

# Course: Chemistry 1

credits: 5

**Course code** ELVP18ACHEM1  
**Name** Chemistry 1  
**Study year** 2020-2021  
**ECTS credits** 5  
**Language** English  
**Coordinator** R.B. Toonen

**Modes of delivery** Lecture  
 Practical / Training  
**Assessments** Lab - Skills test  
 Theory - Written, organised by STAD  
 examinations

## Learning outcomes

- Write and balance chemical equations for combustion reactions, acid-base reactions, redox reactions and electrolysis reactions based on theory and/or observations in the lab
- Predict the products of combustion reactions, acid-base reactions, redox reactions and electrolysis reactions based on theory and/or observations in the lab
- Construct an equilibrium constant for any chemical equation
- Use Le Chatelier's principle to predict how the equilibrium composition of a reaction mixture is changed by adding or removing reagents, compressing or expanding the mixture or changing the temperature
- Calculate the pH and pOH of solutions
- Select an appropriate indicator for an acid/base titration using tables
- Determine the concentration of an analyte based on titrimetric analysis either performed by the student or by somebody else
- Calculate the cell potential for a given arbitrary composition of a cell diagram by using the Nernst equation and the electrochemical series
- Use standard enthalpies of formation or average bond enthalpies to calculate the standard enthalpy of a given reaction
- Use integrated rate laws to calculate elapsed time of a reaction, the rate constant of a chemical reaction or a concentration of a given chemical substance at any moment in time
- Use collision theory or transition state theory to explain how the reaction rate of chemical reactions is dependent on concentration of the reactants, temperature and the presence of a catalyst
- Estimate an unknown concentration of a given ion in a cell diagram by measuring the cell potential and constructing a calibration line of measured cell potentials of cell diagrams of known concentrations of the same ion
- Determine the specific heat of a metal, the enthalpy of neutralization for a strong acid-strong base reaction and/or the enthalpy of solutions for the dissolution of a salt by using a calorimeter
- Determine the rate law for a chemical reaction by determining the reaction speed of a given reaction with different concentrations of the starting materials using a simple calorimeter

## Content

In this study unit you will learn about the chemistry that is needed for the project in semester 2. Note that the knowledge acquired here is not intended exclusively for this project, but will be of use in later projects as well. The following theory is part of the study unit:

- (Short) Repetition of secondary school chemistry
- Acid-base reactions
- Redox reactions
- Titration
- Electrolysis
- Reaction rate
- Enthalpy calculations

Next to theoretical classes also relevant practicals will be conducted. Before you are allowed to enter the chemical lab, you will have to do a small lab on safety regulations. The practicals are the following:

- Chemical sensors
- Vinegar analysis
- Antacid analysis
- Galvanic cells
- Electrolytic cells
- Rate law
- Calorimetry

## Included in programme(s)

Electrical Engineering Major Sensor Technology

## School(s)

Institute of Engineering