



## IDENTIFYING DATA

### Chemistry: Chemistry 2

|                     |                                                                                                                                                                                |                 |      |            |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|------------|
| Subject             | Chemistry:<br>Chemistry 2                                                                                                                                                      |                 |      |            |
| Code                | V11G200V01204                                                                                                                                                                  |                 |      |            |
| Study programme     | (*)Grao en<br>Química                                                                                                                                                          |                 |      |            |
| Descriptors         | ECTS Credits                                                                                                                                                                   | Choose          | Year | Quadmester |
|                     | 6                                                                                                                                                                              | Basic education | 1st  | 2nd        |
| Teaching language   | Spanish<br>Galician                                                                                                                                                            |                 |      |            |
| Department          |                                                                                                                                                                                |                 |      |            |
| Coordinator         | Peña Gallego, María de los Ángeles                                                                                                                                             |                 |      |            |
| Lecturers           | García Martínez, Emilia<br>Peña Gallego, María de los Ángeles<br>Teijeira Bautista, Marta                                                                                      |                 |      |            |
| E-mail              | qfpena@gmail.com                                                                                                                                                               |                 |      |            |
| Web                 | <a href="http://fatic.uvigo.es">http://fatic.uvigo.es</a>                                                                                                                      |                 |      |            |
| General description | The subject "Chemistry II" tries to introduce to the students in the microscopic vision of the subject, providing the necessary basis to understand disciplines more specific. |                 |      |            |

## Competencies

|      |                                                                                                                                                                                                                                            |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Code |                                                                                                                                                                                                                                            |
| A1   | (*)Demostrar coñecemento e comprensión de feitos esenciais, conceptos, principios e teorías en: aspectos principais da terminoloxía química, nomenclatura, conversións e unidades                                                          |
| A2   | (*)Demostrar coñecemento e comprensión de feitos esenciais, conceptos, principios e teorías en: tipos de reacción química e as súas principais características asociadas                                                                   |
| A5   | (*)Demostrar coñecemento e comprensión de feitos esenciais, conceptos, principios e teorías en: características dos diferentes estados da materia e as teorías empregadas para describilos                                                 |
| A9   | (*)Demostrar coñecemento e comprensión de feitos esenciais, conceptos, principios e teorías en: propiedades características dos elementos e os seus compostos, incluíndo as relacións entre grupos e as súas variacións na táboa periódica |
| A12  | (*)Demostrar coñecemento e comprensión de feitos esenciais, conceptos, principios e teorías en: trazos estruturais dos elementos químicos e os seus compostos, incluíndo a estereoquímica                                                  |
| A19  | (*)Aplicar os coñecementos e a comprensión á resolución de problemas cuantitativos e cualitativos de natureza básica                                                                                                                       |
| B1   | (*)Comunicarse de forma oral e escrita en polo menos unha das linguas oficiais da Universidade                                                                                                                                             |
| B3   | (*)Aprender de forma autónoma                                                                                                                                                                                                              |
| B4   | (*)Procurar e administrar información procedente de distintas fontes                                                                                                                                                                       |
| B6   | (*)Manexar as matemáticas, incluíndo aspectos tales como análise de erros, estimacións de ordes de magnitude, uso correcto de unidades e modos de presentación de datos                                                                    |
| B7   | (*)Aplicar os coñecementos teóricos á práctica                                                                                                                                                                                             |
| B8   | (*)Traballar en equipo                                                                                                                                                                                                                     |
| B9   | (*)Traballar de forma autónoma                                                                                                                                                                                                             |
| B12  | (*)Planificar e administrar adecuadamente o tempo                                                                                                                                                                                          |
| B13  | (*)Tomar decisións                                                                                                                                                                                                                         |
| B14  | (*) Analizar e sintetizar información e obter conclusións                                                                                                                                                                                  |
| B15  | (*)Avaliar de modo crítico e construtivo o entorno e a si mesmo                                                                                                                                                                            |

## Learning aims

|                                    |                               |
|------------------------------------|-------------------------------|
| Expected results from this subject | Training and Learning Results |
|------------------------------------|-------------------------------|

|  |                 |                                                                    |
|--|-----------------|--------------------------------------------------------------------|
|  | A5<br>A9<br>A19 | B1<br>B3<br>B4<br>B6<br>B7<br>B8<br>B9<br>B12<br>B13<br>B14<br>B15 |
|  | A5<br>A19       | B1<br>B3<br>B4<br>B7<br>B8<br>B9<br>B12<br>B13<br>B14              |
|  | A5<br>A9        | B1<br>B3<br>B4<br>B7<br>B8<br>B9<br>B12<br>B14                     |
|  | A1<br>A9        | B1<br>B3<br>B4<br>B7<br>B8<br>B9<br>B12<br>B14                     |
|  | A1<br>A2<br>A19 | B1<br>B3<br>B4<br>B7<br>B8<br>B9<br>B12<br>B14                     |
|  | A1<br>A12       |                                                                    |
|  | A5<br>A19       | B1<br>B3<br>B4<br>B7<br>B8<br>B9<br>B12<br>B14                     |
|  | A9              | B1<br>B3<br>B4<br>B7<br>B8<br>B9<br>B12<br>B14                     |

|  |           |                                                |
|--|-----------|------------------------------------------------|
|  | A1<br>A19 | B1<br>B3<br>B4<br>B7<br>B8<br>B9<br>B12<br>B14 |
|  | A1<br>A19 | B1<br>B3<br>B4<br>B7<br>B8<br>B9<br>B12<br>B14 |

## Contents

### Topic

|                                                    |                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Subject 1: Atomic Structure                        | Structure of the hydrogenoid atoms : atomic orbitals, function of radial distribution, forms of the atomic orbitals. Polyelectronic atoms: Penetration and shielding, effective nuclear charge, "aufbau". Atomic parameters: atomic ionic, covalent and van der Waals radio. Lanthanide contraction. Electron affinity. Polarizability. |
| Subject 2: Chemical Bonding                        | Theory of OM. Types of orbitals: sigma, pi, delta. Molecular orbital diagram for homo- and heteronuclear molecules. Bonding in alkene and alkyne.                                                                                                                                                                                       |
| Subject 3: Nuclear Chemistry                       | Nuclear reactions. Types of radioactive disintegration. Stability of the nucleus. Kinetic of the disintegrations. Artificial transmutations. Nuclear fission. Nuclear fusion. Nuclear radiation: effects and units. Applications of the radioactivity.                                                                                  |
| Subject 4: Solid State                             | Structure of the simple solids. Sphere packing. Structure of the metals. Alloys. Metallic bonding. Semiconductors. Ionic solids. Energetic aspects.                                                                                                                                                                                     |
| Subject 5: Elements of the main groups             | Elements of the main groups. Physical properties. Chemical properties. Natural resources. Methods of obtaining.                                                                                                                                                                                                                         |
| Subject 6: Acid-base                               | Acid-base theories. Acid and bases of Brønsted: acid strength. Concept of pKa. Relationship between structure and acidity. Acids and bases of Lewis: Definition, examples. Fundamental types of acid-base reactions of Lewis. Solvents as acids or bases. Hard and soft acids and bases.                                                |
| Subject 7: Electrochemistry                        | $E^\circ$ and Gibbs free energy. Nernst Equation. Concentration cells. Batteries. Fuel cells. Electrolysis. Commercial electrolytic processes. Corrosion.                                                                                                                                                                               |
| Subject 8: Organic compounds and functional groups | Structure and geometry. Formulation and nomenclature of organic compounds. Physical properties.                                                                                                                                                                                                                                         |
| Tema 9: Isomerism                                  | Geometrical isomerism. Conformational stereoisomerism. Configurational stereoisomerism.                                                                                                                                                                                                                                                 |
| Subject 10: Polymers                               | Type of polymers by origin, composition, structure and behavior. Copolymerization. Mechanisms of polymerization. Molecular structure of the polymers. Biopolymers. Colloids and surfaces. Surface tension and surfactants.                                                                                                              |

## Planning

|                                    | Class hours | Hours outside the classroom | Total hours |
|------------------------------------|-------------|-----------------------------|-------------|
| Master Session                     | 26          | 40                          | 66          |
| Others                             | 0           | 0                           | 0           |
| Troubleshooting and / or exercises | 26          | 40                          | 66          |
| Long answer tests and development  | 2           | 10                          | 12          |
| Short answer tests                 | 2           | 4                           | 6           |

\*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

## Methodologies

|                | Description                                                                                                                           |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Master Session | In these sessions we will present the general aspects of the program, doing special emphasis in the bases and aspects more important. |
| Others         | In the different activities we will pay attention to the transversal competitions as the B1, B7 or B14.                               |

Troubleshooting and / or exercises Each week we will employ two hours to the resolution of any problems or exercises proposed related with the subject. These exercises will be delivered previously to the student through the platform Tem@.  
In these sessions we can collect question or short problems in order to know the progress of the students.

### Personalized attention

| Methodologies                      | Description                                                                                                            |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| Troubleshooting and / or exercises | students can ask all the questions they have in order to understand the material and develop tasks that were proposed. |

### Assessment

|                                    | Description                                                                                                                                                                      | Qualification |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Others                             | In the different activities, special attention will be taken to the transversal competitions as B1, B7 or B14.                                                                   | 5             |
| Troubleshooting and / or exercises | Questions or shorts problemas can be collected in order to know the progresos of the students.                                                                                   | 20            |
| Long answer tests and development  | Proofs for evaluation of the competitions purchased in the subject. It is necessary a minimum of 4 on 10 in this proof to take into account the rest of notes of the evaluation. | 45            |
| Short answer tests                 | Two tests were carried out along the course, about the subjects explained in the sessions.                                                                                       | 30            |

### Other comments on the Evaluation

You must attend all tests throughout the course. The final grade for the course will be the highest obtained by comparing the final exam and note examination weighted evaluation

### Sources of information

#### Basic Bibliography

Química. R. Chang. 10ª Ed. McGraw-Hill, 2010.

Química General, 10ª Ed. R. A. Petrucci, W. S. Harwood e F.G. Herring. Ed. Prentice Hall, 2011.

Química General, 5ª Ed. K.W. Whitten, R.E. Davis e M.L. Peck. Ed. McGraw-Hill, 1998.

Química. Brown, LeMay, Bursten, Murphy. 11ª Ed., Pearson Educación, 2009.

Química. McMurry, Fay. 5ª Ed. Pearson Educación, 2009

Principios de Química, 3ª Ed. Atkins, Jones. Ed. médica panamericana, 2005.

#### Complementary Bibliography

1. Chemical Bonding. M. J. Winter. Oxford : Oxford University Press, 1994.
2. Química General Superior. W.L. Masterton, E.J. Slowinski e C.L. Stanitski. Ed. McGraw-Hill Interamericana, 1987.
3. Química General. T.L. Brown, H.E. Lemay e B.E. Bursten. Ed. Prentice Hall, 1998.
4. Química General. P.W. Atkins. Ed. Omega, 1992.
5. Química Orgánica. L. G. Wade. Pearson Educación, 5ª ed. Madrid 2004.
6. Química Inorgánica Descriptiva. G. Rayner-Canham. Pearson Educación, 2ª Ed. 2000.

### Recommendations

#### Subjects that continue the syllabus

Physical chemistry 1/V11G200V01303

Inorganic chemistry 1/V11G200V01404

Organic chemistry 1/V11G200V01304

#### Subjects that are recommended to be taken simultaneously

Physics: Physics 2/V11G200V01201  
Geology: Geology/V11G200V01205  
Mathematics: Mathematics 2/V11G200V01203  
(\*)Química, física e xeoloxía: Laboratorio integrado II/V11G200V01202

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**Subjects that it is recommended to have taken before**

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Biology: Biology/V11G200V01101  
Physics: Physics 1/V11G200V01102  
Mathematics: Mathematics 1/V11G200V01104  
(\*)Química, física e bioloxía: Laboratorio integrado I/V11G200V01103  
Chemistry: Chemistry 1/V11G200V01105

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