



Faculty of Health, Science and Technology
Chemistry

Syllabus

Chemical Calculations

Course Code:

KEGA31

Course Title:

Chemical Calculations

Kemiska beräkningar

Credits:

7.5

Degree Level:

Undergraduate level

Progressive Specialisation:

First cycle, has less than 60 credits in first-cycle course/s as entry requirements (G1F)

Major Field of Study:

KEA (Chemistry)

Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2016-02-19, and is valid from the Autumn semester 2016 at Karlstad University.

Prerequisites

Enrollment in the courses Introductory Chemistry (KEGA21), 7.5 ECTS cr or Matter (CBGAM0), 7.5 ECTS cr, or equivalent

Learning Outcomes

The aim of the course is that students acquire the basic knowledge and skills required for chemically oriented activities and for further studies in science and technology.

Upon completion of the course, students should be able to:

1. use correct units and the correct number of significant figures in chemical calculations,
2. apply the perfect gas equation,
3. determine empirical and molecular formulas,
4. balance a chemical equation, define different ways of reporting a chemical equation and calculate reaction yield,
5. define and use the concepts activity and equilibrium,
6. define pH and calculate pH of a solution,
7. use titration as an analysis technique,
8. perform calculations and explain the concept of kinetics,
9. prepare, conduct and report the result of laboratory experiments within a given time limit.

Content

The course is divided into a theoretical and a laboratory part. Learning outcome 9 only relates to the laboratory part while the others can be treated in both parts.

Learning outcome 1: numerical values, significant figures, converting units, unit analysis

Learning outcome 2: the perfect gas equation, pressure, volume, temperature, amount of substance, the gas constant

Learning outcome 3: empirical formula, molecular formula

Learning outcome 4: chemical reactions in general, redox reactions in particular, molecular reaction equation, ionic reaction equation, net ionic reaction equation, limiting reagents, yield in chemical reactions, simple electrolysis problems, concentration, amount of substance, mass, molar mass

Learning outcome 5: dynamic equilibrium, activity, activities at equilibrium, concentrations at equilibrium, the acid constant (K_a), the base constant (K_b), conjugated acid-base pair, solubility product (K_{sp}), solubility, complex constant, equilibrium constant (concentration, K_c and pressure, K_p), reaction quotient, Le Châtelier's principle, common reactant, the autoionization of water, pK_a , pK_b , pK_w

Learning outcome 6: pH, pOH, pH indicators, pH calculations, buffert solutions, buffert equation (Henderson-Hasselbalch), preparation of buffert solutions

Learning outcome 7: concentration, amount of substance, mass, molar mass, calculate on the dilution of solutions, redox titration, acid-base titration

Learning outcome 8: kinetics, the rate of a reaction, rate constant, half-life, the Arrhenius equation, activation energy

Learning outcome 9: practical laboratory work based on theory treated. Results from the laboratory work are reported according to instructions within a given time limit.

Master of Science Engineering students also undergo a safety test before doing laboratory work.

Reading List

See separate document.

Examination

Assessment of theoretical components is based on voluntary hand-in assignments and a written exam.

Assessment of laboratory components is based on mandatory attendance of laboratory sessions and lab reports according to instructions within a given time limit.

Grades

One of the grades Distinction (VG), Pass (G), or Fail (U) is awarded in the examination of the course.

Engineering students are awarded one of the grades Pass with Distinction (5), Pass with Some Distinction (4), Pass (3) or Fail (U).

Quality Assurance

Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

Course Certificate

A course certificate will be provided upon request.

Additional information

The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.