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

Tel: +27 (0)42 273 1567

info@sainst.org www.sainst.org

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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 ▪ Isotopes ▪ Electron configurations ▪ Ion formation
	The Periodic Table	
	Chemical bonding and related physical properties	▪ Covalent bonds ▪ Ionic bonds ▪ Metallic bonds
	Electronegativity and intermolecular forces	▪ Electronegativity, polar and nonpolar covalent bonds ▪ Polar and nonpolar molecules ▪ 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 ▪ Strong and weak acids ▪ Ionization of water ▪ The pH scale regarding acids ▪ Indicators for pH ▪ Reactions of acids with metals, metal oxides, metal hydroxides, metal carbonates and ammonia ▪ Acidic oxides ▪ Acidic buffer solutions
	Bases and alkaline solutions	▪ Strong and weak bases ▪ The pH scale regarding bases ▪ Alkaline buffer solutions ▪ Neutralization
	Salt hydrolysis	▪ Acidic salt solutions with pH<7 ▪ Nearly neutral salt solutions with pH approximately 7 ▪ Alkaline salt solutions with pH>7
	Acid-base tritrations	
Reaction kinetics and equilibrium	Reaction kinetics	▪ Reaction mechanism ▪ Main factors influencing reaction rate
	Chemical equilibrium	▪ Dynamic equilibrium of a reversible reaction in a closed system ▪ Equilibrium constant for a dynamic equilibrium
	Le Chatelier's Principle	▪ Applied to a change in concentration ▪ Applied to a change in pressure ▪ Applied to a change of temperature
	Equilibrium in buffer solutions	▪ Acidic buffer solutions ▪ Alkaline buffer solutions

Theme	Units	Sub-units
Solubility & Precipitation	Dissolution of solids	▪ Dissolution of molecular solids ▪ Dissolution of ionic salts
	Precipitation	
	The common ion effect	▪ A qualitative discussion ▪ A quantitative discussion
	Complex ions and solubility	▪ The diammine silver (I) ion ▪ 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 ▪ Basic terms regarding redox chemistry ▪ 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 ▪ The use of the standard hydrogen electrode as reference electrode
	Electrolysis and electroplating	
Basic Organic Chemistry	Hydrocarbons	▪ Alkanes as saturated hydrocarbons ▪ Saturated cyclic compounds ▪ Unsaturated hydrocarbons ▪ Unsaturated cyclic compounds
	Halogenated compounds	
	Oxygenated compounds	▪ Alcohols ▪ Ethers ▪ Carbonyl compounds ▪ Carboxylic acids ▪ 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. Certain in-laboratory, practical components will additionally be undertaken via two to three live Zoom sessions, conducted between the student and 2 faculty members.

COURSE DETAILS

Enrolment prerequisites: None
Starting date: Registration open throughout the year
Course duration: 4 months (recommended maximum)
Course fee: USD 770.00 / € 680.00 / GBP 600.00
In-laboratory sessions (via Zoom): USD 25.00 / € 20.00 / GBP 19.00

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

email / questions / enrol