Study program: Integrated academic studies of Pharmacy

Type and level of the study program: integrated academic studies

Course title: PHYSICAL CHEMISTRY(PhI-PCHEM)

Teacher: Mihalj M. Poša, Zita J. Farkaš-Agatić, Kosta J. Popović

Course status: compulsory

ECTS Credits: 7

Condition: Biophysics

Course aim

The aim of this course is to develop understanding the essence, cause and regularity of phenomena in physical and chemical processes of transformations of matter and energy. It offers basic and advanced theoretical and practical knowledge necessary for pharmaceutical chemistry and technology, as well as instruments of pharmaceutical analysis.

Expected outcome of the course:

Knowledge on the structure of matter, nature of chemical bonds and states of matter systems in processes of dissolution, adsorption, adsorpcije, phase, chemical and electrochemical transformations. Practical application of knowledge in lab work in the field of understanding the structure of atoms and molecules, physical, chemical, thermal and electrochemical transformations and processes.

Course description

Theoretical education

1. Structure of atoms and chemical bonds; Bohr atomic model; Wave nature of the matter; Schrödinger's equation; Atomic orbitals and their presentation in chemical bonding; Atomic nucleus; Radioactivity; Nuclear chemistry/physics in medicine.
2. Characteristics of molecules: optical, electrical and magnetic.
3. Aggregation states of the matter: The theory of gaseous state and real gases; The theory of liquid state, liquid crystals;Hard matter theory, crystal state; Crystal classification, basic laws of crystallography; chain-packing mode in the crystallattice.
4. Chemical thermodynamics: Definition and application of the first principle of thermodynamics in physical-chemical processes; Inner energy and enthalpy; Molar thermal capacities; Joule-Thomson effect; The efficacy of transforming thermal energy into work energy; The second law of thermodynamics; Helmholtz energy. Gibbs energy; Chemical potential; Thermodynamic criteria of balance.
5. Solutions: Real solutions; Dissolution theory; Colligative properties of solutions; Colloid dispersion systems; Basics of rheology;
6. Phase balance, Phase transformations and phase diagrams: Clapeyron equation; Gibbs phase rule; Diagrams of conjugative mixtures.
7. Surface phenomena: Adsorption, physical and chemical adsorption; Gibbs, Freundlich and Langmuir adsorption isotherm.
8. Chemical kinetics: Kinetics and mechanism of chemical reactions; Kinetic constant of chemical reactions; Molecularity and order of chemical reactions; Arrhenius theory of chemical reactions kinetics; Activation energy; Complex chemical reactions; Effects of temperature on the kinetics of chemical reactions; Catalysis and catalytic reactions.
9. Electrochemistry: Types of catalysts; Faraday laws; Nernst theory of electrode potentials; Types of electrodes; Electromotor power; Electrolysis; Kinetics of electrochemical reactions (Tafel, diagram).

Practical education: exercises, other forms of education, research related activities

1. The first cycle: Molar mass calculation, Victor Meyer method; Viscosity (capillary method); Surface tension determination (stalagmometric method); Vapor pressure (isotensioscopic method).
2. The second cycle: Solubility; Solubility coefficient; Heat of solution; Heat of neutralization.
3. The third cycle: Adsorption (Freundlich adsorption isotherm;
4. The fourth cycle: Potentiometric Potentiometric pH measurements – values; Conductometric determination of the tension capacity of a conductor cell

Literature

Compulsory

1. Atkins P, de Paula J. Physical chemistry for life science. W.H. Freeman and Copmany New York, 2006.

Additional

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Number of active classes				Other:
Lectures: 60	Practice: 30	Other types of teaching:	Research related activities:	

Teaching methods

Lectures; laboratory Practice

Student activity assessment (maximally 100 points)

Pre-exam activities	**points**	**Final exam**	**points**
Lectures		Written	20
Practices		Oral	40
Colloquium	40	.....	
Essay			