IBH Level Chemistry – U6

Curriculum Intent

Chemistry is the study of matter, its properties, how and why substances combine or separate to form other substances, and how substances interact with energy. The IB Standard Chemistry course provides stimulating opportunities to appreciate the study and creativity associated with chemistry within a global context.

The course aims for all students to: ·

- Acquire, apply and use knowledge, methods and techniques that characterise chemistry
- Develop an ability to analyse, evaluate and synthesise chemistry information
- Develop a critical awareness of the need for, and the value of, effective collaboration and communication during scientific activities
- Appreciate the possibilities and limitations of chemistry while becoming critically aware, as global citizens, of the ethical implications of using chemistry
- Develop and understanding of the relationships between scientific disciplines and their influence on other areas of knowledge

  Promote students' interest in and enthusiasm for the subject.

"In the fields of observation chance favours only the prepared mind" Louis Pasteur

Students will learn: - <u>Autumn Term –</u> <u>Term 1</u>

Core and AHL Chemical kinetics. Core and AHL Acids and bases. Core Periodicity

<u>Spring term – Term 2</u>

Core and AHL Redox processes. Core and AHL Biochemistry.

What does excellence look like?

- Carrying out practical processes logically, precisely, and accurately.
- Linking ideas together to answer questions logically and sequenced.
- Linking ideas to the IB Core.
- Linking big ideas to answer real life Chemistry problems. For example, Deduction of mechanism from empirical evidence. Discussion of apparent anomalies in first ionisation energy values in terms of stability of electron configuration. Link to TOK: role of inductive and deductive reasoning in the development of the periodic table. Explanation of the catalytic depletion of stratospheric ozone by CFCs. Prediction of pH of salt solutions; link to acidity of hydrated transition metal ions. Application of unfamiliar redox reactions to titration calculations. Deduction of feasibility of reaction using cell potential. Explore biochemical structures and pathways in terms of bonding and intermolecular forces.

Knowledge, understanding & Skills

Term 1: Knowledge, understanding, application, analysis, and evaluation of: Collision theory; measurement of rate of reaction, activation energy, catalysts, Maxwell-Boltzmann distribution. Rate expression and reaction mechanism: multistep mechanism, rate-determining step, molecularity of an elementary step, catalytic alteration of mechanism, determination of order of reaction. Theories of acids and base, Bronsted-Lowry and Lewis acids and bases, conjugate pairs; properties of acids and bases; strong and weak acids and bases; acid deposition. pH scale, calculations to solve problems involving pH, pOH, Ka, pKa, Kb, pKb, Kw. Indicators and pH curves, buffer solutions. The periodic table arrangement of elements in blocks, groups, and periods; deduction of position from electron configuration and vice versa. Vertical and horizontal periodic trends in atomic radius, ionic radius, ionization energy, electron affinity and electronegativity; trends in metallic and non-metallic behaviour; acid-base trend of oxides across a period; reactivity trends in group 1 and 17.

Term 2: Knowledge, understanding, application, analysis, and evaluation of: Oxidation and reduction processes; variable oxidation numbers; Winkler method to measure biochemical oxygen demand. Electrochemical cells: voltaic (galvanic) cells; electrolytic cells; explanation in terms of ion flow and electron transfer; voltaic cell diagram convention. Cell potential, standard hydrogen electrode; application and interpretation of $\Delta G^{\ominus} = nFE^{\ominus}$; electrolysis of aqueous solutions with inert electrodes and copper electrodes, explanation in terms of $E^{\ominus}$, current, duration and ionic charge; electroplating; cells in series. Metabolic reactions; proteins and enzymes: protein structure, reactions of amino acids and peptides, physical properties in terms of zwitterions, gel electrophoresis and paper chromatography, enzyme kinetics and inhibition; buffers; protein assay. Nucleic acids: structure, role; stability. Lipids: structure, chemical and physical properties, iodine number, hydrolytic and oxidative rancidity. Carbohydrates: structure, stereochemistry, aldose/ketose, wider perspectives. Vitamins: focus on A, C and D. Bision chemistry. Biological pigments: conjugated systems, porphyrins, cytochromes, anthocyanins, carotenoids. Biochemistry and the environment: xenobiotics, host-guest chemistry, plastics, enzymes, biomagnification, Green chemistry.

What does excellence look like?

Discussion of the responsibilities of government, industry, the medical profession, and the individual in making healthy choices about diet: do public bodies protect the individual or limit freedom? Exploration of the increasing problem of xenobiotics in sewage treatment plants.

How will we assess impact?

- Peer, self and teacher assessment in lessons
- Previous lesson recap quiz
- Teacher questioning
- Landmark tasks
- End of Topic tests

How can you enhance your learning at home?

- Chemguide
- Isaac chemistry
- Inthinking chemistry
- Royal Society of Chemistry

Suggested homework tasks

- Learn definitions of key terms.
- Group and independent research projects
- Past examination questions practice

Practical activity preparation, simulations, and follow-up.

International Opportunities

Visits Programme

- **Community lectures on International themes**
- **International day across the school**
- **Primary research using student cultural diversity**

Within the curriculum

The Chemistry IBS Level curriculum is designed to deepen understanding and appreciation of how our International society makes decisions about world scientific issues. Students can compete in the International Chemistry Olympiad.

Students are encouraged to research each theme beyond lessons and set work to ensure that they can draw on a worldwide knowledge of the skills, techniques and theoretical understanding required for the further study of Chemical Sciences at an International level.