Issues of the competence test for second-degree students
Chemical Technology

Innovative Chemical Technologies

1. Who is obliged to protect nature?
2. The emission law.
3. Recycling of waste according to the applicable definition of recycling.
4. Online engineering information resources.
5. Types of scientific publications.
6. Publication metrics.
7. Orbital hybridization.
8. Chemical bond.
9. Chemical polarity.
10. The IUPAC definition of Green chemistry.
11. NMR spectroscopy or magnetic resonance spectroscopy (MRS).
12. The reaction in the presence of microwave irradiation.
13. Physicochemical properties of silver nanoparticles.
14. Methods of deodorization of malodorous substances.
15. Management of waste plant raw materials.
16. Risks of using metal nanoparticles (Sorption of metallic ions and nanomaterials).
17. Obtaining of silver nanoparticles.
18. Cleaner technology – definitions.
19. Raw materials used for phosphorus compounds production.
20. Production technologies of phosphoric acid.
21. NP fertilisers (nitrogen and phosphorus)– characteristic and production technologies.
22. As the concentration of an NaCl solution in water increases, the surface tension of the solution.
23. The surface tension of a liquid.
24. The Laplace equation is expressed with one of the following relations.
25. The equilibrium of surface forces at the solid/liquid interface is determined with one of the following equations.
26. In the Gibbs equation denotes one of the following.
27. As the concentration increases, the specific conductivity of an electrolyte.
28. For infinitely diluted solutions of electrolytes.
29. For osmosis, the pressure of the solution which the solvent penetrates through a semipermeable membrane.
30. The van't Hoff isotonic ratio.
31. What is the critical concentration of micellization?
32. When micelles are formed from monomeric amphiphilic molecules.
33. Coagulation of lyophobic colloids forced by adding an electrolyte to a colloidal system grows in efficiency while the ionic charge.
34. What is the effect of addition of an electrolyte to a system on the stability of lyophobic colloids?
35. The emulsifiers which facilitate emulsification and increase stability of emulsions may include…
36. The zeta potential.
37. Haw the number of linearly independent chemical reactions is determined according to stoichiometric matrix method?
38. What is the relationships between thermodynamic functions of chemical reactions and thermodynamic functions related to molar quantities and state parameters?

39. What does determining kinetic model of a chemical reaction consist in?
40. What does designing a nonisothermal stirred tank periodic chemical reactor consist in?
41. What impact has partial recirculation of the stream leaving the continuous stirred tank reactor on degrees of conversion of the reference substrates?
42. Let us consider a single continuous stirred tank reactor and a cascade of reactors having the total volume as the sum of volumes of the reactors constituting the cascade. How the change of the degree of conversion in the cascade the reactors in comparison with the single reactor can be justified?
43. What is the importance of determination the regions of multiple steady states in autothermal chemical reactors?
44. How is justified the form and number of the equations describing steady state in a polytrophic tubular reactor with piston flow in which single exothermic chemical reaction occurs?
45. What is the importance of direction flow of cooling medium for exothermic chemical reaction occurring in a polytrophic tubular reactor with piston flow, i.e. changing co-current flow by counter-current flow or vice versa?
46. In what manner Peclet number affects the final degree of conversion in polytrophic tubular reactor for an exothermic chemical reaction?
47. Which sentence DOES NOT describe periodic model ?
48. Heterogeneous catalytic reaction.
49. Mechanism of catalysis.
50. Who proposed mode of thin films growth on support, where adatoms attach preferentially to surface sites resulting in atomically smooth monolayers?
51. Which of the factors only affects the rate of heterogeneous reactions?
52. The role of a catalyst.
53. The sorption in a catalytic process.
54. Description of electron densities.
55. The MNDO method.
56. Analytical techniques, UV-Vis spectroscopy.
57. Analytical techniques, liquid chromatography.
58. Analytical techniques, liquid chromatography, gas chromatography, quantitative analysis.
59. The use of a diode array detector (DAD).
60. Mass spectrometry analysis.
61. Analytical techniques - RP-HPLC.
62. The influence on electrospray ionization (ESI).
63. Auxochrome.
64. The reference electrode in voltammetry techniques
65. Biodiesel – definitions.
66. Method for removal of water from bioethanol.
67. Methods of biodiesel synthesis.
68. Generations of biofuels.
69. Examples of biofuels.
70. Biooil.
71. Comparison of energetic value of various types of solid bioresources.
72. Biomass pyrolysis.
73. Burning of biomass.
74. Raw materials for ethanol fermentation.
75. Biogas production and composition.
76. Properties of biodiesel.

77. FPT quality control parameters for a photocurable composition.
78. Sources of emission in phosphorescence.
79. t-BOC-Polystyrene-based composition.
80. Description of the process of the physisorption.
81. The types of surface reaction mechanisms used in the field of heterogeneous reactions.
82. The measurements of catalytic properties.
83. Conversion of propane to propene in industrial processes.
84. Synthesis of zeolites.
85. The nitrogen adsorption isotherms.
86. The models used in DFT studies for the geometrical representation of the surface cluster and periodic model.
87. The ion exchange procedure in zeolites.
88. The influence of modification of zeolites (dealumination, isomorphic substitution) on the acidity of zeolites.
89. Polymer and carbon materials and new trends in application in medicine.
90. Introduction to Biomaterials – Healing process.
91. Introduction to Biomaterials – Ionic bonding.
92. Ceramic materials and new trends in application in medicine.
93. The methods of physicochemical and biological evaluation applied in biomaterials.
94. The methods of physicochemical and biological evaluation applied in biomaterials – Toughness.
95. Polymer and carbon materials and new trends in application in medicine, Composite materials and new trends in application in medicine.
96. Metallic materials and new trends in application in medicine.
97. Tensile properties of biomaterials.
98. The methods of physicochemical and biological evaluation applied in biomaterials.
99. Chemical polymer structure.
100. Synthesis of urethane groups by isocyanate reaction.
101. Creating a high molecular weight PLA.
102. Viscoelastic polyurethane foams.
103. Bio-polymers produced from sugar cane as renewable raw material.
104. The role of phenyl groups in silicones.
105. Raw materials used for phosphorus compounds production.
106. Technological examples of phosphorus compounds production directly on wastewater treatment plants.
107. Waste that are used as a secondary raw materials for phosphorus recovery.
108. Phosphorus recovery technologies from secondary raw materials.
109. Phosphorus recovery technologies from sewage sludge ash.
110. Technological examples of phosphorus compounds production directly on wastewater treatment plants.
111. Cosmetic microemulsions.
112. Stabilization of alkaline soaps such as sodium laurate.
113. The "freeze / thaw" test.
114. Stabilization of emulsions , which consists in creating on the surface of dispersed phase droplets the "electrically charged" film, causing repulsion of individual drops of the dispersed phase.
115. Stabilization of the emulsion, which consists in creating on the surface of droplets of a dispersed phase the steric hindrances that limit the merging of individual droplets of the dispersed phase.
116. Functional groups of emulsifiers.

117. HLB.
118. Spans.
119. Emulsifiers in certified natural cosmetics.
120. Function fsolve (Scilab).
121. Function ode (Scilab).
122. To solve system of n nonlinear algebraic equations you need to provide…..
123. To integrate a system of ordinary differential equations (ODEs) you need to provide …
124. The general equation for conservation of mass-energy.
125. Mass/energy balance in closed system.
126. Accumulation.
127. Chemical kinetics.
128. Mass balance of a mixer.
129. Kinetic model (closed system) for a given mechanism: A -> B + C, k.
130. The equilibrium constant (K) for a reaction in a solution: A <=> B + C.
131. Mass balance for a system A <=> B + C.
132. Explain a formula: Q= m*c*deltaT.
133. Mass balance for a batch reactor.
134. Mass balance for a semi-batch reactor.
135. Mass balance for a Continuous-Stirred Tank Reactor.
136. Rate of heat generation (q, J/s) by a single exothermic reaction.
137. What is the tank volume if the time it takes to fill the tank with a flow rate of 5L/min ?