# BRIDGING TO CHEMISTRY FOR CONSERVATION

## A DISTANCE STUDY COURSE

COURSE INSTRUCTOR: DR CHRISTIAN DREYER
DURATION: 4 MONTHS (*recommended*)


THE SOUTH AFRICAN INSTITUTE FOR HERITAGE SCIENCE & CONSERVATION

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*The course covers the themes indicated below. Each theme is subdivided into units and sub-units, as indicated.*

| Theme | Units | Sub-units |
|---|---|---|
| Particles and bonding | Atomic structure and ion formation | ▪ The nucleus of an atom<br>▪ Isotopes<br>▪ Electron configurations<br>▪ Ion formation |
| | The Periodic Table | |
| | Chemical bonding and related physical properties | ▪ Covalent bonds<br>▪ Ionic bonds<br>▪ Metallic bonds |
| | Electronegativity and intermolecular forces | ▪ Electronegativity, polar and nonpolar covalent bonds<br>▪ Polar and nonpolar molecules<br>▪ Intermolecular forces |
| The mole concept and stoichiometry | Balanced equations for chemical reactions | |
| | The mole concept | |
| | Stoichiometric calculations | |
| | Molarity of a solution | |
| Acids and bases | Acids | ▪ Formation of hydronium ions<br>▪ Strong and weak acids<br>▪ Ionization of water<br>▪ The pH scale regarding acids<br>▪ Indicators for pH<br>▪ Reactions of acids with metals, metal oxides, metal hydroxides, metal carbonates and ammonia<br>▪ Acidic oxides<br>▪ Acidic buffer solutions |
| | Bases and alkaline solutions | ▪ Strong and weak bases<br>▪ The pH scale regarding bases<br>▪ Alkaline buffer solutions<br>▪ Neutralization |
| | Salt hydrolysis | ▪ Acidic salt solutions with pH<7<br>▪ Nearly neutral salt solutions with pH approximately 7<br>▪ Alkaline salt solutions with pH>7 |
| | Acid-base tritrations | |
| Reaction kinetics and equilibrium | Reaction kinetics | ▪ Reaction mechanism<br>▪ Main factors influencing reaction rate |
| | Chemical equilibrium | ▪ Dynamic equilibrium of a reversible reaction in a closed system<br>▪ Equilibrium constant for a dynamic equilibrium |
| | Le Chatelier's Principle | ▪ Applied to a change in concentration<br>▪ Applied to a change in pressure<br>▪ Applied to a change of temperature |
| | Equilibrium in buffer solutions | ▪ Acidic buffer solutions<br>▪ Alkaline buffer solutions |

| Theme | Units | Sub-units |
|---|---|---|
| Solubility & Precipitation | Dissolution of solids | ▪ Dissolution of molecular solids<br>▪ Dissolution of ionic salts |
| | Precipitation | |
| | The common ion effect | ▪ A qualitative discussion<br>▪ A quantitative discussion |
| | Complex ions and solubility | ▪ The diammine silver (I) ion<br>▪ Increase in the solubility of silver bromide by complex ion formation |
| Redox Chemistry | Balancing redox reactions by using half reactions | ▪ The net ionic equation for a redox reaction<br>▪ Basic terms regarding redox chemistry<br>▪ Balancing a redox reaction taking place in an acidic medium |
| | Spontaneous and non-spontaneous redox reactions | |
| | Electrochemical cells which release energy | ▪ The zinc copper cell<br>▪ The use of the standard hydrogen electrode as reference electrode |
| | Electrolysis and electroplating | |
| Basic Organic Chemistry | Hydrocarbons | ▪ Alkanes as saturated hydrocarbons<br>▪ Saturated cyclic compounds<br>▪ Unsaturated hydrocarbons<br>▪ Unsaturated cyclic compounds |
| | Halogenated compounds | |
| | Oxygenated compounds | ▪ Alcohols<br>▪ Ethers<br>▪ Carbonyl compounds<br>▪ Carboxylic acids<br>▪ Esters |
| | Nitrogen containing compounds | |

<u>EACH of this course's themes includes the following</u>:

1. an introduction which includes outcomes for the theme
2. study material for each of the units into which the theme is subdivided
3. a number of projects which the student needs to complete and submit
4. an online test, in which a mark of 60% must be attained in order to pass

The majority of the projects *(point 3.)* will entail questions / problems to which the student must provide the answers, followed by tutor feedback on such answers - provided to the student shortly after the respective submissions. Some projects may include a practical component for which a parcel (containing apparatus and chemicals) will be mailed to the student.

COURSE DETAILS

**Enrolment prerequisites: None**
**Starting date: Any time prior to 15 December 2020 (registrations now open)**
**Course duration: 4 months (recommended maximum)**
**Course fee: R9 750,00 (VAT Exempt)**
**Chemistry kit: R785,00 (excl. VAT, packaging, and shipping)**

***Please enquire about the availability of part-bursaries.***
**Certificate of attainment & scored Course Report follow completion.**
***(Both hard copy and digital versions are furnished)***

email / questions / enrol