

國立臺北大學自然資源與環境管理研究所

111 學年度第一學期『環境工程科學概論』

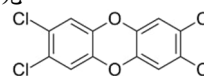
課程講義(04)：環境化學概要
Introduction to Environmental Chemistry

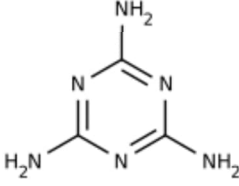
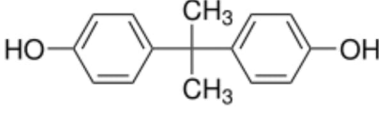
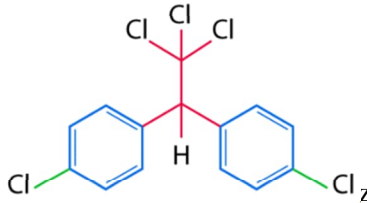
● REVIEW OF BASIC CHEMICAL CONCEPTS

- “Chemistry is the study of matter”
- Atoms, Elements, and the Periodic Table => Isotopes
- Mole, Molar Units (Molarity), and Activity Units
- Chemical Reactions and Stoichiometry
 - ⇒Balancing Chemical Reactions => Stoichiometry
 - ⇒Types of Chemical Reactions: Precipitation-Dissolution Reaction, Complexation Reaction, Oxidation-Reduction (Redox) Reactions
- Chemical Equilibrium
 - ⇒Precipitation (K_{sp}), Partial Pressure and Molar Rate (Molarity), and pH
- Chemical Kinetics
- Important Elements
 - ⇒Carbon, Oxygen, Hydrogen, Nitrogen, Sulfur, and Phosphorus
 - ⇒Halogen: Fluorine, Chlorine, Bromine
 - ⇒Heavy Metals: Lead (Pb) 鉛、Arsenic (As) 砷、Cadmium (Cd) 鎘、Mercury (Hg) 汞、Chromium (Cr) 鉻、Other Metals (Atomic Weight > 40)
 - ⇒RoHS Directive => Pb, Cd, Hg, Cr⁶⁺, 2 Flame Retardants (Polybrominated biphenyls, PBB; Polybrominated diphenyl ether, PBDE)
 - ⇒Greenhouse Gases: CO₂, CH₄, N₂O, HFCs (Flouro-hydrocarbons), PFCs (Perfluorocarbons), SF₆, NF₃
 - ⇒Rare Earth Elements (REE) => Epitaxy (GIS); Silicon crystal => Wafer
- Inorganic Chemicals and Organic Chemicals
 - ⇒Organic Farming and Organic Food
 - ⇒Genetically Modified Organism (GMO)

● ORGANIC CHEMISTRY

- Alkane, Alkene, and Alkynes => 甲烷 Methane、乙烯 Ethylene、丙炔 Propyne
- Aryl (Aromatic) Compounds
 - ⇒BTX (Benzene-Toluene-Xylene) and PAH (Polycyclic aromatic hydrocarbon)
 - ⇒PCB: Polychlorinated biphenyl; PCDDs: Polychlorinated dibenzo-p-dioxins
 - ⇒DDT: di-chloro-diphenyl-tri-chloro-ethane 二氯二苯基三氯乙烷
 - ⇒TCDD: 2,3,7,8-Tetrachlorodibenzo-p-dioxin 四氯聯苯戴奧辛
- Phenol：壬基苯酚 (Nonyl Phenol, NP)；雙酚 A (Bisphenol A, BPA)
- Cyanurotriamine (Melamine) 三聚氰胺
 - ⇒Melamine resin 三聚氰胺-甲醛樹脂 (美耐皿)



 <p>三聚氰胺 (Melamine) Cyanurotriamine 化學式：$C_3H_6N_6$ 1,3,5-Triazine-2,4,6-triamine</p>	 <p>雙酚 A, Bisphenol A (BPA) 化學式：$(CH_3)_2C(C_6H_4OH)_2$ 4,4'-dihydroxy-2,2-diphenylpropane</p>	 <p>滴滴涕, 雙對氯苯基三氯乙烷 化學式：$(ClC_6H_4)_2CH(CCl_3)$ Dichloro-Diphenyl-Trichloroethane</p>
---	--	---

- WATER CHEMISTRY

- State of Solution Impurities
⇒ Distillation, Precipitation, Adsorption, and Liquid Extraction ⇒ Suspensions
- Concentration Units in Aqueous Solutions or Suspensions
⇒ ppm vs. mg/L; Normality and Equivalent Weight
- Transport and Fate of Water Pollutants
- Emerging Water Pollutants

- ATMOSPHERIC CHEMISTRY

- Compressible Fluids vs. Incompressible Fluids
- Composition of the Atmosphere
- Ideal Gas Law and Ideal Gas Constant ⇒ 22.4 L/mole, 24.5 L/mole
- Dalton's Law of Partial Pressures and Henry Constant
- Concentration of Pollutants in Air
⇒ Gaseous vs. Particulate Pollutants ⇒ ppm(v) vs. mg/m³
- Photochemical Reactions
- Radiative Forcing and Greenhouse Effect
⇒ Representative Concentration Pathway

- NUCLEAR CHEMISTRY

- $E = mc^2$
- Nuclear Fission vs. Nuclear Fusion
- Radiation and Radioactivity: Nuclear Decay and Half Life
- Decommissioning of Nuclear Power Plants

- HOMEWORK ASSIGNMENT #2 (Due 2022/10/18) :

本次作業主題為「毒性及關注化學物質」，請回答以下問題：

- (1) 請參考《毒性及關注化學物質管理法》定義「毒性及關注化學物質」。
- (2) 一般俗稱的「環境賀爾蒙」（具有內分泌干擾素特性之化學物質）屬於那一類的「毒性化學物質」？「環境賀爾蒙」會對人體造成什麼危害呢？
- (3) 民國 100 年間發生俗稱「塑化劑事件」之食品安全事件，請問該事件之「違法添加物」有那些？這些添加物又會對人體造成何種影響？