AVIATION HIGH SCHOOL

Work Program

Senior Chemistry

2007 Syllabus

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CHEMISTRY COURSE OVERVIEW

		Contexts	Time (hrs)	Key Concepts and Key Ideas						
				S1	S2	R1	R2	R3	R4	R5
Year 11	Sem I (55 hrs)	**Materials – Living in a world of materials** See unit for details	30 hrs	1, 2, 3 4, 5, 6, 7	1, 2, 3, 5, 6, 7, 9, 10		1	1, 2, 3	1, 3	3
		Water – A unique material See unit for details	25 hrs	2, 3, 5, 7	1, 2, 3, 4, 5, 6, 7, 8, 10, 11	2, 3		1, 2, 3, 4	1, 2, 3	2
	Sem II (55 hrs)	**Transport – A necessary evil** See unit for details	30 hrs	5	2, 3, 4, 5, 7, 8, 10, 11	1	1, 2	1, 2, 3, 4	2, 4	1
		Air – Something we all share – aerospace pollution See unit for details	25 hrs	5, 7	2, 3, 4, 5, 7, 8, 10	1	1	1, 2, 5	1, 2, 3	1, 3, 4
		Contexts	Time (hrs)	Key Concepts and Key Ideas						
				S1	S2	R1	R2	R3	R4	R5
Year 12	Sem I (55 hrs)	**Swimming Pools** See unit for details	30 hrs	2, 5	2, 5, 7, 8, 10	2, 3	1	1, 2, 3, 4	1, 2, 3	1, 2, 3, 4
		Salvage and Aircraft (structures) See unit for details	25 hrs	1, 2, 5	1, 2, 5, 7, 9, 10	1, 2, 3	1, 2, 3	1, 2, 4, 5	1, 2, 3	1, 3, 4
	Sem 2 (55 hrs)	**Manipulating Molecules** See unit for details	25 hrs	7	2, 3, 4, 5, 7, 8, 10, 11	1, 3, 4	1	2	3	2, 3
		Forensic chemistry – air crash investigations See unit for details	30 hrs	1, 2, 3, 5, 6, 7	2, 3, 4, 7, 8, 10, 11	1, 2, 3, 4	1	2, 4	1, 2, 3	1, 2, 3

Folio Contents

Each folio is a collection of individual instruments and is to be judged as a whole, rather than as the sum of its parts. Although the total folio will demonstrate a student's achievements in all three general objectives (KCU, IP, EC), the emphasis on each criterion will vary from instrument to instrument. An on-balance judgment will be made about the student's achievement in each criterion of the exit standards. This judgment is informed and validated by matching the student's responses to the standards associated with the exit criteria (Senior Syllabus Chemistry 2007, p28-29).

Selective updating and the use of fullest and latest information will be applied in accordance with Senior Syllabus Chemistry 2007 sections 7.1.5 and 7.1.6.

Student achievement on individual tasks is for feedback purposes only and informs record keeping on the student record card. Decisions regarding interim and exit levels of achievement will be made on the folio of evidence and the extent to which it reflects the exit standards.

Chemistry Course – Key Concept and Key Idea Matrix

Unit	Structure																	Reactions																
	1							2										1				2			3					4				5			
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	1	2	3	1	2	3	4	5	1	2	3	4	1	2	3	4	
1	*	*	*	*	*	*	*	*	*	*		*	*	*		*	*						*			*	*	*			*		*				*		
2		*	*		*		*	*	*	*	*	*	*	*	*		*	*		*	*						*	*	*	*			*	*				*		
3					*				*	*	*	*		*	*		*	*	*				*	*		*	*	*	*				*		*					
4					*		*		*	*	*	*		*	*		*		*				*			*	*			*		*	*			*	*		
5		*			*				*			*		*	*		*			*	*		*			*	*	*	*			*	*			*	*		
6	*	*			*			*	*			*		*		*	*		*	*	*		*	*		*		*	*			*	*			*	*		
7							*		*	*	*	*		*	*		*	*	*		*		*										*	*					
8	*	*	*		*	*	*		*	*	*			*	*		*	*	*	*	*		*				*		*			*	*	*					
totals	3	5	3	1	7	2	5	3	8	6	5	7	2	8	6	2	8	4	5	4	5	2	7	2	1	6	8	4	5	2	6	6	7	1	5	4	6	3	174

Chemistry Course –Assessment Overview

Grade	Unit	Context	Key concepts	Task	Criteria covered				Task Conditions	Timing
					AV	KCU	IP	EC		
11	1	Materials – Living in a world of materials	S1, 2, R 2, 3, 4, 5	1 SA	✓	✓	✓	✓	1 ½ hrs. **Supervised Assessment** – supervised test (unseen) (multiple choice, short answers and short paragraphs 50 -150 words)	TERM 1
	2	Water – A unique material	S1, 2, R1, 3, 4, 5	2 ERT	✓	✓	✓	✓	3 weeks (1½ weeks in class) **Extended Response Task.** Journal supported individual written report (~ 800-1000 words for discussion)	TERM 2
		Water – A unique material	S1, 2, R1, 3, 4, 5	3 SA	✓	✓	✓	✓	1 ½ hrs. **Supervised Assessment** – supervised test (unseen) (multiple choice, short answers and short paragraphs 50 -150 words)	TERM 2
11	3	Transport - Avgas	S1, 2, R1, 2, 3, 4, 5	4 EEI	✓	✓	✓	✓	5 weeks (2½ weeks in class). **Extended Experimental Investigation** – Research project assessing hydrocarbon fuels. Some group work – individual written reports (800 - 1000 words discussion)	TERM 3
	4	The Air we breathe - Pollution	S1, 2, R2, 3, 4, 5	5 SA	✓	✓	✓	✓	1 ½ hrs. **Supervised Assessment** – supervised test (unseen) (multiple choice, short answers and short paragraphs 50 -150 words)	TERM 4
12	5*	Swimming pools	S1, 2, R1, 2, 3, 4, 5	6 EEI	✓	✓	✓	✓	7 weeks (4½ weeks in class). **Extended Experimental Investigation** – Research project on chemical equilibria. Some group work – individual written reports (1000 - 1500 words discussion)	TERM 1
	6*	Salvage and Aircraft	S1, 2, R1, 2, 3, 4, 5	7 SA	✓	✓	✓	✓	2 hrs. **Supervised Assessment** – supervised test (unseen) (multiple choice, short answers and short paragraphs 50 -150 words, some extended for more complex responses)	TERM 2
12	7*	Materials by Design - composites	S1, 2, R1, 2, 3, 4, 5 S1, 2, R1, 2, 3, 4, 5	8 ERT 9 SA	✓ ✓	✓ ✓	✓ ✓	✓ ✓	4 weeks (1½ weeks in class) **Extended Response Task.** Journal supported individual written report (**1000-1**500 words discussion) 2 hrs. **Supervised Assessment** – supervised test (unseen) (multiple choice, short answers and short paragraphs 50 -150 words)	TERM 3
	8	Forensic chemistry	S1, 2, R1, 2, 3, 4, 5	10 SA	✓	✓	✓	✓	2 hrs. **Supervised Assessment** – supervised test (unseen) (multiple choice, short answers and short paragraphs 50 -150 words, some extended for more complex responses)	TERM 4

* Instruments included in verification folio

Year		Student Profile			
Subject	Chemistry				
Teacher					
Student					
		Criteria			
	Assessment	**KCU**	**IP**	**EC**	**Overall**
Sem 1	1. SA				
	2. ERT				
	End Semester 1				
Sem 2	3. SA				
	4. EEI				
	5. SA				
	Monitoring				
Sem 3	6. EEI				
	7. SA				
	End Semester 3				
Sem 4	8. ERT				
	9. SA				
	Verification				
	10. SA				
	Exit				

Aviation High

Chemistry Course Materials 2008

Context 2 – Water – A unique material

AVIATION INDUSTRY APPLICATIONS Time 25 hrs

Background

Water is a simple three atom molecule yet has many unique properties.

- The Celsius temperature scale is based on the melting and boiling points of water; It is the only substance on earth that naturally occurs in all three states; Water is essential for life and comprises at least 60% of every living cell; The search for life in our solar system has now turned into the search for water; Ice, the solid version of water, is less dense than the liquid version. Ice floats on water, an interesting phenomenon, however the significance of this fact has far reaching consequences; The existence of aquatic organisms living at temperatures near freezing point depends on ice forming top down not bottom up; The water performs various roles in organisms because of the unique properties. These include the solvent properties of water. Water has been described as the universal solvent. Nutrients and wastes are transported around the body dissolved in blood plasma which is 95% water. Lost water must be replaced and the quality of drinking water influences the health of people; Chemical tests can be used to assess drinking water and also the health of the surrounding water ways.

(adapted from 'Chemistry in Use' 2006 McGraw-Hill Australia Pty Ltd)

Skills development component

Reaction rates, titrations, solubility measurements and calculations, density, osmotic effects

Aviation specific context - Water relevant to:

- Aircraft design and operation – ice effects, humidity effects, salts and links to meteorology
- Flight crew and passengers – nutrition and wastes
- Environmental effects – pollution testing techniques

Unit Outline – Assessment by Supervised Assessment Task – 1½ hours in Term 2 Exam Block

Unit Organisation	Key Concepts	Suggested learning experiences	Intrinsic subject matter	Possible in class tasks	General objectives AV	SI	KCU
Water and life—some physical properties that	S1 (1.2, 1.5, 1.7) S2 (2.2, 2.3, 2.7, 2.8)	Investigate where water can be found on Earth in the non-living environment and in all organisms. Explore the difference in density between liquid water and ice. Explore why this unique property of ice is	Theories of atomic structure, electrons are viewed as occupying orbitals which are grouped in electron shells, (Electron configuration, electron dot diagrams). Molecular and intermolecular bonding. Relate the macroscopic properties of water molecules to	Written materials	✓	✓	✓

help		important to the existence of some aquatic organisms. Analyse the molecular and intermolecular bonding in water. Justify the cohesion and adhesion forces in water in relation to the bonding. Investigate the capillary action of water in plants.	their microscopic properties. Two or more atoms bound together by one or more covalent bonds form a molecule, with definite size, shape and arrangement of bonds. How a dipole arises with reference to electronegativity, polar bonds and the effect of molecular shape				
Water—the universal solvent	S1 (1.3) S2 (1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.11) R1 (1.2, 1.3) R3 (3.1, 3.2, 3.3, 3.4) R4 (4.2, 4.3) R5 (4.2)	Investigate the types of substances that can dissolve in water by analysing the composition of blood plasma. Explore the solubility of ionic compounds in water. Compare concentrations of substances in water. Perform conversions between different units of concentration. Classify the solubility of ionic substances using the solubility rules. Investigate the implications of 'hard' water on daily activities. Explore the impact of hard water on washing. Investigate how to soften water. Research the types of organic covalent compounds that dissolve by investigating vitamin solubility. Explore the solubility of gases in blood plasma. Investigate the colligative properties of water produced by solutes. Explore the implications of semi-permeable membranes in cells—diffusion and osmosis. Discuss the term 'isotonic' in relation to sports drinks.	Materials may be elements, compounds or mixtures. Elements, mixtures and compounds can be differentiated experimentally composition of pure substances and mixtures Forces weaker than covalent bonding exist between molecules. Van der Waal's dispersion forces, dipole-dipole forces, hydrogen bonding and the factors affecting their strength the properties of polar and non-polar compounds and models of intermolecular bonding to explain these properties The mole, defined arbitrarily using the isotope carbon-12, is the basic quantity in stoichiometric calculations. Avogadro's number, relative atomic mass, relative molecular mass and relative formula mass, molar mass, molar volume, molarity, empirical and molecular formulas, percentage composition The use of molarity for expressing concentration allows easy interconversions between volume of solution and moles of solute, concentrations (molarity, percentage volume, percentage mass, ppm) dilution, concentrated, dilute, saturated, solubility	Experimental Investigations	✓	✓	✓
Drinking Water	S2 (2.1, 2.2, 2.3, 2.4, 2.5 2.6, 2.7, 2.8, 2.10, 2.11) R1 (1.2) R3 (3.1, 3.2, 3.4) R4 (4.1, 4.2, 4.3) R5 (5.2)	Relate the functions of water in the body including transport of wastes (urea and sweat) to the need to replenish water. Consider the sources of water for drinking. Identify the possible contaminants of drinking water. Investigate methods of treating drinking water, including flocculation, chlorination and reverse osmosis. Compare tap water to bottled water.	Qualitative and quantitative testing may be used to determine the composition or type of material. Specialised techniques and instrumentation are used in chemical analysis.	Experimental Investigations	✓	✓	✓
Monitoring Waterways	S2 (2.1, 2.2, 2.3, 2.4, 2.5, 2.10) R1 (1.2) R3 (3.1, 3.2, 3.4) R4 (4.1, 4.2, 4.3) R5 (5.2)	Discuss the indicators of healthy waterways. Identify ways that healthy waterways may be changed. Perform tests on nearby creeks, streams, rivers or oceans. Compare your findings with published data.	Qualitative and quantitative testing may be used to determine the composition or type of material. Specialised techniques and instrumentation are used in chemical analysis. Primary and secondary data can be collated and compared.	Written test	✓	✓	✓

Aviation High

Chemistry Course Materials 2008

Context 6 – Salvage and Aircraft - Electrochemistry

AVIATION INDUSTRY APPLICATIONS Time 25 hrs

Background

Shipwrecks and salvaging material from them have fascinated people for centuries. One of the major problems facing the salvaging of material is corrosion – both of the sunken ships themselves and the artefacts they contained. Corrosion, however, is not confined to sunken ships.

All steel structures, whether on dry land or water are subject to it – motor cars, bridges, buildings, and machinery and household appliances. In the case of aircraft corrosion plays a critical role in determining the maintenance schedule.

An understanding of electrochemical processes has allowed scientists to develop materials which are more resistant to corrosion. Restoration of objects recovered from shipwrecks without causing additional damage requires a good understanding of a wide range of chemical processes. (adapted from 'Chemistry in Use' 2006 McGraw-Hill Australia Pty Ltd)

Skills development component

Calculations, balancing equations, half equations, Redox series, galvanic protection, electroplating, factors affecting corrosion.

Aviation specific context - Materials relevant to:

- Corrosion and fatigue of structures including aircraft and buildings
- Acid carbonate effects in engines

Unit Outline – Assessment by Supervised Assessment Task – 2 hours in Term 2 Exam Block					General objectives		
Unit Organisation	**Key Concepts**	**Suggested learning experiences**	Intrinsic subject matter	**Possible in class tasks**	**AV**	**SI**	**KCU**
The deep sea environment and corrosion	S2 (2.1, 2.2, 2.9, 2.10) R3 (3.2) R4 (4.1, 4.3) R5 (5.1)	Explore the factors that contribute to the corrosion of shipwrecks, including the nature of ocean water and the nature of iron and steel. Perform investigations to compare the rates of corrosion of iron and steel under different conditions.	Factors affecting reaction rates Corrosion – electron transfer	Experimental Investigation	✓	✓	✓
Corrosion is an Electro-chemical process	S1 (1.1, 1.2, 1.5, 1.6) S2 (2.1, 2.2, 2.5, 2.7, 2.9, 2.10) R1 (1.1) R2 (2.1, 2.2) R3 (3.1, 3.2, 3.4, 3.5) R4 (4.3) R5 (5.1, 5.3, 5.4)	Outline the role of electron transfer in oxidation–reduction reactions and write balanced equations. Compare the differences in corrosion of different metals and devise a metal activity series. Perform investigations to construct electrochemical cells, identifying all components and reactions. Examine the reactions that cause corrosion in shipwrecks at great depth.	Oxidation/Reduction Oxidation number Redox equations – balancing, half reactions Metal activity series Passivating metals Galvanic cells, Standard electrode potentials, E° values Factors affecting corrosion – pH, bacteria, dissolved oxygen, temperature	Extended response writing	✓	✓	✓
Protecting material from corrosion	S1 (1.1, 1.2, 1.5) S2 (2.2, 2.5, 2.7) R1 (1.1, 1.3) R2 (2.1, 2.2) R3 (3.2) R4 (4.2, 4.3) R5 (5.1)	Identify ways in which a metal may be protected from corrosion. Design experiments to investigate methods of protection against corrosion. Predict the metal that corrodes when two metals form an electrochemical cell using standard potentials. Describe the process of cathodic protection.	Galvanic corrosion Equilibrium Galvanising and cathodic protection	Extended experimental investigation ASSESSMENT	✓	✓	✓
Restoring salvaged material	S1 (1.1, 1.2, 1.5) S2 (2.2, 2.5, 2.7, 2.10) R1 (1.1, 1.2, 1.3) R2 (2.1, 2.2) R3 (3.1, 3.2, 3.4, 3.5) R4 (4.1, 4.3) R5 (5.1, 5.3, 5.4)	Examine the relationship between galvanic and electrolytic cells. Describe what happens at the anode and cathode during electrolysis. Identify the use of electrolysis as a means of removing salt. Discuss the range of chemical procedures that can be used to clean, preserve and stabilise artefacts from wrecks. Apply these procedures to other situations, including experimental tasks.	Electrolysis Acid – carbonate reactions	Written materials	✓	✓	✓