



UNIVERSITY OF NICOSIA

ΠΑΝΕΠΙΣΤΗΜΙΟ ΛΕΥΚΩΣΙΑΣ

Course Code PHAR-210	Course Title Introduction to Physical Chemistry and Physical Pharmacy/Αρχές Φυσικοχημείας και Φυσικοφαρμακευτική	Credits (ECTS) 6
Department Life & Health Sciences	Semester Fall	Prerequisites PHAR107, PHAR110
Type of Course Required	Field Pharmacy	Language of Instruction Greek/English
Level of Course 1 st Cycle	Year of Study 2 st year	Lecturer Nicolas Stylianides/Yiota Gregoriou

Objectives of the Course:

This subject offers the basic knowledge of Physical Chemistry and Pharmacy so that the students can understand the subject matter when applied to physical pharmacy, pharmaceutical technology and pharmaceutical or medicinal chemistry.

Learning Outcomes:

After completion of the course students are expected to understand :

- The drugs molecules state
- The nature of matter
- The components of matter
- The conversion of different phases of matter from one state to the other
- Reversible and irreversible processes
- The importance of kinetic theory of gases and other states of matter
- Enthalpy, entropy and Gibbs energy and their impact on chemical reactions and drug solubility
- Surface tension phenomena and their impact on suspensions, surfactants and drug formulation
- Rheology and its importance on drug delivery systems and manufacture
- Drug release attributed to the above principles
- Identification of organic substances
- Drug stability based on chemical kinetics

Course Contents:

Properties of Gases: Thermodynamic properties of gases and state equation, collision and kinetic theory of gases. The First Law of Thermodynamics: Work and heat, enthalpy, heat capacities, thermochemistry, bond energy, enthalpy and internal energy. The Second Law of Thermodynamics: Entropy of the system, universe and surroundings. Gibbs energy and its impact on chemical reactions.

Solutions: Definitions, solubility, cyclotextrins as solubilizing agents, thermodynamic properties such as mixing, Raoult's Law, freezing point depression, osmosis, electrolyte solutions, equilibrium, diffusion, Fick's law. Acid and Bases: Properties of aqueous solutions, acids, bases and buffer solutions, ionization, pH and pKa. Chemical kinetics: Rate of reaction, reaction order (zero, first and second), molecularity of a reaction, effect of temperature on a reaction, Arrhenius equation stability of medicinal products and impact of packing. Quantum Mechanics and Atomic Structure: Classical and quantum transition state theory. The Chemical Bond: Lewis structure, valence bond theory, dipole moment, electronegativity, molecular orbital theory. Solids: Crystal structure and classification of solids, crystallization, polymorphs and pharmaceutical implications, amorphous solids. Spectroscopy: general principles, IR, NMR. Photochemistry and Photobiology: Introduction, thermal vs photochemical reactions and ionic reactions. Oxidation and reduction of organic substances. Surfactants: Surface and interfacial properties of surfactants, surface tension, adsorption, desorption, detergents, lipid bilayer liposomes.

Emulsions, Suspensions and Other Pharmaceutical Disperse Systems: Colloidal dispersion systems, types and properties of colloidal systems. Pharmaceutical Nanotechnology: Particle size, application of nanoparticles in drug delivery, nanoparticles manufacturing methods, drug targeting with nanoparticles. Rheology: Rheological properties of liquids. Freeze-drying techniques and its use in the pharmaceutical sciences. Particle size, distribution and measurement.

Learning Activities and Teaching Methods:

Lectures, class discussion, assignments, laboratory but can change at the discretion of the instructor/lecturer.

Assessment Methods:

Midterm examination, final examination.

Teaching Methods

Lectures, laboratory exercises, written exams, guiding homework

Assessment

Midterm Examination	25%
Laboratory Exercise	25%
Final Examination	50%

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Raymond Chang	Physical Chemistry for the Biosciences	University Science Books	2005	1891389335

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
David Attwood <i>et al</i>	Physicochemical Principles of Pharmacy	PhP	5 th Edition	9780853699842