

COURSE SYLLABUS

Course Title: Chemistry
(12th Grade, TOEFL Beginner)
The Asian International School

I. INSTRUCTIONAL RESOURCES

1. Texts:

(1) *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/9780521153331

(2) *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

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

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 and situation. This year, the students will learn Chapter 11 and 12.

Chapter 11: **Petrochemicals and polymers**. In this chapter the students will study the following topics:

- Petroleum
- Alternative fuels and energy sources
- Addition polymerization
- condensation polymerization
- Biological polymers

Chapter 12: **Chemical analysis and investigation.** In this chapter the students will study the following topics:

- Inorganic analysis
- Test for gases
- Methods of collecting and drying gases
- Other test-pH testing
- Organic analysis chromatography
- Experimental design and investigation
- Interpreting observations and data
- Compare and contrast chemistry concepts in pure science and applied science
- Research current events and topics in chemistry
- Research and evaluate science careers using the following criteria: educational requirements, salary, availability of jobs, and working conditions

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 Chapter 10, **Combustion.** In this chapter, we will cover the following topics:

- Exothermic and endothermic reactions
- Enthalpy
- Measuring enthalpy changes for reactions
- Heat of combustion
- Explaining chemical energy changes
- Activation energy, Ignition temperature
- Pollution from burning fossil fuels
- The Greenhouse effect
- Rates of combustion reactions
- Meaning of rate of reaction
- Factors influencing rate of reaction
- Temperature effect and Activation energy
- Catalysis
- Explosions and small particles

IV. CONTEXTUAL OUTLINE

Petroleum

Petroleum comes from many different substances, such as oil and natural gas, from which various products are derived, such as: gasoline, kerosene propane, fuel oil, lubricating oil, wax, and asphalt. These substances are mainly compounds of only two elements: carbon (C) and hydrogen (H).

Alternative fuels and energy sources

Alternative energy encompasses all those things that do not consume fossil fuel. They are widely available and environment friendly. They cause little or almost no pollution. There have been several alternative energy projects running in various countries to reduce our dependence on traditional fossil fuels.

Addition polymerization

An addition polymer is a polymer which is formed by an addition reaction, where many monomers bond together via rearrangement of bonds without the loss of any atom or molecule under specific conditions of heat, pressure, and/or the presence of a catalyst.

Condensation polymerization

Condensation polymers are any kind of polymers formed through a condensation reaction—where molecules join together—losing small molecules as byproducts such as water or methanol, as opposed to addition polymers which involve the reaction of unsaturated monomers.

Biological polymers

Biological polymers are large molecules composed of many similar smaller molecules linked together in a chain-like fashion. The individual smaller molecules are called **monomers**. When small organic molecules are joined together, they can form giant molecules or **polymers**. These giant molecules are also called macromolecules. Natural polymers are used to build tissue and other components in living organisms.

Inorganic Analysis

Inorganic analysis involves a variety of analytical methods which can qualitatively or quantitatively determine the inorganic and elemental composition of solids or liquids or aqueous solutions, chemical mixtures, materials or products. Inorganic components include cations, metals or anions or inorganic salts.

Test for gases

Several of the tests for anions and cations involved detecting gases produced by the test reactions. The gas tests are another important set of general analytical tests.

Organic Analysis

the analysis of organic compounds, concerned chiefly with the determination of carbon as carbon dioxide, hydrogen as water, oxygen as the difference between the sum of the others and 100 per cent, and nitrogen as freenitrogen, ammonia, or nitric oxide; - formerly called ultimate analysis, in distinction from proximate analysis.

Experimental design and investigation

The scientific method is a method for conducting an objective investigation. The scientific method involves making observations and conducting an experiment to test a hypothesis. The number of steps of the scientific method isn't standard. ... Here are the usual steps of the scientific method

Combustion

A combustion reaction is a major class of chemical reactions, commonly referred to as "burning". Combustion usually occurs when a hydrocarbon reacts with oxygen to produce carbon dioxide and water. In the more general sense, combustion involves a reaction between any combustible material and an oxidizer to form an oxidized product. Combustion is an exothermic reaction, so it releases heat, but sometimes the reaction proceeds so slowly that a temperature change is not noticeable.

Exothermic and endothermic reactions

Many chemical reactions release energy in the form of heat, light, or sound. These are exothermic reactions. Exothermic reactions may occur spontaneously and result in higher randomness or entropy of the system. There are other chemical reactions that must absorb energy in order to proceed. These are endothermic reactions. Endothermic reactions cannot occur spontaneously. Work must be done in order to get these reactions to occur.

Enthalpy

Enthalpy is a thermodynamic property of a system. It is the sum of the internal energy added to the product of the pressure and volume of the system. It reflects the capacity to do non-mechanical work and the capacity to release heat.

Activation Energy

Activation energy is the minimum amount of energy required to initiate a reaction. It is the height of the potential energy barrier between the potential energy minima of the reactants and products.

Pollution from burning fossil fuels

We should all be concerned about the pollution of our environment. In this unit we will look at the damage that burning fossil fuels (oil, coal, and natural gas) can cause and how we can help reduce the problems.

The Greenhouse Effect

The trapping of the sun's warmth in a planet's lower atmosphere due to the greater transparency of the atmosphere to visible radiation from the sun than to infrared radiation emitted from the planet's surface.

Reaction rate

Reaction rate is the speed at which a chemical reaction proceeds. It is often expressed in terms of either the concentration (amount per unit volume) of a product that is formed in a unit of time or the concentration of a reactant that is consumed in a unit of time. Alternatively, it may be defined in terms of the amounts of the reactants consumed or products formed in a unit of time. For example, suppose that the balanced chemical equation for a reaction is of the form.

Catalysis

Any substance that increases the rate of a reaction without itself being consumed. Enzymes are naturally occurring catalysts responsible for many essential biochemical reactions.

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 Chemistry Stage 6 Syllabus and the IGCSE Chemistry text 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:

Petrochemicals and Polymers

- Understand the three major fossil fuel
- Understand the process of cracking
- Understand the uses of shorter alkanes
- Understand that Hydrogen fuel cells are being used to power cars.
- Understand the properties of Polymers
- Understand the uses of the different polymers
- Understand the importance of re-use, recycling and disposal of plastic waste
- Understand Proteins and able to name its building blocks (20 different amino acids).
- Understand the main constituents of food.

Combustion

- understand the basic concepts of energy and its traditional sources

- identify the differences of exothermic and endothermic reactions
- being able to write chemical equations for common types of reactions, regardless of which particular compounds are involved
- being able to do simple quantity calculations based on chemical formulae and equations
- understand the basic concepts of energy and its traditional sources
- identify the differences between exothermic and endothermic reactions
- being able to write chemical equations for common types of reactions, regardless of which particular compounds are involved
- being able to do simple quantity calculations based on chemical formulae and equations

Chemical Analysis

- Understand the qualitative analysis
- Understand the process testing ions and testing cations
- Understand the methods of collecting gases
- Understand the methods of drying gases
- Understand the other two useful general tests: pH testing and testing for the presence of water
- Understand the organic analysis: The test for unsaturated hydrocarbons, The test for ethanol and ethanoic acid and Chromatography
- Understand the scientific investigation and scientific method
- Understand the meaning and process of qualitative analysis
- Enumerate some qualitative tests
- Identify the process of testing the negative ions and positive ions
- Name the different methods for collecting gases
- Enumerate the different methods of drying gases

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

VI. COURSE REQUIREMENTS

A. Assessments

Students will take the course throughout the entire 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 etc.

B. Additional Activities

At least one open- ended investigation/research portfolio integrating the skills and knowledge and understanding outcomes must be included in the course

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
		<i>Introduction</i>		
Petrochemicals and polymers		petroleum	1	
		Alternative fuels and energy sources	1	
		Addition polymerization	1	
		condensation polymerization	1	

		Biological polymers		
Combustion		10.1 Exothermic and endothermic reactions	1	
		10.2 Enthalpy	1	
		10.3 Measuring enthalpy changes for	1	
		10.4 Heat of combustion	.	
		10.5 Explaining chemical energy changes	1	
		10.6 Activation energy	1	
		10.7 Ignition temperature	1	
		10.8 Pollution from burning fossil fuels	.5	
		10.9 The Greenhouse effect	1	
		10.10 Rates of combustion reactions	1	
		10.11 Meaning of rate of reaction	1	
		10.12 Factors influencing rate of reaction	1	
		10.13 Explanations	1	
		10.14 Temperature effect and Activation	1	MIDTERM
		10.15 Catalysis	1	
		10.16 Explosions and small particles	1	
Chemical Analysis and Investigation		Inorganic analysis	1	
		test for gases	1	
		Methods of collecting and drying gases	1	
		other test -pH testing	1	
		Organic analysis Chromatography	1	
		Experimental design and investigation	.	
		Interpreting observations and data	.	
		Compare and contrast chemistry concepts in pure science and applied science	1	
		Research current events and topics in chemistry	1	
		Research and evaluate science careers using the following criteria: educational requirements, salary, availability of jobs, and working conditions.	1 . 5	FINAL EXAM