

國立臺北大學自然資源與環境管理研究所

114 學年度第一學期『環境工程科學概論』

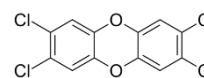
課程講義(03)：環境化學概要 Introduction to Environmental Chemistry

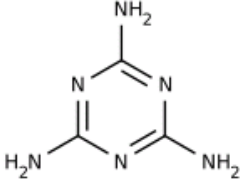
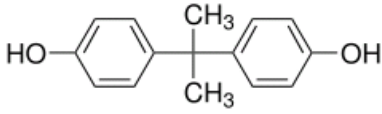
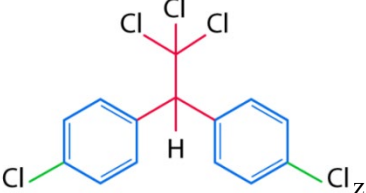
● REVIEW OF BASIC CHEMICAL CONCEPTS

- “Chemistry is the study of matter” => Elements, Compounds, Chemicals
- Atoms, Elements, and the Periodic Table => Isotopes
- Mole, Molar Units (Molarity), and Activity Units
- Chemical Reactions and Stoichiometry
 - ⇒ Balancing Chemical Reactions => Stoichiometry
 - ⇒ Chemical Reactions: Precipitation-Dissolution Reactions, Acid-Base (or Neutralization) Reactions, Complexation Reactions, Oxidation-Reduction (Redox) Reactions
- Chemical Equilibrium
 - ⇒ Precipitation (K_{sp}), Partial Pressure and Molar Rate (Molarity), and pH
- Chemical Kinetics => Reaction Orders
- 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, Cr^{6+} , 2 Flame Retardants (Polybrominated biphenyls, PBB; Polybrominated diphenyl ether, PBDE)
 - ⇒ Greenhouse Gases: CO_2 , CH_4 , N_2O , HFCs (Fluoro-hydrocarbons), PFCs (Perfluorocarbons), SF_6 , NF_3
 - ⇒ 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)



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

● SOIL CHEMISTRY

- ☐ Exchange Capacity
⇒ Ability to leach ions such as magnesium, calcium, nitrate, and phosphate
- ☐ Sorption: Concentration of Soil Contaminants (Pollutants)
- ☐ Soil Organic Carbon (SOC) ⇒ Carbon Pool, Carbon Sink

● ATMOSPHERIC CHEMISTRY

- ☐ Compressible Fluids vs. Incompressible Fluids
- ☐ Composition of the Atmosphere
⇒ Ozone and Vapor ⇒ Green House Gases?
- ☐ 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

● HOMEWORK ASSIGNMENT #2 (Due 2025/10/14) :

請瀏覽環境部化學物質管理署[具食安風險之化學物質](#)網頁，以回答以下問題

- (1) 請整理、定義「環境賀爾蒙」(具有內分泌干擾素特性之化學物質)。「環境賀爾蒙」屬於那一類的「毒性化學物質」？「環境賀爾蒙」又會對人體造成什麼危害呢？
- (2) 請整理【暴露風險評估】單元有關「毒 vs. 藥」、以及「每日容許攝取量」與「最大殘留安全容許量」之說明內容。