

HL First-Year Chemistry

1. Atomic Structure and Stoichiometry

Read: Hill & Holman Chapter 5, all sections; Chapter 1, Sections 1-5.

Presumed knowledge (from IGCSE)

Atomic Structure

- electron, proton, neutron, mass number, isotope, stable isotope, radioactive isotope
- Elemental symbol, (chemical) formula, mass number (A), atomic number (Z), isotopic symbol, chemical formula

Periodic Table

- atomic number, relative atomic mass, period, group, metal, nonmetal, semi-metal, metalloid, transition metal, noble gases, alkali metals, alkaline earth metals, halogens

Mole

- mole, Avogadro's number, relative molecular mass, molecule, molecular formula, chemical equation, balancing chemical equation, reactants, products
- subscript, empirical formula, empirical weight, molecular formula

Presumed skills (acquired in IGCSE)

	Further problems
Atomic Structure	
• Given relative isotopic abundances and relative isotopic masses, determine relative atomic mass of an element	3
• Determine number of protons, electrons and neutrons in atoms and ions from mass number, atomic number and charge	1, 5
Stoichiometry: Mole Concept	
• Given a chemical formula determine the elements present and their proportion	7, 8, 15
• Given an equation determine the state symbols for the chemicals involved	10
• Write chemical equation given word description of a reaction	11
• Balance simple chemical reactions by inspection	10
• Given one of mass, moles or number of particles convert into another	14, 16, 17, 18,
• Calculate mass of each element and mole ratios of atoms in a given amount of a compound, and percent composition from formula of a compound	15
• Given two of mass, moles, and formula weight of a compound, determine the third.	
• Identify a given formula as empirical or molecular	22, 23

IB Concepts to be mastered:

To master a concept, you must be able to do three things:

1. define the concept,
2. explain the concept, and
3. give an example of the concept.

Atomic Structure

- Dalton's Atomic Theory
- mass spectrometer, source, ionizer, accelerator, velocity selector, magnetic deflection, detector, (relative) isotopic mass, atomic weight
- Elemental symbol (The elements to be remembered at this time are numbers 1-30, 35-38, 47, 50, 53-56, 74, 78-80, 82, 86.)

Stoichiometry: Mole Concept

- atomic weight, atomic mass, formula weight, molecular weight, molar mass
- relative molecular mass, relative formula mass, formula unit
- structural formula, chemical equations, balancing equations
- limiting reagent, excess reagent, theoretical yield, actual yield, percent yield
- (weight/weight)%, (weight/volume)%, (volume/volume)%

IB Skills to be mastered:

To master a skill, you must be able to

4. recognize when the skill is needed,
5. recognize what information is needed to execute the skill,
6. execute the skill, and
7. assess whether the skill has been executed correctly.

Further problems

Atomic Structure

- Describe the parts and operation of a mass spectrometer and the use of the mass spectrometer to separate isotopes 2, 6
- Given a non-integer relative atomic mass explain why it is a non-integer 4

Stoichiometry: Mole Concept

- Calculate the molar mass of a substance given its formula and table of relative atomic masses 13,
- Given a structural formula determine the molecular formula 23
- Given mass or mole information about the reactants in a chemical reaction: 19, 20, 21,
 - ◆ determine mass or mole of each product formed
 - ◆ determine limiting reagent
 - ◆ determine excess reagent(s)
 - ◆ determine amount by which excess reagent(s) is(are) in excess
 - ◆ determine % yield if given above information and actual yield
- Given masses or percentages of elements or masses of combustion products determine the empirical formula 24, 25, 26, 27
- Given empirical formula and formula weight of the compound, determine the molecular formula 28, 29, 30

End-of-chapter textbook problems:

Chapter 5: all; Chapter 1: 1-5, 7.