

COURSE SYLLABUS

Course Title: Chemistry
(11th Grade, TOEFL Beginner)
The Asian International School

I. INSTRUCTIONAL RESOURCES

1. Texts:

(1) *Conquering Chemistry*

Preliminary Course Fourth Edition

Roland Smith. **Publisher:** McGraw-Hill; 4Rev Ed edition (2006)

Nelson Cengage Learning,

Level 7, 80 Dorcas street, South Melbourne, Victoria Australia 3205

ISBN: 978-0170226790

For learning solutions, visit

cengage.com.au

(2) *Cambridge IGCSE Chemistry Course book*

Third Edition 2010

Richard Hardwood and Ian Lodge. **Publisher:** Cambridge University Press

Cambridge University Press,

The Edinburgh Building, Cambridge CB2 8RU, UK

For learning solutions, visit

www.cambridge.org

www.cambridge.org/97805211533311

II. COURSE PREREQUISITES

- Minimum efficiency in Reading, Writing, Listening and Speaking skills in English. Functional use of a Dictionary
- The content in each module must be addressed over the course
- Experiences over the course must cover the scope of each skill

III. COURSE DESCRIPTION

Conquering Chemistry Preliminary Course Fourth edition is the first in series of two books that addresses the revised New South Wales Stage 6 Chemistry syllabus. Written by experienced author Roland Smith, the new full color editions include a range of features that reflect the syllabus amendments, with a clear focus on chemical applications in the real world. Each book also includes a free student CD-ROM featuring the whole text in electronic format. This year, students will focus on two modules from the Chemistry Stage 6 Syllabus which are **Metals Properties, Uses and Reaction** and **Quantitative Aspects Of Formulae and Equations**.

Cambridge IGCSE Chemistry Course book third edition is written by experienced authors Richard Hardwood and Ian Lodge, the recently edited version of 2010 includes numerous written experiments, which include models and demonstrate real life results; this is a great help to students, especially for topics such as **Electrolysis**. From this course, students will study the following topics:

- Electrolysis
- Acids, Bases and Salts
- Oxidation and reduction reactions
- Metals
- Quantitative aspects of formulae and equations
- Organic Chemistry

IV. CONTEXTUAL OUTLINE

Electrolysis

Electrolysis is the process of using electricity to break apart the ions in an ionic substance that is either dissolved in water or molten. Half equations can be used to explain what happens to the ions during electrolysis. Electrolysis is often used to obtain chlorine, hydrogen, sodium hydroxide and to purify sodium and copper metals.

Acids, Bases and Salts

Acids and bases are important classes of chemical compounds. They are part of the foods and beverages we ingest, they are present in medicines and other consumer products, and they are prevalent in the world around us.

Metals

The properties and reactivity of metals have become pieces of necessary knowledge as students will need to recall this information when we learn topics such as Electrolysis and REDOX reactions. Because metals make up the majority of elements, an examination of the physical and chemical properties of metals is also an appropriate context in which to consider the organization of the common Periodic Table. Once learning the parts and placement of elements on the Periodic Table, extracting important information about an element, such as relative atomic mass and relative molecular mass will be learned.

Oxidation and reduction reactions

Oxidation-reduction reaction, also called redox reaction, any reaction in which the oxidation number of a participating chemical species changes. The term covers a large and diverse body of processes. Many oxidation-reduction reactions are as common and familiar as fire, the rusting and dissolution of metals, the browning of fruit, and respiration and photosynthesis—basic life functions.

Most oxidation-reduction (redox) processes involve the transfer of oxygen atoms, hydrogen atoms, or electrons, with all three processes sharing two important characteristics: (1) they are coupled—i.e., in any oxidation reaction a reciprocal reduction occurs, and (2) they involve a characteristic net chemical change—i.e., an atom or electron goes from one unit of matter to another.

Quantitative Aspects of Formulae and Equations

A particular compound always contains the same elements. They are always present in a fixed ratio by mass. To make a link between the mass ratios and the chemical formulae of a compound, we use the idea of moles. The idea of moles means that we can now work out chemical formulae from experimental data on combining masses. It provides the link between the mass of an element in a compound and the number of its atoms present.

This module increases students' understanding of the practice of using moles as a unit of measurement when talking and dealing with elements and the composition of compounds.

Organic Chemistry

Organic chemistry is the study of the structure, properties, composition, reactions, and preparation of carbon-containing compounds, which include not only hydrocarbons but also compounds with any number of other elements, including hydrogen (most compounds contain at least one carbon–hydrogen bond), nitrogen, oxygen, halogens, phosphorus, silicon, and sulfur. This branch of chemistry was originally limited to compounds produced by living organisms but has been broadened to include human-made substances such as plastics. The range of application of organic compounds is enormous and also includes, but is not limited to, pharmaceuticals, petrochemicals, food, explosives, paints, and cosmetics.

Through the assigned readings, lectures, films and discussion sections, the course will emphasize the following Key Competencies:

- Chemistry provides the context within which to develop general competencies essential for the acquisition of effective, higher-order thinking skills necessary for further education, work and everyday life.
- Key competencies are embedded in the text *Conquering Chemistry* and the IGCSE Chemistry Course book to enhance student learning and are explicit in the objectives and outcomes.
- The key competencies of **collecting, analyzing and organizing information** and communicating ideas and information reflect core processes of scientific inquiry and the skills identified in the syllabus assist students to continue to develop their expertise in these areas.
- Students work as individuals and as members of groups to conduct investigations and through this, the key competencies **planning and organizing activities and working with others and in teams** are developed.
- During investigations, students use appropriate information technologies and so develop the key competency of using technology. The exploration of issues and investigation of problems contributes towards students' development of the key competency **solving problems**.
- Finally when students analyze statistical evidence, apply mathematical concepts to assist analysis of data and information and construct table and graphs, they are developing the key competency **using mathematical ideas and techniques**.

V. COURSE OBJECTIVES

After completion of this course, students should be able to:

1. Electrolysis

- Understand the process of electrolysis.

- Define the term cathode and anode.
- Identify the parts of an electrolysis experiment.
- Understand how electrolysis of an aqueous solution differs from a solution that does not involve water.
- Understand what materials are suitable for making the electrodes used in electrolysis.
- Understand the process of electroplating and list uses of electroplating that can be applied to real life scenarios.

2. Acid, Base and Salt

Acid, Base and Salt

- Define the term acid and give examples.
- Define the term base and give examples.
- Identify the difference in properties between acids and bases.
- Learn how to identify an acid or a base using their properties.
- Give examples of acid reactions in daily life.
- Understand what the different colors on the pH scale represent
- Compare values on pH scale and choose appropriate indicators.
- Use pH values to compare strengths of acids and bases.

Soluble and Insoluble Salts

- Define an insoluble salt.
- Define a soluble salt.
- Identify set-up for titration and calculate unknown concentration when given data.
- Understand how to prepare soluble and insoluble salts.
- Define acid rain.
- Identify causes and solutions of acid rain.

3. Nitrogen

Nitrogen and its uses

- Define nitrogen
- Define nitrogen cycle.
- Understand and explain the Haber process.
- Understand how nitrogen is used in the development and production of products such as ammonia and fertilizer, and use this information to create a link to the Haber process.
- Discuss the different types of fertilizers (for example, potassium fertilizer).

4. Oxidation - reduction Reactions

Redox reactions

- Define oxidation
- Define reduction
- Define oxidation number.
- Identify oxidizing agents and reducing agents and understand how to identify and differentiate between the both.

5. Metals

Metals have been extracted and used for many thousands of years

- describe the use of common alloys including steel, brass and solder and explain how these relate to their properties
- identify why there are more metals available for people to use now than there were 200 years ago

Metals differ in their reactivity with other chemicals and this influences their uses

- describe observable changes when metals react with dilute acid, water and oxygen
- describe and justify the criteria used to place metals into an order of activity based on their ease of reaction with oxygen, water and dilute acids.
- outline the relationship between the relative activities of metals and their positions on the Periodic Table

6. Quantitative Aspects of Formulae and Equations

Relative atomic mass, relative molecular mass and relative formula mass

- define the terms relative atomic mass, relative molecular mass and relative formula mass.
- identify the relationship between the amount of substance and its mass.
- compare the relative atomic mass, relative molecular mass and relative formula mass of different elements.

Moles are the unit of measurement for elements

- Understand how to calculate the mass of one mole of an element.
- Practice using moles in balancing equations.
- Practice calculations involving moles of gases
- Convert between mass, moles, and number of atoms/molecules by using mole ratio.

Chemical Equations

- Practice calculating formulae from given experimental data
- Understand the historical advances and breakthroughs relating to chemical equations and their relationship to moles.
- Understand how to derive mass calculations from chemical equations.
- Define the term yield
- Understand yield and its importance for extracting metals.

7. Organic Chemistry

Carbon

- Define carbon and state its properties.
- Identify why the properties of carbon are unique compared to other non-metal elements.

Alkenes and Alkanes

- Define the term Alkane and Alkene
- Understand how to differentiate between **Alkenes and Alkanes**.
- Understand the process of burning alkanes and be able to list some of its uses.
- Understand videos that show experiments on how to test for Alkenes and be able to give evidence to support the results of the experiments.
- Naming alkanes, alkenes, alkynes
- Be able to define isomerism
- Be able to identify and recall the hydrocarbon structure and how its structure links to its properties.
- Distinguish between saturated and unsaturated organic compounds.

Alcohols

- Define the term alcohol.
- Understand and identify the steps taken in the production of ethanol.
- Understand and explain the reactions ethanol has with different substances, and create a relationship between the properties of ethanol and the manner in which it reacts with different substances.
- Discuss the effects intake of alcohol has on a person's health and weigh the negative and positive impacts.

- Learn about organic acids and esters.
- Understand the process of esterification and be able to identify all the steps.

In addition, students should also have developed the following skills...

- Be able to make observations from a scientific perspective
- Be knowledgeable about scientific concepts and theories
- Be able to think scientifically and use scientific knowledge to make decisions in real world problems.
- Think analytically by evaluating evidence using relevant criteria; develop appropriate conclusions as well as new questions
- Communicate ideas clearly, both written and verbal
- Be able to read, interpret & examine scientific claims
- Be able to pose questions & form hypotheses based on personal observations, scientific articles, experiments & knowledge
- Draw inferences from complicated contexts and analyze the information within and across texts of varying lengths.
- Demonstrate developed skills of using context clues to understand new vocabulary and concepts and use them accurately in reading, speaking, and writing.
- Describe, analyze, and evaluate information within and across literary and other texts from a variety of cultures and historical periods.
- Explain how literary and other texts evoke personal experience and reveal character in particular historical circumstances.
- Write for a variety of purposes and compose a research paper.
- Write on a variety of tasks and for many different audiences.
- Write from a variety of stimulus materials from various literary genres and within various time constraints.
- Generate, draft, revise, and edit ideas and forms of expression in their writing.
- Organize their writing by using content and writing conventions of English to illustrate and elaborate their ideas.

VI. COURSE REQUIREMENTS

Students will take the course throughout the academic year. To assess students' progress made in this course, there will be two achievement tests, mid-term (30%) and final (30%) in each semester, accounting for the assigned percentage of the overall course grades. The remaining percentages (40%) of student grades will come from homework, class performance (e.g., participation and attendance), behavior and attitude, and in-class formative assessments (e.g., quizzes and projects). In-class assessments as presentation of knowledge and ideas will cover text materials assigned. The summary of the assessments is the following:

- Midterm Exam (30% of grade)
- Final Exam (30% of grade)
- Other (40% of grade): Homework, class activities, class performance, class discipline and participation, power point presentation

VII. EVALUATION AND GRADING

Student progress made during the course taking will be assessed through achievement tests as well as other assessments designed, planned, and implemented by classroom teachers. The following grading scale will be operated separately in each semester.

A. Achievement Tests (60%)

- Mid-term (30%)
- Final Exam (30%)

B. Other Assessments (40%)

- Homework
- In-class assessments: Quizzes, review activities, project, etc.
- Class Performance: Attendance and Participation
- Power point presentation on any topic related with Chemistry

VIII. GRADING SCALE

This scale is operated to translate letter grades into point values, and vice versa, when calculating student final grades.

Letter	Range	Percentages
A	90-100	90% (High Distinction)
B	80-89	80% (Distinction)
C	65-79	70% (Pass with merit)
D	50- 64	60% (Pass)
F	0- 49	Below 60% (Fail)

IX. COURSE SCHEDULE

CHAPTER/SECTION	CONTENT	PERIODS	NOTES
Electrolysis	Electrolysis		
	Process of Electrolysis	1	
	Electrolysis of Aqueous solutions	1	
	electroplating	1	
	Production of electrical energy	1	
Acid and Base	Acid and base		
	What is an acid?	1	
	Metal oxides and Non-metal oxides	1	
	Acid reactions in everyday life	1	

	Experiment: Using universal indicator	1	
	Alkalis and base	1	
	Characteristic reactions of acids	1	
	Acids and Alkali chemical analysis	1	
	salts	1	
	<i>Revision rest for Module</i>	2	
	Preparing soluble and insoluble salts	1	MIDTERM
	Experiment - color change of Indicator in Acidic and Basic	1	
	Experiment: Preparation of Insoluble salt	1	
	Nitrogen cycle	1	
Oxidation-Reduction Reactions	Uses of Nitrogen in production of fertilizers	1	
	Oxidation-Reduction reactions		
	Reduction and Oxidation reactions	1	
	Oxidizing agents and reducing agents	1	
	Reactivity of metal	1	
	Oxidation and reduction and half reactions	1	
	Relative reactivity, periodic table and first ionization energy	1	
	Experiment: Activity series of metals	1	
Quantitative aspects of formulae and equations	Relative atomic mass (atomic weight)	1	
	<i>Revision test</i>		
	Relative molecular mass (molecular weight)	1	FINAL EXAM
	Relative formula mass (formula weight)	1	
	The Mole	1	

	Moles of gaseous elements	1	
	Converting between mass, moles and numbers of atoms or	1	
	Percent composition	1	
	Calculating formulae from experimental data	1	
	Moles and chemical equations	1	
	Mass calculations from chemical equations	1	
	Yield and its importance from extracting metals	1	
	Some history - Dalton, Gay-Lussac and Avogadro	1	
	Volumes of gases in reactions	1	
	<i>Test Yourself - Chapter Testing</i>	1	
	<i>Revision test for Module</i>	2	
	Organic Chemistry		
	Chemical test for unsaturation	1	
	The unique properties of carbon	1	
	Alkanes	1	MIDTERM
	Burning Alkanese	1	
	Alkenes	1	
	Experiment on testing Alkenes	1	
	Chemical test for unsaturation	1	
Organic Chemistry	Hydrocarbon structure and isomerism	1	
	Isomerism	1	
	Chemical reaction of Alkanes	1	
	Chemical reaction of Alkanes	1	

Alcohols	1	
Making ethanol	1	
The reactions of ethanol	1	
Organic acids and esters	1	
Esterification	1	
Revision test for Module	2	FINAL EXAM