

# PHYSICAL PHARMACY

**PHYSICAL CHEMISTRY** – branch of chemistry concerned with physical properties and structure of matter and with laws and theories of physical and chemical changes

**PHYSICAL PHARMACY** – application of physical chemistry in pharmacy; study of physicochemical properties of substances used in drug formulation

## I. FORCES OF ATTRACTION

### A. INTRAMOLECULAR – intra (within) the molecule

- **Ionic Bond** – transfer of electrons; metal (electron donor) + non-metal (electron acceptor); (ex. Na:  $p^+ = 11$ ;  $e^- = 11 \rightarrow p^+ = 11$ ;  $e^- = 10 \rightarrow$  charge = +1)

#### ○ PERIODIC TRENDS REPRESENTING BONDS

- **Ionization Energy** – energy required remove electron (low M; high NM)
- **Electronegativity** – ability to attract electrons (low M; high NM)

- **Covalent Bonds** – sharing of electrons; non-metal + non-metal; polarity – difference in electronegativity (symmetrical = non-polar)

- **Polar** – unequal sharing of electrons; dipole moment – (ex.  $H^{\delta+}-Br^{\delta-}$ )
- **Non Polar** – equal sharing of electrons (ex.  $Br-Br$ )

### B. INTERMOLECULAR – inter (between) the molecules

- **Van der Waals**

- **Dipole-Dipole**  $\rightarrow P + P$ ; Keesom Forces; orientation effect
- **Dipole-Induced Dipole**  $\rightarrow P + NP$ ; Debye Forces; inductive effect
- **Induced Dipole-Induced Dipole**  $\rightarrow NP + NP$ ; London Forces; dispersive effect

- **Ion-Induced Dipole**  $\rightarrow ion + NP$

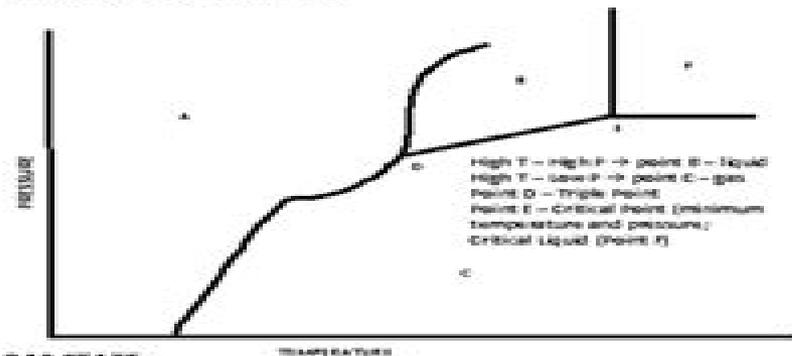
$I_2 \rightarrow NP$  (solubility = 1:2960)

$I_2 + NaI/KI$  (solubilizing agent)  $\rightarrow I_2 + I_3^-$  = increase solubility

- **Hydrogen Bond** – hydrogen atom + electronegative atom (N, O, F)



## PHASE DIAGRAM



### GAS STATE:

- **Kinetic Molecular Theory**

- Gases are composed of small particles called atoms; total volume is negligible in relation to space where they are confined
- Particles do not attract one another but move with complete independence
- Particles exhibit continuous random motion owing to their kinetic energy
- Gases exhibit perfect elasticity (no energy exchange)

## II. GAS LAWS

- at standard temperature (Kelvin =  $^{\circ}C + 273$ ) and pressure (1 atm = 760 mmHg or torr; 760 mmHg;  $1.01325 \times 10^5$  dynes/cm<sup>2</sup>;  $1.01325 \times 10^5$  Pa or N/m<sup>2</sup>; 0.1325 bar)

- **Boyle's Law** – constant temperature; increase P = decrease V; inversely related

$$P \propto \frac{1}{V}$$

- \* density = increase altitude; decrease volume;  $P_1V_1 = P_2V_2$

- **Charles' Law** – constant pressure; increase T = increase V

$$T \propto V; \frac{T_1}{T_2} = \frac{V_1}{V_2} \text{ or } \frac{T_1}{V_1} = \frac{T_2}{V_2}$$

- \*  $H_2O$  – 1.0g/ml  $\rightarrow 4^{\circ}C$

- **Gay Lussac's Law**  $\rightarrow$  constant volume

$$P \propto T; \frac{P_1}{P_2} = \frac{T_1}{T_2} \text{ or } \frac{P_1}{T_1} = \frac{P_2}{T_2}$$

- \*  $121^{\circ}C$  – 15-20psi

# Physical Pharmacy Lecture Notes

**Malverd Abijah Howe**



## 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

**Outlines of Qualitative Chemical Analysis** Frank Austin Gooch, Philip Embury Browning, 1906

**A History of Chemical Theories and Laws** Matthew Moncrieff Pattison Muir, 1907

*Elements of the Infinitesimal Calculus* George Henry Chandler, 1907

**The Chlorination Process** Eugene Benjamin Wilson, 1897

**Analytical Chemistry** Frederick

Pearson Treadwell,1906      **Symmetrical Masonry Arches** Malverd Abijah Howe,1906      *Principles and Practice of  
Artificial Ice-making and Refrigeration* Louis Milton Schmidt,1907      **The Modern Asphalt Pavement** Clifford  
Richardson,1905      **Clays** Heinrich Ries,1906

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