

SCH 3U - CHEMISTRY – COURSE OUTLINE

This course focuses on the concepts and theories that form the basis of modern chemistry. Students will study the behaviours of solids, liquids, gases, and solutions; investigate changes and relationships in chemical systems; and explore how chemistry is used in developing new products and processes that affect our Lives and our environment. Emphasis will also be placed on the importance of chemistry in other branches of science.

Prerequisite: SNC 2D/ 80% SNC 2P

TEXT: Chemistry 11-McGraw/Hill/Ryerson (\$64.95)

UNIT 1: MATTER & CHEMICAL BONDING(1)

17.5 hours(14 PERIODS)

- 1.2 - Physical & chemical properties of matter
- 1.3 - Physical & chemical changes
 - L-mass & volume measurements/graph-Density
- 1.3 - Classification of matter
 - L-classifying 40+ elements/compounds/mixtures
 - Separation techniques
 - L-quantitative separation of sand/salt mixture (Sum)
 - L-simple chromatography (Sum)
- 2.1 - The elements
- 2.2 - the periodic table
 - * elementary atomic theory/# protons/neutrons/electrons
- 5.1 - Isotopes—calculating average atomic mass
- 4.4 - nuclear stability/instability,
 - * nuclear decays – (alpha, beta decay)
 - L-1/2 Life simulation - graphing (Sum)
- 3.4 - Ions (simple, variable charges, compound ions)
- 3.2/3.4- Ionic compounds (writing & naming)
- 10.2 - Acids (writing & naming)
 - simple non-ionic compounds (writing & naming)
- 6.1/6.2- % composition, simplest (empirical) formula
 - L-% composition of MgO (Sum)
 - L-% composition of an unknown oxide of copper (Sum)
- 4.1 - conservation of mass - balancing chemical eq'ns
 - L-conservation of mass

Evaluation:

A1: Radioisotopes

Q1: Names & symbols

Q2: Physical/chemical properties

Q3: Isotopes

Q4: Formula writing x 4

Q5: % composition & balancing

Major TEST #1

UNIT-2: SOLUTIONS (1) - AN INTRODUCTION

12.5 hours(10 PERIODS)

- 8.1 -characteristics of solutions –dissolving vs dissociation
 - electrolytes/non-electrolytes
- 8.2
 - saturated/unsat/supersat
 - solubility curves
 - L-building a solubility curve - KNO₃ (Sum)
- 4.3 - double displacement reactions (precipitation)
 - L-solubility of 80 ionic substances
- 9.2 - Analytical chem - cation / anion analysis -
- 9-B L-identification of unknown ionic compounds (Sum)

Evaluation:

A1: Solubility

A2: Dble displ reactions

Q1: Dble displ reactions

Major TEST #2

UNIT-3: ATOMIC THEORY/CHEMICAL BONDING(2)

20 hours(16 PERIODS)

- 2.1 - Atomic theory - historical background
- 2.2 - Atomic theory - modern theory -orbitals
 - energy level diagrams / electron configurations
 - L-emmission spectra
- 2.3 - periodic trends
- 3.1 - Intramolecular bonding (ionic / covalent)
 - L-building molecules using model kits
- 3.2 - Lewis dot diagrams
 - bonding in molecular ions
- 3.3 - VSEPR Theory - shapes of molecules
 - L-shapes of molecules using model kits
- 3.3 - Molecular polarity
 - L-bending water vs cyclohexane
 - L-ammonia fountain/phobic sand
- 13.1-Introduction to Organic Chemistry
 - Properties of Hydrocarbons
- 13.3 -families of organic compounds
 - L-functional groups using model kits
- 13.3 -naming Hydrocarbons
 - L-building/naming molecules using model kits
- 3.2 - Intermolecular bonding - Aggregates
 - * ionic solids/molecular solids(polar & non-polar) / metallic solids / 3-D network solids

Evaluation:

A1: Molecular architecture

A2: Naming hydrocarbons (1)

A3: Naming hydrocarbons (2)

Q1: Naming hydrocarbons

Q2: Naming hydrocarbons

Major TEST #3

UNIT 4: GASES & CHEMICAL REACTION CALCULATIONS

20 hours(16 PERIODS)

- 11.1 - Review of Kinetic Molecular Theory
- 11.2/3/4-The Gas Laws *Boyles/ Charles (Absolute Zero)/Combined
 - L-exploring the gas Laws
- 5.2/12.1- Avogadros hypothesis
- 5.3 -The mole concept
- 5.3 -Problems involving
 - *molar masses, molar volumes, molar #
 - Gas problems not at STP using PV=nRT
 - L-finding molar mass of unknown gas (Sum)
- 7.1/9.3 -Stoichiometry problems * Mass / mass
 - L-finding charge on unknown ion (Sum)
 - L-decomposition of NaHCO₃ (Sum)
- 7.2/3 Stoichiometry problems * Limiting reactant /* % yield
 - L- a single displ rx with a Lim reagent & % yield (Sum)
- 12.3 Stoichiometry problems * mass / volume
 - * volume / volume
 - L-predicting a volume of gas produced (Sum)

- 6.4 - Hydrated salts
L-finding formula of a hydrated salt (Sum)

Evaluation:

- A1: The Gas Laws Q1: Moles (1)
Q2: Moles (2) Q3: Moles (3)
LAB Test: Stoichiometry/Limiting reagent/% yield

Major TEST #4

UNIT 5: CHEMICAL REACTIONS

20 hours(16 PERIODS)

- 4.2 - Properties, behavior, prep & test for oxygen gas
L-production of O₂ gas - **decomposition Rx**
*heating mercuric oxide
*electrolysis of water
*catalytic decomp of KClO₃
*catalytic decomp of hydrogen peroxide
* catalysts and their role in chemical rxns
- 4.2 - **Synthesis Rx** -combustion reactions
- 14.1 -combustion of hydrocarbons
L-prep of O₂ / comb of 5 fuels (Mg/Fe/S/C/C₂H₅OH)
- Synthesis Rx-metal/non-metal oxides in water
- 14.1 -Hydrocarbons as fuels
L-combustion of C₂H₂ / C₃H₇OH / C₈H₁₈ etc
- 14.2 -Thermochemical equations
- 14.3 -Measuring heat changes
L-The Heat of Combustion Of a Candle (Sum)
- 14.5 -Impact of Petroleum products
- - **Oxidation reactions** - zinc / sulfur
- iron / chlorine
- Alum / bromine
- - Properties, behavior, preparation & test for H₂ gas
- 4.3 - **Single displacement Rx** - metal / acid
- metal / water
- metal / salt solutions
L-The displacement of H₂ from acids & water
L-The displacement of a metal from its salt
- - Building the Activity Series
- 9.2 - **dbl displ rxns that produce a gas**
L-Producing CO₂ from carbonates
L-Producing NH₃ from ammonium salts

Evaluation:

- A1: Hydrogen gas A2: Writing chemical reactions
Q1:Oxygen gas / combustion Q2: Writing chemical equations
LAB Test: The Heat of Combustion Of a Candle

Major TEST #5

UNIT 6: SOLUTIONS(2) / ACIDS & BASES

18.75 hours(15 PERIODS)

- 8.1 -Review characteristics of a solution
- 8.3 -Concentration of a solution
- 8.4 -Making dilutions
- 8.4 -Calculating concentration of a mixture
L-making a solution/ a dilution / a mixture
- 10.1 -Characteristics of Acids / Bases
- 10.1 -acid-base Theories
- 10.2 -pH scale
L-Testing pH of various solutions
- 10.3 -Neutralization reactions
- 10.3 -Acid / base titrations

- L-A/B titrations -conc of unknown acid
-conc of acetic acid/vinegar
-% purity KOH / Saniflush
- % ASA in aspirin
- % NH₃ in ammonia cleaner

Evaluation:

- Q1: concentration & pH Q2: Acid / base Theory
Q3: Acid/base titrations

LAB Test: ALL A/B titrations are summative

Major TEST #6 (if timing permits)

Safety

This chemistry course cannot be completed without extensive work in the Laboratory which will involve many chemicals, sharp objects and combustible materials. Be sure you review all the safety equipment in the Lab area and are familiar with their use. For the safety of the entire class, you are expected to behave maturely during Labs. If your behavior is inappropriate or safety measures compromised you will be removed from the Lab area!

Assessment / Evaluation Policies

Labs and homework assignments (formative & summative) are expected to be in on time. It is your responsibility to hand in the assignment. If you were absent for the Lab/quiz etc then you must do it when you return and hand it in ASAP. Full marks/highest Level may not be given for Late Labs.

Chapter tests are full period tests and are all weighted the same. If you miss a test for a Legitimate reason - no problem, but you must write the test on the first day back unless you have been absent for an extended period of time. I am always willing to Listen to a good explanation. It is your responsibility to write the test not mine !!

Your term work will be broken up into 4 categories and accounts for 70% of your final grade.

Knowledge (tests, quizzes, assignments, Labs)	55%
Thinking/Inquiry (tests, quizzes, Labs)	25%
Making Connections (tests, quizzes, Labs)	10%
Communications (problem format, units, Labs)	10%

The **final exam** includes a practical Lab that takes place in the Laboratory during the final few days as well as a comprehensive 2.5 hour exam that attempts to cover each chapter equally according to the time spent on it.

Practical Lab	5%
Final Exam	25%

Note: The **Junior Chemistry Data Sheet** can be used for all quizzes and tests including the Final Exam.

Course expectations

1. Use class time efficiently. LISTEN, THINK, PARTICIPATE
2. Do your homework! Do not fall behind.
3. Ask questions to clarify concepts you do not understand immediately .
4. Use your textbook as a resource. ALL materials covered in the class are in the text (see references in each unit)
5. Check the answers to all problems assigned (on the bulletin board or on the internet) before each unit test. Be prepared to write the unit tests. No retests will be given !
6. Be present! ATTENDANCE IS VERY IMPORTANT !