

# SUBJECT GUIDE

## INORGANIC CHEMISTRY

Academic year 2016-2017

Updated in the last meeting of Department 24/06/2016



MODULE	CONTENT	YEAR	TERM	CREDITS	TYPE
Chemistry	Inorganic Chemistry	1º	2º	6	Basic
<b>LECTURER(S)</b>		<b>Postal address, telephone nº, e-mail address</b>			
<ul style="list-style-type: none"><li>• Ricardo Navarrete Casas- Group A</li><li>• Josefa M. González Pérez- Group B</li><li>• M<sup>a</sup> Teresa Fernández Martínez- Group C</li><li>• Ricardo Navarrete Casas- Group D</li><li>• Manolo Sánchez Polo- Group E</li><li>• Manolo Sánchez Polo- Group F</li></ul>		Inorganic Department. Third floor. Faculty of Pharmacy. Postal Code 18071. Mails: rncasas@ugr.es, jmgp@ugr.es, mtfernan@ugr.es, mansanch@ugr.es.			
<b>DEGREE WITHIN WHICH THE SUBJECT IS TAUGHT</b>					
Degree in Pharmacy					
<b>PREREQUISITES and/or RECOMMENDATIONS (if necessary)</b>					
Have completed and passed the course Basic Chemical Principles, which is also offered in the first year (first semester) degree in Pharmacy.					
<b>BRIEF ACCOUNT OF THE SUBJECT PROGRAMME (ACCORDING TO THE DEGREE ¿??)</b>					
<ul style="list-style-type: none"><li>- Inorganic Chemistry.</li><li>- Non-metallic elements, metal and composites.</li><li>- Pharmaceutical applications of inorganic elements and compounds.</li></ul>					
<b>GENERAL AND PARTICULAR ABILITIES</b>					
<b>A. General skills</b> <ul style="list-style-type: none"><li>• Identify, design, collect, analyze, control and produce drugs and medicines, and other products and raw materials of medical interest for human or veterinary use.</li><li>• Learn to apply the scientific method and acquire skills in handling legislation, sources of information, literature, protocol development and other aspects that are necessary considered for the design and critical assessment of preclinical and clinical trials.</li><li>• Design, implement and evaluate reagents, clinical analytical methods and techniques, knowing the basics of clinical analyzes, and the characteristics and contents of the reports of laboratory diagnosis.</li><li>• Develop health and hygiene analysis, especially those related to food and the environment.</li><li>• Develop information and communication skills, both oral and written, to deal with patients and users of the center where you are working. Promote and collaboration capabilities in multidisciplinary teams and those related to other health professionals.</li></ul>					



## B. Specific skills

- Identify, design, collect, analyze and produce active ingredients, drugs and another products and materials of sanitary interest.
- Select appropriate techniques and procedures in the design, implementation and evaluation of reagents, methods and analytical techniques.
- Perform standard laboratory procedures including the use of scientific equipment for synthesis and analysis, including appropriate instrumentation.
- Estimating the risks associated with the use of chemical and laboratory procedures.
- To know the physical and chemical characteristics of the substances used for the manufacture of medicines.
- To know and understand the characteristics of reactions in solution, the different states of matter and the principles of thermodynamics and its application to pharmaceutical sciences.
- Understanding the properties of the elements and their compounds, and their application in the pharmaceutical field.

## **OBJECTIVES (EXPRESSED IN TERMS OF EXPECTED RESULTS OF THE TEACHING PROGRAMME)**

- Understand the chemical elements and their compounds with focus on chemical aspects that are important in pharmaceutical practice.
- Understand the role of chemical elements and their inorganic compounds in biological systems, both in normal and altered state.
- To know the important role of the transition elements and coordination compounds in fundamental metabolic processes for life.

## **DETAILED SUBJECT SYLLABUS**

### **Unit 1. Noble Gases and Chemistry of hydrogen.**

Group 18 elements: molecular species; physical properties; chemical behavior (reactivity); collection methods; applications. Major compounds. Hydrogen introduction. Isotopes. Molecular hydrogen. Physical Properties. Chemical behavior. Preparation methods. Applications. Biological aspects. Major compounds. Hydrides.

### **Unit 2. Elements of Group 17.**

Introduction. Isotopes. Molecular species. Physical Properties. Chemical behavior. Preparation methods. Applications. Biological aspects. Lead compounds: halides, oxides (binary oxides, oxoacids and oxosalts).

### **Unit 3. Elements of Group 16: Oxygen**

Introduction. Molecular species. Physical Properties. Chemical behavior. Preparation methods. Applications. Biological aspects. Major compounds. The water and hydrogen peroxide. The water in the chemicals. Inorganic aspects of water treatment and water purification.

### **Unit 4. Orders Group 16 elements**

Introduction. Molecular species. Allotropy and solid phases. Physical Properties. Chemical behavior. Preparation methods. Applications. Biological aspects. Major compounds: hydrides: general aspects. Binary oxides (carbon dioxide and sulfur trioxide); oxoacids (sulfuric acid); oxosalts and other compounds.



### **Unit 5. Elements of Group 15: Nitrogen**

Introduction. Physical Properties. Chemical behavior. Preparation methods. Applications. Biological aspects. Major compounds: hydrides (general, ammonia and hydrazine); binary oxides; oxoacids; oxosalts (nitrates and nitrites).

### **Unit 6. Others group 15 elements**

Introduction. Molecular species. Allotropy and solid phases. Physical Properties. Chemical behavior. Preparation methods. Applications. Biological aspects. Major compounds: hydrides; halides; oxides; oxoacids (phosphoric acid); oxosalts (phosphate and polyphosphate).

### **Unit 7. Elements of Group 14: Carbon.**

Introduction. Molecular species. Allotropy. Physical Properties. Chemical resistance (reactivity of molecular and atomic species). Preparation methods. Applications. Biological aspects. Major compounds: halides; binary oxides (carbon monoxide and carbon dioxide); oxoacids and oxosalts (carbonates and bicarbonates, silicates).

### **Unit 8. Orders Group 14 elements.**

Introduction. Molecular species. Allotropy. Physical Properties. Chemical resistance (reactivity of molecular and atomic species). Preparation methods. Applications. Biological aspects. Major compounds: hydrides; halides; oxides (silica); oxoacids and oxosalts (silicates).

### **Unit 9. Elements of Group 13.**

Introduction. Molecular species and solid phases. Boro: B12 Unit. Metallic character of the other elements. Physical Properties. Chemical behavior. Preparation methods. Applications. Biological aspects. Major compounds: hydrides (boron hydrides); halides; binary oxides and hydroxides (oxides of boron and aluminum, aluminum hydroxide); oxyacids and oxosalts (borates).

### **Unit 10. S block elements .**

Introduction: Electronic configuration . Physical Properties . Chemical behavior. Preparation methods. Biological function of these elements in relation to their chemical properties. Importance of calcium in pharmaceutical preparations. Major compounds : hydrides ( ionic or saline hydrides ); halides ; oxides , peroxides , superoxides ; hydroxides ; coordination compounds and organometallic compounds. Interesting applications of these compounds.

### **Unit 11. D block elements: First transition series**

Introduction: Electronic configuration . Physical Properties . Chemical behavior. Preparation methods. Applications. Role in biological systems . Major compounds: hydrides; halides (simple and metal-metal) ; oxides (binary and mixed); hydroxides, oxyhydroxides, and hydroxy salts; oxoacids and oxoanions; sulfides , interstitial phases. Coordination compounds.

### **Unit 12. D block elements: Second and third transition series.**

Introduction: Electronic configuration. Physical Properties. Chemical behavior. Preparation methods. Applications. Role in biological systems. Major compounds: hydrides; halides (simple and metal-metal); oxides (binary and mixed); hydroxides, oxyhydroxides, and hydroxy salts; oxoacids and oxoanions; sulfides, interstitial phases. Coordination compounds and biological systems.

### **Unit 13. Chemistry f block elements.**

Introduction. Electronic configuration. Physical Properties. Characteristic chemical behavior related to their electronic configurations. Preparation methods. Applications. Major compounds. Coordination compounds. Biohealth applications of these compounds in particular gadolinium complexes used as NMR contrast



## PRACTICAL SYLLABUS.

### FIRST SESSION:

- Preparation of a crystallization gel. Study of the chemical properties of the halogens: reactivity and study the variation of the oxidizing capacity. Solubility of halogens and polyiodides formation.

### SECOND SESSION:

- Study of the chemical properties of compounds formed by metallic elements belonging to the first transition series: chromium, cobalt and copper.

### THIRD SESSION:

- $[\text{Ni}(\text{en})_3]\text{SO}_4$  Studio System
- Synthesis of the complex. Observation of the different reaction steps
- Crystallization of the compound
- Recording and study of IR spectrum.

### FOURTH SESSION:

- Determination of the sulfate nickel tris (ethylenediamine) nickel (II) cation complexometric titration by Ni (II) with the anion ethylenediaminetetraacetate ( $\text{EDTA}^{4-}$ ).

### FIFTH SESSION:

- ANTACIDS: systemic and non-systemic.
- Study of the hydroxides as antacids.
- Calculate the percent of magnesium hydroxide an impure sample by back-titration with excess hydrochloric acid.

## **READING**

1. Ralph H. Petrucci, F. Geoffrey Herring, Jeffrey D. Madura y Carey Bissonnette. General Chemistry: principles and modern applications. Pearson Ed., S.A., Madrid, 2011.
2. Shriver, D. F., Atkins, P. W., Langford, C. H., "Química Inorgánica" (2ª Edición). Editorial Reverté, 1998. Prentice Hall. Madrid, 2.002.
3. **Housecroft, C., Sharpe, A. G. "Química Inorgánica (2ª Edición). Ed. Pearson, Prentice Hall, 2005.**
4. Chang, R. Química (10ª Edición). Editorial Mc Graw Hill.
5. Barrett, J., "Atomic Structure and Periodicity". The Royal Society of Chemistry, 2002.
6. Henderson, W., "Main Group Chemistry ". Tutorial Chemistry Texts, Vol.3, Royal Society of Chemistry, 2000.
7. Norman, N. C. "Periodicity and the s- and p-block elements", Ed. Oxford Chemistry. Primers-Series Zeneca- Oxford Science Publication, Vol.51, 1997.
8. Valenzuela Calahorro, C., "Química General e Inorgánica para estudiantes de Farmacia". Editorial Universidad de Granada, 2002.



## RECOMMENDED INTERNET LINKS

- Peridic system: [http://www.mcgraw-hill.es/bcv/tabla\\_periodica/element/elemento1.html](http://www.mcgraw-hill.es/bcv/tabla_periodica/element/elemento1.html)
- Orbital Viewer: Free software for visualizing atomic and molecular orbitals:  
<http://www.orbitals.com/orb/ov.html>
- Inorganic Department web site: <http://farmacia.ugr.es/cont.php?sec=5&pag=1#26>
- <http://prado.ugr.es/moodle/>

