Dawood Public School
Course Outline 2017-18
Chemistry
Class X

Text book:
Tin Yin Toon and John Sadler Chemistry Matters, 2007, Mc Grewhill.

Introduction:
This syllabus is designed to place more emphasis on factual material and greater emphasis on the understanding and application of scientific concepts and principles.
Successful Cambridge O Level Chemistry candidates gain lifelong skills, including:

- A better understanding of the technological world in which they live, and take an informed interest in science and scientific developments
- Knowledge of the basic principles of chemistry through a mix of theoretical and practical studies
- An understanding of the scientific skills essential for further study at Cambridge International A-Level, skills which are useful in everyday life
- How science is studied and practiced, and an awareness that the results of scientific research can have both good and bad effects on individuals, communities and the environment.

Syllabus Aims and Assessment Objectives:

Aims:
The aims of the syllabus, which are not listed in order of priority, are to:

1. Provide, through well designed studies of experimental and practical chemistry, a worthwhile educational experience for all students, whether or not they go on to study science beyond this level and, in particular, to enable them to acquire sufficient understanding and knowledge to

1.1 Become confident citizens in a technological world, able to take or develop an informed interest in matters of scientific import;
1.2 Recognise the usefulness, and limitations, of scientific method and to appreciate its applicability in other disciplines and in everyday life;
1.3 Be suitably prepared for studies beyond Cambridge O Level in pure sciences, in applied sciences or in science-dependent vocational courses.

2. Develop abilities and skills that:

2.1 Are relevant to the study and practice of science;
2.2 Are useful in everyday life;
2.3 Encourage efficient and safe practice;
2.4 Encourage effective communication.

3. Develop attitudes relevant to science such as:

3.1 Concern for accuracy and precision;
3.2 Objectivity;
3.3 Integrity;
3.4 Enquiry;
3.5 Initiative;
3.6 Inventiveness.

4. Stimulate interest in and care for the local and global environment.

5. Promote awareness that:

5.1 The study and practice of science are co-operative and cumulative activities, and are subject to social, economic, technological, ethical and cultural influences and limitations;

5.2 The applications of sciences may be both beneficial and detrimental to the individual, the community and the environment.

Assessment Objectives:

The assessment objectives describe the knowledge, skills and abilities that candidates are expected to demonstrate at the end of the course. They reflect those aspects of the aims that are assessed.

AO1 Knowledge with Understanding:

Candidates should be able to demonstrate knowledge and understanding in relation to:

1. Scientific phenomena, facts, laws, definitions, concepts and theories
2. Scientific vocabulary, terminology and conventions (including symbols, quantities and units)
3. Scientific instruments and apparatus, including techniques of operation and aspects of safety
4. Scientific quantities and their determination
5. Scientific and technological applications with their social, economic and environmental implications.

Syllabus content defines the factual material that candidates may be required to recall and explain. Questions testing these objectives will often begin with one of the following words: define, state, describe, explain or outline.

AO2 Handling Information and Solving Problems:

Candidates should be able, in words or using symbolic, graphical and numerical forms of presentation, to:

1. Locate, select, organise and present information from a variety of sources
2. Translate information from one form to another
3. Manipulate numerical and other data
4. Use information to identify patterns, report trends and draw inferences
5. Present reasoned explanations for phenomena, patterns and relationships
6. Make predictions and hypotheses
7. Solve problems.

These assessment objectives cannot be precisely specified in the syllabus content because questions testing such skills may be based on information that is unfamiliar to the candidate. In answering such questions, candidates are required to use principles and concepts that are within the syllabus and apply them in a logical, deductive or reasoned manner to a new situation. Questions testing these skills will often begin with one of the following words: predict, suggest, calculate or determine

AO3 Experimental Skills and Investigations:

Candidates should be able to:

1. Follow a sequence of instructions
2. Use techniques, apparatus and materials
3. Make and record observations, measurements and estimates
4. Interpret, evaluate and report upon observations and experimental results
5. design/plan an investigation, select techniques, apparatus and materials
6. Evaluate methods and suggest possible improvements.

Nomenclature, Units and Significant Figures:

- The proposals in 'Signs, Symbols and Systematics' (The Association for Science Education Companion to 16–19 Science)' will generally be adopted, although the traditional names sulfate, sulfite, nitrate, nitrite, sulfurous and nitrous acids will be used in question papers. Sulfur (and all compounds of sulfur) will be spelt with f, not ph. To avoid difficulties arising out of the use of l as the symbol for litre, use of dm^3 in place of l or litre will be made.
- In accordance with current ASE convention, decimal markers in examination papers will be a single dot on the line. Candidates are expected to follow this convention in their answers.
- Candidates should be aware that misuse of units and/or significant figures, i.e. failure to quote units where necessary, the inclusion of units in quantities defined as ratios or quoting answers to an inappropriate number of significant figures, is liable to be penalised.

Scheme of Assessments:

Students are required to enter:

i) In monthly and surprise tests;

ii) In mid-year and final exams give two papers;

Total marks for both papers are 115

Paper	Type of Paper	Duration	Marks
1	Multiple Choice	1hour	40
2	Theory	1hour 30 minutes	75

Instructions:

(i) Students should have her own text book in the class.
(ii) Students are allowed to note the lecture points and ask questions after the lecture.
(iii) Students shall only submit their journals weekly on the allotted days after completing their work.
(iv) Students are allowed to ask and share their problems any time.
(v) Students must write the name of the chapter and date on their work.
(vi) Students must draw diagrams where necessary and write neatly in journals.
(vii) Students are not permitted to use corrector fluids in exams and in class work.
(viii) Talking, doing any other subject's work during class will be strictly penalized.
(ix) Sharing of stationary during test and exams is not allowed.

Syllabus Content with Time Line

First Term

August 2017

Chapter: Salts

- Preparing salts
- Qualitative analysis

Practical:

- Perform acid base titration.
- Prepare insoluble salts by neutralization. 9

Assignments:

- Search the importance of salts in industries and daily life.
- Exercise from chemistry matters.

Resources and References:

- Chemistry by Richard Harwood pg. 138 - 144
- Chemistry for O level By Christopher
- Chemistry by Roger Norris pg. 132 – 144

Chapter: Ammonia

Learning and Assessment objectives
Students should be able to:

(i) Describe the use of nitrogen and hydrogen in the manufacture of ammonia;
(ii) State that some chemical reactions, like the manufacture of ammonia, are reversible;
(iii) Describe the essential conditions which increase the yield of ammonia in the Haber processes
(iv) Describe the use of nitrogenous fertilizer in promotion growth ad crop yield;
(v) Calculate the percentage mass of nitrogen in various nitrogenous fertilizers;
(vi) Describe the eutrophication and water pollution caused by fertilizers;
(vii) Describe the displacement of ammonia from fertilizers like ammonium nitrate by adding lime.

Contents:

- Reversible Reactions
- Manufacturing Ammonia by the Haber process
- Displacement of Ammonia from its salt

Assignments:

- Exercise from the book
- Search for the use of sulfuric acid in the industries

Resources and References:

- Chemistry by Richard Harwood pg. 236- 238
- Chemistry for O level By Christopher N Prescott pg 201- 213
- Chemistry Matters pg. 350 -358
- Chemistry by Jane Morris pg.242 - 249
- Chemistry by Roger Norris pg.197 – 199

Chapter: Sulfuric Acid

Learning and Assessment Objectives:
Students should be able to:

(i) State the use of sulfuric dioxide as bleach in the manufacture of wood pulp for paper; as a food Preservative.
(ii) Describe the manufacture of sulfuric acid from sulfur by the contact process.
(iii) Describe the properties of dilute sulfuric acid as a typical acid.
(iv) State the use of sulfuric acid as in the manufacture of detergents and in fertilizers.

Contents:

- Extraction of sulfur
- Chemistry of oxides of sulfur
- Industrial manufacture of sulfuric acid: the contact process
- Uses of sulfuric acid

Assignments:

- Exercise from Christopher N Prescott Chemistry, 3rd edition
- Exercise from Harwood, R. Chemistry by Cambridge University Press 1998

Resources and References:

- Chemistry by Richard Harwood pg. 221- 223
- Chemistry for O level By Christopher N Prescott pg. 214 - 223
- Chemistry Matters pg. 181 -189
- Chemistry by Jane Morris pg.236 - 242
- Chemistry by Roger Norris pg. 201 – 203

Chapter: Chemical Reactions

Learning and Assessment objectives:

Students should be able to:

Rate of reaction

a) *describe the effect of concentration, pressure, particle size and temperature on the rates of reactions and explain these effects in terms of collisions between reacting particles
b) Define the term catalyst and describe the effect of catalysts (including enzymes) on the rates of reactions
c) *explain how pathways with lower activation energies account for the increase in rates of reactions
d) State that transition elements and their compounds act as catalysts (see 8.3) in a range of industrial processes and that enzymes are biological catalysts
e) Suggest a suitable method for investigating the effect of a given variable on the rate of a reaction
f) *interpret data obtained from experiments concerned with rate of reaction

Redox

(a) Define oxidation and reduction (redox) in terms of oxygen/hydrogen gain/loss
(b) Define redox in terms of electron transfer
(c) Identify redox reactions in terms of oxygen/hydrogen, and/or electron, gain/loss
(d) Describe the use of aqueous potassium iodide, and acidified potassium manganate (VII) and acidified potassium dichromate (VI) in testing for oxidising and reducing agents from the resulting colour changes

Reversible Reactions

(a) Describe the idea that some chemical reactions can be reversed by changing the reaction conditions
(b) Describe the idea that some reversible reactions can reach dynamic equilibrium and predict the effect of changing the conditions (see 7.3(b) and (c))

Content:

- Rate of reaction
- Redox
- Reversible reactions

Resources and References:
Chemistry by Richard Harwood pg.185 – 199
Chemistry for O level By Christopher N Prescott pg.144- 149
Chemistry Matters pg.212- 226
Chemistry by Jane Morris pg.64 - 75
Chemistry by Roger Norris pg. 146 – 156
http://www.crocodile-clips.com/absorb/AC4/m3. htm
go to 'rates of reaction' and click on 'view unit'
www.chemsoc.org/networks/learnnet/classic_exp. htm
Look at experiments 29, 64, 65, 58
www.s-cool.co.uk/contents.asp click on 'GCSE revision' then 'Chemistry' then choose topic: 'Rates of Reaction'
http://www.gcsechemistry.co m/rc11.htm

September 2017

Chapter: Energy from Chemicals

Learning and Assessment objectives
Students should be able to:
(a) describe the meaning of enthalpy change in terms of exothermic (ΔH negative) and endothermic (ΔH positive) reactions
(b) *represent energy changes by energy profile diagrams, including reaction enthalpy changes and activation energies (see 6.1(c))
(c) describe bond breaking as an endothermic process and bond making as an exothermic process
(d) *explain overall enthalpy changes in terms of the energy changes associated with the breaking and making of covalent bonds
(e) Describe combustion of fuels as exothermic, e.g. wood; coal; oil; natural gas; hydrogen
(f) Describe hydrogen, derived from water or hydrocarbons, as a potential fuel for use in future, reacting with oxygen to generate electricity directly in a fuel cell (details of the construction and operation of a fuel cell are not required) and discuss the advantages and disadvantages of this
(g) name natural gas, mainly methane, and petroleum as sources of energy
(h) Describe petroleum as a mixture of hydrocarbons and its separation into useful fractions by

Fractional Distillation
(i) Name the following fractions and state their uses
(ii) Petrol (gasoline) as a fuel in cars
(iii) Naphtha as feedstock for the chemical industry
(iv) Paraffin (kerosene) as a fuel for heating and cooking and for aircraft engines
(v) Diesel as a fuel for diesel engines
(vi) Lubricating oils as lubricants and as a source of polishes and waxes
(vii) Bitumen for making road surfaces
(viii) Describe photosynthesis as the reaction between carbon dioxide and water in the presence of chlorophyll, using sunlight (energy) to produce glucose and explain how this can provide a renewable energy source.

Resources and References:
Chemistry by Richard Harwood pg. 180 – 199
Chemistry for O level By Christopher N Prescott pg.130- 143
Chemistry Matters pg.304- 316
Chemistry by Jane Morris pg.204 - 217
Chemistry by Roger Norris pg. 86 – 94
www.wpbschoolhouse.btinternet.co.uk/page10/page10. htm
Click on 'Reversible Reactions and Ammonia Synthesis'
http://www.ukagriculture.com/uk_farming/crops/fertilising_crops. html

Chapter: Metals

Learning and Assessment Objectives:
Students should be able to:
(i) Describe the general physical properties of metals.
(ii) Explain why metals are often used in the form of alloys.
(iii) Identify representations of metals and alloys from diagram of structures.
(iv) Place calcium copper, hydrogen, iron, magnesium, potassium, silver, sodium, and zinc in order of reactivity.
    a. The reactions, of metals with water or steam; dilute hydrochloric acid.
    b. The reduction, of their oxides with carbon and with hydrogen.
(v) Describe reactivity series as related to the tendency of a metal to form its positive ions, illustrated by its reaction with:
    a. The aqueous ions of other listed metals.
    b. The oxides of the other listed metals.
(vi) Describe the action of heat on the carbonates of the listed metals.
(vii) Account for the apparent un reactivity of aluminum in terms of the p resence of an oxide layer which Adheres to the metal.
(viii) Deduce an order of reactivity from a given set of experimental results.

Contents:
- Metals in the periodic table
- Properties of metals and alloys
- The reactivity series of metals
- The stability of metal compounds
- The displacement power of metals

Assignments:
- Exercise from Christopher N Prescott Chemistry for O level, 3rd edition
- Exercise from Harwood, R Chemistry

Resources and References:
- Chemistry by Richard Harwood pg. 250 -275
- Chemistry for O level By Christopher N Prescott pg. 242 - 256
- Chemistry Matters pg. 227-260
- Chemistry by Jane Morris pg.52 - 63
- Chemistry by Roger Norris pg. 158 – 168

October 2017

Chapter: Extraction of metals

Learning and Assessment Objectives:
Students should be able to:

(i) Describe the case of obtaining metals from their ores by relating the elements to the reactivity series.
(ii) Describe the essential reactions in the extraction of iron from haematite in the blast furnace.
(iii) Describe the idea of changing the properties of iron by the controlled use of additives to form alloys called steels.
(iv) State the use of mild steel and stainless steel.
(v) Describe, in outline, the extraction of aluminium from pure aluminium oxide.
(vi) State the use of aluminium; the manufacture of air craft because of its strength and low density; in food containers because of its resistance to corrosion.
(vii) State the use of Zinc for galvanizing and for making brass.
(viii) State the use of copper related to its properties, e.g electrical wiring.

Contents:

- Metals and alloys
- The reactivity series
- Extraction of metals
- The use of Iron &Steel
- Rusting
- Rusting
- Recycling metals

Assignments:

- Exercise from the book
- Collect information on importance of recycling

Resources and References:

Chemistry by Richard Harwood pg. 27- 31, 46 - 48
Chemistry for O level By Christopher N Prescott pg. 257 - 272
Chemistry Matters pg. 227 - 257
Chemistry by Jane Morris pg.52 - 63
Chemistry by Roger Norris pg. 170 - 178
www.wpbschoolhouse.btinternet.co.uk/page10/page10. htm
Click on 'Extraction of Metals'and 'Extra Industrial Chemistry'
www.alfed.org.uk/aluminium. htm
http://www.btinternet.com/~chemistry.diagrams/aluminium_extraction. htm

November 2017

Revision of class IX & X syllabus

December 2017
Mid-Year Examinations

Final Term

January 2018

Chapter: Electrolysis

Learning and Assessment objectives:
Students should be able to:

(i) Describe the electrode product in the electrolysis of:(a)molten lead(II) bromide, concentrated hydrochloric acid , concentrated aqueous sodium chloride, dilute sulfuric acid between inert electrodes; b)aqueous copper(II)sulfate using carbon electrodes and using copper electrodes.
(ii) Describe electrolysis in term of the ions present and the reactions on the electrodes as examples given.
(iii) State the general principle that metals or hydrogen are formed at the negative electrode and that nonmetal are formed at the positive electrode.
(iv) Predict the likely products of the electrolysis of a specified binary compound in the molten state or in concentrated aqueous solution.
(v) Describe, in outline the manufacture of:
    (a) Aluminum from pure aluminum oxide in molten cryolite.
    (b) Chlorine and sodium hydroxide from concentrated aqueous sodium chloride.
(vi) Describe the electroplating of metals exemplified by copper plating.
(vii) State two uses of electroplating.
(viii) Describe the reasons for the use of copper and aluminum in cables and why plastics and ceramics are used as insulators.

Contents:

- Introducing electrolysis
- Explaining Electrolysis
- Electrolysis of molten Ionic compounds
- Electrolysis of aqueous solution of compounds
- Electrolysis of aqueous solution of compounds
- Industrial Applications of Electrolysis
- Simple cell

Assignment:

- Exercise from the book

Resources and References:

Chemistry by Richard Harwood pg. 1162 - 125
Chemistry for O level By Christopher N Prescott pg.114 - 129
Chemistry Matters pg. 261-282
Chemistry by Jane Morris pg.52 - 63
Chemistry by Roger Norris pg. 70 – 77, 80 – 81, 170 – 171
www.chemsoc.org/networks/learnnet/classic_exp. htm
Look at experiments 82, 92,100
www.chemsoc.org/networks/learnnet/classic_exp .htm
Look at experiments 7, 15.
http://science.howstuffworks.com/battery. htm
www.wpbschoolhouse.btinternet.co.uk/page10/page10. htm
Click on ‘Reactivity of Metals’

February 2018

Chapter: Air

Learning and Assessment Objectives:
Students should be able to:
(i) Describe idea in simple terms the ideas of respiration,, combustion and rusting
(ii) Describe the volume composition f clean air in term of 79%nitrogen, 20%oxygen, with the reminder being noble gases, carbon dioxide and variable amounts of water vapour
(iii) Name common pollutant of air
(iv) State the source of each pollutant
(v) State the adverse effect of acidic pollutants on buildings and plants, and of carbon mono oxide and Lead compounds on health
(vi) Describe the separation of oxygen and nitrogen from liquid air by fractional distillation
(vii) Name the use of oxygen
(viii) Describe paint and other coatings, including galvanizing, as a method of rust prevention
(ix) Describe sacrificial protection in term of the reactivity series of metals

Contents:
- Oxygen
- Combustion and Respiration
- Composition of Air
- Fractional Distillation of Air

Assignments:
- Exercise from the book

Resources and References:
Chemistry by Richard Harwood pg.217 - 218
Chemistry for O level By Christopher N Prescott pg. 273 - 288
Chemistry Matters pg. 359 - 376
Chemistry by Jane Morris pg.52 - 63
Chemistry by Roger Norris pg. 180 - 192
Use a search engine such as
http://mistupid.com/chemistry/aircomp. htm
www.boc.com/education/index. html
www.chemsoc.org/networks/learnnet/classic_exp. htm
Look at experiment 11

Chapter: Water

Learning and Assessment Objectives:
Students should be able to:
(i) Describe the formation of hydrogen as product of the reaction between;
  (a) Reactive metals and water
  (b) Metals and acid
(ii) Solutions related to the ions present and their position in the reactivity series
(iii) Describe, in outline, the manufacture of hydrogen from the reaction between methane and steam
(iv) State the use of hydrogen

(v) Describe in outline, the purification of water
(vi) State some uses of water in industry and in water
(vii) Describe a chemical test for water

Contents:

- Resources of water
- Reactions of water
- Production of hydrogen
- Uses of water

Resources and References:

Chemistry by Richard Harwood pg.205 - 213
Chemistry for O level By Christopher N Prescott pg. 289 - 300
Chemistry Matters pg. 218 - 222
Chemistry by Jane Morris pg.41- 43
Chemistry by Roger Norris pg.180 - 181
www.wpbschoolhouse.btinter net.co.uk/page10/page10. htm
Click on 'Reversible Reactions' for information on eutrophication.
http://www.crocodile-clips.com/absorb/AC4/m3. htm
Use Google image search for 'desalination' to see images of both membrane and distillation processes

March 2018
Revision

April 2018
Mock Examinations

Resource List:

Students may also find references to the following books helpful; these are suitable for use with this syllabus.

- Harwood, R Chemistry (edition 2, 2003), Cambridge University Press
- Berry, R IGCSE study guide for chemistry (2005) Hooder Murray
- Clegg, A Chemistry for IGCSE (2006) Heinemann
- Eral, B & Chemistry John Murray, Hooder Murray (2003)
- Wilford, L D R
- Hill, g Chemistry counts Hooder and Stoughton (2003)
- Lewis & Thinking Chemistry (GCSE edition) Oxford University press (2004)
- Waller

Websites for general use:

- http://www.chemsc.org/networks/learnnet/classic_exp htm
- http://www.thecatalyst.org/
- http://www.wpbschoolhouse.btinternet.co.uk/page10. htm
- http://www.s-cool.co.uk/contents.asp
- http://www.howstuffworks.com/