

UK LEVEL: 4
UK CREDITS: 20

(Updated: Fall 2023)

PREREQUISITES:	CH 1002 Principles of Chemistry
CATALOG DESCRIPTION:	General Chemistry builds upon essential chemical concepts and their applications. It is a systematic study of chemical change and equilibria. Topics include advanced atomic structure and hybridization, thermochemistry and thermodynamics, ionic equilibria, electrochemistry and kinetics.
RATIONALE:	This course is a continuation of CH1002 Principles of Chemistry expanding on the thematics discussed and extends to novel concepts and understandings of the basics of general chemistry. Students will gain a deeper understanding of chemistry and how it affects their lives and the environment with the emphasis given on chemical reactions, equilibria and the chemistry of elements. Students will expand their knowledge on laboratory techniques, exercises and practical quantitative chemistry. This course is directed towards students interested in life and environmental sciences.
LEARNING OUTCOMES:	<p><i>As a result of taking this course, the student should be able to:</i></p> <ol style="list-style-type: none"> 1. Demonstrate understanding of advanced chemical theories, in respect to the chemical nature of elements, as revealed through crystal field theory, as well as bonding explained through hybridization and molecular orbital theory and how structure determines physical properties such as para- and diamagnetism. 2. Relate the physical character of the atom towards the build-up to macroscopic concepts of energetics, thermochemistry and kinetics towards theory and problem solving. 3. Demonstrate understanding of chemical equilibria and how they relate to Lewis acid-base, buffering and oxidation-reduction electrochemistry, both qualitatively and quantitatively. 4. Make use of practical, analytical and experimental techniques and methodologies in the laboratory as well as demonstrate problem solving, data handling, environmental consideration and communication skills.
METHOD OF TEACHING AND LEARNING:	<p>In congruence with the teaching and learning strategy of the college, the following tools are used:</p> <ul style="list-style-type: none"> • Class lectures, interactive learning (class discussions, group work) video presentations, and practical problems solved in class. • Exercises and primary source documents are assigned as homework. • Laboratory work • Internet support through links to corresponding material and

	<p>demonstrations.</p> <ul style="list-style-type: none"> Office hours: students are encouraged to make full use of the office hours of their instructor, where they can ask questions, see their exam paper, and/or go over lecture/lab material. Use of a blackboard site, where instructors post lecture notes, assignment instructions, timely announcements, as well as additional resources 										
ASSESSMENT:	<p>Summative:</p> <table border="1"> <tr> <td>1st assessment: Midterm Examination with an in class (25%) and a take home component (5%)</td> <td>30 %</td> </tr> <tr> <td>2nd assessment: Laboratory reporting</td> <td>25%</td> </tr> <tr> <td>Final assessment: Final examination with a written (40%) and a take home component(5%)</td> <td>45%</td> </tr> </table> <p>Formative:</p> <table border="1"> <tr> <td>Homework</td> <td>0</td> </tr> <tr> <td></td> <td></td> </tr> </table> <p>The formative Homework aims to prepare students for the midterm and final examinations. The Portfolio tests Learning Outcomes 1, 2, 3 The Laboratory Reports test Learning Outcome 4 The "Final Examination" tests Learning Outcomes 1,2,3</p>	1 st assessment: Midterm Examination with an in class (25%) and a take home component (5%)	30 %	2 nd assessment: Laboratory reporting	25%	Final assessment: Final examination with a written (40%) and a take home component(5%)	45%	Homework	0		
1 st assessment: Midterm Examination with an in class (25%) and a take home component (5%)	30 %										
2 nd assessment: Laboratory reporting	25%										
Final assessment: Final examination with a written (40%) and a take home component(5%)	45%										
Homework	0										
INDICATIVE READING:	<p>REQUIRED READING:</p> <p>Chemistry, 10th Edition ISBN10: 1-305-95740-7 ISBN13: 978-1-305-95740-4 AUTHORS: Zumdahl/Zumdahl/DeCoste - ©2018</p>										
<p>INDICATIVE MATERIAL: (e.g. audiovisual, digital material, etc.)</p>	<p>REQUIRED MATERIAL: Laboratory Notebook (22.5x 28.6 cm) 100 page, Scientific Format Grid.</p> <ul style="list-style-type: none"> Laboratory Coat Scientific Calculator <p>RECOMMENDED MATERIAL:</p> <ul style="list-style-type: none"> Molecular Model Set 										
COMMUNICATION REQUIREMENTS:	N/A										
SOFTWARE REQUIREMENTS:	MS Office and Blackboard CMS										
WWW RESOURCES:	<p>Royal Society of Chemistry: http://www.rsc.org/learn-chemistry American Chemical Society: www.acs.org Online Resources for Teaching and Learning Chemistry: http://www.chemcollective.org/</p>										
INDICATIVE CONTENT:	<ul style="list-style-type: none"> Electronic Structure Orbital structure of hydrogen atom, principal quantum number n, 										

- number of electrons per orbital (GC)
- Ground state, excited states
- Heisenberg Uncertainty Principle
- Absorption and emission line spectra
- Molecular orbital theory
- Hybridization
- Effective nuclear charge, paramagnetism and diamagnetism
- The Periodic Table - Variations of Chemical Properties with Group
- and Row
- First and second ionization energy
- Electron affinity
- Electronegativity
- Electron shells and the sizes of atoms
- Electron shells and the sizes of ions
- Energy Changes in Chemical Reactions – Thermochemistry,
- Thermodynamics
- Thermodynamic system – state function
- Second Law – concept of entropy
- Measurement of heat changes (calorimetry), heat capacity, specific heat
- Bond dissociation energy as related to heats of formation
- Free energy: G , Spontaneous reactions and ΔG°
- Coefficient of expansion
- Heat of fusion, heat of vaporization
- Acid/Base Equilibria
- Lewis definition of acid, base
- Conjugate acids and bases
- Strong acids and bases
- Weak acids and bases
- Equilibrium constants K_a and K_b : pK_a , pK_b
- Buffers
- Rate Processes in Chemical Reactions - Kinetics and Equilibrium
- Reaction rate
- Dependence of reaction rate on concentration of reactants
- Rate-determining step
- Dependence of reaction rate upon temperature
- Kinetic control versus thermodynamic control of a reaction
- Catalysts
- Equilibrium in reversible chemical reactions
- Relationship of the equilibrium constant and ΔG°
- Oxidation Reduction and Electrochemistry
- Electrolytic cell
- Galvanic or Voltaic cells
- Concentration cell
- Batteries

- **LABORATORY ACTIVITIES (INDICATIVE)**
- Safety and quantitative methods
- Measurement analysis
- Empirical Formula determination
- Molecular Models and Hybridization

- | | |
|--|---|
| | <ul style="list-style-type: none">• Enthalpy of formation• Kinetics and “Le Chatelliers” principle• Antacid Titration• Potentiometric Titration• Calorimetric Measurements• ☐ Transition Metals: Colorimetry |
|--|---|