UE Structure of matter - CHI131 -

ECTS
6 crédits

Crédits ECTS Echange
6.0

Composante
Département de la licence sciences et technologies (DLST)

Période de l'année
Automne (sept. à dec./janv.)

Diplômes intégrant cet élément

- Licence Chimie

Langue(s) d'enseignement: Anglais
Ouvert aux étudiants en échange: Oui
Crédits ECTS Echange: 6.0
Code d'export Apogée: YAX1CH91

Présentation

Description

Modern chemistry is a physical science and, as such, is ultimately based upon basic mathematical and physical principles. This first semester concentrates on the basic physical chemistry of electrons in atoms, molecular bonding and structure, and crystal structure. First, the basic notions of quantum mechanics and structure of the atom is introduced with emphasis on the energies and shapes of the atomic orbitals. This is used to build up the periodic table and to understand trends in the physical and chemical properties of elements. Then, it concentrates on the structure and bonding of diatomic and polyatomic molecules beginning with Lewis dot structures and the valence-shell electron pair repulsion (VSEPR) model for predicting geometries. The quantum mechanical description of bonding is explored via molecular orbital theory. Then this is followed by valence-bond (i.e., hybridization theory) for describing bonding in polyatomic molecules. Finally intermolecular forces are discussed with the aim of understanding trends in boiling points, melting points, and solubilities.

Informations non contractuelles.
Dernière mise à jour le 30 juin 2026

In parallel, the crystal structure part of the course treats the key mathematics needed to understand metallic and ionic crystals. For reasons of simplicity, only cubic lattices and the hexagonal closest packed (HCP) lattices are considered.

Heures d'enseignement

TP	TP	6h
CM	CM	19,5h
TD	TD	33h

Pré-requis recommandés

High School level physical chemistry: isotopes, molar mass, Avogadro's number, periodic table, Lewis dot structures, vectors, geometry.

The notion of imaginary and complex numbers is helpful but not essential.

Période : Semestre 1

Compétences visées

- Understand the quantum mechanical description of electrons in orbitals and how this is used in chemistry to build up the periodic table and describe chemical bonding in molecules.
- Represent molecules using Lewis dot structures and three dimensional hashed-wedge representations. Understand and be able to use resonance structures. Know how to predict molecular structure for inorganic molecules consisting of atoms around a central atom and for organic molecules of all sorts.
- Understand and be able to make use of cubic lattice structures for metallic and ionic crystals, including such notions as the atomic packing factor, density, atomic radii (metallic, covalent, ionic, van der Waals), coordination number, coordination polyhedron, and associated calculations.

Bibliographie

• Elements of physical chemistry, Peter Atkins (De Boeck)
• Introduction à la cristallochimie, D. Rioux (Technosup)

Infos pratiques

Contacts

Responsable pédagogique

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