Diploma Programme Course Outline		
Name of the DP subject	**Chemistry**	
Level	**Higher □ Standard □**	
YEAR 2		
UNIT	**TOPIC/CONCEPT**	**ASSESSMENT COMPONENTS**
7. <u>HL:</u> **17.1 The equilibrium law** **(Continued from Yr. 1)**	• Physical and chemical equilibria • The equilibrium law and changes in concentration • The relation of equilibrium composition to reaction rate • Calculating equilibrium constants from concentration data • Relationship between the equilibrium constant, spontaneity and Gibbs free energy • Coupled reactions • Homogeneous and heterogeneous equilibria	**Formative Assessment:** • Observation of practical skills and ability to follow steps and show working • Questioning • Discussion of the methodology of the calculations and what working is necessary: class, small group, pair, individual, teacher-led, student-led. • Think, pair, share • Quiz • Worksheets and past paper questions **Peer and self –assessment** • Students will be expected to check their own work at times, marking themselves and making corrections.

		At other times, they will share their answers and working and give and receive feedback from their peers **Summative assessments** • Multiple choice and free response questions on the topic
8. Acids and Bases	**<u>Core:</u>** **8.1 Theories of acids and bases** • Bronsted-Lowry theory • Amphiprotic species • Conjugate acid-base pairs **8.2 Properties of acids and bases** **8.3 The pH scale** • The pH scale • The ionic product constant of water • Solving problems involving pH, $[H^+]$ and $[OH^-]$ • Measuring pH with a pH meter and universal indicator **8.4 Strong and weak acids and bases** • Strong and weak acids (factors required for acidity, factors controlling the strength of inorganic acids, properties of strong and weak acids, acids and their conjugates) • Strong and weak bases (bases and their conjugates) **8.5 Acid deposition**	**Formative assessments** • Observation of practical skills and ability to follow steps and show working • Questioning • Discussion of the methodology of the calculations and what working is necessary: class, small group, pair, individual, teacher-led, student-led. • Think, pair, share • Quiz • Worksheets and past paper questions **Peer and self -assessment** • Students will be expected to check their own work at times, marking themselves and making corrections. At other times, they will share their answers and

	• Formation of acid rain • Environmental effects of acid deposition • Measures to counteract acid deposition **HL** **18.1 Lewis acids and Bases** • Lewis theory (inorganic and organic chemistry) • Classification of Lewis acids • Solvents other than water • Applying Lewis' acid-base theory to organic and inorganic chemistry to identify the role of reacting species **18.2 Calculations involving acids and bases** • Acids-base reactions as equilibria • Calculations involving acids and bases (ionic product of water, pH, pOH, K_a, K_b) • Solve problems involving $[H^+(aq)]$, $[OH^-(aq)]$, pH, pOH, K_a, K_b, pK_a and pK_b • Relative strengths of acids and bases using values of K_a, K_b, pK_a and pK_b • Relationship between K_a for a weak acid and K_b for its conjugate base • Buffer solutions (types of buffers, action of buffer solutions, calculations involving buffer solutions, characteristics of buffer solutions, preparation of buffers)	working and give and receive feedback from their peers **Summative assessments** Multiple choice and free response questions on the topic **PSOW** Titrations with a pH meter

	18.3 pH curves • Salt hydrolysis • Acid – base titrations- titration curves for strong and weak acids and bases • Indicators • Conductometric titrations	
9. Redox Processes	**Core** **9.1 Oxidation and reduction** • Introduction to oxidation and reduction • Oxidation numbers • Naming inorganic compounds • Identifying redox reactions • Disproportionation • Redox equations (constructing half equations, forming redox equations,) • Redox titrations • Oxidizing and reducing agents • Utilization of redox reactions • Reaction of metals with metal ions in solution • The Winkler method **9.2 Electrochemical cells** • Voltaic cells • Electrolytic cells (electrolysis of a molten salt ,electrolysis of other compounds, deducing the products of electrolysis of molten salts)	**Formative assessment** • Observation of practical skills and ability to follow steps and show working • Questioning • Discussion of the methodology of the calculations and what working is necessary: class, small group, pair, individual, teacher-led, student-led. • Think, pair, share • Quiz • Worksheets and past paper questions **Summative assessment** Multiple choice and free response questions on the topic. **Peer and self -assessment** • Students will be expected to check their own work at times, marking themselves and making corrections. At other times, they will share their answers and

	• Distinction between electron and ion flow in both types of electrochemical cells • Constructing and annotating both types of electrochemical cells **HL**: **19.1 Electrochemical cells** • Redox equilibria and electrochemical cells -standard hydrogen electrode (SHE) • Standard electrode potentials • Non-standard conditions • The redox series • Cell spontaneity • Electrolysis of aqueous solutions • Faraday's laws • Electroplating	working and give and receive feedback from their peers **PSOW** Redox titration with $KMnO_4$/Voltaic cells
10 Organic chemistry	**<u>Core</u>** **10.1 Fundamentals of organic Chemistry** • Modern organic chemistry • The nature of a homologous series • Formulas of organic compounds (empirical, molecular, full structural, condensed structural and skeletal formula) • Chains and rings • Structural isomerism • Deducing structural formulas and naming alkanes	**Formative assessment:** • Observation of practical skills and ability to follow steps and show working • Questioning • Discussion of the methodology of the calculations and what working is necessary: class, small group, pair, individual, teacher-led, student-led. • Think, pair, share • Quiz

	• Deducing structural formulas and naming alkenes • Further functional groups • Classifying molecules: primary, secondary and tertiary compounds • Aromatic compounds • Further trends in physical properties within homologous series (volatility, solubility in water) **10.2 Functional group chemistry** • Alkanes (properties, reactivity, combustion, reaction of alkanes with halogens, free radical reaction mechanism • Alkenes (reactions with hydrogen and halogen, hydration, testing for unsaturation, addition polymerization of alkenes, economic importance) • Alcohols (oxidation reactions, esterification reactions) • Halogenalkanes (substitution reaction with sodium hydroxide) • Electrophilic substitution reaction of benzene **HL** **20.1 Types of organic reactions** • Nucleophilic substitution reactions (The S_N2 reaction and S_N1 reaction) • Electrophilic addition reactions	• Worksheets and past paper questions **Peer and self -assessment** • Students will be expected to check their own work at times, marking themselves and making corrections. At other times, they will share their answers and working and give and receive feedback from their peers **Summative Assessment:** Multiple choice and free response questions on the topic. **PSOW** 3-D modelling

	• Electrophilic substitution reactions • Reduction reactions **20.2 Synthetic routes** • Reaction pathways • Retrosynthesis – thinking in reverse **20.3 Stereoisomerism** • Cis-trans isomerism • The E/Z system • Conformational isomers • Optical isomerism • Diastereomers	
11 Measurement and data processing and analysis (Part 2)	**<u>Core:</u>** **11. 4 Spectroscopic identification of organic compounds** • Index of hydrogen deficiency • Analytical techniques • Emission and absorption spectroscopy • Infrared spectroscopy (IR) • Mass spectrometry • Nuclear magnetic resonance spectroscopy (NMR) **<u>HL:</u>** **21.1 Spectroscopic identification of organic compounds** • High resolution NMR • Chromatography (paper, thin -layer, gas-liquid, high-performance liquid) • X-ray crystallography	**Formative assessment** • Questioning • Discussion of the methodology of the calculations and what working is necessary: class, small group, pair, individual, teacher-led, student-led. • Think, pair, share • Quiz • Worksheets and past paper questions **Peer and self -assessment** • Students will be expected to check their own work at times, marking themselves and making corrections. At other times, they will share their answers and working and give and receive feedback from their peers

UNIT ONLY **ONE** OPTION WILL BE DONE	**TOPIC/CONCEPT**	**ASSESSMENT COMPONENTS** **TBA**
Option A- Materials	A.1 Materials science introduction A.2 Metals and inductively coupled plasma (ICP) spectroscopy A.3 Catalysts A.4 Liquid crystals A.5 Polymers A.6 Nanotechnology A.7 Environmental impact: plastics A.8 Superconducting metals and X-ray crystallography A.9 Condensation polymers A.10 Environmental impact: heavy metals	
Option B- Biochemistry	B.1 Introduction to biochemistry B.2 & B.7 Proteins and enzymes B.3 Lipids B.4 Carbohydrates B.5 Vitamins B.8 Nucleic acids B.9 Pigments B.10 Stereochemistry in biomolecules B.6 Biochemistry and the environment	**Formative assessments** • Observation of practical skills and ability to follow steps and show working • Questioning • Discussion of the methodology of the calculations and what working is necessary: class, small group, pair, individual, teacher-led, student-led. • Think, pair, share • Quiz • Worksheets and past paper questions

		Summative Assessment: Multiple choice and free response questions on the topic. **Peer and self -assessment** • Students will be expected to check their own work at times, marking themselves and making corrections. At other times, they will share their answers and working and give and receive feedback from their peers
Option C- Energy	C.1 Energy sources C.2 Fossil fuels C.3 & C.7 Nuclear fusion and fission C.4 Solar energy C.5 Environmental impact: global warming C.6 Electrochemistry, rechargeable batteries, and fuel cells C.8 Photovoltaic and dye-sensitized solar cells (DSSC)	
Option D- Medicinal Chemistry	D. 1 Pharmaceutical products and drug action D.2 Aspirin and penicillin D.3 Opiates D.4 pH regulation of the stomach	

	D.5 Antiviral medications D.7 Taxol: a chiral auxiliary case study D.8 Nuclear medicine D.9 Drug detection and analysis D.6 Environmental impact of some medications	
Green Chemistry	• Twelve principles of green chemistry	

All Diploma Programme courses are designed as two-year learning experiences.