



# IP Chemistry

## INTRODUCTION

Chemistry is the central science which examines, describes and explains interactions between matter and energy. Chemical principles lie behind the physical environment in which we live, and some understanding of chemistry is essential preparation for studies in the life sciences. The study of chemistry thus serves two roles – preparation for courses in other sciences as well as preparation for a career or higher academic studies, especially medicine, dentistry, pharmacy and pharmaceutical sciences, nanoscience, nursing, food science and technology.

Chemistry is closely related to the other natural sciences and, in a sense, unifies them. As an empirical study of the world of substances and their transformations, it traces its descent from the Egyptian, Greek and Arabic philosophers of earlier times. Chemistry emerges as a full-fledged science in the 'long' 19th century, that period of change between American Revolution of 1776 and the First World War of 1914. The first true chemists called themselves natural philosophers, believing that chemical principles showed the underlying truth of the universe.

Chemistry remains one of the most popular subjects at Anglo-Chinese School (Independent) over the years. As the subject has evolved over the decades to one involving concepts mastery and logical thinking, a good grade in physical science, life science and mathematics at the end of Year 2 is mandatory if a student intends to offer the subject at IP level.

The ACS(I) Year 3 & 4 IP Chemistry Course aims to induct ACSians into the thought processes involved in the study of this central science.

Emphasis is placed on presenting the core concepts of chemistry in ways which emphasizes its practical use and applicability to real-world issues. This lays a strong foundation for further work in chemistry at higher levels, such as the International Baccalaureate Diploma Programme, as well as the use of chemical knowledge in other areas. The challenge of chemistry lies in being able to unify real-world data, experimentation, and theoretical concepts to make sense of physical interactions and solve practical problems.

At the school level, both theory and experiments will be undertaken by all students, which will complement one another naturally, as they do in

a wider scientific community. The chemistry course encourages students to develop traditional practical skills and techniques, while at the same time developing interpersonal skills and digital technology skills, which are essential in 21st century endeavours.

## CURRICULUM GOALS

The goal of the ACS(I) Year 3 & 4 IP Chemistry Course is that students should be able to

1. demonstrate an understanding of chemical facts and concepts in abstract as well as in their application to chemical processes and techniques;
2. show this understanding through effective communication, making use of correct scientific terminology and appropriate methods of presentation;
3. apply and use data and their knowledge of chemical facts and concepts to solve problems;
4. selectively and rigorously organise, present and analyse data to identify patterns, report trends, draw inferences and make predictions;
5. construct, analyse and evaluate hypotheses, research questions and predictions; scientific methods / techniques and procedures; and scientific explanations;
6. demonstrate the skills of collaboration, perseverance and responsibility appropriate for effective scientific investigation and problem solving;
7. show awareness of the social, economic, technological, ethical and cultural implications of chemistry for the individual, society, the environment and the world.
8. demonstrate the capabilities in Science, Technology, Engineering, Mathematics (STEM) to prepare them for an increasingly complex and uncertain world.

## COURSE OUTLINE

### Year 3:

**The Mind of the Chemist:** The Nature of Chemistry, How a Chemist Works, Historical Ideas. Empirical Scientific Method, Research Process;

**Matter – Structure and Properties:** Atomic Structure, Bonding, VSEPR Theory, Intermolecular Forces, Physical Structure, Physical Properties;

**Chemical Calculations:** Chemical Formulae, Chemical and Ionic Equations, Relative Masses, the Mole Concept; Stoichiometry;

**The Periodic Table:** Inorganic Chemistry, Periodic and Group Trends;

**Acid-Base Chemistry:** Definitions, Reactions of Acids and Bases, Classification and Reactions of Oxides;

**Salts & its Preparation:** Solubility of Salts, Preparation of Salts;

**Qualitative Analysis:** Tests for Gases, Cations and Anions, Determination of Unknown Substances;

**Oxidation-Reduction Reactions:** Definitions, Oxidation States, Oxidising and Reducing Agents.

### Year 4:

**Rate of Reactions:** Methods to Determine Rate, Collision Theory;

**Energetics:** Enthalpy Changes, Endothermic and Exothermic Reactions; Bond Enthalpy;

**Chemical Equilibrium:** Dynamic Equilibrium, Position of Equilibrium and Le Chatelier's Principle;

**Metals:** Physical and Chemical Properties, Reactivity Series;

**Electrochemistry:** Electrolytic Cells and their Uses, Electrochemical Cells and their Uses, Fuel cells;

### Organic Chemistry:

Fuels and Crude Oil;

Nomenclature, Isomerism, Physical and Chemical Properties (including types of reactions) and Uses of the Alkanes, Alkenes, Alcohols, Carboxylic Acids & Esters;

Study of Synthetic and Natural Polymers, Addition Polymerisation & Condensation Polymerisation, Issues relating to Recycling of Plastics and Environmental Concerns;

**Environmental Chemistry:** Maintaining Air Quality;

**Introduction to Spectrophotometry:** Use of Spectrophotometer to determine Absorbance, and Obtain Calibration Graph, Beer-Lambert Law.

## ASSESSMENT

Assessment for the Year 3 & 4 IP Chemistry Course comprises a combination of class quizzes, assessment of practical skills, coursework, common test and a final assessment in the form of a year-end written examination. The table shown summarises the student assessment modes for both years.

Internal Assessment Modes	Weighting
Term 2 Common Test	15%
Term 3 Practical Test / Coursework	15%
Term 4 End of Year Exam	70%

## ACCELERATED CLASS FOR SCIENCE (ACS)

The ACS is a differentiated 2-year programme offered by ACS (Independent) for Year 3 and 4 students who have great interest in the sciences and display special talents. This programme requires students to offer Physics, Chemistry and Biology.

## PREREQUISITES FOR IBDP CHEMISTRY

The prerequisites for students to do IBDP Chemistry in Year 5 and 6 are:

- Standard Level (SL) – students must obtain at least a pass in Year 4 IP Chemistry
- Higher Level (HL) – students must obtain at least a Grade 6 in Year 4 IP Chemistry