COLLEGE OF PHARMACY
UNIVERSITY OF BASRAH

Physical Pharmacy I

By
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1

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Outlines

- Introduction
- Objectives
- Module construction
- Module assessments
- References

2

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No	Lecture title	hours
1.	**States of matter**, binding forces between molecules, gases, liquids, solid and crystalline matters; phase equilibria and phase rule; thermal analysis.	10
2.	**Thermodynamics**, first law, thermochemistry, second law, third law, free energy function and applications.	8
3.	**Solutions of non-electrolytes**, properties, ideal and real colligative properties, molecular weight determination.	7
4.	**Solution of electrolytes**, properties, Arrhenius theory of dissociation, theory of strong electrolytes, ionic strength, Debye-Huchle theory, coefficients for expressing colligative properties.	5
5.	**Ionic equilibria**, modern theories of acids, bases and salts, acid-base equilibria, calculation of pH, acidity constants, the effect of ionic strength and free energy.	8
6.	**Buffered and isotonic solutions**: Buffer equation; buffer capacity; methods of adjusting tonicity and pH; buffer and biological system.	7

3

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Introduction

- This module is designed to help the pharmacy students to understand the application of **quantitative** and **theoretical** principles of the physical characters of matter in the practice of pharmacy.
- It aids the pharmacists in their attempt to predict the **solubility**, **compatibility** and **biological activity** of drug products.
- It will help in the development of new **dosage forms** as well as in improvement of various modes of administration.

"Each capsule contains your medication, plus a treatment for each of its side effects."

4

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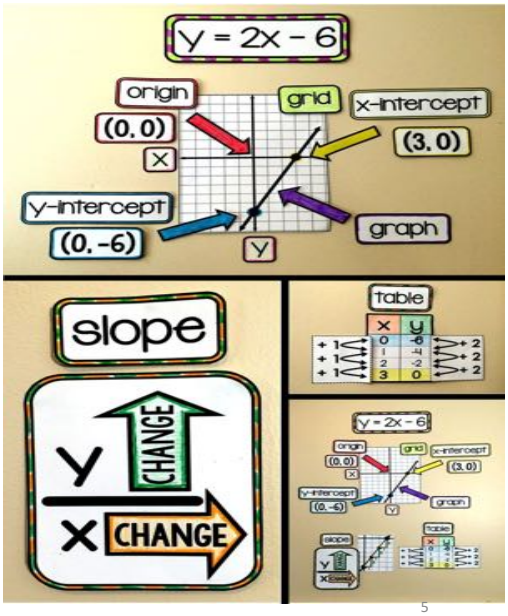
Introduction

- The module requires a basic knowledge about the **mathematical derivation** and integration of equations, methods of **concentration expressions** and calculations and other skills developed during the study of the pharmaceutical orientation and calculation in the 1st class.



5

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Introduction

- During this module, **states of matter** in terms gases, liquids, solid and crystalline, **phase equilibria** and **phase rule**.
- The module will also cover the area of **Thermodynamics laws** and **their applications**.
- Solution of non electrolytes will be discussed and the molecular weight will be determined based on **colligative properties**.
- The final part of the module would be an explanation for **solution of electrolytes**, **ionic equilibria** and **buffered solutions**.

6

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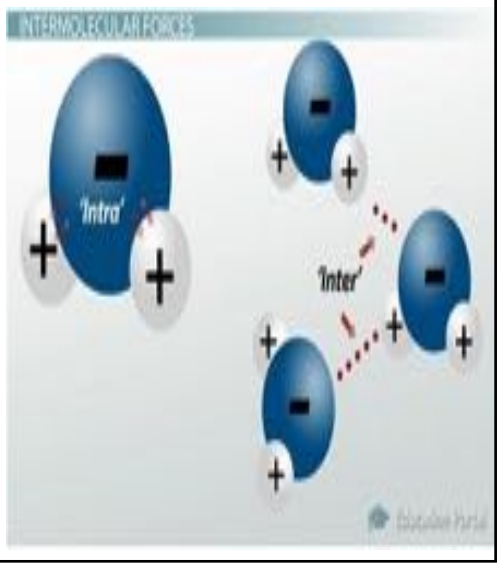
Objectives

- Understand the nature of the intra- and intermolecular forces that are involved in stabilizing molecular and physical structures.
- Describe the solid state, crystallinity, solvates, and polymorphism.
- Understand phase equilibria and phase transitions between the three states of matters.



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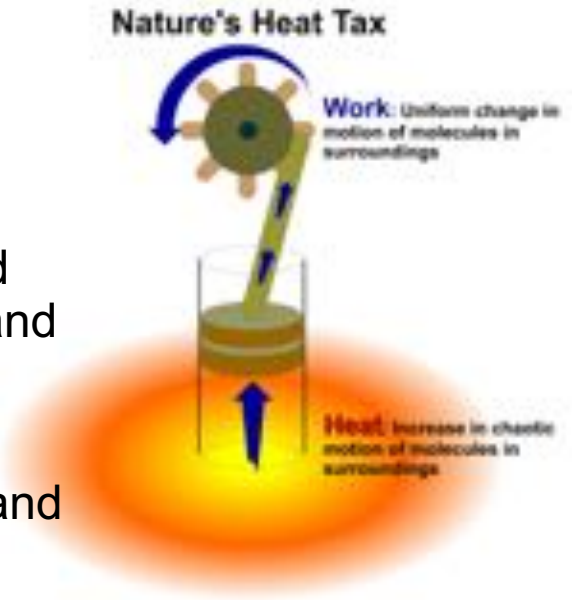
Objectives

- Describe Thermodynamics.
- Understanding of 1st, 2nd and 3rd laws of thermodynamics and their uses.
- Describing the **free energy** and their pharmaceutical applications



8

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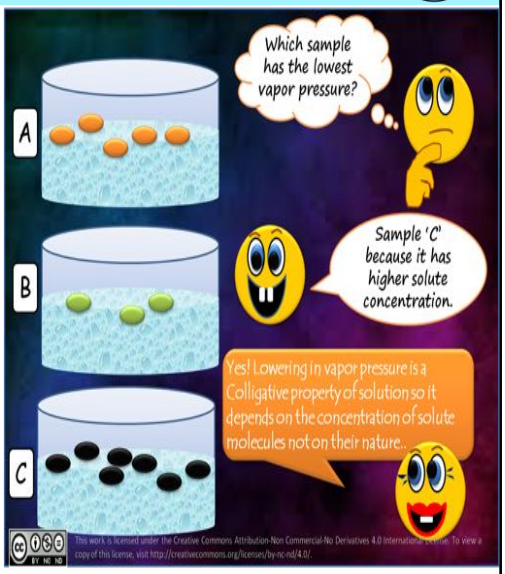
Objectives

- Identification of the colligative properties for non-electrolytes in solution.
- Calculate vapor pressure lowering, boiling point elevation. freezing point depression, and osmotic pressure for solutions of nonelectrolytes.
- Use colligative properties to determine molecular weight



9

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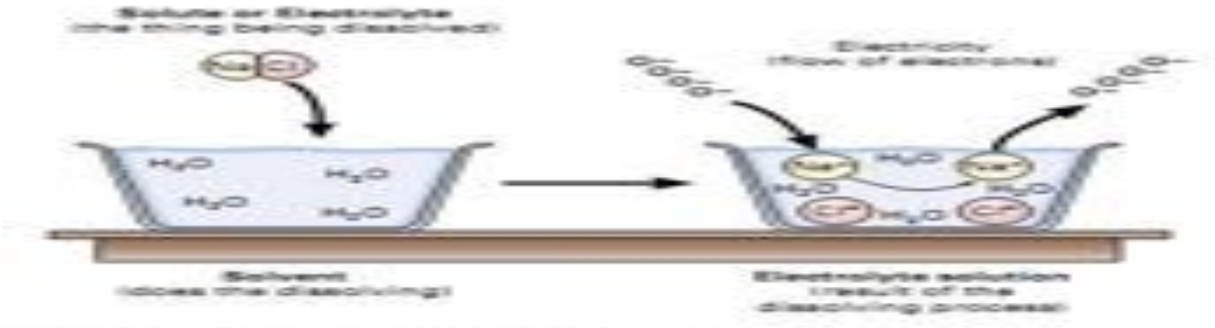
Objectives

➢Apply the Arrhenius theory of electrolyte dissociation.
- Calculate ionic strength.
- Calculate osmotic coefficient, osmolality, and osmolarity.



10

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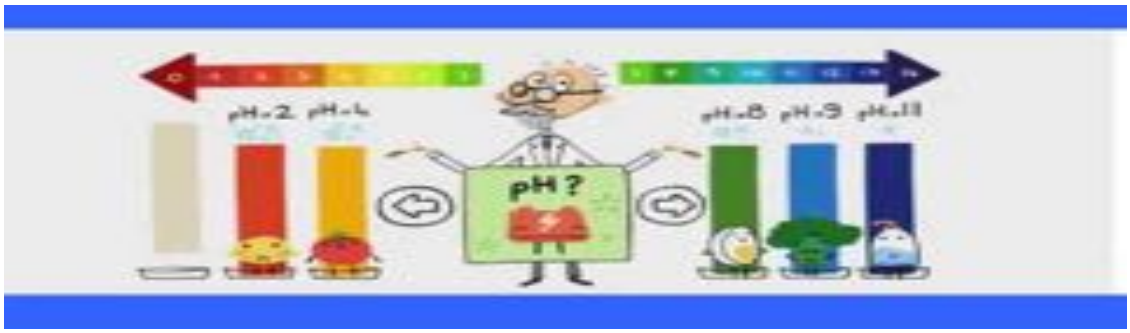
Objectives

- Define of acids and bases
- Concept of Sörensen's pH scale.
- Understanding different terminology such as Ampholytes, Aprotic , etc
- **pKa** and **pH** calculation of aqueous solutions with different composition



11

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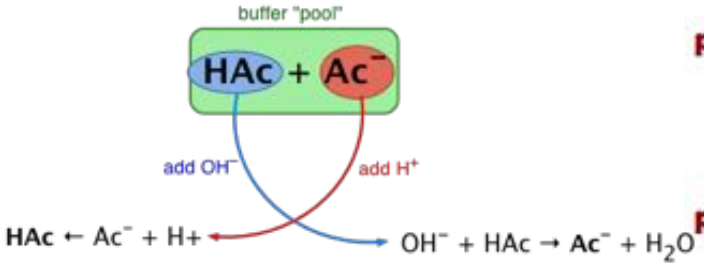
Objectives

- Understand the relationship between pH, pKa and ionization for weak acids and weak bases.
- Apply Henderson-Hasselbalch equation for a weak acids or bases and their salts.
- The concept and calculation of Buffer capacity.



$$pH = pKa + \log \left[\frac{\text{conjugate base}}{\text{weak acid}} \right]$$

$$pH = pKa + \log \left[\frac{[A^-]}{[HA]} \right]$$

12

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Module construction

Theory Lectures:

3 hr /week

Practical lab sessions:

2 hr/ week

13

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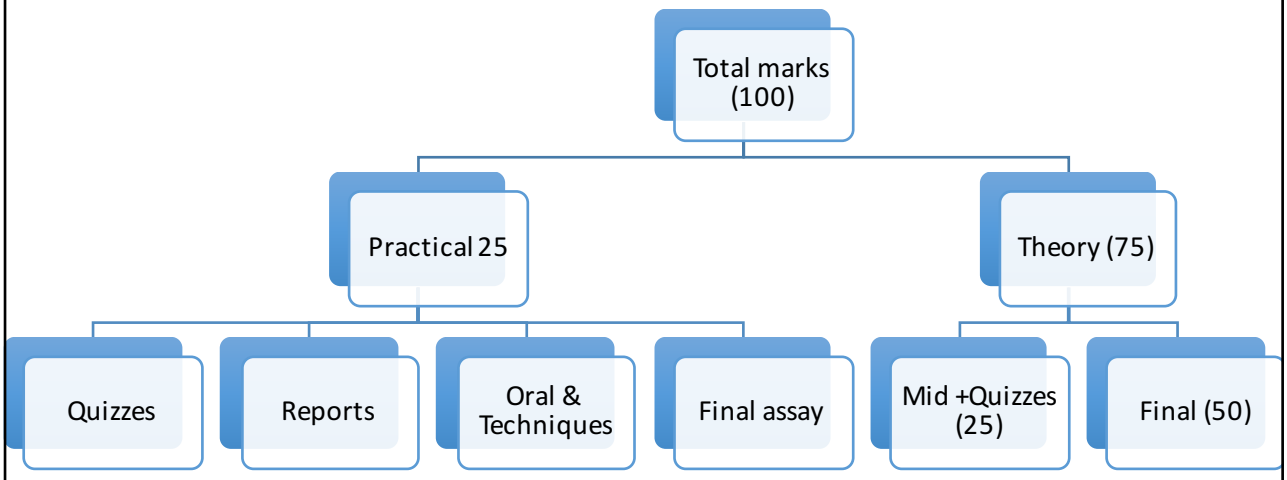
Module Assessment



14

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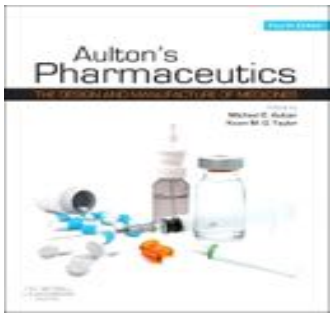

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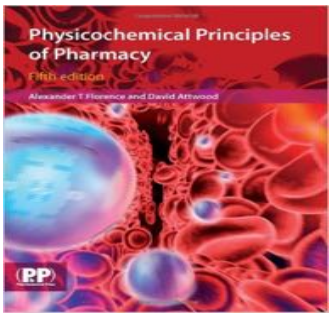

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15

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Thanks for your attention

16