SCH 3U Exam Study Guide

(as of June 2019)

Mark Breakdown

Here is a breakdown of the exam emphasis by strand and question type. This does not indicate degree of difficulty and some questions overlap; that is, a 6 mark question on the exam might involve 2 marks from strand 1 and 4 marks from strand 3 so marks are allocated in the table according to which strand relates to that component of the question. For example, the stoichiometry strand seems low in marks, but it is needed to complete questions in several other strands so its importance is greater than marks would indicate. The exam is two hours in length.

Strand	Marks From Multiple Choice	Marks From Short Answer Questions	Total Marks	Mark Weight of Exam (%)
Matter	10	0	10	8.7
Chemical Bonding	5	19	24	20.9
Chemical Reactions	4	18	22	19.1
Stoichiometry	3	14	17	14.8
Solutions	9	0	9	7.8
Solubility	5	10	15	13.0
Gases and Atmospheric Chemistry	9	9	18	15.7
Total	**45**	**70**	**115**	**100**

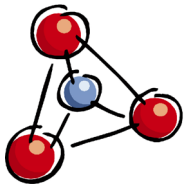
Study Guide

Here is a breakdown of the concepts to study. Again, this does not indicate degree of difficulty or amount of emphasis; rather just a complete list of exam topics by strand and unit. Note that for each strand, the first point states that you need to know terms. This does not necessarily mean that there is a question related to defining or explaining a term. It could just mean that this is a term you are expected to be fluent with and cannot be defined for you during the exam. Also, the chemical reactions strand, stroichiometry strand, solutions and solubility strand and the gases and atomospheric strand rely on each other so questions are intermixed. This list is complete at this time; if a concept or term is not on this sheet, it is not covered by the exam. Knowing everything on this sheet, does not guarantee success on the exam; you have to demonstrate understanding and apply this knowledge.

Strand 1 Matter and Chemical Bonding

Unit 1 Matter

1. Know the following terms: atomic mass units, atomic radius, electron affinity, electronic configuration, electron-electron repulsion, first ionization energy, isotope, matter, second ionization energy and shell.
2. Identify the relationship among atomic number, mass number and number of electrons.
3. Given an atomic symbol, calculate the number of electrons, protons and neutrons as well as the charge, atomic number and mass number.
4. Use periodic trends to determine the atomic size, reactivity, and lowest/highest ionization energies.
5. Use electronic configurations to determine atomic size, reactivity, and lowest/highest ionization energies and electron affinity.



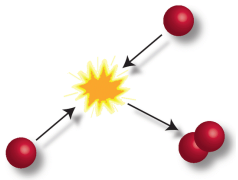
Unit 2 Chemical Bonding

1. Know the following terms: boiling point, bonding, compound, core charge, core electrons, covalent, electrical conductivity, electron-electron repulsion, electrostatic force, dipole, dipole-dipole, hydrogen bond, inductive dipole, instantaneous dipole, ionic, ionic character, ionic-ionic interactions, intermolecular, IUPAC, LDF (London dispersion Force), lone-pairs of electrons, metal, molecule, nomenclature, non-metal, nonpolar, nuclear charge, octet rule, polar, soluble, transition metal, van der Waals, valence electrons, volatile and VSEPR theory.
2. Explain how ionic, covalent and polar covalent bonding occurs.
3. Determine whether atoms undergo ionic, covalent and polar covalent bonding.
4. Calculate/predict electronegativity differences and use this information to determine ionic character, types of bonds formed and which substance ionize/dissociate in water.
5. Identify and compare the different types of intermolecular forces of attraction within solids and liquids and identify their effects on the physical properties of substances.
6. Predict the types of intermolecular forces of attraction that exists within various substances.
7. Compare the physical properties of ionic, covalent and polar covalent solids.
8. Use Lewis structures and VSEPR theory to determine the 3-D shape of molecules. Name these shapes.
9. Write IUPAC names for various compounds/molecules with proper spelling.
10. Given the IUPAC name for various compounds/molecules, determine the chemical formula.

Strand 2 Chemical Reactions

Unit 3 Chemical Reactions

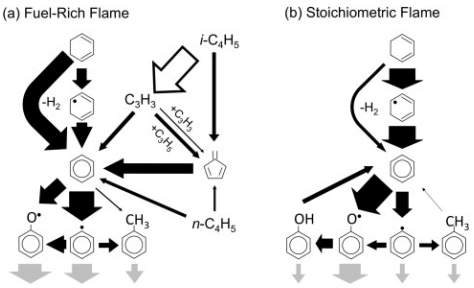
1. Know the following terms: activity (reactivity) series, combustion reaction, decomposition reaction, double displacement/replacement reaction, endothermic reaction, exothermic reaction, ionic equation, precipitate, net ionic equation, single displacement/replacement reaction, spectator ion and synthesis reaction.
2. Balance chemical equations.
3. Identify the different types of chemical reactions and predict the products of those chemical reactions.
4. Use data to determine the order of activity/reactivity of metals and non-metals.
5. Use the activity/reactivity series of metals and non-metals to predict whether a reaction will proceed and the products of a chemical reaction.
6. Identify endothermic and exothermic reactions by the placement of the heat term in the equation.
7. Predict precipitate formation using solubility rules.
8. Determine ionic equations, spectator ions and net ionic equations.



Strand 3 Stoichiometry

Unit 4 Stoichiometry

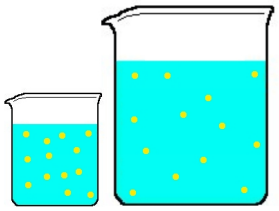
1. Know the following terms: Avogadro's constant, empirical formula, excess reagent/reactant, experimental yield, limiting reagent or reactant, gravimetric analysis, molecular formula, percent composition, percentage yield, simplest formula, stoichiometry and theoretical yield.
2. Conduct conversions using Avogadro's constant, the mole and molar mass.
3. Calculate the percent composition of a compound/molecule.
4. Calculate the simplest/empirical formula of a substance.
5. Calculate the molecular formula of a compound/molecule.
6. Conduct stoichiometric calculations using moles and mass.
7. Determine the limiting reactant/reagent.
8. Conduct calculations of theoretical yield, experimental yield and percentage yield.
9. Use stoichiometry to calculate the percentage yield of a substance.



Strand 4 Solutions and Solubility

Unit 5 Solutions

1. Know the following terms: [ ], concentrated solution, dilute solution, dissociation, hydronium, hydroxide, insoluble, ionic equations, ionization, net ionic equation, neutralization, pH, precipitate, qualitative analysis, solute, solution, solvation, solvent, spectator ion, strong and weak solutions.
2. Explain why water is such a good solvent (the universal solvent).
3. Explain how ionic, covalent, polar covalent substances dissolve and the forces involved.
4. Explain why one substance is more soluble than another substance (intermolecular and intramolecular attractions).
5. Given various substances, determine which substance would be the most soluble.
6. Identify and explain factors affecting dissolving.
7. Explain the difference between exothermic and endothermic dissolving.
8. Identify and explain factors affecting and consequences of solvation.
9. Use solubility rules to predict if a precipitate will occur and determine how to remove ions from a solution.
10. Identify spectator ions and determine net ionic equations.
11. Identify the purpose and processes involved in qualitative analysis.
12. Explain the Arrhenius theories of acids and bases.
13. Compare weak and strong acids and bases.
14. Compare weak and strong electrolytes.
15. Complete ionization/dissociation reactions of molecules/compounds.
16. Explain qualitatively, in terms of degree of or percent ionization/dissociation, the difference between strong and weak acids and bases.
17. Conduct pH and $[H^+]$ conversions.
18. Explain the effect of dilution on pH and $[H^+]/[OH^-]$.



Unit 6 Solubility

1. Know the following terms: concentration, buret/burette, end-point, equivalence point, indicator, molarity, m/v, unsaturated solution, saturated solution, solubility, stock solution, supersaturated solution, titrant, titration, volumetric flask and v/v.
2. Calculate solution concentrations in terms of mass/mass, mass/volume, volume/volume, moles/L, percent by mass and percent by volume.
3. Determine and explain how to prepare solutions included from stock solutions.
4. Compare dilute and concentration solutions.
5. Conduct dilution calculations.
6. Conduct stoichiometric calculations using solution concentrations.
7. Conduct neutralization math using the neutralization/titration formula and by stoichiometry.
8. Identify the components of a titration.
9. Compare the different types of solutions (unsaturated, saturated and supersaturated) and given data predict the type of solution.

Strand 5 Gases and Atmospheric Chemistry

Unit 7 Gases and Atmospheric Chemistry

1. Know the following terms: density, Kelvins, Kinetic energy, rotational, SATP, STP, translational and virbrational.
2. Identify the postulates of the Kinetic Molecular Theory.
3. Use the Kinetic Molecular Theory to explain the structure of solids, liquids and gases.
4. Use the Kinetic Molecular Theory to explain changes in state in terms of molecular motion and types of energy.
5. Conduct pressure and temperature conversions.
6. Identify temperature and pressure at STP and SATP.
7. Calculate volume, temperature and pressure changes using theory and gas laws (combined, Charles' Boyle's and Gay-Lussac's).
8. Identify the gas laws (define and apply them).
9. Calculate the volume, temperature, pressure or moles of gas using the Ideal Gas Law.
10. Calculate number of particles, moles and molar volume conversions of gases.
11. Use Dalton's Law of Partial pressure to calculate the pressure of component gases.
12. Conduct stoichiometric calculations using gas laws.
13. Calculate the density of a gas at various temperatures and pressures.