**Brooklyn College**
**Department of Chemistry**

***Chem 35. Introduction to Inorganic Chemistry***
4 hours lecture; 4 credits
**Prerequisite:** Chemistry 2.

**Description**: This course introduces the principles of modern inorganic chemistry including elements of geochemistry and it integrates the properties and reactions of representative compounds with illustrations of the importance of inorganic chemistry in the chemical industry, in advanced materials technology, in biology/medicine, and in environmental issues.

**Objective:** To familiarize students with the basic principles of inorganic chemistry and to enable them to recognize the role and the importance of inorganic compounds and reactions in industrial applications, in living systems, and in environmental issues. This course also aims at providing or improving oral presentation skills through multiple sessions devoted specifically to student presentations.

## Course Outline

### *Part I: General principles*

1. The origin of the elements. Composition of stars and solar system planets, nucleosynthesis of light elements and stellar evolution. Nucleosynthesis of heavy elements.
2. Structure and composition of the Earth: core, mantle, crust, and biosphere. Rocks, minerals and metals. The hydrosphere and the atmosphere. The cycles of matter and energetics of earth systems.
3. Atomic structure, quantum numbers and atomic orbitals. Electron configurations, the Periodic Table and periodic trends.
4. Qualitative description of molecular orbital theory. Homonuclear and heteronuclear diatomic molecules and examples of polyatomic molecules.
5. Acids and bases. Aqueous and non-aqueous systems. Hard-soft acid-base principles. Superacids.
6. Physical methods for the characterization of inorganic compounds.
7. d-Metal complexes. Coordination and organometallic compounds.
8. Solid state chemistry: Composition, structures and properties of minerals and simple solids. Ionic crystals: energetics and crystal structures. Metallic solids. Oxidation and reduction: chemical and electrochemical extractions of metals and other elements.
9. Bioinorganic chemistry. The role of metals in biology.

### *Section II: Descriptive chemistry and special topics*
### *(Independent study/research projects and student presentations; guidelines attached)*

Some examples of possible topics for discussion are:

- Hydrogen: The fuel of the future?
- Silicon and computers.
- Ozone: good or bad?
- Carbon dioxide and the greenhouse effect. Petroleum-derived fuels and alternative biofuels.
- Advanced materials and nanotechnology: Fullerenes, superconducting fullerides and carbon nanotubes.
- Inorganic materials for solar cells and advanced batteries.

- Catalysts in today's world.
- What is asbestos and why is it dangerous?
- The colors of precious stones.
- Metal-based drugs against cancer and other diseases.
- Fluoride in dental health.
- Blood is red but plants are green. Hemoglobin and chlorophyll.
- Biological functions of nitric oxide.
- Oxygen and life: superoxide and superoxide dismutase proteins.
- Lead poisoning.
- Industrial production of ammonia, nitrogen fixation and fertilizers.
- Sulfur and nitrogen oxides in air pollution.
- Heavy metals in the environment.

**Bibliography:**

-*Shriver and Atkins Inorganic Chemistry*, 5th Ed., by Atkins Overton, Rourke, Weller, Armstrong, and Hagerman; Freeman (2010) – *Note: 6th Edition will be available in January 2014*
**Required.**

**Handouts and supplemental reading**: Additional information will be distributed for special topics.

**Other recommended books:**

*Inorganic Chemistry*, Gary L Miessler and Donald Tarr, 5th Ed, Pearson – Prentice Hall (2013)
**Solutions Manual for Inorganic Chemistry (Miessler & Tarr) - Inorganic/organic molecular models**

-*Inorganic Chemistry*, Catherine E. Housecroft and Alan G. Sharpe, 4th Ed., Pearson – Prentice Hall (2012)