DIPARTIMENTO DI SCIENZE

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| COURSE: Fundamentals of Inorganic Chemistry (Module) | | | |
| ACADEMIC YEAR: **2017-2018** | | | |
| TYPE OF EDUCATIONAL ACTIVITY: Characterizing | | | |
| TEACHER: Giampaolo Ricciardi | | | |
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| phone: 0971-205933 | | mobile: | |
| Language: italian | | | |
| ECTS: 6 (6 lessons and tutorials/0 practice) | n. of hours: (48 lessons and tutorials/0 practice) | Campus: **Potenza**<br>Dept./School: **Dipartimento di Scienze**<br>Program: **Chemstry (L27)** | Semester:<br>**1th Semester, from 02/10/2017 to 15-31/01/2018** |

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The main objective of the Course is to provide the Students with the fundamentals of the chemical and physical properties of the main group elements and transition metals. In particular, at the end of the Course, the Students should be able to handle the basic Inorganic Chemistry concepts in discussing the key relationships between the electronic structure and the chemical and physical properties of the main group elements and transition metals and of their most relevant compounds.

PRE-REQUIREMENTS

General and Inorganic Chemistry, Physical Chemistry, Organic Chemistry.

SYLLABUS

**Introduction.** Origin and evolution of Inorganic Chemistry. Peculiarities of the Inorganic Chemistry and relationships with Organic Chemistry and Biology: Organometallics and Bioinorganic Chemistry.

**Periodic properties of the elements**. Main group elements and transition metals. Relationships between the electronic structure of the elements and their properties, such as ionization energies, electronic affinities, electronegativity, oxidation states, atomic and ionic radii.

**Oxides and Hydrides.** Periodicity of their thermochemical stability, solubility, and acid-base character.

**Main-group elements.**

**Group 1 and 2 elements.** Redox behavior. Binary compounds: oxides, peroxides, superoxides, hydrides, halides. Hydroxides.

**Group 13 elements.** Redox behavior. Binary compounds: oxides, hydrides, halides. Hydroxides. Hydrido-complexes. Organocompounds. Polynuclear compounds. Role of the low-oxidation states in the chemistry of the heavier elements of the group.

**Group 14 elements.** Redox behavior. Binary compounds: oxides, hydrides, halides. Oxoanions. Oxoacids. Organocompounds. Catenation. Multiple bonds. Polynuclear compounds. Role of the low-oxidation states in the chemistry of the heavier elements of the group.

**Group 15 elements.** Redox behavior. Binary compounds: oxides, hydrides, halides, oxohalides. Oxoanions. Oxoacids. Catenation. Multiple bonds. Polynuclear compounds. Oxidation states and metallic character of the heavier elements of the group.

**Group 16 elements.** Redox behavior. Binary compounds: oxides, hydrides, halides, oxohalides. Oxoanions. Oxoacids. Catenation. Multiple bonds. Polynuclear compounds. Oxidation states and metallic character of the heavier elements of the group.

**Group 17 elements.** Redox behavior. Binary compounds: oxides, hydrides, oxohalides. Oxoanions. Oxoacids. Hydrogen halides. Catenation. Multiple bonds. Polynuclear and interhalogenic compounds.

**Group 18 elements.** General properties. Xenon fluorides and oxofluorides.

**Transition elements (*d*-block elements).** First-raw transition metals. Electronic configurations, dimensional properties, oxidation states, redox potentials, solution chemistry. Second and third raw transition metals. Electronic configurations, dimensional properties (lanthanoidic contraction), oxidation states, redox potentials, solution chemistry. Comparison with the first-raw transition metals. Relevant properties of the most common transition-metal families and their binary compounds.

**Coordination compounds.** Electronic and structural properties of the most common ligands. Stereochemistry of the coordination compounds. Formation equilibria, partial and global stability constants of the coordination compounds. Metal-ligand bond in the coordination compounds and interpretation of their electronic and magnetic properties: crystal-field and ligand-field models. Electronic and structural properties of coordination compounds of special interest: metal carbonyls, metal clusters, and organometallic compounds.

TEACHING METHODS
Theoretical lessons, Classroom tutorials.
Lecture format: lectures will be comprised of PowerPoint slides prepared by the Teacher supplemented with chalkboard presentations.

EVALUATION METHODS
Final oral examination.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL
Textbooks:

- Purcell, K. F.; Kotz, J. C., *Inorganic Chemistry* - Holt-Saunders International Editions.
- Miessler G. L.; Tarr, D. A., *Inorganic Chemistry,* Forth Edition – Pearson Prentice Hall, 2011.
  (Edizione Italiana: Miessler G. L.; Tarr, D. A, Chimica Inorganica - Piccin, 2012)
- Mahan, B. H.*, Chimica Generale ed Inorganica*, Casa Editrice Ambrosiana, Milano, 1971 and next editions.
- Mahan, B. H., Myers, R. J., *Chimica*, Casa Editrice Ambrosiana, Milano, 1991.
- Atkins P.et al., *Inorganic Chemistry*, Fifth Edition - Oxford University Press, 2010.
- Cotton, F. A.; Wilkinson, G., Chimica Inorganica - Casa Editrice Ambrosiana, Milano, 1984.
- In addition the students will be provided with PowerPoint slides prepared by the Teacher.

INTERACTION WITH STUDENTS
Office hours: 9.30-11.30 am M., 11:30-1:30 pm Th., and by appointment.

EXAMINATION SESSIONS (FORECAST)[1]
February, 15, 2018
March, 15, 2018
May, 17, 2018
June, 14, 2018
July, 12, 2018
October, 4, 2018
December, 6, 2018

SEMINARS BY EXTERNAL EXPERTS YES □ NO X

FURTHER INFORMATION

[1]Subject to possible changes: check the web site of the Teacher or the Department/School for updates.