Summary

Unit 1

Subject	Year	Start date	Duration
Chemistry	IB1	Week 1, September	2 weeks

Course Part

Introduction to IBDP Chemistry

Inquiry & Purpose

Inquiry / Higher Order Questions

Type	Inquiry Questions
Skills-based	Chemical equations are the “language” of chemistry. How does the use of universal languages help and hinder the pursuit of knowledge?
Content-based	Solution of problems involving the relationships between the number of particles, the amount of substance in moles and the mass in grams.
Concept-based	Assigning numbers to the masses of the chemical elements has allowed chemistry to develop into a physical science. Why is mathematics so effective in describing the natural world?

Curriculum

Aims

Develop an ability to analyse, evaluate and synthesize scientific information

Develop experimental and investigative scientific skills including the use of current technologies

Objectives

Demonstrate knowledge and understanding of

methodologies and techniques

Formulate, analyse and evaluate

hypotheses, research questions and predictions

scientific explanations

Demonstrate the appropriate research, experimental, and personal skills necessary to carry out insightful and ethical investigations

Syllabus Content

Core

1. Stoichiometric relationships

1.1 Introduction to the particulate nature of matter and chemical change

Nature of science:

Making quantitative measurements with replicates to ensure reliability - definite and multiple proportions.

Understandings:

Atoms of different elements combine in fixed ratios to form compounds, which have different properties from their component elements.

Mixtures contain more than one element and/or compound that are not chemically bonded together and so retain their individual properties.

Mixtures are either homogeneous or heterogeneous.

Applications and skills:

Deduction of chemical equations when reactants and products are specified.

Application of the state symbols (s), (l), (g) and (aq) in equations.

Explanation of observable changes in physical properties and temperature during changes of state.

1.2 The mole concept

Nature of science:

Concepts - the concept of the mole developed from the related concept of “equivalent mass” in the early 19th century.

Understandings:

The mole is a fixed number of particles and refers to the amount, n, of substance.

Masses of atoms are compared on a scale relative to ^{12}C and are expressed as relative atomic mass (A r) and relative formula/molecular mass (M r).

Molar mass (M) has the units g mol^{-1}.

The empirical formula and molecular formula of a compound give the simplest ratio and the actual number of atoms present in a molecule respectively.

Applications and skills:

Calculation of the molar masses of atoms, ions, molecules and formula units.

Solution of problems involving the relationships between the number of particles, the amount of substance in moles and the mass in grams.

Interconversion of the percentage composition by mass and the empirical formula.

Determination of the molecular formula of a compound from its empirical formula and molar mass.

Obtaining and using experimental data for deriving empirical formulas from reactions involving mass changes.

1.3 Reacting masses and volumes

Nature of science:

Making careful observations and obtaining evidence for scientific theories - Avogadro's initial hypothesis.

Understandings:

Reactants can be either limiting or excess.

The experimental yield can be different from the theoretical yield.

Avogadro’s law enables the mole ratio of reacting gases to be determined from volumes of the gases.

The molar volume of an ideal gas is a constant at specified temperature and pressure.

The molar concentration of a solution is determined by the amount of solute and the volume of solution.

A standard solution is one of known concentration.

Applications and skills:

Solution of problems relating to reacting quantities, limiting and excess reactants, theoretical, experimental and percentage yields.

Calculation of reacting volumes of gases using Avogadro’s law.

Solution of problems and analysis of graphs involving the relationship between temperature, pressure and volume for a fixed mass of an ideal gas.

Solution of problems relating to the ideal gas equation.

Explanation of the deviation of real gases from ideal behaviour at low temperature and high pressure.

Obtaining and using experimental values to calculate the molar mass of a gas from the ideal gas equation.

Solution of problems involving molar concentration, amount of solute and volume of solution.

Use of the experimental method of titration to calculate the concentration of a solution by reference to a standard solution.

ATL Skills

Approaches to Learning

Research

- In this unit, we will

require students to formulate/construct a focused research question (either in class or in a homework assignment)

assign a task that required students to use the library

require students to practise effective online search skills (for example, use of Booleans and search limiters)

provide opportunities for students to reflect on how they determine the quality of a source, or analyse contradictory sources

Developing IB Learners

Learner Profile

Inquirers

Knowledgeable