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CEE 772: Instrumental Methods in Environmental Analysis

Lecture #1

Introduction: Course Administration and Analytical Review

(Skoog, Chapt. 1A-1D)

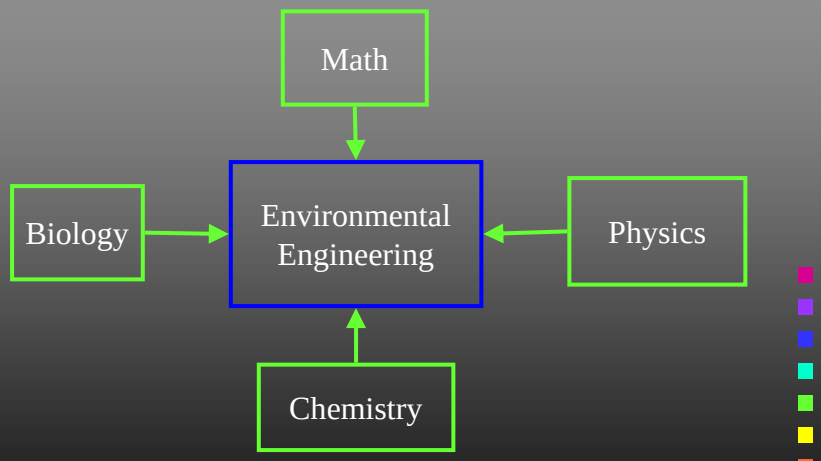
(pp.1-11)

(Harris, Chapt. 0)
(pp.xvi-12)

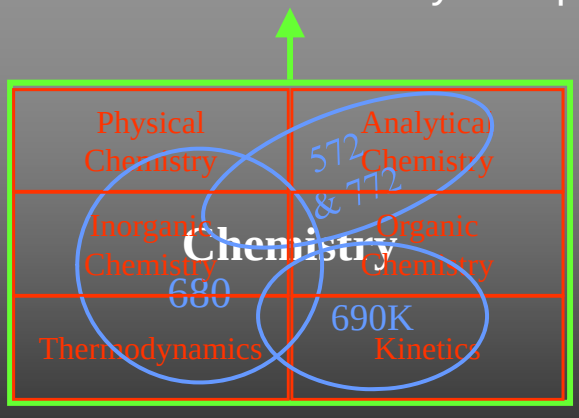
Course Administration

- Schedule
  - TuTh: lecture, M: lab in Elab II, room 301/308
- Course Syllabus
- Book: Skoog et al., 2006
  - supplemented by Harris, 2006
  - course notes (Reckhow, 2012)
- Detailed Course Outline
- Instrument Project
  - Design and execute lab exercise
  - Supporting lecture
  - Written report
- Web site

Relation with Environmental Engineering



Relation with other Chemistry Disciplines



- First of two courses on chemical analysis

Questions for Environmental Analytical Chemists

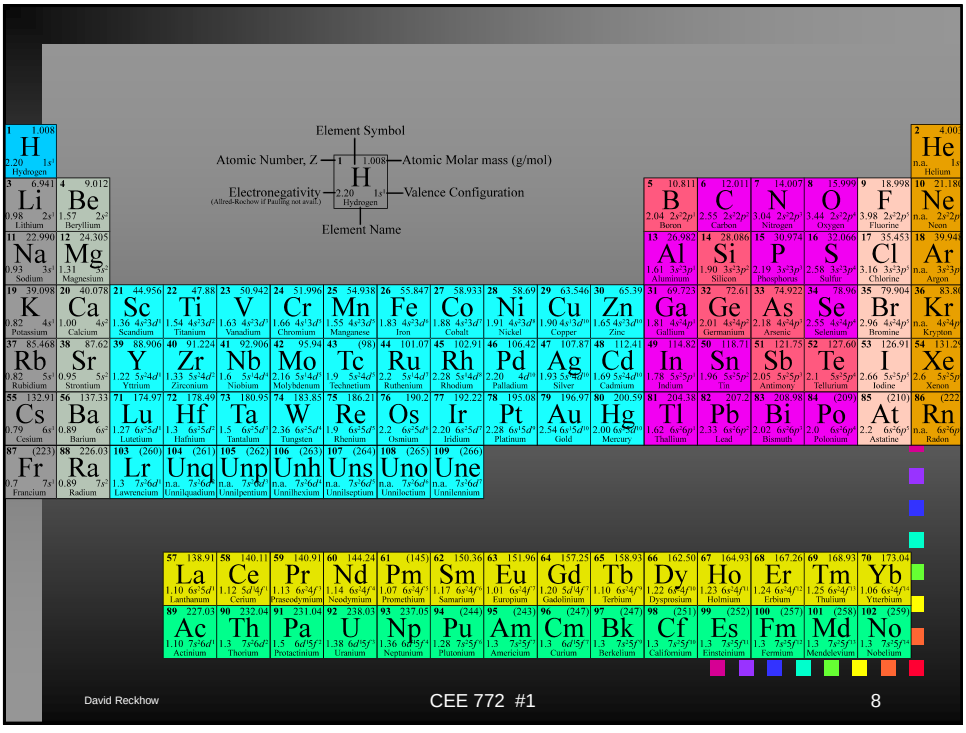
- How do we assess water quality?
  - What to measure, when and why
- How do we do it?
  - Gravimetry, titrimetry, spectrophotometry, chromatography
- What can chemical analysis tell us?
  - What can't it be used for?
- What is the significance of WQ parameters?
  - Metals, nutrients, solids, organics?
- How should samples be collected and preserved?
  - How do we spot blunders?
- How sure can we be of the measurements?

Why learn WQ analysis?

- You may have to make these measurement yourself
  - As a consultant
  - As a utility or industrial employee
  - As a graduate student
- You may need to interpret and critique water quality data collected by others
- You may need to select the types of water quality analyses required for a particular job

Review

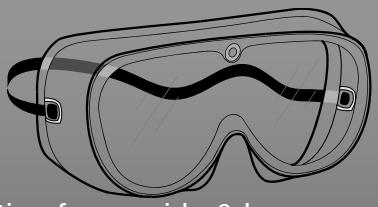
- Laboratory Basics
  - CEE 577
  - Early Chapters in Harris
- Units
  - Mass based
  - Molarity
  - Molality
  - Normality
  - Mole fraction
  - Atmospheres
- Chemical Stoichiometry
  - mass balance
  - balancing equations
- Thermodynamics
  - law of mass action
  - types of equilibria



Chemical Equilibria

- Law of mass action
  - equilibrium quotients
- Examples
  - ion product of water
  - acid dissociation
  - precipitation
  - redox
  - adsorption
  - volatilization

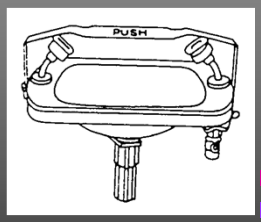
Personal Safety

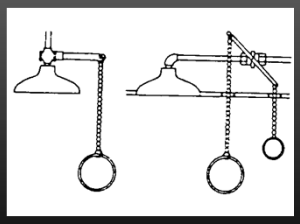


- Lab coats
  - Recommended for protection from acids & bases
- Goggles
  - Especially important if you don't wear shatter-proof glasses
- Gloves
  - Latex: good flexibility, but leaky
  - Butyl rubber: much better
- General
  - Avoid loose fitting clothing

Lab Safety

- Washes
  - Eye wash
    - Squeeze bottle
    - Plumbed fixture
  - Drench Shower





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Eye wash

- In Attleboro WTP

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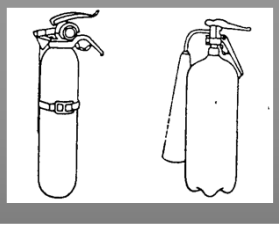
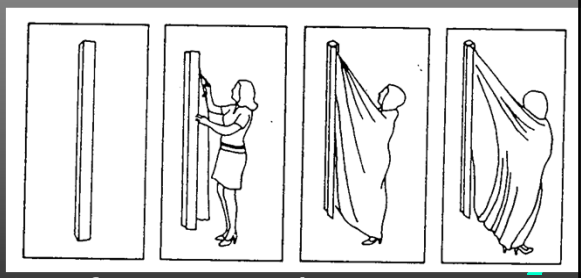
Lab Safety



- Fire
  - Extinguisher
  - Fire blanket



- General: EH&S safety manual
  - http://www.umass.edu/safety/lhs.html

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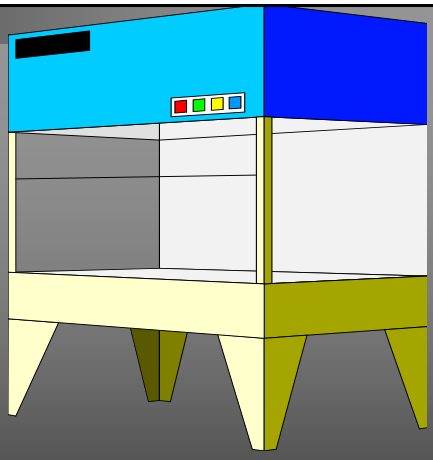
Vapors



- Fume hood
  - Face velocities
  - Sash position
  - EH&S standards
    - http://www.umass.edu/safety/fume-hood.html

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Disposal

- General waste
  - Non recyclables
- Recyclable materials
  - Paper, plastic
- Non hazardous Chemical waste
  - Organic waste (container with EH&S hazardous waste label)
  - Aqueous waste (flushed down a drain after pH neutralization)
- Hazardous wastes
  - Definitions
  - Typical Examples

- To next lecture