constant of the reaction.

Sample 6.

1. The function of enzymes is
   a) the increase the activation energy;
   b) the decrease the activation energy;
   c) not affected on the activation energy.
2. The reaction rate of the fist order depends on:
   a) the concentration of a single reactant;
   b) the amount of the reactants;
   c) the volume of the reactants.
3. Write van' t Hoff formula.
4. How does the reaction rate change if the temperature is accelerated by 30 ºC. (γ= 3)?
5. How does pressure influence on the chemical equilibrium?
6. Calculate the equilibrium constant of $NO_2 \leftrightarrow NO + O_2$ if equilibrium concentrations of NO_2 is 0.8 mol/L, NO is 2.2 mol/L and 1.1 mol/L of O_2.

Sample 7.

1. What is the molecularity. Examples.
2. The enzymatic catalysis is depended on
   a) the reaction medium (pH);
   b) pressure;
   c) the amount of proteins making use of a human.
3. The less it is the activation energy,
   a) the slower it is the reaction rate;
   b) the faster it is the reaction rate;
   c) the later it is the reaction rate.
4. Explain Le Chaterlier's principle for the reaction $I_2 + H_2 \leftrightarrow HI$ - 8H. Write the equilibrium constant.
5. The value of the equilibrium constant does not depend on:
   a) temperature; b) the presence of a catalyst; c)nature of the reactants.
6. What does chemical equilibrium mean?

Sample 8.

1. What is the heterogeneous catalysis?
2. The reaction rate of the third order is depended on :

a) the concentration of the third reactants;
b) the concentration of all three reactants;
c) the concentration of the first reactant.

3. Write the Arrhenius equation. Explain the parameters.
4. Characterize the reaction state if Keq = 0, K eq >1, Keq < 1.
5. Explain Le Chaterlier's principle for the reaction $2A + B \leftrightarrow 2C$ - 8H. Write the equilibrium constant.
6. In organism the reactions are:
   a)reversible; b) irreversible; c) fast.

Sample 9.

1. The reaction rate constant is depended on
   a) the concentration and temperature;

b) the nature of the substances and temperature;
c) the nature of the substances and pressure.

2. What does the temperature coefficient show?
3. The collision theory. Main aspects.
4. The reaction rate constant of $A + 2B \rightarrow C$ is 0.6 L^2 mol^{-2} c^{-1}. The concentration of A is 2 mol/L and B is 2.5 mol/L. Calculate the reaction rate.
5. The precipitation occurs as the result of the reaction. The reaction is:
   a)irreversible; b) reversible; c) in equilibrium.
6. Calculate SP of silver iodide if its solubility is $1.5 * 10^{-16}$ mol/L

Sample 10.

1. What is the reaction rate in the homogeneous reaction? Explain the experimental measurement of the reaction rate.
2. The heterogeneous catalysis is explained by
   a)the formation of the intermediate states;
   b) the collision theory;
   c)multiplied theory of Balandin.
3. The activation energy is
   a)the maximum energy that is necessary to the reaction occurs;
   b) the minimum energy that is necessary to the reaction occurs;
   c)the average energy that is necessary to the reaction occurs.
4. How does the reaction rate of $A_2 + B \rightarrow AB$ change if the system pressure is accelerated in 5 times?
5. What does chemical equilibrium mean?
6. How does the chemical equilibrium shift of the reaction $CH_4 + I_2 \leftrightarrow CH_3I + HI$ if pressure of the system is increased in 5 times?

Control test 13 "Potentiometric method of analysis."

Sample 1.

1. Write the cell reaction and the half-reactions for the galvanic cell
   $Tl(s)|Tl^{+}(aq)||Sn^{2+}(aq)|Sn(s)$
2. What is an electrochemical cell? Write an example.
3. Calculate the emf of the concentrated galvanic cell containing two copper electrodes where one is immersed in 0.001 M $CuSO_4$ solution and the other in 1 M $CuSO_4$ solution.

Sample 2.

1. Write the cell reaction and the half-reactions for the galvanic cell
   $Zn(s)|Zn^{2+}(aq)||Fe^{3+}(aq), Fe^{2+}(aq)|Pt$
2. What is the charge of the anode? Write the redox reaction occurring at the anode.
3. Calculate the emf of the galvanic cell containing the copper electrode and the zinc electrode where one is immersed in1.5 M $CuSO_4$ solution and the other in 0.01 M $ZnSO_4$ solution ($E°_{Zn}$=-0.76 V, $E°_{Cu}$=+0.34 V)

Sample 3.

1. What is the charge of the cathode? Write the redox reaction occurring at the cathode.
2. The reactions occurring at the cathode and anode are given below. Write the notation for the galvanic cell
   $Cl_2(aq)+2e^{-} \rightarrow 2Cl^{-}$;
   $Zn(s)-2e- \rightarrow Zn^{2+}$.
3. The galvanic cell contains the hydrogen electrode dipped in gastric juices and the saturated colomel electrode. Calculate pH and C_{H+} of gastric juices if emf equals 0.87 at 18 °C.

Sample 4.

1. Why does the **salt bridge** use to generate an electric current in a galvanic cell?
2. Write the cell notation for a galvanic cell with the following half-reactions.
   $Cd(s) \rightarrow Cd^{2+}(aq)+2e^{-}$
   $Pb^{2+}(aq)+2e^{-} \rightarrow Pb(s)$
3. Calculate the standard emf of the following cell at 25 °C.
   $Cr(s)|Cr^{3+}(aq)||Hg_2^{2+}(aq)|Hg(l)$

Sample 5.

1. What is the electromotive force?
2. Write the Nernst equation.
3. The galvanic cell contains the hydrogen electrode dipped in gastric juices and the standard hydrogen electrode. Calculate pH and C_{H+} of gastric juices if emf equals 0.75 at 25 °C.

Sample 6.

1. What is the standard electromotive force?
2. Write the cell notation for a galvanic cell with the following half-reactions.
   $Fe(s) \rightarrow Fe^{2+}(aq)+2e^{-}$
   $Ag^{+}(aq)+1e^{-} \rightarrow Ag(s)$
3. The standard potential of the hydrogen electrode is 0. Calculate the potential of the electrode immersed in pure water.

Sample 7.

1. How does the emf depend on the concentrations of ions and on gas pressure?

2. Write the cell reaction and the half-reactions for the galvanic cell
   $Cr(s)|Cr^{3+}(aq)||Hg_2^{2+}(aq)|Hg(l)$
3. Calculate the emf of the concentrated galvanic cell containing two silver electrodes where one is immersed in 0.01 M $AgNO_3$ solution and the other in 1.5 M $AgNO_3$ solution.

Sample 8.

1. What is the concentrated galvanic cell? Write an example.
2. Write the cell notation and the half-reactions of the following reaction.
   $Al(s)+3Ag^+ \rightarrow Al^{3+}(aq)+3Ag(s)$
3. The galvanic cell contains two hydrogen electrodes. One is dipped in solution with pH=0. Calculate pH and C_{H+} of the unkown solution if emf is 0.354 V at 25 °C

Sample 9.

1. Write the construction of the glass electrode. What is the type of it?
2. Write the Nernst equation.
3. The galvanic cell contains two hydrogen electrodes. One is dipped in solution with pH=0. Calculate pH and C_{H+} of the unknown solution if emf is 0.243 V at 18 °C

Control test 14 "Determination of oxidation-reduction (redox) potential."

Sample 1.

1. Immersing the electrode in the redox system solution where the concentration of oxidized form is predominant, the electrode is charged:
   a) negatively; b) positively; c) no change.
2. The transformation of $FeSO_4 \rightarrow Fe_2(SO_4)_3$ is:
   a)oxidation; ` b)reduction; c) no change.
3. Write the Nernst equation for the Fe^{3+}/Fe^{2+} redox system.
4. The oxidation stage of the oxidazing agent in redox reactions:
   a)increase; b)decrease; c)no change.
5. How many electrons take place in the redox reaction if E_{red}=0.169 V, $E°_{red}$=0.110 V and the concentration of the oxidizing agent is higher in 10 times than the reducing agent?

Sample 2.

1. Immersing the electrode in the redox system solution where the concentration of reduced form is predominant, the electrode is charged:
   a) negatively; b) positively; c) no change.
2. The transformation of $Fe_2O_3 \rightarrow Fe$ is:
   a)oxidation; ` b)reduction; c) no change.
3. Write the Nernst equation for the Mn^{7+}/Mn^{2+} redox system.
4. The oxidation stage of the reducing agent in redox reactions:
   a)increase; b)decrease; c)no change.
5. Calculate the standard redox potential if E_{red}=-0.15 V and the percent ratio of oxidizing and reducing agents is 10%/90%. (n=1)

Sample 3.

1. The redox potential appears when the redox electrode is immersed in the solution of:
   a)oxidizing agent; b)reducing agent; c) both of them.
2. Write the Nernst formula.
3. What is the redox electrode?
4. Write the formula of emf calculation for a redox cell.
5. Calculate the standard redox potential if E_{red}=-0.15 V and the percent ratio of oxidizing and reducing agents is 20%/80%. (n=1).

Sample 4.

1. Emf of the redox system is depended on:
   a) the concentration of the reducing and oxidizing agents;
   b) the standard redox potential and ratio of the concentration of the reducing and oxidizing agents;
   c) the concentration of the reducing and oxidizing agents and temperature.
2. What are the reducing and oxidizing agents of the reaction $FeCl_3 + SnCl_2 \rightarrow$? Finish the reaction.
3. Ascorbic acid is detected using a dye. The standard redox potential of the last is 0.217 V and the dye is 0.14 V. Ascorbic acid is:
   a) oxidized; b) reduced; c) neither oxidized nor reduced.
4. What is the standard redox potential? Calculate the ratio of the reducing and oxidizing agents in the redox system if E_{red}=0.22 V, $E°_{red}$=0.180 V (n=2).

Sample 5.

1. Potentiometric titration is used to detect:
   a) potential acidity; b)active acidity; c)total acidity.
2. The system ($E°_{red}$=-0.03) is detected using the dye with $E°_{red}$=0.217 V. The system is:
   a) oxidized; b) reduced; c) neither oxidized nor reduced
3. Increasing the concentration of the reducing agent the redox potential is;
   a) increased; b) unchanged; c)decreased.
4. Write the Nernst equation.
5. Calculate the standard redox potential if E_{red}=-0.3 V and the percent ratio of oxidizing and reducing agents is 20%/80%. (n=2).

Sample 6.

1. What is the electrode immersed to measure the redox potential of MnO_4^-/Mn^{2+}?
   a) the silver chloride electrode;
   b) the golden electrode;
   c) the hydrogen electrode.
2. The redox potential is appeared when:
   a) the hydrogen electrode is immersed in the redox system;
   b) the platinum electrode is immersed in the redox system;
   c) the metal is immersed in the salt solution.
3. What is the system a or b posses the higher oxidative power:
   a) $E_{Fe3+/Fe2+}$ =0.78 V;
   b) $E_{Sn4+/Sn2+}$ =0.15 V;
   c) The same.
4. Write Nernst equation for N^{+5}/N^{+3}.
5. Calculate the ratio of the reducing and oxidizing agents in the $FeCl_3/FeCl_2$ redox system if E_{red}=0.88 V, $E°_{red}$=0.77 V.

Sample 7.

1. How does the potential change immersing the redox electrode in the system of $FeCl_3$ and $FeCl_2$ after lowering the reducing agent concentration?
   a) decrease; b) increase; c)unchanged.
2. The redox system having the lower redox potential:
   a)accepts the electrons; b)donates the electrons;
3. Write the Nernst equation.
4. Write the chemical reaction between two species if $E°_{Fe3+/Fe2+}$=+0.77 V and $E°_{I2/I-}$=+0.52 V.
5. The redox potential and the standard redox potential of Cr^{3+}/ Cr^{2+} system are +0.526 V and +0.41 V correspondently. Calculate the ratio of oxidized and reduced form at 25 °C

Sample 8.

1. Write the determinations of diffusion and membrane potentials.
2. How does the potential change immersing the redox electrode in the system of $FeCl_3$ and $FeCl_2$ after increasing the reducing agent concentration?
   a) decrease; b) increase; c)unchanged
3. Calculate emf of the redox cell containing MnO^-/Mn^{2+} and H_2O_2/H_2O redox systems knowing that $E°_{MnO4-/Mn^{2+}}$ =+1.49 V and $E°_{H2O2/H2O}$= +1.78 V.
4. Calculate the ratio of the reducing and oxidizing agents in the redox system if E_{red}=0.18 V, $E°_{red}$=0.22 V (n=2).
5. Write the chemical reaction between two species if $E°_{Fe3+/Fe2+}$=+0.77 V and $E°_{Cl2/Cl-}$=+1.36 V.

Sample 9.

1. Calculate emf of the redox cell containing MnO^-/Mn^{2+} and H_2O_2/H_2O redox systems knowing that $E°_{MnO-/Mn2+}$ =+1.49 V and $E°_{H2O2/H2O}$= +1.78 V.
2. Potentiometric titration is used to detect:
   a) potential acidity; b)active acidity; c)total acidity
3. What is the system a or b posses the higher oxidative power:
   a. $E_{Fe3+/Fe2+}$ =0.78 V;
   b. $E_{Sn4+/Sn2+}$ =0.15 V;
   c. The same.
4. What are the reducing and oxidizing agents of the reaction $FeCl_3 + SnCl_2 \rightarrow$? Finish the reaction.
5. Calculate the ratio of the reducing and oxidizing agents in the $FeCl_3/FeCl_2$ redox system if E_{red}=0.88 V, $E°_{red}$=0.77 V

Control test 15 "Sorption at the interface liquid-gas"

Sample 1.

1. Increasing the temperature, the surface tension at the interface liquid-gas is:
   a) lowered; b) accelerated; c) the surface tension does not depend on the temperature.
2. If $\frac{d\sigma}{dc} > 0$ the adsorption is
   a) negative; b) positive; c) it does not influence on the adsorption.
3. Depict the surface layer of a surfactant solution.
4. Write the surfactants containing in the body.

Sample 2.

1. Increasing the polarity, the surface tension at the interface liquid-gas is:
   a) lowered; b) accelerated; c) the surface tension does not depend on the polarity.
2. The Gibbs equation for the adsorption is:
   a) $\Gamma = \frac{C}{RT} \cdot \frac{dC}{d\sigma}$ b) $\Gamma = -\frac{C}{RT} \cdot \frac{d\sigma}{dC}$ c) $\Gamma = -\frac{C}{RT} \cdot \frac{d\sigma}{dC}$
3. What is the surface tension?
4. What is the surfactant meaning in organism?

Sample 3.

1. The surface inactive agent solutions have the surface tension comparing with the surface tension of pure solvent:
   a) higher; b) lower; c) equal.
2. If $\frac{d\sigma}{dc} < 0$ the adsorption is:
   a) negative; b) positive; c) it does not influence on the adsorption
3. Classification of the surfactants.
4. What is the surface energy?

Sample 4.

1. How do the below given physical and chemical properties of the surfactants change if the hydrocarbon skeleton of its is lowered:
   a) the acceleration of hydrophilic property;
   b) the decrease of the interface surface tension;
   c) the acceleration of the surface activity;
   d) the increase of the adsorption.
2. The coefficient of the surfactant surface activity in Duclo-Traube rule is:
   a)1.5-2.0; b) 2-4; c) 2-3.5.
3. The structure of biological membrane.
4. Give the definition of the surfactants. Examples.

Sample 5.

1. The surfactant solutions have the surface tension comparing with the surface tension of pure solvent:
   a) higher; b) lower; c) equal
2. According to the Duclo-Traube rule, the increase of the hydrocarbon skeleton by CH_2 group leads to:
   a) the decrease of the surface activity;

b) the increase of the surface activity;
c) the increase of the hydrophobic property;
d) the increase of the hydrophilic property.

3. Write the Gibbs equation of the adsorption.
4. What is the adsorption?

Sample 6.

1. Fatty acids are:
   a) anionic surfactant;b) cationic one; c) amphoteric one; d) non-ionic one.
2. The positive adsorption at the interface liquid-gas:
   a) does not influence on the surface tension;
   b) decreases the surface tension;
   c) increases the surface tension.
3. Viral infection cycle.
4. Write the values of the surface tension of water, mercury, blood serum and hexane.

Sample 7.

1. The strong inorganic electrolytes are:
   a) the cationic surfactant; b) anionic one; c) the surface-inactive agent.
2. What is an interface? Write the examples.
3. The role of the surfactants in the lungs.
4. Compare and explain the difference between the surface tension of water and blood serum.

Sample 8.

1. What is the physisorption?
2. The surfactant molecules are concentrated at the interface in the way of the polar groups are situated in:
   a) aqueous phase; b) gas phase; c) solid phase.
3. Write the factors influenced on the surface tension.
4. Compare and explain the difference between the surface tension of water and protein's solution.

Sample 9.

1. What are the positive and negative adsorption?
2. The negative adsorption at the interface liquid-gas:
   a. does not influence on the surface tension;
   b. decreases the surface tension;
   c. increases the surface tension.
3. Stalagmometric method of surface tension detection.
4. Write the values of the surface tension of water, mercury, blood serum and hexane.

Control-test 16 "Adsorption into solid surface. Ion exchange. Chromatography"

Sample 1.

1. What are the phenomena called adsorption and desorption?
2. Depict Langmur equation and isotherm.
3. Write the interfaces in human organism.
4. Panet-Phayance rule.
5. The distance moved by solvent is 43 cm, the distance moved by a substance is 28 cm. What is the carbohydrate under analysing if R_f of the following carbohydrates corresponds 0.88 for sucrose; 0.05 for fructose; 0.41 for ribose and 0.65 for glucose

Sample 2.

1. What is the selective adsorption?
2. Explain what is shown in the adsorption isotherm.
3. Using Al_2O_3 as the adsorbent select the cation predominantly adsorbing into the Al_2O_3 surface:
   a)Na^+; b)Ba^{2+}; c)Pt^{4+}; d)Fe^{3+}.
4. What is the retention time?
5. It is observed the spot with R_f =0.70. What is an analyzing alkaloid if the distance moved by solvent is 13 cm and the distances from the start line of "witnesses" are:
   a) codeine is 7.4 cm; b)caffeine is 9.1 cm; c) nicotine is 9.9 cm; d) papaverine is 11.4cm

Sample 3.

1. Write the examples of the adsorbent in living organism.
2. The basis of hemosorption.
3. Using gypsum as the adsorbent select the cation predominantly adsorbing into the gypsum surface:
   a)Na^+; b)Ca^{2+}; c)Pt^{4+}; d)Al^{3+}
4. What is an analyte in chromatography?
5. It is observed the spot with R_f =0.43. What is an analyzing carbohydrate if the distance moved by solvent is 11 cm and the distances from the start line of "witnesses" are:
   a) fructose is 5.2 cm; b)fructose is 4.7 cm; c)xylose is 6.8 cm; d)ribose is 7.4 cm.

Sample 4.

1. Write the examples of widely used adsorbents.
2. Is the adsorption endothermal or exothermal process?
3. What are the chemisorption and physisorption? The examples.
4. What are cation and anion exchangers?
5. The distance moved by solvent is 63 cm, the distance moved by a substance is 51 cm. What is the alkaloid under analysing if R_f of the following alkaloids corresponds 0.81 for codeine; 0.74 for caffeine; 0.64 for atropine and 0.92 for quinine.

Sample 5.

1. How does the adsorption of gases change under temperature changing?
2. Adsorption theory of narcosis.
3. Select the solvent that is necessary to use for the chromatographic separation of $MgSO_4$:
   a)benzene; b)ethanol; c)water, d)the mixture of water and ethanol.
4. The distance moved by solvent is 77 cm, the distance moved by amino acid is 33 cm. What is the amino acid if R_f of the following amino acids corresponds 0.44 for leucine; 0.78 for alanine; 0.70 for glycine, 0.69 for leucine.
5. The entity of high performance liquid chromatography.

Sample 6.

1. Depict Freundlich equation and isotherm.
2. What is the adsorption therapy? Examples.
3. What is the plate theory?
4. Select the solvent that is necessary to use for the chromatographic separation of $Na_2S_2O_3$:
   a)benzene; b)ethanol; c)water, d)the mixture of water and ethanol.
5. The distance moved by solvent is 63 cm, the distance moved by a substance is 51 cm. What is the alkaloid under analysing if R_f of the following alkaloids corresponds 0.81 for codeine; 0.74 for caffeine; 0.64 for atropine and 0.92 for quinine.

Sample 7.

1. What is the adsorption significance in the photosynthesis?
2. The mechanism of the adsorption accordingly to Langmur theory.
3. What are the porous adsorbents? Examples.
4. If the poisoning was caused by the excess of carbonates in an organism, select the recommended adsorbent:
   a) chalk; b)barium sulfate; c)starch; d) clay.
5. The distance moved by solvent is 39 cm, the distance moved by a substance is 17 cm. What is the vitamin under analysing if R_f of the following vitamins corresponds 0. 41 for vitamin K; 0.56 for vitamin B; 0.43 for vitamin D and 0.61 for vitamin C.

Sample 8.

1. What is molecular adsorption?
2. What are the active sites in the adsorption theory?
3. The entity if ion exchange chromatography.
4. Select the adsorbent that is used to separate toluene from the mixture:
   a)activated carbon; b)silics; c)starch; d)chalk.
5. What is the stationary phase?

Sample 9.

1. What does the adsorption process influence on the activity of enzymes?
2. What is the temperature influence on the chemisorption and physisorption?
3. What is an adsorbent? What is an adsorbate?
4. It is observed the spot with R_f =0.56. What is an analyzing carbohydrate if the distance moved by solvent is 14 cm and the distances from the start line of "witnesses" are: f) fructose is 11.2 cm; b)fructose is 6.7 cm; c)xylose is 7.84 cm; d)ribose is 9.1 cm.
5. The principle of the thin layer chromatography.

Control-test 17 "Preparation, purification and properties of colloidal solutions"

Sample 1.

1. Write the micelle structure of the product formed after reaction of silver nitrate and calcium bromide solutions at the condition:
    a) when silver nitrate is in excess;
    b) when calcium bromide is in excess.
2. Write the classification of the dispersive systems by particle size. Write the examples.

Sample 2.

1. Write the micelle structure of the product formed after after reaction of potassium chromate and lead (II) nitrate $\{Pb(NO_3)_2\}$solutions at the condition:
    a) when potassium chromate is in excess;
    b) when lead (II) nitrate is in excess.
2. Write the classification of the dispersive systems by aggregative states of dispersed and dispersing phases. Write the examples.

Sample 3.

1. Write the micelle structure of the product formed after reaction of sodium sulfate and strontium chloride solutions at the condition:

a) when sodium sulfate is in excess;
b) when strontium chloride is in excess.

2. Write the classification of the dispersive systems by aggregative states of dispersed and dispersing phases. Write the examples.

Sample 4.

1. Write the micelle structure of the product formed after reaction of silver nitrate and calcium bromide solutions at the condition:

a) when silver nitrate is in excess;
b) when calcium bromide is in excess.

2. Explain the Tyndall effect.

Sample 5.

1. Write the micelle structure of the product formed after reaction of barium chloride and sulfuric acid solutions at the condition:

a) when barium chloride is in excess;
b) when sulfuric acid is in excess.

2. Explain hydrophobicity. Write the example of hydrophobic dispersive systems.

Sample 6.

1. Write the micelle structure after reaction of manganese iodide and potassium sulfide solutions at the condition:
    a) when manganese iodide is in excess;
    b) when potassium sulfide is in excess.
2. Explain liophobicity. Write the example of liophobic dispersive systems.

Sample 7.

1. Write the micelle structure after reaction of silver nitrate and potassium chromate solutions at the condition:

a) when silver nitrate is in excess;
b) when potassium chromate is in excess.

2. Write the methods of colloid's synthesis.

Sample 8.

1. Write the micelle structure after reaction of lead (II) acetate and potassium iodide solutions at the condition:

a) when lead (II) acetate is in excess;
b) when potassium iodide is in excess.

2. Explain hydrophilicity. Write the example of hydrophilic dispersive systems

Sample 9.

1. Write the micelle structure after reaction of barium chloride and potassium chromate solutions at the condition:

a) when barium chloride is in excess;
b) when potassium chromate is in excess.

2. Properties of colloids.

Sample 10.

1. Write the micelle structure after reaction of silver nitrate and ammonium oxalate solutions at the condition:

a) when silver nitrate is in excess;
b) when ammonium oxalate is in excess.

2. Penet-Phayance rule.

Control test 18 "Coagulation of colloidal solutions. Colloidal stability."

Sample 1.

1. Write the structure of AgI micelle if the excess of KI was added to $AgNO_3$ solution.
2. Select the ions (Na^+, Li^+, Cl^-, SO_4^{2-}, Cr^{3+}, Pb^{2+}, CH_3COO^-, PO_4^{3-}, OH^-, Cs^+, Sr^{2+}, Br^-, Mg^{2+}) that are able to cause the coagulation of the colloidal particles described in question 1.
3. Write the dependence of the coagulation ability on the charge of the electrolyte cations.
4. Write the dependence of the coagulation concentration on the charge of the electrolyte anions.

Sample 2.

1. Write the structure of $BaSO_4$ micelle if the excess of $BaCl_2$ was added to Na_2SO_4 solution. Write the chemical equation.
2. Select the ions (Na^+, Li^+, Cl^-, SO_4^{2-}, Cr^{3+}, Pb^{2+}, CH_3COO^-, PO_4^{3-}, OH^-, Cs^+, Sr^{2+}, Br^-, Mg^{2+}) that are able to cause the coagulation of the colloidal particles described in question 1.
3. Write the dependence of the coagulation ability on the charge of the electrolyte anions.
4. Write the dependence of the coagulation concentration on the charge of the electrolyte anions.

Sample 3.

1. Write the structure of AgBr micelle if the excess of KBr was added to $AgNO_3$ solution. Write the chemical equation.
2. Select the ions (Na^+, Li^+, Cl^-, SO_4^{2-}, Cr^{3+}, Pb^{2+}, CH_3COO^-, PO_4^{3-}, OH^-, Cs^+, Sr^{2+}, Br^-, Mg^{2+}) that are able to cause the coagulation of the colloidal particles described in question 1.
3. Write the dependence of the coagulation concentration on the charge of the electrolyte cations.
4. Write the dependence of the coagulation ability on the charge of the electrolyte cations.

Sample 4.

1. Write the structure of PbI_2 micelle if the excess of $Pb(NO_3)_2$ was added to KI solution. Write the chemical equation.
2. Select the ions (Na^+, Li^+, Cl^-, SO_4^{2-}, Cr^{3+}, Pb^{2+}, CH_3COO^-, PO_4^{3-}, OH^-, Cs^+, Sr^{2+}, Br^-, Mg^{2+}) that are able to cause the coagulation of the colloidal particles described in question 1.
3. Write the dependence of the coagulation concentration on the charge of the electrolyte ions.
4. Write the dependence of the coagulation ability on the charge of the electrolyte ions.

Sample 5.

1. Write the structure of $Fe_4[Fe(CN_6)]_3$ micelle if the excess of $FeCl_3$ was added to $K_4[Fe(CN_6)]$ solution. Write the chemical equation.
2. Select the ions (Na^+, Li^+, Cl^-, SO_4^{2-}, Cr^{3+}, Pb^{2+}, CH_3COO^-, PO_4^{3-}, OH^-, Cs^+, Sr^{2+}, Br^-, Mg^{2+}) that are able to cause the coagulation of the colloidal particles described in question 1.
3. Write the dependence of the coagulation concentration on the charge of the electrolyte ions.
4. Write the dependence of the coagulation ability on the charge of the electrolyte ions.

Sample 6.

1. Write the structure of AgCl micelle if the excess of NaCl was added to $AgNO_3$ solution. Write the chemical equation.
2. Select the ions (Na^+, Li^+, Cl^-, SO_4^{2-}, Cr^{3+}, Pb^{2+}, CH_3COO^-, PO_4^{3-}, OH^-, Cs^+, Sr^{2+}, Br^-, Mg^{2+}) that are able to cause the coagulation of the colloidal particles described in question 1.
3. Write the dependence of the coagulation concentration on the charge of the electrolyte cations.
4. Write the dependence of the coagulation ability on the charge of the electrolyte ions.

Sample 7.

1. Write the structure of $Fe(OH)_3$ micelle that has been formed by hydrolysis. Write the chemical equation.
2. Select the ions (Na^+, Li^+, Cl^-, SO_4^{2-}, Cr^{3+}, Pb^{2+}, CH_3COO^-, PO_4^{3-}, OH^-, Cs^+, Sr^{2+}, Br^-, Mg^{2+}) that are able to cause the coagulation of the colloidal particles described in question 1.
3. Write the dependence of the coagulation concentration on the charge of the electrolyte anions.
4. Write the dependence of the coagulation ability on the charge of the electrolyte cations.

Sample 8.

1. Write the structure of AgBr micelle if the excess of $AgNO_3$ was added to NaBr solution. Write the chemical equation.
2. Select the ions (Na^+, Li^+, Cl^-, SO_4^{2-}, Cr^{3+}, Pb^{2+}, CH_3COO^-, PO_4^{3-}, OH^-, Cs^+, Sr^{2+}, Br^-, Mg^{2+}) that are able to cause the coagulation of the colloidal particles described in question 1.
3. Write the dependence of the coagulation concentration on the charge of the electrolyte anions.
4. Write the dependence of the coagulation ability on the charge of the electrolyte cations.

Sample 9.

1. Write the structure of PbI_2 micelle if the excess of KI was added to $Pb(NO_3)_2$ solution. Write the chemical equation.
2. Select the ions (Na^+, Li^+, Cl^-, SO_4^{2-}, Cr^{3+}, Pb^{2+}, CH_3COO^-, PO_4^{3-}, OH^-, Cs^+, Sr^{2+}, Br^-, Mg^{2+}) that are able to cause the coagulation of the colloidal particles described in question 1.
3. Write the dependence of the coagulation concentration on the charge of the electrolyte cations.
4. Write the dependence of the coagulation ability on the charge of the electrolyte cations.

Sample 10.

1. Write the structure of $BaSO_4$ micelle if the excess of Na_2SO_4 was added to $BaCl_2$solution. Write the chemical equation.
2. Select the ions (Na^+, Li^+, Cl^-, SO_4^{2-}, Cr^{3+}, Pb^{2+}, CH_3COO^-, PO_4^{3-}, OH^-, Cs^+, Sr^{2+}, Br^-, Mg^{2+}) that are able to cause the coagulation of the colloidal particles described in question 1.
3. Write the dependence of the coagulation concentration on the charge of the electrolyte cations.
4. Write the dependence of the coagulation ability on the charge of the electrolyte anions.

Control-test 19 "Properties of biopolymers. Isoelectric point of proteins."

Sample 1.

1. Write the determination of polymers. Examples.
2. Write the main properties of polymers that are distinguished from the properties of colloids.
3. What is configuration?

Sample 2.

1. Write the classification of polymers by nature.
2. What are limited and unlimited swelling? Swelling degree.
3. What is the phenomenon responsible for stability of polymers?

Sample 3.

1. What are the properties of proteins in IEP?
2. What is the charge of proteins in acidic medium? Write the general scheme.
3. Write Hofmeister series.

Sample 4.

1. What is the salting out of proteins?
2. Write the factors influenced on swelling**.**
3. Write the bonds in polymers.

Sample 5.

1. Write the examples of swelling in organism.
2. Write the formula for viscosity calculation of polymers.
3. Osmotic pressure of polymers.

Sample 6.

1. What is the conformation?
2. Write the classification of polymers by chemical nature of functional groups.
3. Write the physical properties of polymers.

Sample 7.

1. What is denaturation of proteins? What are the factors of denaturation?
2. Write the classification of polymers by chemical nature of the main polymeric chain.
3. Interaction of the polymers with the solvents.

Sample 8.

1. Write the classification of polymers by compatibility with the tissues of human.
2. Write the mechanism of the swelling.
3. What is viscosity? Factors influenced on viscosity.

Sample 9.

1. What is the isoelectric state of proteins?
2. Write the factors influenced on swelling**.**
3. What is denaturation of proteins? What are the factors of denaturation?