VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

VCE CHEMISTRY 2008–2011: UNIT 3 SAMPLE COURSE OUTLINE

This sample course outline represents one possible teaching and learning sequence for Unit 3.

Week	Area of Study	Key knowledge	Key Skills	Possible activities and assessment tasks
1–2	**1. Chemical analysis**	• calculations including amount of solids, liquids and gases; concentration; volume, pressure and temperature of gases	• apply chemical understandings	• Revision of stoichiometry from Unit 2. Practice examples of calculations involving solids, solutions and gases in preparation for gravimetric and volumetric analysis.
		• gravimetric analysis	• investigate and inquire scientifically	• Introduce use of MSDS and research examples of MSDS to complete a risk assessment of first practical.
		• matching analytical technique/s to a particular task	• communicate chemical information and understandings	• Flow chart of practical method for gravimetric analysis.
				• Experimental activities involving gravimetric analyses. For example analysis of lawn food (2 x 50min + 10 min). This could be presented as ***a written report of a practical activity*** if the extended experimental investigation is completed in area of study 2.

Week	Area of Study	Key knowledge	Key Skills	Possible activities and assessment tasks
3	**1. Chemical analysis**	• calculations including amount of solids, liquids and gases; concentration; volume, pressure and temperature of gases	• apply chemical understandings	• Revise acid-base reactions from Unit 2. • Flow chart of practical method for volumetric analysis – contrast with gravimetric analysis.
		• volumetric analysis: simple titrations, acid-base titrations	• investigate and inquire scientifically	• Use results from titration to complete calculations. These could be included as part of the analysis of ***first hand data using structured questions*** if the extended experimental investigation is completed in area of study 2.
		• matching analytical technique/s to a particular task	• communicate chemical information and understandings	• Experimental activities related to volumetric analyses. For example preparing a standard solution (30 min) and analysis of brick cleaner (acid base titration 50 min). These experiments could be presented as ***a written report of a practical activity*** if the extended experimental investigation is completed in area of study 2.
4	**1. Chemical analysis**	• volumetric analysis: back titrations, acid-base titrations	• investigate and inquire scientifically	• Back titrations – contrast method with direct titration using flow chart. • Redox reactions – oxidation numbers - writing half equations and identifying whether oxidation or reduction has occurred using oxidation numbers. Experimental activities. For example the determination of ammonium ions in lawn food (back titration, 50 min). This could be presented **as *a written report of a practical activity*** if the extended experimental investigation is completed in area of study 2.
		• matching analytical technique/s to a particular task	• communicate chemical information and understandings	
		• use of oxidation numbers to write redox equations	• apply chemical understandings	

Week	Area of Study	Key knowledge	Key Skills	Possible activities and assessment tasks
5–6	**1. Chemical analysis**	• volumetric analysis: simple titrations, redox titrations • matching analytical technique/s to a particular task	• investigate and inquire scientifically • apply chemical understandings • communicate chemical information and understandings	• First lesson of the ***Extended Experimental Investigation*** – The composition of wine. Class discusses the question(s) to be investigated wine. Working in pairs students discuss to what they will investigate and to plan the experiments (approx 50 min). All plans to be recorded in log books. Planning must include using MSDS and risk assessment. Students order equipment and chemicals required from the lab technician by a given date. Teacher demonstration of a redox titration, standardization of $KMnO_4$ with oxalic acid. Class discussion of the applications of redox titrations. • Start extended experimental investigation practical work (logbooks collected after each lesson). Continue extended experimental investigation (approx 3 hours). Last lesson is for students to complete an individual report.
7–8	**1. Chemical analysis**	• principles and applications and interpretation of qualitative and quantitative data from spectroscopic techniques of qualitative and quantitative data from atomic absorption spectroscopy (AAS)	• apply chemical understandings	• Start Spectroscopy – detection of amounts of substance. Calibration curves – apply to AAS. UV-visible spectroscopy. (**Note**: Remaining spectroscopy will be covered after hydrocarbons have been revised).

Week	Area of Study	Key knowledge	Key Skills	Possible activities and assessment tasks
7–8	**1. Chemical analysis**	• principles and applications of chromatographic techniques and interpretation of qualitative and quantitative data from thin layer chromatography (TLC), high performance liquid chromatography (HPLC) and gas chromatography (GC) • matching analytical technique/s to a particular task	• investigate and inquire scientifically • communicate chemical information and understandings	• Chromatography (qualitative analysis). Start with paper and thin layer chromatography move to column chromatography then to HPLC and GC. • Experimental activities. For example chromatography of inks and smarties and demonstration of column chromatography. Second-hand data exercise in manipulation of data from instrumental analyses (HPLC and GC). These could be included as part of the ***analysis of second-hand data*** using structured questions if the extended experimental investigation is completed in area of study 2. • ***References(area of study 1)*** VCE Study Design 2007–2011: Advice for teachers p46–49; p60–61; useful websites p64–65 VCAA CDROM 'Chemistry- a pathway to the emerging sciences in Victoria' Some useful instrumental analysis animations can be found at http://www.shsu.edu/~chm_tgc/sounds/sound.html
9–10	**2. Organic reaction pathways**	• principles of fractional distillation • structure and systematic nomenclature of alkanes, alkenes, amines, chloroalkanes, alkanols and carboxylic acids up to C_{10}	• apply chemical understandings • communicate chemical information and understandings • investigate and inquire scientifically	• Use annotated chart of fractionating column to visualize fractional distillation. Revise hydrocarbons from Unit 1. Functional groups as listed. Employ visual representation of organic molecules and functional groups by drawing molecular structures, with a view to representing the 3-dimensional structure. Experimental activity demonstration of cracking of a hydrocarbon. Practical exercises involving molecular modelling with commercial kits or blue tack (or plasticine) and tooth picks and/or computer software.

Week	Area of Study	Key knowledge	Key Skills	Possible activities and assessment tasks
11	**1. Chemical analysis**	• principles and applications of spectroscopic techniques and interpretation of qualitative and quantitative data from atomic absorption spectroscopy (AAS), infrared spectroscopy (IR), mass spectroscopy, nuclear magnetic resonance spectroscopy (NMR), and visible and ultraviolet spectroscopy (visible-UV)	• apply chemical understandings • investigate and inquire scientifically	• **Return** to analysis with emphasis on identification of structure – Infrared spectroscopy – Mass spectroscopy – NMR spectroscopy. Animated Infrared spectra (shows vibrations of functional groups) at http://www.cem.msu.edu/~parrill/AIRS/ Second-hand data exercise in manipulation of data from instrumental analyses (Infrared, mass spectroscopy, NMR). These could be included as part of the ***analysis of second-hand data using structured questions*** if the extended experimental investigation is completed in area of study 2.
12–14	**2. Organic reaction pathways**	• Common reactions of organic compounds: addition reactions of alkenes, substitution reactions of alkanes and primary chloroalkanes, oxidation of primary alkanols, esterification • organic reaction pathways including the production of esters from alkenes, condensation and polymerisation reactions that produce large biomolecules	• apply chemical understandings	• Addition reactions of alkenes. • Substitution reactions of alkanes and primary chloroalkanes. • Oxidation of primary alkanols. Experimental activity related to the preparation and collection of esters. This could be presented as ***a written report of a practical activity*** if the extended experimental investigation is completed in area of study 1.

Week	Area of Study	Key knowledge	Key Skills	Possible activities and assessment tasks
		• function of organic molecules in the design and synthesis of medicines including the production of aspirin from salicylic acid	• investigate and inquire scientifically	• Condensation reactions including esterification. Poster showing the polymerisation of a range of large biomolecules with reactions labeled clearly (50 min). This could be used as ***a report in a visual format on organic reaction pathways*** if the extended experimental investigation is completed in area of study 1.
			• communicate chemical information and understandings	• Design and synthesis of medicines – flowchart or annotated poster could be used here. This could be used as ***a report in a visual format on organic reaction pathways*** if the extended experimental investigation is completed in area of study 1. Refer VCAA CDROM 'Chemistry –a pathway to the emerging sciences in Victoria').
			• investigate and inquire scientifically	• Experimental activity, the preparation of aspirin (2 x 50 minutes). This could be presented as ***a written report of a practical activity*** if the extended experimental investigation is completed in area of study 1.
15–16	**2. Organic reaction pathways**	• primary, secondary and tertiary structure of proteins and the function of protein catalysts (enzymes)	• apply chemical understandings	• Protein structure Enzymes
		• use of proteins as markers for disease		• Proteins as markers for disease
		• the structure and bonding of DNA and its applications in forensic analysis		• Structure and bonding of DNA.
		• biochemical fuels including fermentation of sugars to produce ethanol		• Biochemical fuels.

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Week	Area of Study	Key knowledge	Key Skills	Possible activities and assessment tasks
		• function of organic molecules in the design and synthesis of medicines including the production of aspirin from salicylic acid	• communicate chemical information and understandings	• Research into the design and synthesis of medicines, or into the history of aspirin. ***References (area of study 2)*** VCE Study Design 2007–2011: Advice for teachers p50–52; p60–61; useful websites p64–65. ***References (area of study 2)*** VCE Study Design 2007–2011: Advice for teachers50–52; p60–61; useful websites p64–65. VCAA CD-ROM 'Chemistry – a pathway to the emerging sciences in Victoria'.
17–18	**2. Organic reaction pathways**	• catch up time revision and Exam preparation revision		• VCAA sample exam paper under timed conditions http://www.vcaa.vic.edu.au/vce/studies/chemistry/chemindex.html

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