

Foundations of Scientific Inquiry Pre-IB/H

Final Part 2 Topics

Name _____ Date _____ Mod _____

- **Classification and States of Matter (Chapter 2 & 6)**
 - ✓ Distinguish between substances and mixtures
 - ✓ Distinguish between elements and compounds
 - ✓ Compare and contrast solutions, colloids, suspensions
 - ✓ Describe miscibility
 - ✓ Describe emulsions and emulsifiers
 - ✓ Distinguish between physical and chemical properties
 - ✓ Distinguish between physical and chemical changes
 - ✓ State and explain the law of conservation of mass

- **Atom Structure (Chapter 3) / Nuclear Changes (Ch 7)**
 - ✓ Explain brief history of atomic structure
 - ✓ Describe electron cloud and quantum model of atom
 - ✓ Identify quarks as particles of matter that make up protons and neutrons
 - ✓ Explain how protons are broken apart with linear accelerators
 - ✓ List the names and symbols of 40 common elements
 - ✓ Identify atomic number and mass number for elements
 - ✓ Diagram the energy levels of electrons for common elements
 - ✓ Identify and describe isotopes of common elements
 - ✓ Identify four types of nuclear radiation and their properties
 - ✓ Explain nuclear decay
 - ✓ Calculate the half-life of radioactive isotopes
 - ✓ Contrast properties of radioactive isotopes versus stable nuclides
 - ✓ Identify uses of radioactive isotopes including medical
 - ✓ Calculate the average atomic mass of an element
 - ✓ Explain the mole and understand its significance as the SI base unit for quantity
 - ✓ Convert between moles and grams for an element

- **Periodic Table (Chapter 3)**
 - ✓ Explain brief history of the periodic table
 - ✓ Describe the periodic table of elements and use it to obtain information about an element
 - ✓ Distinguish between a group and a period
 - ✓ Explain the sublevels of electrons in an atom
 - ✓ Explain ionization
 - ✓ Distinguish between cations and anions
 - ✓ Distinguish between metals, nonmetals, and metalloids (semiconductors)
 - ✓ Explain metallic bonding
 - ✓ Distinguish between ionic and covalent bonding
 - ✓ Identify metals as alkali, alkaline earth, and transition elements
 - ✓ Identify elements as lanthanides, actinides, and transuranium
 - ✓ Recognize hydrogen as a typical nonmetal
 - ✓ Identify nonmetals as halogens, noble gases, and in mixed groups
 - ✓ Identify diatomic molecules
 - ✓ Describe the nature of allotropes
 - ✓ Construct electron dot diagrams for atoms

- **Chemical Compounds (Chapter 4)**

- ✓ Describe how a compound differs from the elements it is composed of
- ✓ Explain what a chemical formula represents
- ✓ Explain an octet and its role in forming compounds between elements
- ✓ State reasons why chemical bonding occurs
- ✓ Explain electronegativity and its ability to indicate bond types
- ✓ Describe ionic bonds and covalent bonds
- ✓ Identify the particle produced by ionic bonding and by covalent bonding
- ✓ Distinguish between a nonpolar covalent bond and a polar covalent bond
- ✓ Construct electron dot diagrams of ionic, polar covalent, and nonpolar covalent bonds
- ✓ Explain how to determine oxidation numbers
- ✓ Distinguish between monatomic ions and polyatomic ions
- ✓ Write chemical formulas using oxidation numbers for ionic compounds
- ✓ Name ionic compounds from chemical formula
- ✓ Write chemical formula for covalent compounds from name and reverse
- ✓ Calculate formula mass and molar mass for compounds
- ✓ Distinguish between empirical and molecular formulae
- ✓ Identify bond axis, bond length and bond angle

- **Organic Chemistry (Chapter 4)**

- ✓ Distinguish between saturated and unsaturated hydrocarbons
- ✓ Identify isomers of an organic compound
- ✓ Identify aliphatic compounds (alkanes, alkenes and alkynes) and the general formula for each
- ✓ Describe the characteristics of aromatic hydrocarbons
- ✓ Draw structures of aliphatic and aromatic hydrocarbons
- ✓ Identify substituted hydrocarbons
- ✓ Identify general formulas and structures for alcohols, organic acids and esters
- ✓ Describe the formation of polymers and discuss their importance as biological compounds
- ✓ Compare and contrast carbohydrates, lipids, proteins and nucleic acids

- **Chemical Reactions (Chapter 5)**

- ✓ Identify reactants and products in a chemical reaction
- ✓ Explain how a chemical reaction satisfies the law of conservation of mass
- ✓ Interpret chemical equations
- ✓ Explain what is meant by a balanced chemical equation
- ✓ Demonstrate how to write a chemical equation and balance it
- ✓ Classify five types of chemical reactions using their generalized formula
- ✓ Predict the products of some reactions based on the reaction type
- ✓ Use stoichiometry to solve mole-mole, mole-mass and mass-mass calculations
- ✓ Differentiate between exothermic and endothermic reactions
- ✓ Describe factors affecting reaction rates
- ✓ Describe the effects of catalysts and inhibitors on the speed of a chemical reaction

- **Solutions (Chapter 6)**

- ✓ Classify solutions into three types and identify their solutes and solvents
- ✓ Explain the dissolving process
- ✓ Describe the factors that affect the rates at which solids and gases dissolve in liquids
- ✓ Explain enthalpy of solution for solids and gases dissolving in liquids
- ✓ Compare and contrast the behavior of polar and nonpolar substances in forming solutions
- ✓ Compare and contrast ionization and dissociation processes
- ✓ Compare and contrast electrolytes and nonelectrolytes
- ✓ Explain how the addition of a solute to a solvent affects the solvent's freezing and melting points
- ✓ Discuss how solubility varies among different solutes and different temperatures
- ✓ Compare and contrast a saturated, unsaturated, and supersaturated solution
- ✓ Calculate concentration by per cent volume and by per cent mass
- ✓ Interpret solubility curves and table
- ✓ Describe molarity
- ✓ Calculate the mass needed for molar solutions

- **Acids and Bases (Chapter 6)**

- ✓ Define acid and base
- ✓ Describe the characteristic properties of acids and bases
- ✓ List the names, formulas, and uses of common acids and bases
- ✓ Relate the processes of ionization and dissociation of the formation of acids and bases
- ✓ Explain what determines the strength of an acid and base
- ✓ Define pH
- ✓ Describe the relationship between pH and the strength of an acid or base
- ✓ Describe the neutralization reaction
- ✓ Explain what a salt is and how it is formed
- ✓ Demonstrate how to write and balance a neutralization reaction