



**NATIONAL UNIVERSITY OF ENGINEERING**  
**COLLEGE OF CHEMICAL AND TEXTILE ENGINEERING**  
**CHEMICAL ENGINEERING PROGRAM**

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**QU215 – LABORATORY OF INORGANIC CHEMISTRY**

**I. GENERAL INFORMATION**

<b>CODE</b>	: QU215 Laboratory of Inorganic Chemistry
<b>SEMESTER</b>	: 3
<b>CREDITS</b>	: 1
<b>HOURS PER WEEK</b>	: 3 (Laboratory)
<b>PREREQUISITES</b>	: QU118 Chemistry II QU119 Laboratory of Chemistry II
<b>CONDITION</b>	: Compulsory

**II. COURSE DESCRIPTION**

This course is complementary to theory course QU214 Inorganic Chemistry. Students develop skills for the handling of chemical reactants, materials, laboratory instruments and equipment, applying safety norms. In this laboratory course, students experimentally verify the theoretical concepts and methods presented in course QU214 Inorganic Chemistry.

**III. COURSE OUTCOMES**

At the end of the course, students:

1. Carefully use chemical reactants in proper quantity and concentration according to the experiment to be done.
2. Use instruments, devices and equipment proper of the experimental practice of chemical engineering.
3. Take care safety and security measures in the handling of chemical reactants, instruments and equipment.
4. Write laboratory reports clearly describing carried out experiments, analyzing results and presenting conclusions.

**IV. COURSE CONTENTS**

**1. SOLUBILITY**

Separation and identification of the components of a solid mixture / Determination of properties of some solid substances.

**2. CRYSTALLIZATION**

Crystal growing / Purification by fractional crystallization.

**3. SYMMETRY IN AISLED MOLECULES**

Construction of molecules models / Molecule symmetry / Molecule groups.

**4. REACTION STOICHIOMETRY**

Determination of stoichiometric point of a reaction by JOB method / Mass measurement / Temperature measurement.

**5. COMPLETE REACTIONS**

Copper / Lead / Dioxides.

**6. ACID-BASE**

Conditions for precipitates formation / Precipitates dissolution / Ionic reactions / Hydrolysis / Gas releasing reactions / Reactions forming a complex ion.

## 7. COORDINATION COMPOUND COMPLEXES

Complex reaction of cobalt salt / Formation of iron complexes / Complex dissolution / Relative stability of complex ions / Relative stability of metal cation solution precipitates.

## 8. METAL REACTION WITH ACIDS

Identification of gas released in metal reacting with acids / Gas released by action of sulfuric acid (various concentrations) over zinc.

## 9. ELEMENT OF IA AND IIA GROUPS

Synthesis of sodium peroxide / Synthesis of potassium superoxide / K ion reactions with sodium salts / Properties of magnesium salts / Reaction of calcium chloride in soup water.

## 10. OXYGEN, PEROXIDES, OXIDES AND WATER

Oxygen properties / Synthesis of hydrogen peroxide / Identification and properties of hydrogen peroxide / Decomposition of sodium peroxide / Cations hydration.

## 11. NITROGEN OXYGENATED COMPOUNDS

Preparation and reaction of nitrogen monoxide / Preparation and reaction of nitrogen dioxide / Identification of nitrite ions / Nitrates identification / decomposition of nitrates yielding nitrites / Ammonia synthesis.

## 12. SULFUR AND ELEMENTS OF VIA GROUP

Rhombic sulfur / Monoclinic sulfur / Plastic sulfur / Preparation of sodium thiosulfate / Formation and stability of thiosulfate complex / Oxidant action of sulfuric acid.

## 13. HALOGENS

Preparation and properties / Gaseous chloride / Bromine and iodine preparation / Chemical properties / Action over metals.

## 14. TRANSITION NOBLE METALS

Silver / Gold / Copper / Recognition of silver ion / Formation of silver mirrors / Electrolytic silvering / Electrolytic coppering.

## 15. IRON GROUP METALS

Preparation of iron salt and its recognition / Sensibility of iron thiocyanate reaction.

## 16. ALUMINUM AND SILICON

Recognition of aluminum salts / Aluminum as active metal / Reaction of aluminum ions / Preparation of silicic acid gel.

## VI. METHODOLOGY

There is a guide for every laboratory experience students should read before the experience. At the beginning of the experience, an entrance test is taken to verify the preparedness of students. Students carry out the experience working by teams and following guide indications and faculty advice. At the end of the experience, students submit a report summarizing main results, analysis and conclusions. Student active participation is promoted.

## VII. GRADING SYSTEM

The Final Grade (FG) is calculated with the following formula:

$$FG = ( 15 PP + 1 C1 + 2 C2 ) / 18$$

PP: Average grade of 15 laboratory experience work and report

C1: Average of entrance quizzes

## VIII. BIBLIOGRAPHY

1. Inorganic Chemistry Laboratory Guide  
National University of Engineering, Lima, Peru, 2010
2. CHANG RAYMOND  
Inorganic Chemistry  
McGraw-Hill Editorial, 2012