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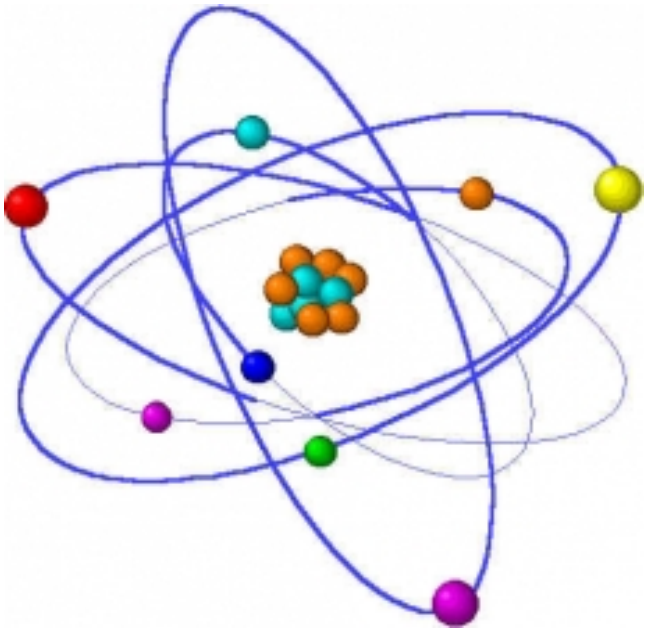
Medical Chemistry

Collected test problems

Training appliance for foreign students
of Zaporozhye State Medical University



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Medical Chemistry : collected test problems Training appliance for foreign students of Zaporozhye State Medical University / A. G. Kaplaushenko, I. A. Iurchenko, A. I. Avramenko, B. A.Varinskiy, M. A Shcherbak. - Zaporozhye, 2014. - 37 p.

PREFACE

Introduction to the credit-module-rating system for organization of the academic process is an integral part of adaptation of the domestic system of the higher medical education to conditions of Bologna Declaration. One of the requirements to the organization of the academic process within the pedagogical experiment is standardization of the system of quality evaluation of education of a student.

The manual to the Medical Chemistry course represents the experience of long-term teaching of this subject by the teachers of the Physical and Colloid Chemistry Department of Zaporozhye State Medical University in creating the bank of the test intended for the organization of the individual work of students and the control of their progress.

The chapters contain tests that allow a student to get acquainted with the typical questions and problems of each topic, which will be used for the current and final control. Besides, student has the opportunity to check his or her knowledge individually after listening lectures, performing laboratory works and studying separate sections of the course in the textbook. The correct answers are marked by asterisk *. The authors thank all, who will express the remarks and wishes concerning manual.

Topic: Colligative properties of solutions

How velosity of diffusion depends on the temperature and viscosity?

a) **Increases with growth of temperature and decrease of viscosity;*
b) *Increases with a temperature decrease and growth of viscosity.*
c) *Increases with a temperature and viscosity decrease;*

The aqueous solutions of saccharose, $CaCl_2$, NaCl, $Al_2(SO_4)_3$ and $K_3[Fe(CN)_6]$with identical molarity were prepared. What from the listed solutions boils at greatest temperature?

a) **Solution of $Al_2(SO4)_3$;*
b) *Solution of $K_3[Fe(CN)_6]$;*
c) *Solution of saccharose;*
d) *Solution of $CaCl_2$;*
e) *Solution of NaCl.*

What ratio connects a cryoscopic constant to melting heat of resolvent?

a) **Vant-Hoff;*
b) *Arrhenius;*
c) *Henry.*

What equation the diffusion expresses by?

a) **By Fick equation;*
b) *By Einstein's equation;*
c) *By Raoul equation.*

On what the diffusion coefficient depends?

a) **From radius of particles;*
b) *From a gradient of concentration;*
c) *From time;*
d) *From the charge of particles.*

To what concentration the temperature decrease is proportional at a freezing of solutions?

a) **Molal concentration;*
b) *Molar fraction;*
c) *Mass fraction;*
d) *Molar concentration.*

How the freezing temperature of solution depends on its concentration?

a) **Decreases with growth of concentration;*
b) *Does not depend of;*
c) *Increases with growth of concentration.*

How the saturation pressure is changed at increase of concentration of solution?

a) **Decreases*
b) *Increases*
c) *Is not changed*

What law expresses dependence of saturation pressure on concentration of solution?

a) **Raoult law;*
b) *Henry law;*
c) *Vant-Hoff law;*
d) *Mendeleyev-Clapeyrons law.*

How the concentration in an equation of a Raoult law expresses?

a) **Molar fraction;*
b) *Molar concentration;*
c) *Mass fraction;*
d) *Molal concentration*

The aqueous solutions NaCl, $Al_2(SO_4)_3$, KI, urea and hexamethylenetetramine of identical molal concentration were prepared. What from the listed solutions crystallizes at lowest temperature?

a) **Solution of $Al_2(SO4)_3$*
b) *Solution of NaCl;*
c) *Solution of KI;*
d) *Solution of urea;*
e) *Solution of hexamethylenetetramine.*

How far the boiling point for 5 % solution of glucose will be increased?

a) **Tb=E*5*1000/95*Mb*$C_6H_{12}O_6$*
b) *Tb=E*5 %*
c) *Tb=I*E*5 %*
d) *Tb=I*5*1000/95*M*b $C_6H_{12}O_6$*
e) *Tb=I*E*5*1000/95*Mb*$C_6H_{12}O_6$*

How far the freezing temperature for 3 % solution of KJ will be decreased?

a) **T_f=ik*3*1000/97*M_bKJ*
b) *T_f=k*3%KJ*
c) *T_f=ik*3%KJ*
d) *T_f=k*3*1000/97*M_bKJ*

What is level of molarities Na_2SO_4 and $MgSO_4$ in isoosmotic solutions?

a) **For $MgSO_4$ it is higher;*
b) *For Na_2SO_4 it is higher;*
c) *They are identical.*

How the molecular concentration is determined by a cryoscopic method?

a) **M=K*a*1000/dTc*b*
b) *M=K*a*100 / (dTc-b)*
c) *M=dTc*a*1000/k*b*
d) *M=dTc*b*k/a*1000*

The increase of concentration of solution initiates:

a) **Increase of temperature of boiling and decrease of temperature of freezing;*

b) *Decrease of temperature of boiling and increase of temperature of freezing;*
c) *Increase of temperature of boiling and increase of temperature of freezing;*
d) *Decrease of both boiling and freezing temperatures.*

What equation is mathematical expression of a Raoult law?

a) *$N_2=(P_0-P)/P_0$*
b) *$P=(P_1-P)/N_2$*
c) *$N_2=P/(P_0+P)$*
d) *$N_2=(P+P)/P$*

How the isotonic coefficient of Vant-Hoff is determined?

a) *$i = 1+a\ (v-1)$*
b) *$i = (v-1) / (1+a)$*
c) *$i = (1-a) / (v+1)$*
d) *$i = (1+a) / (v-1)$*

What is a hypertonic solution?

a) *Solution having the greater osmotic pressure in comparison to the standard;*
b) *Solution having identical osmotic pressure in comparison to the standard.*
c) *Solution having smaller osmotic pressure in comparison to the standard.*

How to determine the osmotic pressure under the law of Vant-Hoff?

a) *$p=n/V*RT$*
b) *$p=nRT/V$*
c) *$p=V/n*RT$*
d) *$p=V*RT/n$*

On what equation the speed of diffusion through cell-like membranes isdetermined?

a) *$dm/dt =-PS\ (C_1-C_2)$*
b) *$dT =-PS\ (C_1-C_2)*dm$*
c) *dm/dt*
d) *$C_1/C_2 =-PS * (dM/dT)$*
e) *$PS =-dM/dT = (C_2-C_1)$*

How to detrmine the speed of diffusion on a Fick's law?

a) *$dm/dt =-DS*dC/dx$*
b) *$DS =-dm/dt*dC/dX$*
c) *$dC/dX =-DS*dm/dt$*
d) *$dX=dC/DS-dm/dt$*

What colligative property of solutions is determined by?

a) *By amount of particles of solute.*
b) *By the nature of solvent.*
c) *By the nature of solvent.*
d) *By amount of solvent.*

At manufacturing some liquid medicinal forms it is necessary to take into account the value of osmotic pressure. What from listed 0,1 M solutions: glucose, saccharose, $AlCl_3$, KNO_3, $CaCl_2$, has a greatest osmotic pressure?

a) *0,1 M solution of $AlCl_3$*
b) *0,1 M solution of $CaCl_2$*
c) *0,1 M solution of glucose*
d) *0,1 M solution of saccharose*
e) *0,1 M solution of KNO_3*

During an osmosis:

a) *Resolvents from solution with smaller concentration moves to solution with the greater concentration;*
b) *Resolvents in solutions moves simultaneous from one solution to another;*
c) *Resolvents in solutions with the greater intensity moves to solution with smaller concentration.*

Topic: Buffer solutions

What is buffer effect:

a) **solution resists the change of pH when acids or alkalis or water are added to solution*
b) *solution resists the change of pH when acids or alkalis are added to solution*
c) *solution resists the change of pH when water are added to solution*
d) *solution resists the change of pH when acids are added to solution*
e) *solution resists the change of pH when alkalis are added to solution*

What composition of buffer solutions are?

a) **mixture of either a weak acid and its conjugate base, or weak base and its conjugate acid*
b) *mixture of weak acid and its salt*
c) *mixture of weak base and its salt*
d) *mixture of two salts*
e) *mixture of two acids*

How do buffer solutions classify?

a) **Acid, base, salt buffers*
b) *Solid, liquid, gaseous buffers*
c) *Stable and non-stable buffers*
d) *Strong and weak buffers*
e) *Resistant and non-resistant*

Choose range of pH of acetate buffer:

a) **3,6 - 5,6*
b) *8,3 - 10,3*
c) *9,24 - 11,0*
d) *9,2 - 10,8*
e) *5,8 - 8,0*

Choose range of pH of ammonia buffer:

a) **8,3 - 10,3*
b) *3,6 - 5,6*
c) *9,24 - 11,0*
d) *9,2 - 10,8*
e) *5,8 - 8,0*

Choose range of pH of borate buffer:

a) **9,24 - 11,0*
b) *8,3 - 10,3*
c) *3,6 - 5,6*
d) *9,2 - 10,8*
e) *5,8 - 8,0*

Choose range of pH of carbonate buffer:

a) **9,2 - 10,8*
b) *8,3 - 10,3*
c) *9,24 - 11,0*
d) *3,6 - 5,6*
e) *5,8 - 8,0*

Choose range of pH of phosphate buffer:

a) **5,8 - 8,0*
b) *8,3 - 10,3*
c) *9,24 - 11,0*
d) *9,2 - 10,8*
e) *3,6 - 5,6*

Choose acid buffer:

a) **H_2CO_3/$NaHCO_3$*
b) *NH_4OH/NH_4Cl*
c) *NaH_2PO_4/ Na_2HPO_4*
d) *$Na_2B_4O_7$/NaOH*
e) *$N(CH_3)_2$/$[NH(CH_3)_2]Cl$*

Choose salt buffer:

a) **NaH_2PO_4/ Na_2HPO_4*
b) *H2 CO_3/$NaHCO_3$*
c) *NH_4OH/NH_4Cl*
d) *$Na_2B_4O_7$/NaOH*
e) *$N(CH_3)_2$/$[NH(CH_3)_2]Cl$*

Choose base buffer:

a) **NH_4OH/NH_4Cl*
b) *H_2CO_3/$NaHCO_3$*
c) *H_2SO_3/$NaHSO_3$*
d) *$Na_2B_4O_7$/NaOH*
e) *NaH_2PO_4/ Na_2HPO_4*

Choose mechanism of buffer effect of acetate buffer solution at presence of alkalis:

a) **$CH_3COOH + OH^- = CH_3COO^- + H_2O$*
b) *$CH_3COO^- + H^+ = CH_3COOH$*
c) *$CH_3COOH = CH_3COO^- + H^+$*
d) *$CH_3COO^- + H_2O = CH_3COOH + OH^-$*
e) *$CH_3COOH^{2+} + 2OH^- = CH_3COO^- + H_2O$*

Choose mechanism of buffer effect of acetate buffer solution at presence of acids:

a) **$CH_3COO^- + H^+ = CH_3COOH$*
b) *$CH_3COOH + H^+ = CH_3COOH_2^+$*
c) *$CH_3COOH = CH_3COO^- + H^+$*
d) *$CH_3COO^- + H_2O = CH_3COOH + OH^-$*
e) *$CH_3COOH^{2+} + 2OH^- = CH_3COO^- + H_2O$*

Choose mechanism of buffer effect of bicarbonate buffer solution at presence of alkalis:

a) **$H_2CO_3 + OH^- = HCO_3^- + H_2O$*
b) *$HCO_3^- + OH^- = CO_3^{2-} + H_2O$*
c) *$HCO^{3-} + H^+ = H_2CO_3$*
d) *$HCO_3^- + H_2O = H_2CO_3 + OH^-$*
e) *$CO_3^{2-} + H^+ = HCO_3^-$*

Choose mechanism of buffer effect of bicarbonate buffer solution at presence of acids:

a) *$HCO^{3-} + H^+ = H_2CO_3$
b) $CO_3^{2-} + H^+ = HCO^{3-}$
c) $HCO^{3-} + OH^- = CO_3^{2-} + H_2O$
d) $H_2CO_3 = HCO_3^- + H^+$
e) $HCO_3^- + H_2O = H_2CO_3 + OH^-$

Choose mechanism of buffer effect of ammonia buffer solution at presence of alkalis:
a) *$NH_4^+ + OH^- = NH_3 + H_2O$
b) $NH_4OH + H^+ = NH_4^+ + H_2O$
c) $NH_4OH = NH_4^+ + OH^-$
d) $NH_3 + H_2O = NH_4OH$
e) $NH_3 + H^+ = NH_4^+$

Choose mechanism of buffer effect of ammonia buffer solution at presence of acids:
a) *$NH_3 + H^+ = NH_4^+$
b) $NH_4^+ = NH_3 + H^+$
c) $NH_4OH = NH_4^+ + OH^-$
d) $NH_3 + H_2O = NH_4OH$
e) $NH_4^+ + OH^- = NH_3 + H_2O$

Choose mechanism of buffer effect of phosphate buffer solution at presence of alkalis:
a) *$H_2PO_4^- + OH^- = HPO_4^{2-} + H_2O$
b) $HPO_4^{2-} + OH^- = PO_4^{3-} + H_2O$
c) $H_2PO_4^- + H^+ = H_3PO_4$
d) $H_2PO_4^- = HPO_4^{2-} + H^+$
e) $H_3PO_4 + OH^- = H_2PO_4^- + H_2O$

Choose mechanism of buffer effect of phosphate buffer solution at presence of acids:
a) *$HPO_4^{2-} + H^+ = H_2PO_4^-$
b) $H_2PO_4^- + H^+ = H_3PO_4$
c) $PO_4^{3-} + H^+ = HPO_4^{2-}$
d) $HPO_4^{2-} + OH^- = PO_4^{3-} + H_2O$
e) $H_2PO_4^- + H_2O = H_3PO_4 + OH^-$

Choose formula of calculation of pH of buffer solutions:
a) *$pH = pKa + lg(Cb/Ca)$
b) $pH = 1/2\ pKa - 1/2\ lgCa$
c) $pH = 7 + 1/2\ pKa + 1/2\ lgCb$
d) $pH = -lg[H+]$
e) $pH = 14 - pOH$

What is buffering capacity?
a) *Number of moles of a strong monoprotonate base or acid required to be added to 1 l of buffer solution to rais its pH by 1
b) Number of moles of a strong monoprotonate base or acid required to be added to 1 l of buffer solution to rais its pH by 5
c) Number of moles of a strong monoprotonate base or acid required to be added to 1 kg of buffer solution to rais its pH by 1
d) Number of moles of a strong base or acid required to be added to 1 kg of buffer solution to rais its pH by 1
e) Number of moles of a strong biprotonate base or acid required to be added to 1 kg of buffer solution to rais its pH by 1

Choose buffer solution which presence in the human body:
a) *Bicarbonate
b) Acetate
c) Borate
d) Ammonia
e) Tartrate

Choose buffer solution which presence in the human body:
a) *Phosphate
b) Acetate
c) Borate
d) Ammonia
e) Tartrate

Choose buffer solution which presence in the human body:
a) *Protein
b) Acetate
c) Borate
d) Ammonia
e) Tartrate

Choose buffer solution which presence in the human body:
a) *Hemoglobin
b) Acetate
c) Borate
d) Ammonia
e) Tartrate

Choose buffer solution which presence in the human body:
a) *Oxyhemoglobin
b) Acetate
c) Borate
d) Ammonia
e) Tartrate

What normal range of pH of blood:
a) *7,36-7,42
b) less than 6,90
c) more than 7,80
d) ~7,0
e) 6,90-7,80

What normal ratio $[HCO_3^-]/[H_2CO_3]$ inplasma?

a) *20
b) 10
c) 3
d) 4
e) 15

What concentrations of HCO_3^- and H_2CO_3 in plasma?

a) *28 and 1,4mM
b) 15 and 1,6mM
c) 28 and 15 mM
d) 1,4 and 28 mM
e) 1,6 and 15 mM

What is alkali reserve?

a) *HCO_3^- - content in plasma
b) HPO_4^{2-} - content in plasma
c) CH_3COO^- - content in plasma
d) Pr^- - content in plasma
e) NH_3 - content in plasma

What place of biological importance of carbonate buffer?

a) *Extracellular fluids
b) Intracellular fluids
c) Neither extracellular nor intracellular
d) Intracellular and extracellular fluids
e) In erytrothytes

What normal ratio $[HPO_4^{2-}]/[H_2PO_4^-]$?

a) *4
b) 20
c) 15
d) 2
e) 10

Choose effect of hypoventilation:

a) *respiratory acidosis
b) respiratory alkalosis
c) metabolic acidosis
d) metabolic alkalosis
e) pH of blood not change

Choose effect of hyperventilation:

a) *respiratory alkalosis
b) respiratory acidosis
c) metabolic alkalosis
d) pH of blood not change
e) metabolic acidosis

How organism usually compensate acidosis or alkalosis?

a) *Pulmonary elimination of CO_2 or urinary elimination of HCO_3^-
b) Urinary elimination of CO_2
c) Pulmonary elimination of O_2
d) Pulmonary elimination of HCO_3^-
e) Urinary elimination of proteins

Topic: Electrochemistry

Please indicate, how the equivalent admittance of weak electrolyte is changed at given temperature with dissolution:

a) **Fast grows and reaches a maxima;*
b) *Slowly grows, and then drops;*
c) *Slowly increases;*
d) *Is not changed;*
e) *Decreases;*

What electrode is used most frequently as indicator at titrating the basis:

a) **Glass*
b) *Chlorine-argentine*
c) *Calomel*
d) *Quinhydrone*
e) *Standard hydrogenous*

On what from the following formulas it is possible to calculate ionic strength of electrolyte?

a) **0,5 c^2z^2*
b) *0,5 cz^2*
c) *0,5cz*
d) *0,5 az^2*
e) *0,5cz^2*

For what galvanic cell value of electromotive force does not depend from Ai:

a) **Ag/$AgNO_3$/$AgNO_3$/Ag*
b) *Pt/H_2/HCl/AgCl/Ag*
c) *Ag/AgCl/KNO_3/K*
d) *Pt/Fe^{2+} Fe^{3+} // Sn^{2+} Sn^{4+}/Pt*
e) *Pt/H_2/C_6H_5OH // CH_3COOH/H_2/Pt*

The glass electrode is widely applied to measuring ?I in biological environments, in the liquid medicinal forms etc. Please indicate, to what type of electrodes the glass electrode belongs?

a) **Ion-selective*
b) *Electrode of II kind*
c) *Electrode of I kind*
d) *Redox electrode*
e) *Gaseous electrode*

One of yardsticks of an estimation of quality of some medicinal preparations is the pH value. Please indicate, what galvanic cell is suitable for determination of pH:

a) **Ag,AgCl|HCl|glass. membrane|H+||KCl|AgCl,Ag*
b) *Cd, Hg|$CdSO_4$ || $HgSO_4$, Hg*
c) *Zn|$ZnSO_4$ || $CuSO_4$|Cu*
d) *Pb|$PbSO_4$ || PbI_2|Pb*
e) *Ag|$AgNO_3$|NH_4NO_3|$AgNO_3$|Ag*

For quantitative determination of potassium hydroxide the method of potentiometric titrating is selected. A point of equivalence in this method is determined on leap of:

a) **Electromotive force;*
b) *Diffuse current;*
c) *Voltage;*
d) *Current intensity;*
e) *Intensity of a fluorescence*

Concentration of sodium of bromide has been determined by a method of potentiometric titrating. Titrant - standard solution of silver nitrate. Please select an indicator electrode:

a) **Argentine*
b) *Hydrogenous*
c) *Platinum*
d) *Chlorine-argentine*
e) *Antimony*

The diffusion potential arises on border between:

a) **Two solutions;*
b) *Two metals;*
c) *Metal and solution*

What from the following circuits is more preferential to use for determination of concentration of medicinal matter having acid-base properties:

a) **Ag/AgCl/HCl/glass membrane / explor. sol./KCl/AgCl/Ag*
b) *Pt/H_2/explor. sol./KCl/AgCl/Ag*
c) *Pt/H_2/explor. sol./KCl/Hg_2Cl_2/Hg*
d) *Pt/$C_6H_4(OH)_2$, $C_6H_4O_2$/explor. sol./KCl/AgCl/Ag*
e) *Ag/AgCl/KCl/explor. sol./KCl/AgCl/Ag*

What is the nature of a biopotential?

a) **It is a membrane potential;*
b) *It is a electrode potential;*
c) *It is an contact potential*

What potential from the listed electrodes does not depend from pH?

a) **Calomel*
b) *Hydrogenous*
c) *Glass*
d) *Quinhydrone*

What from the following electrodes most frequently uses for determination of pH?

a) **Glass*
b) *Quinhydrone*
c) *Zinc*
d) *Chlorine-argentine*

The degree of dissociation using conductometric method is determined: (degree of dissociation of solutions - a; electrical conductivity L):

a) *a =- L (v) / L(max)
b) a = - L(max) / L (v)
c) a=x/c* L(max)

The greatest significance of equivalent conductivity has the electrolyte solution, if:

a) *An indefinitely weak solution;
b) If the concentration of solution is max;
c) Speeds of cation and anion are equal

What pH in a point of equivalence in a method of potentiometric titrating, i.a. when all acid has been titrated by alkali at pH will be equal to:

a) *pH = 7
b) pH< 7
c) pH> 7

Equation of Nernst for a galvanic cell of Daniel-Jacobi:

a) *E=E0 - RT/nF ln a Zn^{2+}/a Cu^{2+}
b) E=E0 - RT/nFlg a Zn^{2+}/a Cu^{2+}
c) E=E0 - RT/nF ln [a Zn^{2+} - a Cu^{2+}]

The magnitude of a potential of an electrode of a II kind is described by an equation:

a) *E=E0 - RT/nF ln a C^{l-}
b) E=E0 - RT/2F lg C Cl^-
c) E=E0+0.059 lg C Ag Cl/C KCl

Nernst Equation for determination or indicator electrodes:

a) *E=E0+0.059 lg a H^+
b) E=E0+0.059 ln pH
c) E=E0 - RT/nF ln C H+/pH

Please record an equation of Nernst for a membrane glass electrode in an alcaline environment:

a) *E=E0 + RT/nF ln a Na^+
b) E=E0 - RT/nFlg [OH^-]
c) E=E0 - 0.059 lg C of a glass / C solut.

To what type of electrodes a chlorine-argentine electrode belongs:

a) *II kind;
b) I kind;
c) Ion – selective;
d) Gaseous

Whether the membrane glass electrode in acidic environment will work as a hydrogenous electrode?

a) *Yes
b) No

The diffusion potential arises on border:

a) *Of two solutions;
b) Of metal and membrane of a cell

The verbiage of a Kohlrausch law:

a) *At infinite dissolution the electrical conductivity is equal to the sum of movabilities of cations and anions;
b) At infinite cultivation the electrical conductivity depends on an ion concentration of electrolyte;
c) Electrical conductivity does not depend on absolute speeds of cation and anion

Between specific and equivalent conductivity (L) there is a relation:

a) *L(v) =x v
b) L (v) =1/x*10
c) L (v) =L (max) c

Physical sense of equivalent conductivity:

a) *It is conductivity of a strata of electrolyte by thickness 1m, placed between electrodes of such thickness, that volume of solution between them conta
b) It is value, reciprocal to electrical conductivity referred to 1 kmole/m^3;
c) It is conductivity of electrolyte solution equivalent to conductivity of standard electrolyte

What is specific conductivity?

a) *It's a value, reciprocal to resistance of one cubic meter of solution with an rib of length of 1 m;
b) It is value, equivalent to resistance of one cubic meter of solution with an rib of length of 1 m;
c) It is a electrical conductivity of electrolyte solution at a unit surface charge

To what the ionic strength of solution is equal?

a) *To half-sum of products of molarity of each ion on quadrate of its charge;
b) To a half-sum of products of concentration of each ion on magnitude of activity ratio;
c) To quadrate of a charge on a half-sum of activities of all ions.

Measure of active acidity of environment - pH it is:

a) *A negative decimal logarithm of an ion concentration of hydrogen;

b) *Total acidity of solution;*
c) *Hydrogen ion exponent of amphoteric electrolyte.*

The ionization constant of weak electrolyte expressed by: (degree of dissociation of solutions - a)

a) **Cd=ca^2/1-a;*
b) *Cd=ca/1-a;*
c) *Cd=a(1-c)/c(1-a).*

How it is possible to calculate activity ratio?

a) **On an equation of Debye-Hukkel;*
b) *On an equation of Ostwald;*
c) *On an equation of ionic strength of solution.*

How the concentration magnitude of a degree of dissociation influences?

a) **The degree of dissociation is moderated a degree of dissociation grows;*
b) *Remains to a constant.*

To what degree of dissociation of solutions (a) of weak electrolytes is equal?

a) **0 < and < 1*
b) *a=1*
c) *a=0*

What is a degree of dissociation?

a) **This is a relation of dissociated molecules to a total number of particles of electrolyte in solution;*
b) *This is a relation of source molecules of electrolyte solution to an amount of dissociated molecules*
c) *This is a relation of dissociated molecules to number of non-dissociated molecules of solution.*

To what degree of dissociation of solutions (a) of non-electrolytes is equal?

a) **a=0*
b) *a=1*
c) *0 < a < 1*

Topic: Biogenic s-, p-, d-block elements

Choose macroelements:
- *a) Co*
- *b) Zn*
- *c) *P*
- *d) *I*
- *e) Fe*

Choose macroelements:
- *a) Cu*
- *b) *C*
- *c) Mn*
- *d) Mo*
- *e) *S*

Choose macroelements:
- *a) *Na*
- *b) Bi*
- *c) Te*
- *d) Cs*
- *e) *H*

Choose macroelements:
- *a) Hg*
- *b) Mo*
- *c) Sb*
- *d) *O*
- *e) Au*

Point range of content of macroelements:
- *a) 10 -3 – 10 -12%*
- *b) *> 10 -2%*
- *c) <10 -12<./sup>%*

Point range of content of microelements:
- *a) < 10-12<./sup>%*
- *b) *10 -3 – 10 -12%*
- *c) 10-2%*

Point range of content of ultramicroelements:
- *a) 10-2%*
- *b) *< 10-12<./sup>%*
- *c) 10 -3 – 10 -12%*

Choose factors influenced to content in human organism:
- *a) *Deseases*
- *b) *Sex*
- *c) *Age*
- *d) *Conditions of labour*
- *e) *Season of the year*

Point content of Li in the human body:
- *a) *10-4 %*
- *b) 10-5 -10-6 %*
- *c) 0,1%*
- *d) 10%*
- *e) 1%*

What do you know about biological function of Li?
- *a) Have an influence upon the transport of Fe-ions in nervous and muscle cells*
- *b) Have an influence upon the transport of Cl-ions in nervous and muscle cells*
- *c) *Have an influence upon the transport of Na-ions in nervous and muscle cells*
- *d) Have an influence upon the transport of Ca-ions in nervous and muscle cells*
- *e) Have an influence upon the transport of Mg-ions in nervous and muscle cells*

Choose application in medicine of Li-salts:
- *a) Antiallergic*
- *b) Anticonvulsant*
- *c) Antiacidic*
- *d) Effective laxative*
- *e) *Suspension of pathological emotional lability and exitation*

How many percent of Na content in human body?
- *a) *0,25%*
- *b) 10-4%*
- *c) 10-5-10-6%*
- *d) 0,1%*
- *e) 5%*

Choose primary location of Na in human body:
- *a) Intracellular*
- *b) *Extracellular*

How many gram of Na for 24 hours necessary for human life ?
- *a) 1 g*
- *b) 100 g*
- *c) *4-7 g*
- *d) 20 g*

Point biological importance of salts of Na:
- *a) *Takes part in a regulation of water exchange*
- *b) React with SH-groups of albumins*
- *c) Depress the center of breathing*
- *d) *Maintains an acid-base equilibrium (pH) in an organism*
- *e) *Ensure of an osmotic pressure of blood*

Choose application in the medicine of 0,9% solution of NaCl:
- *a) *At Vomiting*
- *b) *At Shock*
- *c) *At Bleeding*

d) *At Choler
e) *At Poisoning

Choose application in the medicine of Na_2SO_4:
a) Anticeptic
b) Antiarhythmic
c) Anticonvulsant
d) Antiallergic
e) *Purgative

Choose application in the medicine of $NaHCO_3$:
a) Antiarhythmic
b) Anticeptic
c) Anticonvulsant
d) *Antiacidic
e) Purgative

What total mass part of K in the organism?
a) 10-2%
b) 5%
c) 10%
d) 0,1%
e) *0,22 %

Choose primary location of K in human body:
a) *Intracellular
b) Extracellular

What biological importance of K in human organism?
a) React with SH-groups of albumins
b) Depress the center of breathing
c) *Influence to activity of enzymes
d) *Take part in albumen synthesis
e) *Influence to membrane potential of cell

Application in the medicine of KCl:
a) Cure diseases of thyroid gland
b) Cure stomach ulcer
c) Cure hyperacidic gastritis
d) *Cure disturbance of heart rhythm
e) *Cure muscle dystrophy

Where primary situated Mg in human organism?
a) Extracellular
b) *Intracellular

Choose total mass part of Mg in human organism:
a) 0,1%
b) 10-4%
c) 10%
d) 1%
e) *0,04%

Choose types of existing of different elements in human organism:
a) Combines with fats
b) Simple substances
c) *Combines with nucleic acids
d) *Combines with proteins
e) *Free station of ions

Choose functions of Mg in human organism:
a) Takes part in a regulation of water exchange
b) Can react with SH-groups of albumins
c) *Can depress a vasmoving center
d) *Can depress the center of breathing
e) *Can blockade and can ensure a nerve-muscle transmission

Choose functions of Mg in human organism:
a) Mg-ions are the antagonists of Fe-ions
b) Mg-ions are the antagonists of Na-ions
c) Mg-ions are the antagonists of K-ions
d) *Mg-ions are the antagonists of Ca-ions
e) *Stimulate the cholesterol secrete out of the organism

Choose application in the medicine of $MgSO_4$:
a) Cure stomach ulcer
b) Cure hyperacidic gastritis
c) *Has purgative effect
d) *Cure hypertensive diseases
e) *Cure convulsions

Choose application in the medicine of MgS_2O_3:
a) Cure disturbance of heart rhythm
b) Cure muscle dystrophy
c) Has purgative effect
d) *Cure atherosclerosis
e) *Cure hypertensive diseases

How to use magnesium hydroxide?
a) *Cure hyperacidic gastritis
b) *Has slight purgative effect
c) Cure hypertensive diseases
d) Cure convulsions
e) *Cure the stomach ulcer

How to use magnesium carbonate basic?
a) *Cure hyperacidic gastritis
b) *Has slight purgative effect
c) Cure hypertensive diseases
d) Cure convulsions
e) *Cure the stomach ulcer

What total mass percentage of Ca in human body?
a) 0.1%
b) 10-4%
c) 20%
d) 10%

e) *1.4%

What needing for human organism of Ca for 24 hours?
a) 50 g
b) 0,1 g
c) 10 g
d) 5 g
e) *0,8-0,9 g

Where primary situated Ca in human organism?
a) Pancreatic gland
b) Kidneys
c) Lungs
d) Liver
e) *Osseous tissues and teeth

Choose biological importance of Ca:
a) Can depress a vasomoving center
b) Can depress the center of breathing
c) *Coagulation of blood
d) *Regulation of the work of heart
e) *Take part in the transmission of nervous impulse

Choose application in medicine of $CaCl_2$:
a) Antihyperthensive
b) Antiacidic
c) *Antiinflamatory
d) Anticonvulsant
e) *Antiallergic

What total mass percentage ofSr in human body?
a) 0,1%
b) 10-4%
c) *10-3%
d) 1,4%
e) 10%

Choose biological impotanceof Sr:
a) Regulation of the work of heart
b) Coagulation of blood
c) Take part in the transmission of nervous impulse
d) *Bones formation
e) *Teeth enamel formation

Where is Ba concentrated in human body?
a) In stomach juice
b) In heart
c) In bones
d) In liver
e) *In eyes

How to use $BaSO_4$?
a) Cure stomach ulcer
b) Cure hyperacidic gastritis
c) Cure disturbance of heart rhythm
d) Cure muscle dystrophy
e) *For X-ray photography

How many percent content of Boron in the human body?
a) 0,1%
b) 10-3%
c) 10%
d) *10-5%
e) 1%

Choose primary location of boron in the human organism:
a) Osseous tissues and teeth
b) *Spleen, brain
c) Kidneys, pancreatic gland
d) Muscles, liver
e) *Lungs, thyroid gland

Choose application in the medicineof boric acid:
a) Antihyperthensive
b) Antiacidic
c) Antiallergic
d) Anticonvulsant
e) *Anticeptic

Choose application in the medicine of sodium tetraborate:
a) Antihyperthensive
b) Antiacidic
c) Antiallergic
d) Anticonvulsant
e) *Anticeptic

What mass part of Al is in human body?
a) 10-3%
b) 10%
c) 1%
d) *10-5%
e) 0,1%

Choose application in the medcine of "Almagel":
a) Antihyperthensive
b) Antiallergic
c) Anticonvulsant
d) *Protective of stomach
e) *Antiacidic

Choose application in the medicine of potassium-aluminum sulfate $KAl(SO_4)_2*12H_2O$:
a) Antihyperthensive
b) Anticonvulsant
c) *Anticeptic

d) *Anti-inflammatory
e) *Astringent

What mass part of C in human body?
a) 10-3%
b) *21,15%
c) 1%
d) 10-5%
e) 0,1%

Point biological importance of carbon:
a) Constituent of some cells
b) Constituent of some tissues
c) *Constituent of all the tissues and cells

Choose medical application of sodium hydrocarbonate:
a) *Antiacidic
b) Anticonvulsant
c) Anticeptic
d) Antiinflammatory
e) Astringent

How many percent content of silicon in human body?
a) *10-3%
b) 21,15%
c) 1%
d) 10-5%
e) 0,1%

Choose biological importance of the Si:
a) Influence the formation and functioning of the lymph
b) Influence the formation and functioning of the osseous tissues
c) Influence the formation and functioning of the nervous tissues
d) Influence the formation and functioning of the blood
e) *Influence the formation and functioning of the epithelial and connecting tissues

What diagnostic test use at infection hepatitis?
a) Determination of Ca
b) Determination of Mo
c) Determination of B
d) *Determination of Si
e) Determination of Fe

Choose nitrogen content in human body:
a) 10-5%
b) 10-3%
c) 1%
d) 10%
e) *3,1%

Point biological importance of nitrogen:
a) Constituent of some cells
b) Constituent of some tissues
c) *Constituent of all the tissues and cells

What natural compounds content Nitrogen?
a) *Alkaloids
b) *Nucleic acids
c) Carbohydrates
d) Fats
e) *Proteins

How to use nitrogen oxide?
a) Antiacidic
b) Antiinflammatory
c) Anticonvulsant
d) *For inhalation narcosis
e) Diuretic

How to use ammonia chloride?
a) Antihypertensive
b) Anticeptic
c) Hepatoprotector
d) Spasmolytic
e) *Diuretic

Choose percentage of phosphorus in human organism:
a) 5%
b) 10-3%
c) 1%
d) *0,25%
e) 10%

Choose daily need of phosphorus:
a) 0,01 g
b) 0,1 g
c) 50 g
d) 10 g
e) *1,3 g

Point biological importance of Phosphorus compounds:
a) Can depress the center of breathing
b) Takes part in a regulation of water exchange
c) Coagulation of blood
d) *Part of cellular membranes
e) *Energetic exchange and deposition of energy

How to use in medicine phosphororganic compounds?
a) Purgative
b) Diuretic
c) Anticonvulsant

d) *Antacidic*
e) **Antitumor*

Choose biological role of As:

a) *Coagulation of blood*
b) *Takes part in a regulation of water exchange*
c) *Energetic exchange and deposition of energy*
d) **In large amounts strong poison*
e) **It takes part in processes of blood forming*

Choose percentage of As in the human organism:

a) *10-5%*
b) *0,1%*
c) *10%*
d) *1%*
e) **10-3%*

Topic: Coordination compounds

Molar conductivity of solution of compound is 0. Choose it compound from list:

a) *[Pt(NH$_3$)6] Cl$_4$*
b) *[Pt(NH$_3$)$_4$Cl$_2$] Cl$_2$*
c) **[Pt(NH$_3$)$_2$Cl$_4$]*
d) *PtCl$_4$*2KCl*
e) *[Pt(NH$_3$)$_5$Cl]Cl$_3$*

Molar conductivity of solution of compound is 0. Choose it compound from list:

a) *[Co(NH$_3$)$_6$]Cl$_3$*
b) **[Co(NH$_3$)$_3$Cl$_3$]*
c) *CoCl$_3$*KCl*
d) *[Co(NH$_3$)$_4$Cl$_2$]Cl*
e) *[Co(NH$_3$)$_5$Cl]Cl$_2$*

Molar conductivity of solution of compound is 0. Choose it compound from list:

a) **[Co(NH$_3$)$_4$Cl$_2$]*
b) *CoCl$_2$*KCl*
c) *[Co(NH$_3$)$_5$Cl]Cl*
d) *[Co(NH$_3$)$_6$]Cl$_2$*
e) *CoCl$_2$*NaCl*

Molar conductivity of solution of compound is 0. Choose it compound from list:

a) *[Co(NH$_3$)$_6$]Cl $_3$*
b) **[Ni(CO)$_4$]*
c) *[Zn(NH$_3$)$_4$]Cl$_2$*
d) *[Cu(NH$_3$)$_4$]Cl$_2$*
e) *K$_3$[Fe(CN)$_6$]*

What compound has highest molar conductivity?

a) *[Pt(NH$_3$)$_5$Cl]Cl$_3$*
b) *[Pt(NH$_3$)$_6$] Cl$_4$*
c) *[Pt(NH$_3$)$_4$Cl$_2$] Cl$_2$*
d) *[Pt(NH$_3$)$_2$Cl$_4$]*
e) **PtCl$_4$*2KCl*

Choose complex biochemical active compound.

a) *Ribose*
b) *Ascorbic acid*
c) *Glucose*
d) *Vitamin B$_1$*
e) **Vitamin B$_{12}$*

Choose complex biochemical active compound.

a) *Desoxyribose*
b) *Fructose*
c) *Ascorbic acid*
d) **Hem*
e) *Vitamin B$_2$*

Choose complex biochemical active compound.

a) *Nicotinic acid*
b) *Ascorbic acid*
c) *Vitamin B$_6$*
d) *Lactose*
e) **Chlorophyll*

Choose formula of complex compound:

a) *(CuOH)$_2$CO$_3$*
b) *CaClOCl*
c) *KAl(SO$_4$)$_2$*
d) *PtCl$_4$*2KCl*
e) **K$_4$[Fe(CN)$_6$]*

Choose formula of complex compound:

a) *K$_2$Cr$_2$O$_7$*
b) *Sr(HS)Cl*
c) *NaTl(NO$_3$)$_2$*
d) **[Cu(NH$_3$)$_4$]Cl$_2$*

How many chloride-ions in [Pt(NH$_3$)$_2$Cl$_4$] can react with AgNO$_3$:

a) *4*
b) *3*
c) *2*
d) **0*

How many chloride-ions in [Pt(NH$_3$)$_4$Cl$_2$] Cl$_2$ can react with AgNO$_3$:

a) *3*
b) *4*
c) *0*
d) *1*
e) **2*

How many chloride-ions in [Pt(NH$_3$)$_3$Cl$_3$] Cl can react with AgNO$_3$:

a) *4*
b) *3*
c) *0*
d) *2*
e) **1*

How many chloride-ions in [Pt(NH$_3$)$_4$Cl] Cl$_3$ can react with AgNO$_3$:

a) *1*
b) *2*
c) *4*
d) *0*
e) **3*

How many chloride-ions in [Pt(NH~~3~~)$_6$] Cl$_4$ can react with AgNO$_3$:

a) *3*
b) *1*
c) *0*
d) **4*
e) *2*

How many chloride-ions in $[Cr(H_2O)_6]Cl_3$ can react with $AgNO_3$:

a) 1
b) 2
c) 4
*d) *3*
e) 0

How many chloride-ions in $[Cr(H_2O)_5Cl]Cl_2*H_2O$ can react with $AgNO_3$:

a) 1
b) 4
c) 3
d) 0
*e) *2*

How many chloride-ions in $[Cr(H_2O)_4\ Cl_2]\ Cl* 2H_2O$ can react with $AgNO_3$:

a) 4
b) 0
c) 3
d) 2
*e) *1*

How many molecules of water easy to evaporate from compound:
$[Cr(H_2O)_6]Cl_3$

a) 4
b) 6
c) 1
*d) *0*
e) 2

How many molecules of water easy to evaporate from compound:
$[Cr(H_2O)_5Cl]Cl_2*H_2O$

*a) *1*
b) 4
c) 2
d) 0
e) 6

How many molecules of water easy to evaporate from compound:
$[Cr(H_2O)_4\ Cl_2]\ Cl* 2H_2O$

a) 4
b) 5
c) 6
d) 1
*e) *2*

Choose complexing agent of compound:
$K[Pt(NH_3)_2Cl_4]$:

a) K^+
b) NH_3
c) Cl^-
*d) *Pt^{4+}*
e) Pt^{2+}

Choose complexing agent of compound:

a) $[Cu(NH_3)_4]SO_4$
b) NH_3
c) $SO4^{2-}$
d) Cu^+
e) $[Cu(NH_3)_4]^{2+}$
*f) *Cu^{2+}*

Choose complexing agent of compound:

a) $[Co(NH_3)_5Cl]NO_3$
b) $[Co(NH_3)^{2+}$
c) Cl^-
d) Co^{3+}
e) NH_3
*f) *Co^{2+}*

Choose complexing agent of compound:

a) $[Ni(NH_3)_6]SO_4$
b) $[Ni(NH_3)6]^{2+}$
c) SO_4^{2+}
d) H
e) NH_3
*f) *Ni^{2+}*

Choose complexing agent of compound:

a) $K_2[Co(NH_3)(NO_2)_5]$
b) $[Co(NH_3)(NO_2)_5]^{2-}$
c) NO^{2-}
*d) *Co^{2+}*
e) K^+
f) NH_3

Formula of compound is $[Ag(NH_3)_2]NO_3$
Choose formula of ligand:

a) NO^{3-}
b) $[Ag(NH_3)_2]^+$
*c) *NH_3*
d) Ag^+

Formula of compound is $[Cu(H_2O)_4]SO_4$.
Choose formula of ligand:

a) Cu^+
b) Cu^{2+}
c) SO_4^{2-}
d) $[Cu(H_2O)_4]^{2+}$
*e) *H_2O*

Formula of compound is $K_4[Fe(CN)_5Cl]$. Choose ions of outer coordination sphere.

a) $[Fe(CN)_5Cl]^{4+}$
b) Cl-
*c) *K^+*
d) Absent
e) CN^-

Formula of compound is $[Co(NH_3)_5(NO_2)]Cl_2$
Choose ions of outer coordination sphere.

a) $[Co(NH_3)_5]^{3+}$
b) $*Cl^-$
c) *Absent*
d) Co^{3+}
e) $[Co(NH_3)_5(NO_2)]^{2+}$

Formula of compound is $K_3[Co(NO_2)_5Cl]$ Choose ions of outer coordination sphere:

a) $[Co(NO_2)_5Cl]^{3-}$
b) $*K^+$
c) Co^{3+}
d) *Absent*
e) Cl^-

Formula of compound is $(NH_4)_2[Pt(OH)_2Cl_4]$
Choose ions of outer coordination sphere:

a) $[Pt(OH)_2Cl_4]^{2+}$
b) Pt^{4+}
c) OH^-
d) *Absent*
e) $*NH_4^+$

Formula of compound is $[Co(NO_2)Cl(NH_3)_3]$ Choose ions of outer coordination sphere:

a) NH_3
b) Cl^-
c) Co^{3+}
d) *Absent*
e) NO^{2-}

Formula of compound is $[Co(NH_3)_5(NO_2)]Cl_2$.
Choose inner coordination sphere:

a) NO_2
b) Cl^-
c) Co^{3+}
d) NH_3
e) $*[Co(NH_3)_5(NO_2)]^{2+}$

Formula of compound is $K_3[Co(NO_2)_5Cl]$
Choose inner coordination sphere:

a) Cl^-
b) K^+
c) Co^{3+}
d) NO^{2-}
e) $*[Co(NO_2)_5Cl]^{3-}$

Formula of compound is $K_4[Fe(CN)_5Cl]$. Choose inner coordination sphere:

a) Cl^-
b) Fe^{2+}
c) K^+
d) $*[Fe(CN)_5Cl]^{4-}$
e) CN^-

Formula of compound is $(NH_4)_2[Pt(OH)_2Cl_4]$.
Choose inner coordination sphere:

a) Cl^-
b) NH^{4+}
c) Pt^{4+}
d) OH^-
e) $*[Pt(OH)_2Cl_4]^{2-}$

Formula of compound is $[Co(NO_2)_2Cl(NH_3)_3]$.
Choose inner coordination sphere:

a) Co^{3+}
b) Cl^-
c) NH_3
d) NO^{2-}
e) $*[Co(NO_2)_2Cl(NH_3)_3]$

What ligand is monodentate?

a) $C_2O_4^{2-}$
b) SO_3^{2-}
c) SO_4^{2-}
d) $H_2N\text{-}CH_2\text{-}CH_2\text{-}NH_2$
e) $*Cl^-$

What ligand is monodentate?

a) $B_4O_7^{2-}$
b) SO_4^{2-}
c) $H_2N\text{-}CH_2\text{-}CH_2\text{-}NH_2$
d) PO_4^{3-}
e) $*NH_3$

What ligand is bidentate?

a) CN^-
b) NO^{2-}
c) NH_3
d) H_2O
e) $*C_2O_4^{2-}$

What ligand is bidentate?

a) Br^-
b) Cl^-
c) F^-
d) CN^-
e) $*H_2N\text{-}CH_2\text{-}CH_2\text{-}NH_2$

Choose formula of aquacomplex:

a) $MgSO_4 * H_2O$
b) $KCl*MgCl_2*6H_2O$
c) $NaCl*2H_2O$
d) $*[Co(H_2O)_6]Cl_2$
e) $Na_2SO_4*10H_2O$

What size of most stable cycles of chelates?

a) *3 and 4*
b) *4 and 5*

c) *3 and 7*
d) **5 and 6*
e) *7 and 8*

What central ion in molecule of hem?
a) Fe^{3+}
b) Cu^{2+}
c) Cr^{3+}
d) Co^{2+}
e) **Fe^{2+}*

What central ion in molecule of vitamin B_{12}?
a) Cr^{3+}
b) Cu^{2+}
c) **Co^{2+}*
d) Fe^{2+}
e) Fe^{3+}

What central ion in molecule of chlorophyll?
a) Co^{2+}
b) Fe^{3+}
c) Fe^{2+}
d) Cr^{3+}
e) **Mg^{2+}*

Choose chelate molecules:
a) *Ribose, desoxyribose*
b) *Maltose, sucrose*
c) **Chlorophyll, vitamin B_{12}, hem*
d) *Glucose, fructose, lactose*
e) *DNA, RNA*

Choose formula of potassium pentacyanoammineferrate (III):
a) $K[Fe(CN)_3(NH_3)_3]$
b) $K_2[Fe(CN)_4(NH_3)_2]$
c) $K_4[Fe(CN)_6]$
d) $K_3[Fe(CN)_6]$
e) **$K_3[Fe(CN)_5NH_3]$*

Choose formula of ammonium dihydroxotetrachloroplatinate (IV):
a) $(NH_4)_2[Pt(OH)_5Cl]$
b) $(NH_4)_2[Pt(OH)_4Cl_2]$
c) $(NH_4)_2[Pt(OH)Cl_5]$
d) $(NH_4)_2[Pt(OH)_3Cl_3]$
e) **$(NH_4)_2[Pt(OH)_2Cl_4]$*

Choose name of the compound $[Cr(H_2O)_3F_3]$
a) *potassiumdiaquatetrafluorochromate (III)*
b) *monochlorotetraquachromium*
c) *monofluorotetraquachromium*
d) *tetrafluorodiaquachromium*
e) **trifluotriaquachromium (III)*

Choose name of the compound $[Pt(NH_3)_4Cl_2](NO_3)_2$:
a) *dinitrotetrammineplatinum (IV) chloride*
b) *potassiumpentachloroammineplatinate (IV)*
c) *tetrachlorodiammineplatinum(IV)*
d) *monochloropentammineplatinum(IV) nitrate*
e) **dichlorotetraammineplatinum(IV) nitrate*

Choose more stable comlex compound:
a) $[Cu(CN)_2]^-$ *Kinst=* $1*10^{-16}$
b) $[Ag(NO_2)_2]^-$ *Kinst=* $1,3*10^{-3}$
c) $[Ag(NH_3)_2]^+$ *Kinst=* $6,8*10^{-8}$
d) $[Ag(S_2O_3)]^{3-}$ *Kinst=* $1*10^{-13}$
e) *** $[Ag(CN)_2]^-$ *Kinst=* $1*10^{-21}$

Choose less stable comlex compound:
a) $[HgCl_4]^{2-}$ *Kinst=* $6*10^{-17}$
b) $[Ni(NH_3)_4]^{2+}$ *Kinst=* $4,8*10^{-8}$
c) $[Cd(CN)_4]^{2-}$ *Kinst=* $1,4*10^{-17}$
d) $[Cu(NH_3)_4]^{2+}$ *Kinst=* $4,56*10^{-14}$
e) *** $[Cd(NH_3)_4]^{2+}$ *Kinst=* $2,5*10^{-7}$

Topic: Chemical Thermodynamics

The influence of temperature on an equilibrium constant expresed by an equation of the reaction isobar: d ln K/dT = dH/RT*RT. To what side the equal balance will be shifted, if dH is negative?

a) *To the side of source substances;
b) To the side of products;
c) The equal balance will not be shifted.

Select an exact record of an equation of an isotherm of chemical reaction:

a) *dG =-RT lnKp;
b) dG =RT lnKp;
c) dF=RT ln P;
d) dS=K ln W.

What equation it is possible to evaluate temperature effect on an equilibrium constant by?

a) *By an equation of the reaction isobar;
b) By an equation of Vant-Hoff;
c) By an equation of the reaction isotherm;
d) By an equation of Bolzman.

Select valid conditions dislodging equal balances of reacting $3H_2+N_2=2NH_3$-dH to the side of formation of a product:

a) *Decrease of temperature and increase of pressure;
b) Increase of temperature and increase of pressure;
c) Increase of temperature and decrease of pressure;
d) Decrease of temperature and decrease of pressure.

Enthalpy factor has the sign "-", and entropy has sign "+". What are direction and condition of process?

a) *The reaction goes at any temperature;
b) The reaction can go only at a heat;
c) The reaction does not go in general;
d) The reaction goes at low temperature.

Enthalpy factor is positive, and entropy is negative. What are direction and conditions of process?

a) *The reaction does not go in general;
b) The reacting can go only at a heat;
c) The reaction goes at any temperature;
d) The reacting goes at low temperature.

Enthalpy and the entropy factors have the sign "-". What are direction and conditions of process?

a) *The reaction goes at low temperature;
b) The reaction can go only at a heat;
c) The reaction does not go in general;
d) The reaction goes at any temperature.

The system is in equal balance. Thus:

a) *dG=0;
b) dG> 0;
c) dG< 0.

For chemical reaction, that is spontaneously flowing in a forward direction is characteristic:

a) *dG< 0;
b) dG> 0;
c) dG=0.

Whether the statement, that the energy of the Gibbs is equal to the algebraic sum of entropy and enthalpy factors is correct?

a) *Yes;
b) No.

Enthalpy and the entropy factors have the sign "+". What are direction and conditions of process?

a) *The reaction can go only at heats;
b) The reaction does not go in general;
c) The reaction goes at any temperature;
d) The reaction goes at low temperatures.

For spontaneously flowing processes entropy is:

a) *More than zero point;
b) Equal to zero point;
c) Less than zero point;
d) Is a constant.

For the insulated system at a reversible process dS:

a) *Is equal to zero point;
b) Is greater than zero point;
c) It is less than zero point.

Does the statement that the second law of thermodynamics on the basis of variation of entropy enables to judge probability of weep of process is correct?

a) *Yes;
b) No.

The system is in isochoric-isothermal conditions. What state function we must use for its description?

a) *Energy of the Helmholtz;
b) Energy of the Gibbs;
c) Bound energy;
d) Enthalpy;
e) Entropy.

The system is in isobaric-isothermal balance. What function we must select for the description of process?

a) *Energy of the Gibbs;
b) Entropy;
c) Enthalpy;
d) Energy of the Helmholtz;
e) Intrinsic energy.

Select a valid equation for energy of the Helmholtz:
a) *dF=dU-TdS;
b) A=TdS-dU;
c) dG=dH-TdS;
d) dF=dU+TdS;
e) A=dG.

Select a valid equation for energy of the Gibbs:
a) *dG=dH-TdS.
b) dF=dU+TdS;
c) dG=dH+TdS;
d) dF=dU-TdS.

Work of a reversible process in comparison to work of an irreversible process always is:
a) *More;
b) Less;
c) They are identical.

Select a valid equation of the second beginning of a thermodynamics:
a) *dS=dQ/T;
b) dG=dH-TdS;
c) A = -dG;
d) S=K ln W.

For what persistence of conditions energy of the Helmholtz is used?
a) *VT;
b) V;
c) PT;
d) SV;
e) P

For what persistence of conditions is used energy of the Gibbs?
a) *PT;
b) T;
c) P;
d) V;
e) SV.

Whether the following statement is correct: "With growth of a randomness of a system the entropy is descending"?
a) *No.
b) Yes

What equation entropy and state probability of a system are connected by?
a) *Bolzman;
b) Hess;
c) Vant-Hoff;
d) Kirhhoff.

What is the nature of the second beginning of a thermodynamics?
a) *Relative;
b) Absolute.

At what temperature the third beginning of a thermodynamics will be realized?
a) *0 K;
b) 298 K;
c) 273 K;

Entropy of an ideal crystal matter at absolute zero is:
a) *Equal to zero point.
b) More than zero point;
c) Less than zero point;
d) It is not meaningful;

Whether it is possible to calculate an absolute value of entropy?
a) *Yes;
b) No.

For what thermodynamic systems the entropy is a criteria of a possibility of weep of process?
a) *Insulated.
b) Open;
c) Closed;

Select a valid ratio for "bound" energy:
a) *TdS;
b) dQ/T;
c) dQ/P;
d) SdT;
e) dF.

Select a proper correlation:
a) *dS=dQ/T;
b) dS=dH*T;
c) dS=dH/RT*RT;
d) dS=dQ/dT;

Select a valid ratio for a "normalized" heat:
a) *dQ/T;
b) TdS;
c) dQp;
d) dG;
e) dF.

To characterize a bound energy following concepts are used:
a) *Entropy;

b) *Enthalpy;*
c) *Energy of the Gibbs.*

Whether the following statement is correct: "The process is called thermodynamically convertible, when it can be realized in direct and reverse direction without variations in an environment"?
a) **Yes;*
b) *No.*

Conception of entropy in thermodynamics has entered by:
a) **Klausius;*
b) *Joule;*
c) *Thompson;*
d) *Hess;*
e) *Arrhenius.*

The dependence of heat effect on temperature express by an equation of:
a) **Kirhhoff;*
b) *Hess;*
c) *Bolzman;*
d) *Vant-Hoff;*
e) *Arrhenius.*

Heat effect of chemical reaction:
a) **Depends on temperature;*
b) *Does not depend on temperature;*
c) *Depends on some reactionsonly.*

Variations of heat effect with temperature is equal to a differential:
a) **Calorific capacities.*
b) *Energy of Gibbs;*
c) *Enthalpies;*
d) *Entropies;*

The first law of thermodynamics allows:
a) **To evaluate the power performances of process;*
b) *To determine a possibility of weep of process;*
c) *To determine directions of process;*
d) *To calculate equilibrium state of a system.*

Whether the verbiage is valid: "The heat cannot of itself pass from a cold body to ardent"?
a) **Yes;*
b) *No.*

Whether the statements are equivalent: 1. The heat cannot of itself pass from a cold body to ardent, not keeping variations in an environment. 2. The different kinds of energy have a tendention to turn to a heat, and heat to be dispersed, i.e. it is impossible completely to turn the heat into work.
a) **Yes;*
b) *No.*

In homologous sequences the heat of combustion is increased with each CH2-group on:
a) **660 J;*
b) *101 J;*
c) *213 J;*
d) *728 J;*
e) *54 J.*

The heat effect of a neutralization reaction in sequence of acids HCl, HNO3, H2SO4 will be:
a) **Remain a constant.*
b) *To ascend;*
c) *To descend;*

Heat effect of a neutralization reaction of acids of different force is:
a) **Constant;*
b) *Depends on their basicity;*
c) *Is determined by oxidizing operating.*

The heat effect of a neutralization of a strong acid is equal:
a) **-57.3 kJ;*
b) *-68.5 kJ;*
c) *660 J;*
d) *0 kJ;*
e) *1385 kJ;*

The persistence of significances of heat of neutralization for any pair of a strong acid and strong alkali is correctly explained by the theory of:
a) **Arrhenius;*
b) *Vant-Hoff;*
c) *Lengmure;*
d) *Mendeleyev;*
e) *Hess.*

The heat of dilution is called:
a) **Heat effect of dissolution 1 mole of matter in very large volume of resolvent;*
b) *Heat effect of dissolution of matter;*
c) *Heat effect of dissolution of 1 mole of matter;*
d) *Heat effect of dissolution of 1 mole of matter in standard conditions.*

What is the heat effect of reaction, if conditionally 2AB + 2CD = 2ABCD of heat of forming AB=5 KJ, CD=10 KJ, ABCD=20 KJ?

a) *10 KJ;
b) -10 KJ;
c) 70 KJ;
d) 20 KJ;
e) 50 KJ.

For reaction of combustion of acetylene the heats of forming of source substances and products are given. What consequent from the law of Hess you will use for accounting of heat effect of reacting?
a) *First;
b) Second;
c) Not any of them.

Standard heat of combustion is:
a) *Heat effect of oxidizing reaction of 1 mole of matter up to higher oxides;
b) Heat effect of oxidizing reaction of 1 mole of matter in standard conditions.

Enthalpy of formation of simple matter:
a) *Is equal to zero point.
b) It is more than zero point;
c) It is less than zero point.

Whether the enthalpies of water formation in liquid and vaporized state are identical?
a) *No;
b) Yes.

It is more, less or the identical amount is of heat is produced at formation of 1 mole of steam in comparison to 1 mole of pool water?
a) *It is less.
b) It is more;
c) Identical amount;

Whether the verbiage is valid: “The enthalpy of formation is a heat effect of formation of combination in standard conditions”?
a) *No.
b) Yes;

Whether will be executed the law of the Hess in conditions of constant pressure Qp=dH?
a) *Yes.
b) No;

Select valid standard conditions:
a) *101.3 ePa, 298 E.
b) 100 ePa, 298 K;
c) 100 ePa, 273 K;
d) 101.3 ePa, 273 K;

Whether will be executed the law of the Hess in conditions of constant volume Qv=dU?
a) *Yes;
b) No.

For what persistence of conditions the law of Hess is valid?
a) *P, V;
b) P, T;
c) P, S;
d) V, m;
e) S, T.

The basic law of thermochemistry was formulated:
a) *By Hess;
b) By Vant Hoff;
c) By Lomonosov;
d) By Joule;
e) By Arrhenius.

Whether the verbiage of the law of Hess is valid: “The heat effects of chemical reactions depend only on the nature both state of source substances and final products and do not depend on intermediate reactions”?
a) *No.
b) Yes;

For isovolumic process expansion work:
a) *Is equal to zero point;
b) Is maximal;
c) Is a constant and is always determined by pressure;
d) Depends on temperature of process.

For a condition V=const heat effect:
a) *Is equal to variation dU;
b) Is equal to zero point;
c) Is equal to variation of enthalpy of process;
d) Is equal to work of process;

For isobaric process heat effect:
a) *Is equal to variation dH.
b) Is always maximal;
c) Is equal to zero point;
d) Is equal to variation dU;

Enthalpy:
a) *Depends only on initial and final parameters;
b) Depends on paths of weep of process;
c) Is not the state function of a system;
d) Is a measure of a randomness of a system.

Select an exact equation:
a) *dH=dU+pdV;

b) *dH=dU-pdV;*
c) *dU=dH+pdV;*
d) *dH=dU+SdT;*

Select exact expression for Qp:
a) *Qp=dU+pdV;
b) Qp=dU;
c) Qp=dS+pdV;
d) Qp=Qv-pdV.

Work and heat of process:
a) **In definite cases the heat does not depends on paths of weep of process;*
b) *Always depends on paths of weep of process;*
c) *As intrinsic energy and enthalpy do not depend on paths of weep of process;*

If the reaction goes with separation of a heat, then:
a) **Its enthalpy is decreased;*
b) *Its enthalpy is increased;*
c) *The enthalpy is not changed, since it is a constant.*

Heat effect of an isochoric and isobaric process:
a) **Does not depend on paths of weep;*
b) *Depends on conditions of weep;*
c) *Depends on paths for isobaric, but does not depend for isochoric;*
d) *Depends for isochoric, but does not depend for isobaric;*
e) *Is a constant always.*

Heat:
a) **Only of isochoric and isobaric processes is a heat effect.*
b) *Always is a heat effect of process;*
c) *Is a heat effect of the isochoric process, but not of isobaric;*
d) *Isochoric and isobaric processes are not heat effects;*

The verbiage of the first beginning of thermodynamics:
a) **The heat is spent for variation of intrinsic energy and undertaking of work;*
b) *The heat is spent for separation of intrinsic energy and undertaking of work;*
c) *The intrinsic energy of a system is equal to the sum of produced heat and undertaking work.*

Intrinsic energy of the insulated system:
a) **A constant magnitude;*
b) *Is equal to zero point;*
c) *Increases in isothermal processes;*
d) *Descends at adiabatic compression.*

If the stock of intrinsic energy of a system is decreased, then:
a) **The quantity of heat is decreased, and the work a is undertaking by the system;*
b) *The quantity of heat is increased, and the work is undertaking by the system;*
c) *The quantity of heat is increased, and the work is undertaking over the system.*

Absolute value of intrinsic energy:
a) **It is impossible to determine;*
b) *It is possible to determine;*
c) *It is possible to determine only in a number of cases.*

The first law of thermodynamics is:
a) **A special case of a law of saving of energy, bounded with its transition into a heat and work;*
b) *The law of saving of a matter;*
c) *The law of saving of matter and energy;*
d) *A special case of a law of saving of energy, bounded with its transition from one kind in other.*

Select an exact record of an equation of the first beginning of thermodynamics:
a) **dQ=dU+dA;*
b) *dU=dQ+dA;*
c) *dA=dQ+dU.*

The heat is:
a) **A quantitative measure of transition of different kinds of energy;*
b) *Energy contracted in a system;*
c) *A measure of intrinsic energy of a system;*
d) *Energy of movement of microparticles of a system.*

Intrinsic energy:
a) **Is the state function of a system;*
b) *Is not the state function of a system;*
c) *Depends on paths of transition of a system from one state into other;*
d) *Does not depend from initial and final state of a system.*

The phase is:
a) **A part of a system with the identical chemical and thermodynamic properties*

which have been carved out from other parts;
- *b) Individual chemical agent;*
- *c) A definite succession of process;*
- *d) A part of a system with different chemical, but identical thermodynamic properties;*
- *e) A piece of the system which have been carved out with division surface from an environment.*

The intrinsic energy is:
- *a) *Full margin of energy of a systems which not includes potential and kinetic energy;*
- *b) Energy of heat motion of particles of a system;*
- *c) Magnitude describing quantitative transition of a heat into work.*

The thermodynamic operation is:
- *a) *A quantitative measure of transition of different kinds of energy from one to another;*
- *b) Always – product of multiplication of the pressure on the volume;*
- *c) A measure of intrinsic energy of a system;*
- *d) An amount of energy, transiting into the heat and work;*

In a state of thermodynamic equilibrium thermodynamic parameters:
- *a) *Are not changed spontaneously and the constant values are unchanged; Are equal to zero point;*
- *b) The maximum ratings reach;*
- *c) Are not changed spontaneously and have different values in different phases.*

The heterogeneous system is:
- *a) *A system composed of several phases;*
- *b) A multicomponent system;*
- *c) A system composed of two and more matters;*
- *d) A system composed of components, carved out from each other;*
- *e) A system composed of two and more components in different phases.*

The homogeneous system consists of:
- *a) *Components were in one phase;*
- *b) Homogeneous phases;*
- *c) Homogeneous components;*
- *d) Homogeneous components in different phases;*
- *e) Homogeneous components in homogeneous phases.*

The open system is:
- *a) *A system exchanging energy with an environment and mass;*
- *b) A system, in which the exchange reactions with an environment flows;*
- *c) A system exchanging matter with an environment;*
- *d) A system, to which the access is open from the side of an environment.*

Living organisms are:
- *a) *Systems exchanging energy and mass with an environment;*
- *b) The insulated thermodynamic systems;*
- *c) The closed systems;*
- *d) Systems carved out from an environments and which are not exchanging matter with it;*

The chemical thermodynamics studies:
- *a) *Heat effects, directions and equal balance of chemical processes;*
- *b) Dodges of weep of reactions;*
- *c) Speed of chemical reactions and equal balance.*

The chemical thermodynamics bases:
- *a) *On three basic laws (beginnings);*
- *b) On the different laws and equations of physics;*
- *c) On two basic laws (beginnings);*
- *d) On five basic laws (beginnings).*

The thermodynamic system is:
- *a) *Collection of the material objects which have been carved out from an environment;*
- *b) Definite succession of joint of the constituents;*
- *c) The device permitting to convert a heat into work;*
- *d) Collection of material and incorporeal objects;*
- *e) Collection of material objects and environment;*

Depending on nature of interplay with an environment the thermodynamic systems are divided on:
- *a) *Insulated, open and closed;*
- *b) One, two, three-component;*
- *c) Homogeneous and heterogeneous;*
- *d) Exogenic and endogenic;*
- *e) Balanced and unbalanced.*

The insulated system is:

a) *A system which is not exchanging matter, nor energy with an environment;
b) A system which has been carved out from an environment;
c) A system which is not exchanging matter with an environment;
d) A system which is not exchanging a heat with an environment;

The closed system is:

a) *A system exchanging with an environment only energy;
b) A system, insulated from an environment;
c) A system which is not exchanging heat, nor work with an environment;
d) A system which is not exchanging energy and matter with an environment;

The chemical thermodynamics is a branch of science learning:

a) *Interconversions of a heat and work;
b) Methods of transition of a heat from one body to another;
c) Interconversions of different kinds of energy;
d) Transformations of different kinds of energy in the form of a heat and work.

Topic: Chemical Kinetics

Please indicate dimension of a reaction's velocity of the 2nd order:

a) *$Mole^{-1}*dm^{3}*c^{-1}$
b) $Mole*dm^{3}*C^{-1}$
c) C^{-1}
d) $Mole^{2}*dm^{6}*C^{-1}$

Please indicate dimension of a reaction's velocity of an order zero:

a) *$Mol*dm^{-3}*sec$
b) C^{-1}
c) $Mole*dm^{3}*sec^{-1}$
d) $Mole^{-2}*dm^{6}*sec^{-1}$

The half-life of what reaction expresses by an equation T=1/kc(0):

a) *The second order;
b) The third order;
c) The fractional order;
d) An order zero;
e) The first order.

The half-life of what reaction expresses by an equation T=C(0)/2k:

a) *An order zero;
b) The third order;
c) The fractional order;
d) The first order;
e) The second order.

Temperature coefficient of velocity of reaction = 3. In how many of times the velocity of this reacting will be changed at a temperature variation on 30?

a) *In 27 times;
b) In 9 times;
c) In 18 times;
d) In 36 times;
e) In 45 times.

The reaction $2NO+Cl_2=2NOCl$ is composite. It is possible to assert, that it is 3-molecular?

a) *No.
b) Yes.

Whether the following expression is correct: " Velocity of particular chemical reaction is a constant "?

a) *No.
b) Yes.

Whether the following expression is correct: " A constant of velocity of chemical reaction is a constant "?

a) *Yes.
b) No.

What formula reflects true velocity of chemical reaction:

a) *V=dc/dt
b) V=?C/?T

How the order of reaction is determined?

a) *By method of determination of dependence of half-life of reaction from initial concentration of reactants;
b) By a method of gradual dissolution;
c) By a method of determination of an activation energy;
d) On determination of isotonic and isothermal factor of Vant-Hoff;
e) By a method of weighing.

How the order of reacting is determined?

a) *By graphic method on dependence of concentration on time;
b) By a method of determination of isothermal factor of Vant-Hoff;
c) On an equation of Nernst; D. On an equation Colerauche;

d) *On significance of an equilibrium constant of chemical reaction.*

The empiric rule, according to which the velocity of chemical reaction increases in 2-4 times at temperature rise on 10 has formulated by:

a) **Vant-Hoff.*
b) *Ostwald;*
c) *Kirchhoff;*
d) *Hess;*
e) *Henry;*

Temperature coefficient of velocity of chemical reaction = 4. In how many of times the velocity of this reaction will be changed at a temperature variation on 30?

a) **In 64 times.*
b) *In 16 times;*
c) *In 24 times;*
d) *In 32 times;*
e) *In 48 times;*

Please indicate exponential form of an equation of the Arrhenius:

a) **K=A*e-E/RT*
b) *dlnK/dT=E/RT^2*
c) *lgK=lgA-E/RT*

What is activation energy?

a) **It is energy of molecules entering chemical interplay;*
b) *It is energy of molecules;*
c) *It is energy of molecules before reacting;*
d) *It is energy of molecules after reacting;*
e) *It is a differential of energy of molecules before and after reacting;*

Influencing of the catalyzer on activation energy:

a) **Decreases;*
b) *Does not influence;*
c) *Increases;*

Temperature influence on activation energy:

a) **Decreases;*
b) *Does not influence;*
c) *Increases;*

Increasing of activation energy:

a) **Decreases velocity of chemical reaction;*
b) *Increases velocity of chemical reaction;*
c) *Does not influence on velocity of chemical reaction;*
d) *Promotes formation of a fissile complex.*

Please indicate dimension of a reaction velocity of the 1st order:

a) **C^{-1}*
b) *Mol*dm $^{-3}$*C^{-1}*
c) *Mole^{-1}*dm^3*C^{-1}*
d) *Mole^{-2}*dm^6*C^{-1}*

Please indicate the order and molecularity of reaction of a hydrolysis of saccharose $C_{12}H_{22}O_{11}$ + H_2O = $C_6H_{12}O_6$ (glucose) + $C_6H_{12}O_6$ (fructose):

a) **Bimolecular, first order;*
b) *Monomolecular, first order;*
c) *Bimolecular, second order;*
d) *Monomolecular, second order;*
e) *Bimolecular, third order.*

What determines molecularity of reaction?

a) **Amount of molecules, which one participate in the elementary act of reacting;*
b) *An amount of molecules of agents, according to stoichiometric factors of reacting;*
c) *An amount of molecules of reaction products.*
d) *In what case the equation of velocity of chemical reaction, according to a law of mass action, is fair:*
e) **For single-stage reactions;*
f) *For multiphase reactions.*

What formula reflects an average velocity of chemical reaction:

a) **V=ΔC/ΔT*
b) *V=dc/dt*

What value gives the comparative performance of velocity of chemical reaction:

a) **Value of a constant of velocity (K).*
b) *Value of reaction velocity (V);*

Half-life of what reaction expresses by an equation T = 1*3/k_2C(0):

a) **The third order;*
b) *The first order;*
c) *The second order;*
d) *The fractional order;*
e) *An order zero.*

Please indicate for reaction of what order a constant of velocity expresses by the following equation: k=1/t(C(0)-C):

a) **An order zero;*
b) *The third order;*
c) *The second order;*

d) *The first order;*
e) *The fractional order.*

The half-life of what reaction expresses by an equation T(1/2) = 1/K*ln2:
a) **The first order;*
b) *An order zero;*
c) *The second order;*
d) *The third order;*
e) *The fractional order.*

Please indicate, for reaction of what order the constant of velocity expresses by the following equation: K=1/tlnC(0)/C:
a) **The first order;*
b) *An order zero;*
c) *The second order;*
d) *The third order;*
e) *The fractional order.*

Please indicate, for reaction of what order the constant of velocity expresses by the following equation: $K=1/2t(1/C^2-1/C(0)^2)$:
a) **The third order.*
b) *The fractional order;*
c) *An order zero;*
d) *The first order;*
e) *The second order;*

Kinetic equation of reaction velocity of what order is the expression K=1/t (1/C-1/C (0))?
a) **2nd order;*
b) *1st order;*
c) *3rd order;*
d) *An order zero;*
e) *The fractional order.*

What is a catalysis?
a) **This is an alteration of velocity of chemical reaction;*
b) *This is an increasing of velocity of chemical reaction;*
c) *This is an decreasing of velocity of chemical reaction;*
d) *It is an industrial synthesizing of chemical agents;*
e) *It is a laboratory synthesizing of chemical agents.*

Catalyzers:
a) **Do not influence on value of an equilibrium constant of chemical reaction;*
b) *Increases velocity of direct reacting in a reversible reaction;*
c) *Increases velocity of reverse reaction in a reversible process;*
d) *Do not influence on velocity of reversible reactions.*

The molecularity of reaction is determined by:
a) **Number of molecules sharing in the elementary act of reacting;*
b) *Number of molecules which are generated as a result of the elementary act of reacting;*
c) *Total number of all molecules before and after reacting.*

If the reaction velocity does not depend on concentration of reactants, it is a reaction:
a) **The order zero;*
b) *The first order;*
c) *The second order;*
d) *The third order;*
e) *The fractional order.*

How the order of reaction is determined?
a) **By trial and error method of a kinetic equation of the miscellaneous orders;*
b) *By a method of weighing;*
c) *By a method of determination of an activation energy of reacting;*
d) *On determination of an isotonic coefficient of reacting.*

Whether the molecularity and order of reacting coincides?
a) **Only for simple single-stage reactions;*
b) *Coincide always;*
c) *Do not coincide never;*
d) *Only for composite reactions;*
e) *Only for enzymatic reactions.*

The velocity of what reaction is determined by the formula $V=KC_1^2 C_2$:
a) **$2H_2 + O_2 = 2H_2O$*
b) *$C + O_2 = CO_2$*
c) *$2N_2 + 3H_2 = 2NH_3$*
d) *$S + O_2 = SO_2$*
e) *$H_2 + Cl_2 = 2HCl$*

Whether the expression is correct: The constant of velocity of chemical reaction is reaction velocity at concentration of reactants, equal to 1:
a) **Yes.*
b) *No.*
c) *Yes, if the concentrations of reactants are not equal to 1.*

According to what law the velocity of chemical reaction is determined by expression V=KC(1)^3 C(2):
a) **The law of mass action;*

b) *The law of Vant Hoff;*
c) *The law of partial pressures;*
d) *The law of the Arrhenius;*
e) *The law of ionic strength.*

Please indicate an equation expressing a half-life of chemical reaction of the 3rd order:

a) *$T=3/2KC_0^2$*
b) *$T=1/2C_0$*
c) *$T=C_0/2K$*
d) *$T=ln2/K$*

According to the law of mass action, the velocity of chemical reaction is determined by expression:

a) *$V = KC_1C_2$*
b) *$V = -dc/dt$*
c) *$V=S/t$*
d) *$V=ezdt/kl$*

Please indicate an equation which reflects a half-life of reaction of 1st order:

a) *$T=1/K*Ln2$*
b) *$T=1/K*3/2C_0^2$*
c) *$T=1/KC(0)$*
d) *$T=C(0)/2K$*

Please indicate a kinetic equation of a constant of velocity of chemical reaction of 2nd order:

a) *$K=1/t(1/C-1/C(0))$*
b) *$K=1/t*Ln(C(0)/C)$*
c) *$K=1/t(1/C^2-1/C_0^2)$*
d) *$K=1/t(C_0-C)$*

Please indicate a kinetic equation of a constant of velocity of chemical reaction of 3d order:

a) *$K=1/t(1/C^2-1/C_0^2)$*
b) *$K=1/t*lnC_0/C$*
c) *$K=1/t\ (1/C-1/C_0)$*
d) *$K=1/t\ (C_0-C)$*

Please indicate an equation which reflects a half-life of reaction of 2nd order:

a) *$T=1/KC_0$*
b) *$T=1/K*ln2$*
c) *$T=C_0/2K$*
d) *$T=1/K*3/2C(0)\text{^}2$*

Please indicate an equation of a constant of velocity of chemical reaction of 1 order:

a) *$K=1/t*ln(C_0/C)$*
b) *$K=1/t(1/C-1/C_0)$*
c) *$K=1/2t(1/C^2-1/C_0^2)$*
d) *$K=1/t(C_0-C)$*

On what value we can compare velocities of chemical reactions:

a) **On value of a reaction velocity constant;*
b) *On value of reaction velocity;*
c) *On time of the termination of reaction;*
d) *On concentration of reactants.*

Topic: Adsorption

How the adsorption of gases on temperature depends?

a) **Is moderated with growth of temperature;*
b) *Is augmented with growth of temperature;*
c) *Is not changed.*

In how many of times the surface activity of acetic acid differs from a surface activity of formic?

a) **3,5;*
b) *10;*
c) *6,3;*
d) *8,5;*
e) *1,8.*

On what the separation of reductants in elution analysis is based?

a) **On discrepancy of distribution ratios;*
b) *On miscellaneous speed of advance;*
c) *On different dissolubility;*
d) *On discrepancy of activity ratios;*

In what the principle guard rope of phases in chromatography consists?

a) **Discrepancy of distribution ratioes;*
b) *Good dissolubility of phases in each other;*
c) *High dissolubility of agents in mobile and fixed phases.*

Constant of an equation of Freindlich allows to determine the schedule constructed in coordinates:

a) **lg x/m - lgC.*
b) *G-T;*
c) *G-C;*
d) *x/m-C;*
e) *s-C;*

What is an explanation of difficulties of idealized account of an adsorption on solid surfaces in comparison to an adsorption on a liquid?

a) **By impossibility of measuring of boundary tension and specific surface;*
b) *By heterogeneity of a surface;*
c) *By absence of methods of variation of boundary tension;*

In the field of what concentrations the equation of Lengmure passes in an equation of Freindlich?

a) **Average;*
b) *High;*
c) *Low.*

How the magnitude of boundary tension of solution of SAA is changed during formation of a monomolecular layer?

a) **Is moderated and becomes to equal boundary tension of SAA;*
b) *Is not changed;*
c) *Increases and becomes to equal boundary tension of water;*

What explains persistence of a limiting adsorption in a homologous line?

a) **By an identical amount of molecules placing on unit of an interface;*
b) *By the identical size of molecules of SAA;*
c) *By magnification of dissolubility of SAA in water in a homologous line;*

What statement for small concentrations of SAA is correct?

a) **Hydrocarbon chains floats on a surface of water, and the polar groups are loaded in water;*
b) *Hydrocarbon radicals are in water, and the polar groups are reversed in air;*
c) *Molecular <palings> will be derivated;*
d) *The polar groups are disposed in air in bridge surfaces of phases.*

What possibility gives the equation of the Gibbs?

a) **To place intercoupling between an adsorption, concentration and boundary tension;*
b) *To construct an isotherm of boundary tension;*
c) *To construct an isotherm of an adsorption;*
d) *To place(install) intercoupling between an adsorption and concentration.*

Whether the following statement is correct: The adsorption is positivegoing, if the surface activity is more than zero point ?

a) **No;*
b) *Yes.*

Whether the following statement is correct: The adsorption is positive going, if the surface activity is less than zero point?

a) **Yes;*
b) *No.*

What statement is correct for surface-inactive agents?

a) *The adsorption is less than zero point;
b) The adsorption is more than zero point;
c) The adsorption is equal to zero point.

What explains a positive adsorption of SAA?
a) *By weaker coupling of dipoles of water with molecules of SAA, than one with another;
b) By small dissolubility of SAA in water;
c) By stronger coupling of molecules of SAA with water, than molecules of water among themselves.

What equation describes dependence of an adsorption on concentration?
a) *Lengmure equation;
b) Equation of Shishkovsky;
c) Equation of Nernst;
d) Equation of Ostwald.

What is a measure of an adsorption on border the liquid - gas?
a) *Surplus of number of moles on unit of a surface in comparison to the volume of a phase;
b) Mass of agent;
c) Number of moles of agent;
d) Number of moles on unit of a surface;

What kind has the schedule of an isotherm of boundary tension?
a) *Hyperbola;
b) Parabola;
c) Direct rakish downwards;
d) Direct rakish hill up;
e) Direct, parallel to an abscissa axis.

What adsorption from the following definitions strictly corresponds to concept?
a) *Increase of concentration of matter in surface layer;
b) Concentrating of one agent by another;
c) Upbuilding of agent of volume of other matter;
d) Variation of concentration of agent.

What from the listed dependences is expressed with an isotherm of boundary tension?
a) *Boundary tension - function from concentration;
b) Adsorption - function from concentration;
c) Adsorption - function from boundary tension;
d) Boundary tension - function from temperature;

What statement is correct: "At dissolution of a molecule of SAA..."
a) *The non-polar radical is in air;
b) They are completely placed inside water;
c) Only hydrocarbon radical is loaded into water;
d) The polar part of SAA is in a gas phase.

For what from alternatives of a location of molecules Traube rule is valid?
a) *The molecules Of SAA are disposed in bridge surfaces;
b) The molecules of SAA are under an arbitrary angle to a surface;
c) The molecules of SAA will derivate " a palings of Lengmure ";
d) The molecules of SAA are chaotically distributed inside a liquid.

Among the listed matters please indicate surfactant.
a) *C_2H_5OH;
b) NaCl;
c) H_2SO_4;
d) $K_4Fe(CN)_6$.

What from the listed values is a surface activity?
a) *ds/dC;
b) A;
c) ds;
d) C/RT;

What is a boundary tension?
a) *Specific surface energy;
b) Margin of energy of an interface;
c) A surface energy;
d) Equal in effect attractive forces.

What equation determines dependence of boundary tension on concentration of SAA?
a) *By an equation of Shishkovsky;
b) By an equation of the Gibbs;
c) By an equation of Lengmure;
d) By an equation of Nernst.

In how many of times (maximum) a surface activity of SM will increase at growth a hydrocarbon radical on group - CH_2?
a) *In 3.5 times;
b) In 2 times;
c) In 7 times;
d) In 3 times;
e) In 0.3 times;

What rule institutes dependence of a surface activity on length of a hydrocarbon radical?

a) *A rule of Traube;
b) A rule of Rebinder;
c) A rule of Faience;
d) A rule of Schultz-Hardy.

Who has instituded dependence of a surface activity on length of a hydrocarbon radical?
a) *Traube
b) Gibbs;
c) Shishkovsky;
d) Vant-Hoff;

Please select the valid statement: "The surface-active agent calls matter..."
a) *Diphile matter;
b) Organic matter;
c) The matter, includes hydrophilic group into its structure;
d) The matter containing non-polar group.

Please select the valid statement: "The surface activity depends from..."
a) *The length of a non-polar hydrocarbon radical;
b) Amount of hydrophilic groups;
c) Affinities SAA to water.

From the list of matters select matter having surfactant properties:
a) *Acetic acid;
b) Water;
c) Caustic soda;
d) aluminiumsulphate;
e) Hydrogen nitrate;

Please select the valid statement: "The surface-active agent calls matter, which one at attachment to solution..."
a) *Moderates boundary tension;
b) Augments a surface energy;
c) Augments boundary tension.

How it is possible to diminish a surface energy of solution?
a) *By decreasing of boundary tension;
b) By decreasing of an interface;
c) By increasing of boundary tension.

What to explain confluence of small-sized drops of water in larger by?
a) *Decreasing of a surface energy;
b) Decreasing of boundary tension;
c) Increasing of the floor space of the surface unit.

What method a surface energy of clean matters is decreased by?
a) *Integration of fragments;
b) Crushing of fragments;
c) Decreasing of boundary tension.

Please mark a method which is not being a method of an abatement of a surface energy.
a) *Heat transfer;
b) Decreasing of an interface;
c) Decreasing of boundary tension.

In the list of physicochemical methods of testing please mark a method which is not being a method of determination of boundary tension of liquids.
a) *Gravimetric;
b) Stalagmometric;
c) Method of capillary ascent;
d) Method of break off of a ring;
e) Rebinder method.

There is a water and solution of alcohol in water. Please compare boundary tension of these liquids.
a) *The boundary tension of water is greater, than of solution;
b) The boundary tensions are equal;
c) The boundary tension of solution is greater, than of water.

What method it is possible to determine boundary tension by?
a) *Stalagmometric
b) Titrimetric;
c) Potentiometric;

In what units the boundary tension is metered?
a) *Newton/meter.
b) Centimeter;
c) Kilogram;
d) Newton;

What from the following four statements is correct?
a) *The surface energy is greater than boundary tension;
b) The surface energy is equal to boundary tension;
c) The surface energy is less than boundary tension;
d) These values cannot be compared.

What from the following three statements is correct?
a) *Surface energy - work on formation of an interface;
b) Surface energy - full margin of energy of a phase boundary;

c) *Surface energy - energy of transition of matter from one phase in other;*

What is the direction of equal in effect ofall forces on border liquid - gas?

a) **To the side of solution;*
b) *To the side of a gas phase;*
c) *In bridge interfaces.*

What is the value of equal in effect of all forces inside a fluid phase?

a) **Is equal to zero point;*
b) *Is more than zero point;*
c) *Is less than zero point.*

Sollubilization is:

a) **Dissolution of organic matters in hydrocarbon part of SAA;*
b) *Association of particles;*
c) *Dissolution of organic agents in polar parts of SAA.*

The adsorption will be directly proportional concentrations in the field of concentrations of SAA:

a) **Small;*
b) *Average;*
c) *Large.*

The equation A=C/RT*ds/dC is called:

a) **An equation of Gibbs;*
b) *An equation of Lengmure;*
c) *An equation of Freindlih.*

The equation d = B ln (1+AC) ia called:

a) **An equation of Shishkovsky;*
b) *An equation of Gibbs;*
c) *An equation of Lengmure;*
d) *An equation of Freindlih.*

The equation $G = G_0 P / (A+P)$ is called:

a) **An equation of Lengmure;*
b) *An equation of Gibbs;*
c) *An equation of Shishkovsky.*

The equation $x/m = B P_1/n$ is called:

a) **An equation of Freindlich;*
b) *An equation of Gibbs;*
c) *An equation of Lengmure;*
d) *An equation of Shishkovsky.*

SAA in comparison to resolvent has boundary tension:

a) **Smaller;*
b) *Greater;*
c) *Equal.*

Topic: Solutions of biopolymers

How the viscosity of solutions of protein influences by pH value? (N-viscosity)

a) **The least viscosity of solutions of protein at pH(iep) with magnification of pH grows;*
b) *Viscosity grows up to n(spec) with magnification of pH;*
c) *The viscosity grows is decreased up to n(relat.)*

The specific viscosity of polymers is detrmined on a Staudinger equation: (N-viscosity)

a) **n (spec) = EIN*
b) *n (spec) =N*E/I*
c) *n (spec) = [n]*KM*

Determination of an isoelectric point of protein is:

a) **This significance of pH, at which one protein is in an isoelectric state, i.e. the sums positive and negative charges are equal;*
b) *This is a system condition, when pH corresponds to the cationic form of protein;*
c) *The value of pH, at which one protein is in the anionic form.*

In an isoelectric state the protein have:

a) **The least degree of a bloating;*
b) *The greatest degree of a bloating*
c) *pH does not influence a degree of a bloating of protein.*

The threshold concentration is determined on an equation:

a) **$C_{(thresh.)}$ =(CV/W)*1000;*
b) *$C_{(thresh.)}$ = NV*100;*
c) *$C_{(thresh.)}$ =CV/100*

How the value a zeta - potential influences stability of sols?

a) **Than more zeta-potential, the higher stability of salt*
b) *Than more zeta-potential, the less stability of salt*

In an isoelectric state of a colloidal micelle:

a) **Zeta-the potential of a pellet is equal to zero point*
b) *Zeta-potential is maximal*
c) *Zeta-potential is equal to half of initial value.*

Whether can the zeta-potential under influencing of ectogenic electrolytes to change the magnitude and sign of a charge?

a) **Yes*
b) *No*

Where there is a zeta-potential?

a) **On border between adsorptive and diffuse strata;*
b) *On border of a core and potential of negatively ionized atoms;*
c) *On border between SFI and counterions*

What is the ratio between a zeta- and e-potential?

a) **The zeta-potential always is only part of a e-potential;*
b) They are equal;
c) The zeta-potential is greater than e-potential

Coagulative operating have the ions having a charge:

a) **Opposite to a charge of a pellet;*
b) *Equal to a charge of a pellet;*
c) *Identical on the sign to a charge of a pellet*

The intercoagulation is supervised, if:

a) **To drain 2 sols containing pellet with opposite charges;*
b) *To drain 2 sols equally charged to add inert electrolyte*

What deflocculant is necessary for taking to receive negatively charged sol of AgI, obtained on reaction: $AgNO_3$ + KI = >AgI (settlings) + KNO_3

a) **KI*
b) *K_2SO_4*
c) *$AgNO_3$*

Value of a zeta - potential is calculating under the formula: (Z- zeta potential; n-viscosity; D-inductivity)

a) **Z=4InLU/DE*
b) *Z=4IDE/n U*
c) *Z=4InD/ELU*

Sol have been received with the help of reacting: $AgNO_3$ +KI = >AgI (settlings) +KNO_3. That the charge of a pellet was positive, what deflocculant needs to be taken?

a) **$AgNO_3$*
b) *$NaNO_3$*
c) *$Al(NO_3)_3$*

Please indicate valid pattern of sol of sulphide of arsenic. Deflocculant: H_2S. $2H_3AsO_3 + 3 H_2S <=> As_2S_3 + 6 H_2O$

a) *{[mAs_2S_3 * n HS^-] (n-x) H^+}$^{x-}$ xH^+
b) { [mAs_2S_3 * n HS^{2-}] 2 (n-x) H^+}$^{2x-}$ $2xH^+$

What there will be by the deflocculant of sol of dioxide of manganese, if C(KMnO4) = 2 %, and C(natriumthiosulphate) =1 %? The volumes are equal.

a) *Permanganate
b) Thiosulphate

How correctly to record a constitution of a micelle, if the sol is obtained by a method of reduction: $2 KAuO_2 + K_2CO_3 + 3 HCHO = > 2Au$ (settlings) + 3 HCOOK + $KHCO_3$ + H_2O. The deflocculant: $EAuO_2$ K+ + AuO^{2-}

a) *{[m Au* nAuO^{2-}] (n-x) K+}$^{x-}$ xK^+
b) {[m Au* nK^+] (n-x) AuO^{2-}}$^{x+}$ x AuO_2
c) {[m AuI_2^- (n-x) K^+](m-x) AuO_2

Please indicate an exact constitution of a micelle of sol of manganese dioxide obtained on reacting: $8 KMnO_4 + 3Na_2S_2O_3 + H_2O = > 8 MnO_2$ (settlings) + $3K_2SO_4$ + 2KOH + $3Na_2SO_4$

a) *{[m MnO_2 * n MnO^{4-}] (n-x) K^+}$^{x-}$ xK^+
b) {[m MnO_2* n Mn^{2+}](n-x) K^+}$^{x+}$ xK^+
c) {[m MnO_2 * n $S_2O_3^{2-}$] 2 (n-x) Na^+} $2xNa^+$

Please indicate a constitution of sol of the Berlin glaze obtained from: $FeCl_3$ and $K_4[Fe(CN)_6]$, deflocculant: $K_4[Fe(CN)_6]$

a) *{[m KFe [Fe $(CN)_6$] n[Fe $(CN)_6$]$^{4-}$] 4(n-x) K^+}$^{4x-}$ $4xK^+$
b) {[mKFe [Fe$(CN)_6$]nFe^{3+}]3(n-x)Cl^-}$^{3x+}$ $3xCl^-$
c) {[m$K_4[Fe(CN)_6]nK^+$](n-x)[Fe$(CN)_6$]^4}$^{4x+}$ x $[Fe(CN)_6]^{4-}$

Relay equation for intensity of aunpolarized light, dissipated by sols: (L- wave length; D- frequency)

a) *$I=I_0 K DV^2/L^4$
b) $I = I_0 CV^2/L^4K$
c) $I=I_0 (n_1-n_2) KV^2/L$

What is the dependence between intensity of scattered light and wave length of a polarized light driving through sol?

a) *Inversely proportional the dependence I from L^4
b) I is proportional to L
c) I does not depend from L

Is the Tyndall-Faradey effect a general optical property of all salts?

a) *Yes
b) No

The micelle of sol has a constitution: {[m$BaSO_4$ * nBa^{2+}] 2 (n-x) NO^{3-}}$^{2x+}$ 2x NO_3^-. The least threshold of coagulation will be at attachment:

a) *PO_4
b) Na^{2+}
c) Cl^-

Structure of a micelle of sol of pentatione acid: {[mS* n$S_2O_6^{2-}$] 2 (n-x)H^+}$^{2x-}$ $2xH^+$. The least threshold of coagulation will be at attachment:

a) *Al^{3+}
b) K^+
c) SO_4^{2-}

The method of peptization is referred to:

a) *Dispergation methods
b) Condensation methods

The synthetic kidney device works by a principle of:

a) *Compensatory dialysis
b) Electrodialysis
c) Ultrafiltration

The degree of dispersion of colloidal solutions is:

a) *D ~10^{-9}-10^{-7} m^{-1}
b) D ~10^{-10} m^{-1}
c) D ~10^{-6} m^{-1}-10^{-4} m^{-1}

How the sol will be charged, if it is obtained on dual interchange reaction: $AgNO_3$+KI=>AgI+K NO_3, if the deflocculant takes agent NaI?

a) *Negatively
b) Positively
c) Neutral

Structure of a micelle of sol of gold: {[m Au*nAuO_2^-](n-x)K^+}$^{x-}$xK^+. What ion will coagulate this sol better?

a) *Al^{3+}
b) Na^+
c) PO_4^{3-}

Berlin blue prepared from $FeCl_3$ and $K_4[Fe(CN)_6]$. What from agents is necessary for taking much to receive negative sol?

a) *$FeCl_3$
b) In equivalent amounts
c) $K_4[Fe(CN)_6]$

How ferric hydroxides obtained by a method of a hydrolysis will be charged?

*a) *Positively*
b) Negatively

Are the colloidal solutions heterogeneous systems?

*a) *Yes*
b) No