

# The University of Jordan

**Faculty:** Pharmacy

**Department:** Pharmaceutics and Pharmaceutical Technology

**Program:** BSc. In Pharmacy

**Academic Year/ Semester:** 2013/2014 (Second semester)

**Course Name (Course Number):** Physicochemical Principles of Pharmacy  
(1202134)

<b>Credit hours</b>	2	<b>Level</b>	1	<b>Pre-requisite</b>	0303101
<b>Coordinator/ Lecturer</b>		<b>Office number</b>		<b>Office phone</b>	
<b>Course website</b>		<b>E-mail</b>		<b>Place</b>	

<b>Office hours</b>					
<b>Day/Time</b>	<b>Sunday</b>	<b>Monday</b>	<b>Tuesday</b>	<b>Wednesday</b>	<b>Thursday</b>

## Course Description

Study of the physicochemical properties of molecules incorporated in pharmaceutical preparations.

## Learning Objectives

The student will be introduced to the physico-chemical characteristics of drugs and allied entities. In addition, the student will be provided with the knowledge and how to apply the fundamental physicochemical principles to the design, formulation, manufacture and evaluation of a wide range of dosage forms.

### **Intended Learning Outcomes (ILOs):**

Successful completion of the course should lead to the following outcomes:

#### **A. Knowledge and Understanding:** Student is expected to

A.1. To understand the following basics of the physicochemical properties of drugs such as:

Intermolecular forces, States of matter (gas, liquid and solid). Phase equilibria and phase rule, Physical properties of drug molecules.

A.2. To understand the concept and factors affecting solubility and distribution phenomena.

#### **B. Intellectual Analytical and Cognitive Skills:** Student is expected to

B.1. Conceptual understanding that enables the student to evaluate critically the principles of physical pharmacy, all aspects of scientific activities and theories intended to be applied in aspects related to characterization, preparation and understanding of drug formulation.

B.2. have an ability to deal with complex issues both systematically and creatively, and to assemble, assimilate and analyze critically a range of information including both scientific data and library-based.

#### **C. Subject-Specific Skills:** Student is expected to have:

C.1. A systematic understanding of knowledge to interpret and evaluate information related to the physicochemical characteristics of drugs

C.2. A comprehensive ability to differentiate between properties of solutions of electrolytes and nonelectrolytes.

#### **D. Transferable Key Skills:** Students is expected to

D.1. The ability to work effectively both in an independent manner through self-direction in planning and implementing tasks, and also as a member of a team following discussion and agreement of procedures.

D.2. The ability to disseminate information effectively both orally and in written form both to specialist and non-specialist audiences.

D.3.The independent learning ability required for continuing professional development.

**ILOs: Learning and Evaluation Methods**

ILO/s	Learning Methods	Evaluation Methods
	<b>Lectures and Discussions, Homework and Assignments, Projects, Presentation, ...</b>	<b>Exam, Quiz, assignments.</b>

**Course Contents**

Content	Reference*	Week	ILO/s**
<p><b>Intermolecular forces.</b> Ionic bond, coordinate bond, covalent bond, hydrogen bond and van der waal forces.</p>		<b>1 and 2</b>	
<p><b>States of matter.</b></p> <ul style="list-style-type: none"> <li>• Gas state: definition, properties, Ideal gas law, Real gas behaviors and law.</li> <li>• Liquid state: definition, properties, vapor pressure, boiling point.</li> <li>• Pharmaceutical aerosols: liquefied gas aerosols and compressed gas aerosols.</li> <li>• Solid state: Definition and properties, arrangement of drug molecules in the solid state (amorphous form, crystalline form and polymorphism) and its effect on melting, solubility and dissolution. Studying of solid</li> </ul>		<b>3-5</b>	

state using differential scanning calorimetry (DSC).			
<b>Phase equilibria and phase rule.</b> Liquid-liquid binary mixtures, liquid-liquid ternary mixture, solid-solid binary mixtures.		<b>6 and 7</b>	
<b>Mid Exam</b>		<b>8</b>	
<b>Physical properties of drug molecules.</b> Dielectric constant, Dipole moment, Polarization, Refractive index.		<b>9</b>	
<b>Solutions of nonelectrolytes.</b> Properties of solutions, concentration expressions, equivalent weights, ideal solutions, real solutions, colligative properties, molecular weight determination.		<b>10 and 11</b>	
<b>Solutions of electrolytes.</b> Electrical conductance, equivalent conductance, colligative properties of electrolytes, Arrhenius theory of electrolytic dissociation, theory of strong electrolytes, the ionic strength, the Debye-Huckel theory, osmotic coefficient, osmolality and osmolarity.		<b>12 and 13</b>	
<b>Isotonic solutions.</b> Measurement of tonicity, calculating tonicity using Liso value, methods of adjusting tonicity.		<b>14</b>	
<b>Solubility and Distribution.</b>		<b>15 and 16</b>	

Solvent-Solute interaction, solubility of gases in liquids, solubility of liquids in liquids, solubility of solids in liquids, solubility improvement, distribution of solutes between two immiscible solvents.			
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\*Mentioned below.

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### **Evaluation**

<b>Evaluation</b>	<b>Point %</b>	<b>Date</b>
<b>Midterm Exam</b>	<b>30</b>	<b>8<sup>th</sup> week</b>
<b>Assignments</b>	<b>10</b>	<b>4<sup>th</sup> week</b>
<b>Quiz</b>	<b>10</b>	<b>10<sup>th</sup> week</b>
<b>Final Exam</b>	<b>50</b>	<b>17<sup>th</sup> week</b>

### **Main Reference/s:**

- Martin's Physical Pharmacy and Pharmaceutical Sciences. 6<sup>th</sup> Edition. 2011.  
Published by Lippincott Williams & Wilkins, USA.

<http://thepoint.lww.com/Sinko6e>

- Martin's Physical Pharmacy and Pharmaceutical Sciences. 5<sup>th</sup> Edition. 2006.  
Published by Lippincott Williams & Wilkins, USA.
- Physical Pharmacy, Physical Chemical Sciences, A.Martin et al., 4<sup>th</sup> Edition. 1993.  
Published by Lea and Febiger, USA.

**Other references:**

**Some Basic Reading References:**

- Physicochemical Principles of Pharmacy by A.T. Florence and D. Attwood. 4<sup>th</sup> Edition.  
2005. Published by Pharmaceutical Press, UK.
- Pharmaceutics, The Science of Dosage Form Design by M.E. Aulton. 2<sup>nd</sup> Edition.  
2002. Published by Churchill Livingstone, USA.
- Pharmaceutical Calculations. Howard C. Ansel and Mitchell J. Stoklosa.  
12<sup>th</sup> Edition.  
2006. Published by Lippincott Williams & Wilkins, USA.
- Bently's Text Book of Pharmaceutics, by E.A.Rawlins, 8<sup>th</sup> Edition, 1984.  
Published  
by EI, BS.UK.