

Module Synopses

Inorganic Chemistry

This module aims to provide students with the essential knowledge and understanding on fundamental principles in Atomic Structure, Chemical Periodicity, Chemical Bonding and the Applications of Transition Elements & their Complexes. Students will acquire the relevant practical laboratory skills to determine the inorganic properties of chemicals and interpret these results clearly.

Organic Chemistry

This module aims to provide students with the basic knowledge of organic functional groups and be able to apply requisite IUPAC nomenclature rules to name and draw structures of organic compounds. They will also have the ability to generate structural isomers of organic compounds. In addition, students will have developed a theoretical understanding of the chemical reactions that key functional groups undergo and have a qualitative understanding of the physical properties (boiling points and solubilities) of principal organic compounds too. Students will acquire the practical skills to synthesis and characterise organic chemicals.

Chemical and Biosafety

This module aims to provide students with knowledge on important topics such as safety management of a chemical testing; safety planning; risk assessment; handling of hazards and chemical waste; storage and disposal of hazards; accident reporting, etc. Concepts of biorisk management and biosecurity are also covered. Laboratory design, practices and safety equipment of the four biosafety levels, routes of transmission and decontamination are taught. In addition, students have to examine the implications of local and international regulations to laboratory operations such as Workplace Safety and Health Act and the Biological Agents and Toxin Act.

Analytical Chemistry

This module aims to provide students with the fundamental knowledge and skills for Analytical Chemistry. They will learn the basic concepts of important chemical reactions in aqueous medium (including acid-base neutralisation and oxidation-reduction reactions) and the underlying principle of a typical analytical procedure. They will also be able to apply the knowledge acquired, in particular titrimetric analysis, to quantify chemical substances through stoichiometric calculations. Students will acquire the practical skills to analyse chemicals and present their data as a scientific report.

Physical Chemistry

This module aims to provide students with fundamental understanding on how materials behave and how chemical reactions occur at the molecular and atomic level. Important concepts of physical chemistry such as units and dimensions, fundamentals of gas and solution laws, thermodynamics, equilibrium and electrochemistry are taught with focus on their applications in the chemical industries. Students will acquire the laboratory skills to determine the physical properties of chemicals and their reactions.

Microbiology

The module aims to provide students with basic understanding of microbiology and immunology. The methodology used in the study of microorganisms will be taught and further reinforced during the practicals. In addition, students will also be given an overview of the importance of microbes in daily life, both beneficial as well as detrimental effects.

Environmental and Water Technology

This module aims to provide students with the underlying principles and key concepts of

environmental and water technology and how these can be applied to the resolution of contemporary global issues such as climate change, environmental degradation, transboundary pollution, species extinction, soil remediation, etc. It enhances a growing environmental awareness towards waste minimisation, environmental impact assessment, industrial health and safety, quality and purification of water. Practical classes will impart to students hands-on laboratory skills and experience relating environmental and water analysis while case studies assignment will develop students' awareness and global perspective of the current developments in environmental and water technology.

Good Laboratory Practice and Management

On completion of this module, students will be equipped good laboratory practice and quality management skills to work effectively and manage daily laboratory operations. Students will also develop capability in problem solving of economic and technical aspects of laboratory management so as to better prepare for support of laboratory activities.

Applied Statistics and Quality Assurance

This module aims to provide an understanding of important concepts of ISO 9000, ISO 14000, quality assurance and the use of statistics in quality control in control charts and experimental design in the chemical manufacturing, life science and service sectors.

Organic Chemistry - Reaction Mechanisms

The module aims to give students the fundamental concepts of organic chemistry and its reaction mechanisms. Common reaction mechanisms are taught in detail. Laboratory sessions on organic syntheses and kinetic measurements will reinforce the concepts taught in the lectures. This will provide students with the capability to understand and rationalise the products obtained in terms of reaction pathways.

Instrumental Analysis

This module aims to provide students with practical laboratory skills and theoretical knowledge to perform chemical analysis using analytical instruments such as gas and liquid chromatograph, ultra-violet visible, infra-red spectrophotometer, etc. It provides students with a capability for problem solving, independent thinking and innovation so that they can work effectively in research teams and/or in the industry on life science or chemical analysis.

Basic Biochemistry

The module aims to provide students with an understanding of the structure of water and biomolecules like proteins, carbohydrates and lipids. The types and functions of enzymes and energy and their roles in cells will be covered.

Molecular Genetics

This module aims to provide students with the theoretical knowledge and practical skills in molecular biology and genetic analysis. It also supports the overall course aims of developing problem-solving skills in these areas of knowledge by encouraging students to analyse and solve problems in genetic and molecular biology independently. Students will learn the fundamentals of genetics, function of genes and the concepts and applications of recombinant DNA technology and the tools used in molecular biology.

General Anatomy & Physiology

The subject is designed to introduce the structure and function of the various systems and organs of the human body. The students are given an overview of the basic concepts in human physiology in relation to the gross and microscopic anatomical structures of organs and how they function.

Forensic Science

This module aims to provide students with knowledge on the basic principles and skills for forensic investigations in the chemical and life sciences. The topics covered include chain of custody and crime scene investigation, arson and explosives, DNA and protein analysis of samples from crime scenes and paternity testing, toxic inorganic elements and organic compounds, drugs, food forensic as well as toxicology. Real-life case studies will be introduced into each topic and the students will apply their knowledge to these studies. In addition, the important mind-sets essential by all analysts will be introduced and their implications on the law and judgement in court. Students will also acquire the practical skills to analyse and characterise important chemicals encountered in forensic laboratories.

Materials for the Modern World

This module aims to provide broad-based and fundamental knowledge required to understand the conventional and advanced materials, in term of their structures, properties, testing methods, processing methods and applications, so as to enable us to select the right materials to suit different needs.

Petrochemicals and its Applications

This module aims to provide students with laboratory skills and the theoretical knowledge of petrochemicals and its applications. Detailed knowledge of the various processes to convert petrochemicals to basic building blocks followed by their conversion to useful common and specialty chemicals, as well as their importance to Singapore's economy will be taught. In addition, the role of the specialty chemicals derived from petrochemicals will be covered. Students will acquire the essential skills to determine the physical and chemical properties of petroleum products and petrochemicals.