

## Examination topics, Physical Chemistry I, 2018

1. Terms in thermodynamics
2. The state of the thermodynamic system
3. Internal energy, the first law of thermodynamics
4. Work and heat
5. Enthalpy
6. Ideal gas (perfect gas). Relation between  $C_{mp}$  and  $C_{mv}$
7. Reversible changes of ideal gases (isobaric, isochor, isothermal)
8. Adiabatic reversible changes of ideal gases
9. The standard reaction enthalpy. Measurement of heat of reaction
10. Hess's law
11. Standard enthalpies
12. The first law for open systems, steady state systems
13. Thermodynamic definition of entropy. Change of entropy in closed systems
14. The second law and entropy
15. Statistical approach of entropy
16. T-S diagram
17. The third law of thermodynamics
18. The Helmholtz free energy
19. Gibbs free energy
20. The first and second derivatives of the thermodynamic functions
21. p-T phase diagram and the thermodynamic interpretation of the p-T diagram (the Clapeyron equation)
22. One component liquid-vapor equilibria, the Clapeyron Clausius equation
23. Standard Gibbs free energies, Gibbs free energy of an ideal gas
24. The chemical potential
25. Conditions for phase equilibria
26. The phase rule
27. Equation of state for real gases
28. The principle of corresponding states
29. The Joule-Thomson effect
30. Solutions – quantities of mixing
31. Partial molar quantities
32. Determination of partial molar quantities
33. Raoult's law, deviations from ideality
34. Chemical potential in liquid mixtures
35. Entropy of mixing and Gibbs free energy of mixing
36. Vapor pressure and boiling point diagrams of miscible liquids
37. Boiling point diagrams of partially miscible and immiscible liquids
38. Solid - liquid equilibria: simple eutectic diagrams
39. Vapor pressure lowering, boiling point elevation, and freezing point depression
40. Osmotic pressure
41. Enthalpy of mixing
42. Henry's law, solubility of gases
43. Thermodynamic stability of solutions, liquid - liquid phase equilibria
44. Distribution equilibria
45. Activities and standard states
46. Thermodynamic equilibrium constant
47. Chemical equilibrium in gas phase
48. Effect of pressure on equilibrium
49. Gas - solid chemical equilibrium
50. Chemical equilibrium in liquid state
51. Temperature dependence of the equilibrium constant