

# MARINA INTERNATIONAL SCHOOL

## CHEMISTRY SCHEME OF WORK

### FORM 5 - TERM 1

WEEK	TOPIC	TOPIC DETAILS
1.1	Rate (speed) of reaction	1. Devise and evaluate a suitable method for investigating the effect of a given variable on the rate of a reaction 2. Describe and explain the effect of concentration, particle size, catalysts (including enzymes) and temperature on the rate of reactions 3. Describe the application of the above factors to the danger of explosive combustion with fine powders (e.g. flour mills) and gases (e.g. methane in mines)
1.2	Rate (speed) of reaction	4. Demonstrate knowledge and understanding of a practical method for investigating the rate of a reaction involving gas evolution 5. Interpret data obtained from experiments concerned with rate of reaction Note: Candidates should be encouraged to use the term rate rather than speed.
2.1	Rate (speed) of reaction continue	6. Describe and explain the effects of temperature and concentration in terms of collisions between reacting particles. (An increase in temperature causes an increase in collision rate and more of the colliding molecules have sufficient energy (activation energy) to react whereas an increase in concentration only causes an increase in collision rate.)
2.2	Rate (speed) of reaction continue	7. Describe and explain the role of light in photochemical reactions and the effect of light on the rate of these reactions. (This should be linked to section 14.4.) 8. Describe the use of silver salts in photography as a process of reduction of silver ions to silver; and photosynthesis as the reaction between carbon dioxide and water in the presence of chlorophyll and sunlight (energy) to produce glucose and oxygen
3.1	Reversible reactions	1. Understand that some chemical reactions can be reversed by changing the reaction conditions. (Limited to the effects of heat and water on hydrated and anhydrous copper(II) sulfate and cobalt(II) chloride.) (Concept of equilibrium is not required.)
3.2	Reversible reactions continue	2. Predict the effect of changing the conditions (concentration, temperature and pressure) on other reversible reactions 3. Demonstrate knowledge and understanding of the concept of equilibrium

WEEK	TOPIC	TOPIC DETAILS
4.1	Nitrogen, sulfur and fertilizers	1. Describe and explain the essential conditions for the manufacture of ammonia by the Haber process including the sources of the hydrogen and nitrogen, i.e. hydrocarbons or steam and air 2. Name some sources of sulfur 3. Name the use of sulfur in the manufacture of sulfuric acid 4. State the uses of sulfur dioxide as a bleach in the manufacture of wood pulp for paper and as a food preservative (by killing bacteria)
4.2	Nitrogen, sulfur and fertilizers	5. Describe the manufacture of sulfuric acid by the Contact process, including essential conditions and reactions 6. Describe the properties and uses of dilute and concentrated sulfuric acid 7. Describe the need for nitrogen-, phosphorus- and potassium-containing fertilisers
5.1	Nitrogen, sulfur and fertilizers Carbonates	8. Describe the displacement of ammonia from its Salts 9. Describe the manufacture of lime (calcium oxide) from calcium carbonate (limestone) in terms of thermal decomposition
5.2	Nitrogen, sulfur and fertilizers Carbonates	10. Name some uses of lime and slaked lime such as in treating acidic soil and neutralizing acidic industrial waste products, e.g. flue gas desulfurisation 11. Name the uses of calcium carbonate in the manufacture of iron and cement
6.1	WATER & AIR	1. Describe chemical tests for water using cobalt(II) chloride and copper(II) sulfate 2. Describe, in outline, the treatment of the water supply in terms of filtration and chlorination 3. Name some of the uses of water in industry and in the home
6.2	WATER & AIR	4. Discuss the implications of an inadequate supply of water, limited to safe water for drinking and water for irrigating crops 5. State the composition of clean, dry air as being approximately 78% nitrogen, 21% oxygen and the remainder as being a mixture of noble gases and carbon dioxide 6. Describe the separation of oxygen and nitrogen from liquid air by fractional distillation
7.1	POLLUTANTS AND RUSTING	1. Name the common pollutants in the air as being carbon monoxide, sulfur dioxide, oxides of nitrogen and lead compounds 2. State the source of each of these pollutants: <ul style="list-style-type: none"> <li><input type="checkbox"/> carbon monoxide from the incomplete combustion of carbon-containing substances</li> <li><input type="checkbox"/> sulfur dioxide from the combustion of fossil fuels which contain sulfur compounds (leading to 'acid rain')</li> <li><input type="checkbox"/> oxides of nitrogen from car engines</li> <li><input type="checkbox"/> lead compounds from leaded petrol</li> </ul>

WEEK	TOPIC	TOPIC DETAILS
7.2	POLLUTANTS AND RUSTING	3. State the adverse effect of these common pollutants on buildings and on health and discuss why these pollutants are of global concern 4. Describe and explain the presence of oxides of nitrogen in car engines and their catalytic removal
8.1	POLLUTANTS AND RUSTING	5. State the conditions required for the rusting of Iron 6. Describe and explain methods of rust prevention, specifically paint and other coatings to exclude oxygen
8.2	POLLUTANTS AND RUSTING	7. Describe and explain sacrificial protection in terms of the reactivity series of metals and galvanising as a method of rust prevention
9.1	CARBON DIOXIDE AND METHANE	1. State that carbon dioxide and methane are greenhouse gases and explain how they may contribute to climate change 2. State the formation of carbon dioxide: <input type="checkbox"/> as a product of complete combustion of carbon-containing substances <input type="checkbox"/> as a product of respiration <input type="checkbox"/> as a product of the reaction between an acid and a carbonate <input type="checkbox"/> from the thermal decomposition of a carbonate
9.2	CARBON DIOXIDE AND METHANE	3. State the sources of methane, including decomposition of vegetation and waste gases from digestion in animals 4. Describe the carbon cycle, in simple terms, to include the processes of combustion, respiration and photosynthesis
10.1	Metals	1. List the general physical properties of metals 2. Describe the general chemical properties of metals, e.g. reaction with dilute acids and reaction with oxygen 3. Explain in terms of their properties why alloys are used instead of pure metals
10.2	Metals	4. Identify representations of alloys from diagrams of structure 5. Place in order of reactivity: potassium, sodium, calcium, magnesium, zinc, iron, (hydrogen) and copper, by reference to the reactions, if any, of the metals with: <input type="checkbox"/> water or steam <input type="checkbox"/> dilute hydrochloric acid and the reduction of their oxides with carbon
11.1	metals	6. Deduce an order of reactivity from a given set of experimental results 7. Describe the reactivity series as related to the tendency of a metal to form its positive ion, illustrated by its reaction, if any, with: <input type="checkbox"/> the aqueous ions <input type="checkbox"/> the oxides of the other listed metals
11.2	Metals	8. Describe and explain the action of heat on the hydroxides, carbonates and nitrates of the listed metals 9. Account for the apparent unreactivity of aluminium in terms of the oxide layer which adheres to the metal

<b>WEEK</b>	<b>TOPIC</b>	<b>TOPIC DETAILS</b>
12.1	metal extraction	1. Describe the ease in obtaining metals from their ores by relating the elements to the reactivity series 2. Describe and state the essential reactions in the extraction of iron from hematite
12.2	metal extraction continue	3. Describe the conversion of iron into steel using basic oxides and oxygen 4. Describe in outline, the extraction of zinc from zinc blende
13.1	metal extraction continue	5. Name the uses of copper related to its properties (electrical wiring and in cooking utensils) 6. Name the uses of mild steel (car bodies and machinery) and stainless steel (chemical plant and cutlery)
13.2	metal extraction continue	7. Explain the uses of zinc for galvanising and for making brass 8. Describe the idea of changing the properties of iron by the controlled use of additives to form steel alloys

# CHEMISTRY SCHEME OF WORK

## FORM 5 - TERM 2

WEEK	TOPIC	TOPIC DETAILS
1.1	Organic chemistry- Names of compounds	1. Name and draw the structures of methane, ethane, ethene, ethanol, ethanoic acid and the products of the reactions 2. State the type of compound present, given a chemical name ending in -ane, -ene, -ol, or -oic acid or a molecular structure
1.2	Organic chemistry- Names of compounds	3. Name and draw the structures of the unbranched alkanes, alkenes (not cis-trans), alcohols and acids containing up to four carbon atoms per molecule 4. Name and draw the structural formulae of the esters which can be made from unbranched alcohols and carboxylic acids, each containing up to four carbon atoms
2.1	Fuels	1. Name the fuels: coal, natural gas and petroleum 2. Name methane as the main constituent of natural gas 3. Describe petroleum as a mixture of hydrocarbons and its separation into useful fractions by fractional distillation 4. Describe the properties of molecules within a fraction
2.2	Fuels	5. Name the uses of the fractions as: <input type="checkbox"/> refinery gas for bottled gas for heating and cooking <input type="checkbox"/> gasoline fraction for fuel (petrol) in cars <input type="checkbox"/> naphtha fraction for making chemicals <input type="checkbox"/> kerosene/paraffin fraction for jet fuel <input type="checkbox"/> diesel oil/gas oil for fuel in diesel engines <input type="checkbox"/> fuel oil fraction for fuel for ships and home heating systems <input type="checkbox"/> lubricating fraction for lubricants, waxes and polishes <input type="checkbox"/> bitumen for making roads
3.1	Homologous series & Alkanes	1. Describe the concept of homologous series as a 'family' of similar compounds with similar chemical properties due to the presence of the same functional group 2. Describe the general characteristics of a homologous series 3. Recall that the compounds in a homologous series have the same general formula

WEEK	TOPIC	TOPIC DETAILS
3.2	Homologous series & Alkanes	4. Describe and identify structural isomerism 5. Describe the properties of alkanes (exemplified by methane) as being generally unreactive, except in terms of burning 6. Describe the bonding in alkanes 7. Describe substitution reactions of alkanes with chlorine
4.1	Alkenes,	1. Describe the manufacture of alkenes and of hydrogen by cracking 2. Distinguish between saturated and unsaturated hydrocarbons: <input type="checkbox"/> from molecular structures <input type="checkbox"/> by reaction with aqueous bromine
4.2	Alkenes,	3. Describe the formation of poly(ethene) as an example of addition polymerisation of monomer units 4. Describe the properties of alkenes in terms of addition reactions with bromine, hydrogen and steam
5.1	Alcohols	6. Describe the properties of ethanol in terms of burning 7. Name the uses of ethanol as a solvent and as a Fuel 8. Outline the advantages and disadvantages of these two methods of manufacturing ethanol
5.2	Carboxylic acids	9. Describe the properties of aqueous ethanoic acid 10. Describe the formation of ethanoic acid by the oxidation of ethanol by fermentation and with acidified potassium manganate(VII) 11. Describe ethanoic acid as a typical weak acid 12. Describe the reaction of a carboxylic acid with an alcohol in the presence of a catalyst to give an ester
6.1	Polymers	1. Define polymers as large molecules built up from small units (monomers) 2. Understand that different polymers have different units and/or different linkages 3. Name some typical uses of plastics and of man-made fibres such as nylon and Terylene 4. Describe the pollution problems caused by non-biodegradable plastics
6.2	Synthetic polymers	5. Explain the differences between condensation and addition polymerisation 6. Deduce the structure of the polymer product from a given alkene and vice versa 7. Describe the formation of nylon (a polyamide) and Terylene (a polyester) by condensation polymerisation, the structure of Nylon and the structure of Terylene as: being represented as:( CHECK SYLLABUS) (Details of manufacture and mechanisms of these polymerisations are not required.)

<b>WEEK</b>	<b>TOPIC</b>	<b>TOPIC DETAILS</b>
7.1	Natural polymers	1. Name proteins and carbohydrates as constituents of food 2. Describe proteins as possessing the same (amide) linkages as nylon but with different units 3. Describe the structure of proteins as:
7.2	Natural polymers	4. Describe the hydrolysis of proteins to amino acids. (Structures and names are not required.) 5. Describe complex carbohydrates in terms of a large number of sugar units, considered as HO----- OH, joined together by condensation polymerization
8.1	Natural polymers	6. Describe the hydrolysis of complex carbohydrates (e.g. starch), by acids or enzymes to give simple sugars 7. Describe the fermentation of simple sugars to produce ethanol (and carbon dioxide). (Candidates will not be expected to give the molecular formulae of sugars.)
8.2	Natural polymers	8. Describe, in outline, the usefulness of chromatography in separating and identifying the products of hydrolysis of carbohydrates and proteins

# CHEMISTRY SCHEME OF WORK

FORM 5 - TERM 3

WEEK	TOPIC	TOPIC DETAILS
------	-------	---------------