FACULTAD DE
CIENCIAS QUÍMICAS

# GENERAL CHEMISTRY

COURSE GUIDE

BSc Chemistry

Academic Year 2025-2026

UNIVERSIDAD
COMPLUTENSE
MADRID

# I.- IDENTIFICATION

| | |
|---|---|
| **COURSE NAME:** | **General Chemistry** |
| **CREDITS (ECTS):** | **12** |
| **CHARACTER:** | **Basic formation** |
| **SUBJECT:** | **General Chemistry** |
| **MODULE:** | **Basic** |
| **DEGREE:** | **Bachelor in Chemistry** |
| **SEMESTER/TERM:** | **Annual (first year)** |
| **DEPARTMENT/S:** | **Inorganic Chemistry**<br>**Organic Chemistry** |

## LECTURERS:

| | | |
|---|---|---|
| **Coordinator** | **Lecturer:**<br>**Department:**<br>**Office:**<br>**e-mail:** | RAQUEL CORTÉS GIL<br>Química Inorgánica<br>QA-138A<br>rcortesg@ucm.es |

| **Group E** | | |
|---|---|---|
| **1st term** | **Lecturer:**<br>**Department:**<br>**Office:**<br>**e-mail:** | GONZALO DURAN SAMPEDRO<br>Química Orgánica<br>QB-346B<br>goduran@ucm.es |
| **2nd term** | **Lecturer:**<br>**Department:**<br>**Office:**<br>**e-mail:** | LAURA RODRÍGUEZ PÉREZ<br>Química Orgánica<br>QA-338<br>laura.rodriguez.perez@quim.ucm.es |

## II.- OBJECTIVES

### ■ GENERAL OBJECTIVE

The aim is to introduce students to the basic concepts of Chemistry and provide them with the appropriate tools to tackle the contents of the Basic Module.

This course presents the basics that will allow student to understand the nature of matter, with a microscopic conception, going from atoms to molecules and from these to the aggregation states (solids, gases and liquids), introducing intermolecular forces. The fundamentals of chemical kinetics and thermodynamics required for the understanding of chemical reactions and equilibria as well as the thermodynamic aspects involved in phase transitions and the dissolution process will be provided. Basic concepts of electrochemistry, nuclear chemistry and the chemistry of organic functional groups will be introduced.

A general objective of great importance is to encourage the student’s interest in learning Chemistry and to highlight the role that Chemistry plays in nature and today's society.

### ■ SPECIFIC OBJECTIVES:

The specific objectives are to:

- Learn the fundamentals of quantum mechanics and its application to understand the atomic structure.
- Understand the organization of the Periodic Table of the elements and how to obtain information about the properties of the chemical elements.
- Learn the different types of chemical bonds: covalent, ionic and metallic, and the simplest theories used to describe them
- Establish relationships between the properties of the substances and the nature of the bonds they present.
- Understand the nature of the different aggregation states of matter and the intermolecular forces that originate them.
- Learn the structure and properties most relevant to gases, liquids and solids.
- Learn the basic concepts of organic chemistry: structure and nomenclature of organic compounds, most important functional groups and types of isomerism.
- Understand the basic concepts of chemical kinetics, its methodology and the application to the study of simple reactions.
- Know the factors that affect the stability of atomic nuclei.
- Understand the principles of thermodynamics.
- Understand the thermodynamics of the chemical reaction.
- Apply thermodynamic concepts to phase transitions.
- Understand the concept of chemical equilibrium and the factors that affect the equilibrium state.
- Apply the concepts of chemical equilibrium to acid-base, redox, and precipitation reactions.
- Learn the basic concepts of electrochemistry.

## III.- PREVIOUS KNOWLEDGE AND RECOMMENDATIONS

- **PREVIOUS KNOWLEDGE:**

Those required in the previous education level.

- **RECOMMENDATIONS:**

A basic knowledge on chemical nomenclature and physical chemistry magnitudes and units is recommended.

It is recommended that the student has some background in Physics and Mathematics.

## IV.- CONTENTS

- **BRIEF DESCRIPTION:**

Atomic structure. Periodic table of the elements. Chemical Bond. Aggregation states of matter. Nuclear Chemistry. Introduction to the study of organic compounds. Kinetics and thermodynamics of the chemical reactions. Chemical equilibrium. Equilibria in solution.

- **SYLLABUS:**

***Unit 0:* General Concepts**

Pure substances and mixtures. Elements and compounds. The concept of mole. Formulation and nomenclature of inorganic compounds. Chemical reactions and stoichiometric calculations.

**Section I. Atomic structure and bond**

***Unit 1*: Nuclear Chemistry**

Radioactivity. Isotopes. Nuclear reactions. Nuclear stability. Nuclear fission and fusion.

***Unit 2*: Atomic structure**

Electromagnetic radiation. Atomic spectra. Quantum theory. Photoelectric effect. Bohr atomic model. Wave-particle duality. The uncertainty principle. Wave mechanics. Atomic orbitals. Electronic spin. Polyelectronic atoms. Effective nuclear charge. Electron configurations.

***Unit 3*: Periodic table of the elements. Periodic properties**

Classification of the elements. Electron configurations and periodic table. Size of atoms and ions. Ionization energy. Electron affinity.

***Unit 4*: Chemical bonding: theories and types of bonds**

Types of chemical bonding. Covalent bond: bond order, length and bond energy. Polar bonds. Electronegativity. Lewis structures. Formal charge. Resonance. Molecular geometry. VSERP theory. Valence bond theory: hybridization of atomic orbitals, $\sigma$ and $\pi$ bonds. Molecular orbital theory: homo and heteronuclear diatomic molecules. Metallic bond: band model. Ionic bond: reticular energy and Born-Haber cycle.

**Section II. Aggregation states. Chemical kinetics. Organic compounds**

***Unit 5:* Aggregation states of matter**

Intermolecular forces. Solid state. Liquid state. Gaseous state. Equation of state of an ideal gas. Mixture of ideal gases. Kinetic-molecular theory of gases. Real gases.

***Unit 6*: Chemistry of the organic functional groups**

Structure and basic nomenclature for hydrocarbons and compounds with the most important functional groups. Concept and types of isomerism. Structural isomerism: chain, position and function. Types of projections. Stereoisomery.

***Unit 7*: Chemical Kinetics**

Rate of a chemical reaction. Kinetic equations. Molecularity and order of reaction. Collision theory. Activation energy. Reaction mechanism. Catalysis. Rate of radioactive decay: datation techniques.

**Section III. Thermodynamics**

***Unit 8*: Chemical Thermodynamics**

1. *First law of thermodynamics*

Purpose and scope of thermodynamics. Functions of state. Work on hydrostatic systems. Heat and heat measurement: heat capacities. Internal energy function. The first law of thermodynamics. Enthalpy. Adiabatic changes for an ideal gas.

2. *Second and Third laws. Thermodynamic Functions*

Spontaneous processes. Entropy. Second law of thermodynamics. The Clausius Inequality. Molecular interpretation of entropy. Third law. Standard molar entropy. Helmholtz energy and Gibbs energy. Conditions of equilibrium and spontaneity.

3. *Enthalpy, entropy and free energy of chemical change.*

Reaction Enthalpy. Standard states. Hess's law. Standard enthalpy of formation. Entropy of reaction. Gibbs energy of reaction. Gibbs energy of formation.

***Unit 9*: Multiphase equilibrium in one component**

Phases and phase transitions. Vapour pressure. Variation of the vapour-pressure with temperature. Phase diagrams of pure substances.

***Unit 10*: Solutions and their physical properties**

Types of solutions. Concentration of a solution. Intermolecular forces and dissolution processes. Solubility of gases: Henry's law. Colligative properties. Binary liquid mixtures. Distillation. Azeotropes.

***Unit 11*: Chemical Equilibrium**

Nature of the chemical equilibrium. Equilibrium and law of mass action: equilibrium constant. Thermodynamic equilibrium constant for ideal gases. Extent of a reaction: The reaction quotient. Relationship between the standard Gibbs energy and the equilibrium constant. Dependence of the equilibrium constant on temperature. Modification of equilibrium conditions.

**Section IV. Equilibria in solution**

***Unit 12*: *Acid-Base equilibrium and solubility***

Brönsted and Lowry theory. Lewis acids and bases. Autoprotolysis. pH scale. Strength of acids and bases. Acidity and basicity constants. Hydrolysis. Effect of the common ion. Buffer solutions. Acid base titrations. Solubility product. The common ion effect. Dissolution of precipitates.

***Unit 13*: *Electrochemistry***

Redox half-reactions. Balancing reactions. Electrochemical cells. Electrode potential. Standard potentials. Nernst´s equation. Concentration batteries. Batteries and fuel cells. Electrolysis. Corrosion.

## V.- COMPETENCES

- **GENERAL:**
  - **CG1** To recognize and value chemical processes in everyday life.
  - **CG5** To explain and apply the essential facts, concepts, principles and theories related to Chemistry.
  - **CG6** To analyse and solve qualitative and quantitative problems.
- **SPECIFIC:**
  - **CE1-QG1** To apply chemical language to the designation and formulation of chemical compounds.
  - **CE2-QG1** To balance chemical reactions and perform stoichiometric calculations.
  - **CE2-QG2** To apply to chemical reactions the concepts related to matter composition and the basic thermodynamic and kinetic principles.
  - **CE3-QG1** To use the concepts of chemical equilibrium with special emphasis on solution equilibrium.
- **GENERIC:**
  - **CT2** To work as a team
  - **CT3** To demonstrate critical thinking and self-criticism.
  - **CT4** To be able to adapt to new situations.
  - **CT8** To communicate in English using the most common audio-visual media

## VI.- LEARNING OUTCOMES

Having passed this course, the student must be able to:

***Unit 0***

1. Differentiate pure substances from homogeneous or heterogeneous mixtures.
2. Know the concept of mole and apply it in stoichiometric calculations.
3. Name and correctly formulate simple inorganic compounds.
4. Balance chemical reactions and use them to perform stoichiometric calculations.

***Unit 1***

5. Describe different examples of nuclear reactions and types of radiation.

6. Identify conditions of nuclear stability and predict the most likely decay of radioactive nuclei.
7. Calculate the energy released during a nuclear reaction as a result of the mass defect.
8. Explain the processes of nuclear fission and fusion and point out examples of nuclides capable of carrying out these processes.
9. Describe the effects of radiation on matter and the most important practical applications of radioisotopes.

***Unit 2***

10. Apply the wave-particle duality principle to the behaviour of subatomic particles.
11. Explain the origin of the current atomic structure model.
12. Describe the atomic orbitals in the hydrogen atom and their relationship to the electron quantum numbers by applying the basic principles of quantum mechanics.
13. Explain the origin of the atomic spectra.
14. Describe the factors that affect the energy of an electron in a polyelectronic atom.
15. Write the electron configuration of the fundamental state of any element.

***Unit 3***

16. Identify and name the elements of the Periodic Table.
17. Relate the electron configuration of the fundamental state of any element to its position in the Periodic Table.
18. Predict the variation of atomic radius, ionization energy and electron affinity in a group and a period of the Periodic Table.

***Unit 4***

19. Predict the fundamental types of bond as a function of the constituent atoms.
20. Predict the shape of simple molecules using the valence shell electron repulsion theory.
21. Apply the valence bond theory to determine the hybridization scheme of the central atom in simple molecules.
22. Explain the electronic structure of a molecule in terms of sigma and pi bonds, using the valence bond theory.
23. Construct and interpret an energy level diagram of a diatomic molecule.
24. Apply the concept of band to explain the main properties of metals.
25. Use the ionic bond model to explain the properties of these substances.
26. Calculate thermodynamic magnitudes in ionic compounds using the Born-Haber cycle.

***Unit 5***

27. Identify the different types of intermolecular forces.
28. Classify substances according to their melting or boiling points based on the strength of the interactions existing in them.
29. Relate the characteristic properties of the different types of solids with the nature of their constituent particles.
30. Determine the physical properties of an ideal gas from its equation of state.
31. Explain the behaviour of ideal gases from the kinetic theory.
32. Apply the equation of state of a real gas and define the factors that determine the deviation from the ideal behaviour.

***Unit 6***

33. Identify the main functional groups.
34. Name and formulate simple organic compounds.
35. Recognize the different types of isomerism.
36. Decide whether an organic compound is chiral.

37. Distinguish and name geometric and optical isomers.
38. Draw in the plane three-dimensional molecules in perspective and using the Fischer and Newman projections.

***Unit 7***

39. Define the terms reaction rate, reaction order, elemental equation and molecularity.
40. Determine the reaction order, its law of velocity and the reaction rate constant from experimental data.
41. Calculate the concentration, time or rate constant, using an integrated rate law, for reactions of zero-order, first-order or second-order.
42. Derive a rate law from a reaction mechanism.
43. Use the Arrhenius equation to calculate activation energies or rate constants.
44. Justify how the collision theory and the activated complex theory determine the dependence of the reaction rate on temperature.
45. Describe the action of catalysts and their main types.

***Unit 8***

46. Define basic thermodynamic concepts: types of systems, intensive and extensive magnitudes, thermodynamic processes, state functions
47. Calculate the work done by an ideal gas in different types of thermodynamic processes.
48. Evaluate the heat transfer associated to temperature and changes of state.
49. Enunciate the first law of thermodynamics and use it to compute simple transformations.
50. Define internal energy, enthalpy and calorific capacities, and apply these concepts to physical changes.
51. Describe the behaviour of a thermal machine that operates according to the Carnot cycle, or another simple cycle, and represent in a PV-diagram the different stages of the cycle.
52. State the second law of thermodynamics, and explain the direction of natural changes.
53. Define entropy and calculate entropy changes in ideal-gas processes and phase changes.
54. Interpret entropy from a molecular point of view.
55. State the third law of thermodynamics.
56. Define the standard molar entropy.
57. Define the thermodynamic potentials A (Helmholtz energy) and G (Gibbs energy).
58. Apply the Gibbs energy variation to predict the spontaneity of a process.
59. Calculate energy changes in chemical reactions.
60. Predict the spontaneous sense of a chemical reaction from the values of enthalpy and reaction entropy.
61. Calculate the enthalpy, entropy and Gibbs energy of a chemical reaction from the thermodynamic formation data of the intervening species.

***Unit 9***

62. Distinguish between homogeneous and heterogeneous systems and define the concept of phase.
63. State the phase rule and apply it to simple cases.
64. Describe the characteristics of phase transitions between solids, liquids and gases.
65. Explain the concept of vapour pressure and use the Clausius-Clapeyron equation to calculate its variation with temperature.

66. Draw the phase diagram of a pure substance and identify the phase boundaries and characteristic points of the pure substance.
67. Use the phase diagram to explain changes in the behaviour of a pure substance.

***Unit 10***

68. Describe the different types of solutions.
69. Use the different ways of expressing the concentration of a solution.
70. Explain the dissolution process through the intermolecular forces involved.
71. Explain the solubility of gases and the factors on which it depends.
72. Explain the colligative properties of solutions and use them for simple calculations.
73. Explain the behaviour of a binary mixture of two volatile liquids using the Raoult's law.
74. Explain the concept of azeotrope.

***Unit 11***

75. Explain the nature of chemical equilibrium.
76. Use the equilibrium constant to study quantitatively chemical balances.
77. Calculate the reaction quotient and use this value to predict the displacement direction of a reaction.
78. Use the relationship between Gibbs energy and equilibrium constant to predict the extent of a reaction.
79. Calculate the variation of the equilibrium constant with temperature.
80. Predict the direction of the chemical equilibrium shift when a system is disturbed and calculate the new composition in equilibrium.

***Unit 12***

81. Identify Brönsted-Lowry and Lewis acids and bases in a chemical reaction.
82. Predict the relative forces of acids and bases in aqueous solution from the value of their dissociation constants.
83. Calculate the pH and concentration of species in equilibrium for aqueous solutions of acids and bases.
84. Describe the concept of buffer solution and its properties.
85. Explain how to prepare a buffer solution and calculate the pH variation by adding strong acids or bases to it.
86. Calculate the pH in the different zones on the titration of a strong acid (base) with strong base (acid) or weak acid (base) with strong (acid) base.
87. Know the most common methods for measuring pH and justify the behaviour of indicators in a titration.
88. Calculate the solubility and the solubility product of simple precipitation equilibria.
89. Predict the precipitation of a salt from its ions concentrations in solution.
90. Explain the variations in solubility of a substance according to the different factors that affect it.

***Unit 13***

91. Balance oxidation-reduction reactions.
92. Write the diagram of a battery and the chemical reaction involved.
93. Calculate the potential of a battery from the tabulated reduction potentials.
94. Predict the spontaneous direction of a redox reaction from the reduction potentials of the corresponding half-reactions.
95. Describe the most common types of electrodes.
96. Calculate the variation of a reaction redox potential with the concentration using the Nernst equation.

97. Predict the products of electrolysis of simple substances from the reduction potentials.
98. Use Faraday's laws in electrolysis calculations.
99. Describe how the main types of batteries work
100. Describe the basic aspects of corrosion.

## VII.- WORKING HOURS DISTRIBUTED BY ACTIVITY

| Activity | Attendance (hours) | Self-study (hours) | Credits/ hours |
|---|---|---|---|
| Lectures | 64 | 86 | 6/150 |
| Seminars / Problem classes | 36 | 39 | 3/75 |
| Tutorials / Guided work | 12 | 25 | 1,5/37 |
| Written assignments and exams preparation | 8 | 30 | 1,5/38 |
| **Total** | **120** | **180** | **12/300** |

## VIII.- METHODOLOGY

The contents of the course are presented face-to-face to students divided in two types of classes:

**Lectures** will be given to the whole group and the student will be introduced to the fundamental contents of the subject. At the beginning of each unit, the contents and the main objectives will be clearly stated.

Exercises and questions that illustrate the contents developed in the lectures will be solved in **seminars and problem classes**. A list of problems/exercises to solve will be given to the students periodically before the class. Some of these exercises will be collected by the lecturer for assessment.

As a complement to the **self-study** carried out by the student, and in order to promote the development of team work, the elaboration and presentation of a *written assignment* or some other alternative activity about the contents of the course will be proposed as a **guided activity**.

The lecturer will program **tutorials** about diverse activities that allow him to identify the strengths and weaknesses in the daily work of the students. Tutorials will also be available for students who individually wish to solve doubts that arise during the study.

The Virtual Campus will be used as a mean to promote a fluent communication between the lecturer and the students and as an instrument to make available to students the material for both lectures and problem solving classes.

## IX.- BIBLIOGRAPHY


- **BASIC:**
  - Petrucci, R. H., Herring, F. G., Madura, J. D. y Bissonette, C.: "*General chemistry: principles and modern applications*", 11th ed., Pearson, 2017.
  - Atkins, P. y Jones, L.: "*Chemical principles: the quest for insight*", 7th ed. New York: W.H. Freeman; 2016.
  - Oxtoby, D. W., Gillis, H. P. y Buttler, L. J.: *"Principles of Modern Chemistry"*, 8ª ed., Cengage Learning, 2016.
- **COMPLEMENTARY:**
  - Chang, R.: "*Chemistry*", 10th ed., McGraw-Hill, 2010.
  - Casabó i Gispert, J.: "*Estructura Atómica y Enlace Químico*", Reverté, 1999.
  - Soto Cámara, J. L.: "*Química Orgánica vol. 1. Conceptos básicos*", 2ª ed. Revisada y aumentada, Síntesis, 2003.
  - Silva, M. y Barbosa, J.: "*Equilibrios iónicos y sus aplicaciones analíticas*", Síntesis, 2008.


## X.- ASSESSMENT PROCEDURE

The student's academic performance and the final marks of the course will be computed in a weighted manner, taking into account the following percentages, which will be maintained in all the exams.

- **WRITTEN EXAMS: 70%**

  Final exam: There will be two *partial exams* at the end of each semester/term and one *final exam* common to all groups. Passed partial exams will serve to release material in the final exam. Students who pass both partial exams are not required to take the final exam. In order to pass both partial exams, a minimum score of 4 out of 10 for each partial exam and an average of 5 out of 10 between both exams will be required. The exams will consist of questions about the concepts application learned during the course and other related practical questions (CG5, CG6, CE1-QG1, CE2-QG1, CE2-QG2, CE3-QG1). In the final exam, a minimum score of 4 out of 10 (4/10) will be a prerequisite for averaging the remaining activities.

  The students who have obtained in the exam a score of (5/10) or more but whose final mark is lower than (5/10), will keep the exam score for the *resit exam*. In this, they will only have to improve the qualification of the personal work, as it is described in the following section.

  Resit: A single exam will be carried out maintaining the same criteria as in the final exam.

- **PERSONAL WORK: 20%**

  The evaluation of the individual learning work carried out by the student will take into account three factors (all competences):

- The student's ability to solve problems and proposed exercises, which will be collected periodically.
- Assessment of the work carried out in the face-to-face problem solving classes.
- Assessment of group tutorials.

Those students who wish to improve their marks in this section for the *resit exam* must solve and handle, before the exam, a set of problems and exercises proposed by the lecturer. Subsequently, the student must solve one or two exercises, chosen by the lecturer, among all those submitted.

- **GUIDED ACTIVITIES: 10%**

Students will develop as a team work written assignments among the topics proposed by the lecturer that will present orally to the class. The lecturer will evaluate the work presented, the clarity in the oral presentation and the answers to questions (CG5, CT2, CT3, CT4, CT8).

- **ATTENDANCE AND PARTICIPATION:**

Attendance at all in-class activities will be **compulsory**, and the student's active participation in all teaching activities will be taken into account positively in the final evaluation. (CT3, CT4, CT8).

The marks considered in the course evaluation will be communicated to the students soon enough to the final exam, so that they can properly plan the study of this or other courses. In particular, the marks of the partial exams will be communicated within 20 days, except in the case of the second partial exam, in which the period may be shorter according to the final exam. In any case, a minimum of seven days between the publication of the marks and the date of the final exam will be scheduled.

## ACTIVITY SCHEDULE

| SECTION | | ACTIVITY | HOURS | GROUPS | START | END |
|---|---|---|---|---|---|---|
| I. | Atomic structure and bond | Lectures | 28 | 1 | 1st week | 9th week |
| | | Problem solving classes /Tutorials | 8 | 1 | | |
| II. | Aggregation states. Chemical kinetics. Organic compounds | Lectures | 10 | 1 | 10th week | 14th week |
| | | Problem solving classes /Tutorials | 10 | 1 | | |
| III. | Thermodynamics | Lectures | 16 | 1 | 15th week | 22nd week |
| | | Problem solving classes /Tutorials | 16 | 1 | | |
| IV. | Equilibria in solution | Lectures | 10 | 1 | 23rd week | 27th week |
| | | Problem solving classes /Tutorials | 10 | 1 | | |
| | | Oral presentation of the written assignments | 4 | 1 | 28th week | |

| SUMMARY OF ACTIVITIES | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Teaching activity** | **Associated competences** | **Lecturer activity** | **Student activity** | **Assessment procedure** | **P** | **NP** | **Total** | **C** |
| **Lectures** | CG1, CG5, CG6, CE1-QG1, CE2-QG1, CE2-QG2, CE3-QG1. | Presentation of theoretical concepts and approach of questions and new objectives. | Taking notes. Resolution of questions. Development of the new objectives. Formulation of questions and doubts. | Assessment of the answers given to questions related to theoretical concepts. | 64 | 86 | 150 | 20% |
| **Problem solving classes/ Seminars** | CG1, CG5, CG6, CE1-QG1, CE2-QG1, CE2-QG2, CE3-QG1, CT2, CT3, CT4, CT8. | Application of the theory to the resolution of exercises and problems. Presentation of new questions. | Taking notes. Resolution of exercises and questions. Formulation of questions and doubts. | Assessment of the answers (approach and result) given for the resolution of practical exercises and numerical problems. | 36 | 39 | 75 | |
| **Tutorials** | CG1, CG5, CG6, CE1-QG1, CE2-QG1, CE2-QG2, CE3-QG1, CT2, CT3, CT4, CT8. | Direction and supervision of the study and activities of the students. Raise questions. Resolution of doubts. | Discussing with the lecturer concept and method difficulties encountered when studying the subject. Asking questions and answering those proposed by the lecturer. | | 8 | 12 | 20 | |
| **Guided activities** | CG5, CT2, CT3, CT4, CT8. | Proposal and critical evaluation of assignments. | Team working for the preparation of the written assignments. Oral presentation of the assessed assignments. | Assessment of the in-group written assignment, the analyses carried out and the oral presentation. | 4 | 13 | 17 | 10% |
| **Examinations** | CG5, CG6, CE1-QG1, CE2-QG1, CE2-QG2, CE3-QG1 | Exam design. Surveillance and correction. Evaluation of the student. | Exam preparation and examination | Exam marking. | 8 | 30 | 38 | 70% |
| **P: In-class; NP: Self-study; C: Evaluation** | | | | | | | | |