



# 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

Registered as: *The South African Institute for Heritage Science (Pty) Ltd.* Registration Number: 2015/317414/07

CAMPUS DRIVE, TWEE RIVIERE, SOUTHERN CAPE REGION, SOUTH AFRICA

Tel: +27 (0)42 273 1567

info@sainst.org www.sainst.org



# Bridging to Chemistry for Conservation

Distance Study Course

Course Instructor: Dr Christian Dreyer

Duration: 4 months (recommended)

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	<ul style="list-style-type: none"> <li>The nucleus of an atom</li> <li>Isotopes</li> <li>Electron configurations</li> <li>Ion formation</li> </ul>
	The Periodic Table	
	Chemical bonding and related physical properties	<ul style="list-style-type: none"> <li>Covalent bonds</li> <li>Ionic bonds</li> <li>Metallic bonds</li> </ul>
	Electronegativity and intermolecular forces	<ul style="list-style-type: none"> <li>Electronegativity, polar and nonpolar covalent bonds</li> <li>Polar and nonpolar molecules</li> <li>Intermolecular forces</li> </ul>
The mole concept and stoichiometry	Balanced equations for chemical reactions	
	The mole concept	
	Stoichiometric calculations	
	Molarity of a solution	
Acids and bases	Acids	<ul style="list-style-type: none"> <li>Formation of hydronium ions</li> <li>Strong and weak acids</li> <li>Ionization of water</li> <li>The pH scale regarding acids</li> <li>Indicators for pH</li> <li>Reactions of acids with metals, metal oxides, metal hydroxides, metal carbonates and ammonia</li> <li>Acidic oxides</li> <li>Acidic buffer solutions</li> </ul>
	Bases and alkaline solutions	<ul style="list-style-type: none"> <li>Strong and weak bases</li> <li>The pH scale regarding bases</li> <li>Alkaline buffer solutions</li> <li>Neutralization</li> </ul>
	Salt hydrolysis	<ul style="list-style-type: none"> <li>Acidic salt solutions with <math>\text{pH} &lt; 7</math></li> <li>Nearly neutral salt solutions with <math>\text{pH}</math> approximately 7</li> <li>Alkaline salt solutions with <math>\text{pH} &gt; 7</math></li> </ul>
	Acid-base titrations	
Reaction kinetics and equilibrium	Reaction kinetics	<ul style="list-style-type: none"> <li>Reaction mechanism</li> <li>Main factors influencing reaction rate</li> </ul>
	Chemical equilibrium	<ul style="list-style-type: none"> <li>Dynamic equilibrium of a reversible reaction in a closed system</li> <li>Equilibrium constant for a dynamic equilibrium</li> </ul>
	Le Chatelier's Principle	<ul style="list-style-type: none"> <li>Applied to a change in concentration</li> <li>Applied to a change in pressure</li> <li>Applied to a change of temperature</li> </ul>
	Equilibrium in buffer solutions	<ul style="list-style-type: none"> <li>Acidic buffer solutions</li> <li>Alkaline buffer solutions</li> </ul>

Theme	Units	Sub-units
Solubility & Precipitation	Dissolution of solids	<ul style="list-style-type: none"> <li>Dissolution of molecular solids</li> <li>Dissolution of ionic salts</li> </ul>
	Precipitation	
	The common ion effect	<ul style="list-style-type: none"> <li>A qualitative discussion</li> <li>A quantitative discussion</li> </ul>
	Complex ions and solubility	<ul style="list-style-type: none"> <li>The diammine silver (I) ion</li> <li>Increase in the solubility of silver bromide by complex ion formation</li> </ul>
Redox Chemistry	Balancing redox reactions by using half reactions	<ul style="list-style-type: none"> <li>The net ionic equation for a redox reaction</li> <li>Basic terms regarding redox chemistry</li> <li>Balancing a redox reaction taking place in an acidic medium</li> </ul>
	Spontaneous and non-spontaneous redox reactions	
	Electrochemical cells which release energy	<ul style="list-style-type: none"> <li>The zinc copper cell</li> <li>The use of the standard hydrogen electrode as reference electrode</li> </ul>
	Electrolysis and electroplating	
Basic Organic Chemistry	Hydrocarbons	<ul style="list-style-type: none"> <li>Alkanes as saturated hydrocarbons</li> <li>Saturated cyclic compounds</li> <li>Unsaturated hydrocarbons</li> <li>Unsaturated cyclic compounds</li> </ul>
	Halogenated compounds	
	Oxygenated compounds	<ul style="list-style-type: none"> <li>Alcohols</li> <li>Ethers</li> <li>Carbonyl compounds</li> <li>Carboxylic acids</li> <li>Esters</li> </ul>
	Nitrogen containing compounds	



### EACH of this course's themes includes the following:

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

Registration date: Discretionary (we like to help)

Course duration: 4 months (recommended maximum)

Course fee: R9 750,00 (VAT Exempt) / USD770.00 / €680.00

Chemistry kits: R785,00 (excl VAT & postage) / USD60.00 / €50.00

Payment terms: 50% of course fee upon enrolment

chemistry kit cost receivable 1 month after registration

balance of course fee receivable prior to completion

**Certificate of Attainment & scored Course Report follow completion**

[email / questions / enrol](#)