

PHYSICAL PHARMACY (LECTURE)

Rays-J Leradd, RPh, MSPhar

IMPORTANCE OF STUDYING THE PHENOMENON OF SOLUBILITY

Understanding the phenomenon of solubility helps the pharmacist to:

1. Select the best solvent for a drug or a mixture of drugs.
2. Overcome problems arising during preparation of pharmaceutical solutions.
3. Have information about the structure and intermolecular forces of the drug.
4. Many drugs are formulated as solutions or added as powder or solution forms to liquids.
5. Drugs with low aqueous solubility often present problems related to their formulation and bioavailability.

SOLUBILITY

- > **In a quantitative way:** it is the concentration of solute in a saturated solution at a certain temperature.
- > **In a qualitative way:** it is the spontaneous interaction of two or more substances (solute and solvent) to form a homogenous molecular dispersion.

DEFINITION OF TERMS

SOLUTION

- > is a mixture of two or more components that forms a homogenous mixture. The components are referred to the solute and/or solutes and the solvent and/or solvents.

SOLUTE

- > is the dissolved agent (less abundant part of the solution)

SOLVENT

- > is the component in which the solute is dissolved (more abundant part of the solution)

A SUPERSATURATED SOLUTION

- > contains more of the dissolved solute than it would normally contain in a saturated state at a definite temperature.

DEGREE OF SATURATION SOLUBILITY CURVE

Any solution can be saturated, unsaturated, or supersaturated by changing temperature.



THERMODYNAMIC SOLUBILITY OF DRUGS

- > The thermodynamic solubility of a drug in a solvent is the maximum amount of the most stable crystalline form that remains in solution (or quantity of the drug substance which can be completely dissolved) in a given volume of the solvent at a given temperature and pressure under equilibrium conditions.
- > The equilibrium involves a balance of the energy of three interactions against each other:
 - o Solvent with solvent
 - o Solute with solute
 - o Solvent and solute

Fig. 10. Solubility depends on the solution.



Fig. 11. Solubility of the solid depends on the solvent.



Fig. 12. The same solid substance is more soluble in one solvent than the other.



SOLUBILITY PROCESS

A mechanistic perspective of solubilization process for organic solute in water involves the following steps:

1. Break up of solute-solute intermolecular bonds.
2. Break up of solvent-solvent intermolecular bonds.
3. Formation of cavity in solvent phase large enough to accommodate solute molecule.
4. Transfer of solute into the cavity of solvent phase.
5. Formation of solute-solvent intermolecular bonds.

ENTHALPY

- > The enthalpy change of solution refers to the overall amount of heat which is released or absorbed during the dissolving process (at constant pressure).
- > The enthalpy of solution can either be positive (endothermic reaction) or negative (exothermic reaction).



Physical Pharmacy Lecture Notes

Tao Wei



Physical Pharmacy Lecture Notes:

FASTtrack Physical Pharmacy David Attwood, Alexander Taylor Florence, 2012 This FASTtrack book is a revision guide for students giving bullet points of basic information on physical pharmacy This text is derived from the textbook *Physicochemical Principles of Pharmacy* and is designed to be used alongside it for those revision periods when time is short It includes key points tips self assessment questions answers and memory maps to aid with revision For this second edition there is a new chapter added on pharmaceutical nanotechnology and clinical notes are incorporated Journal of the American Pharmaceutical Association American Pharmaceutical Association, 1929 **Advanced Pharmaceutics** Cherng-ju Kim, 2004-03-17 Discussing a comprehensive range of topics *Advanced Pharmaceutics Physicochemical Principles* reviews all aspects of physical pharmacy The book explains the basic mechanistic and quantitative interpretation skills needed to solve physical pharmacy related problems The author supplies a strong fundamental background and extensively covers therm

Catalogue American University of Beirut, 1927 **School of Pharmacy** Temple University. School of Pharmacy, 1958 *Current Catalog* National Library of Medicine (U.S.), 1969 Includes subject section name section and 1968 1970 technical reports **General Bulletin** University of Santo Tomás, 1972 **National Library of Medicine Current Catalog** National Library of Medicine (U.S.), 1969 First multi year cumulation covers six years 1965 70 *Collected Studies on Immunity* Paul Ehrlich, 1906 **Pharmaceutical Journal**, 1901 **Handbook of Engineering Systems Design** Anja Maier, Josef Oehmen, Pieter E. Vermaas, 2022-07-30 This handbook charts the new engineering paradigm of engineering systems It brings together contributions from leading thinkers in the field and discusses the design management and enabling policy of engineering systems It contains explorations of core themes including technical and socio organisational complexity human behaviour and uncertainty The text includes chapters on the education of future engineers the way in which interventions can be designed and presents a look to the future This book follows the emergence of engineering systems a new engineering paradigm that will help solve truly global challenges This global approach is characterised by complex sociotechnical systems that are now co dependent and highly integrated both functionally and technically as well as by a realisation that we all share the same climate natural resources a highly integrated economical system and a responsibility for global sustainability goals The new paradigm and approach requires the re designing of engineering systems that take into account the shifting dynamics of human behaviour the influence of global stakeholders and the need for system integration The text is a reference point for scholars engineers and policy leaders who are interested in broadening their current perspective on engineering systems design and in devising interventions to help shape societal futures **Elements of the Infinitesimal Calculus** George Henry Chandler, 1907 **The Chlorination Process** Eugene Benjamin Wilson, 1897 **Analytical Chemistry** Frederick Pearson Treadwell, 1906 **The Modern Asphalt Pavement** Clifford Richardson, 1905 **Clays** Heinrich Ries, 1906 Principles and Practice of Artificial Ice-making and Refrigeration

Louis Milton Schmidt, 1907 A History of Chemical Theories and Laws Matthew Moncrieff Pattison Muir, 1907
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