

Central High School Inorganic Chemistry Syllabus

Mr. D. Ladehoff

Course Description

The course is designed for college bound students who plan science-related and medical careers. Topics include; properties of matter, writing formulas and equations, periodic table, atomic structure, gas laws, electrochemistry, and nuclear chemistry.

Course Objectives

Identify the most familiar elements by name and some of their most familiar properties.

Identify the chemical symbol for familiar elements.

Know that atoms are made of sub-atomic particles (protons, neutrons, electrons) which have positive, neutral, and negative charges.

Understand that the periodic table displays the elements in increasing atomic number and shows how periodicity of the physical and chemical properties of the elements relates to atomic structure.

Understand how to relate the position of an element in the periodic table to its chemical properties.

Understand how to use the periodic table to identify the families of elements (and their properties) known as alkali metals, alkaline Earth metals, halogens, and noble gases.

Know that there is a kind of periodicity in the physical properties of chemical elements, that the periodic table arranges them accordingly, and that this way of ordering corresponds to the order of their atomic structures.

Understand that the major groups of chemical elements are: (1) alkali metals, (2) alkaline Earth metals, (3) transition metals, (4) nonmetals (boron family, carbon family, nitrogen family, oxygen family, halogen family, noble gases), (5) metalloids, and (6) rare Earth elements. Know why hydrogen is not in any of these groups.

Know that there are two major differences in bonds (ionic and covalent).

Know the distinction between a compound and a mixture.

Understand how to use the periodic table to identify the trends in relative sizes of ions and atoms.

Understand how to use the periodic table to determine the number of electrons available for bonding.

Understand that the nucleus of the atom is much smaller than the whole atom yet contains most of its mass.

Understand isotopes.

Understand that the transuranium elements were not discovered in nature but synthesized through the use of nuclear accelerators.

Understand the different states of matter: solid, liquid, gas, plasma.

Define freezing, melting, boiling, condensing, and sublimation.

Understand that the temperature of water (or any substance) is constant during phase changes, even when heat is being added or removed.

Understand the kinetic molecular theory explains the properties of gases by the random motion of molecules in them. For example, the collision of these particles with a surface create an observable pressure on that surface, and their motion explains the diffusion of gases.

Understand how to apply the gas laws to relations between pressure, temperature, and volume of any amount of an ideal gas. Understand Boyle's Law and Charles' Law and how to logically solve problems.

Understand the values of standard temperature and pressure (STP): 0° Celsius and 1 atm.

Understand how to convert between Celsius and Kelvin temperature scales. Understand that there is no temperature lower than 0 Kelvin, or absolute zero.

Understand that in chemical reactions, atoms combine into molecules by means of bonds (e.g., by sharing electrons to form covalent or metallic bonds or by exchanging electrons to form ionic bonds).

Know that ions are atoms or groups of atoms that have a positive or negative charge and that polyatomic ions are groups of covalently bonded atoms that act like a single atom when combining with other atoms.

Understand that metals tend to form positive ions, and nonmetals tend to form negative ions.

Understand that ionic solids like NaCl (sodium chloride, ordinary table salt) are formed from a three dimensional repeating pattern of alternating positive and negative ions, held together by electrostatic forces (ionic bonds).

Understand that the conservation of atoms in a chemical reaction, as summarized in a balanced chemical equation, leads to the ability to calculate theoretical masses of reactants and products.

Understand how to read, interpret, and balance chemical equations.

Understand the quantity of one mole is set by calling the number of atoms in exactly 12 grams of carbon-12 atoms one mole. This number turns out to be 6.02×10^{23} , also known as Avogadro's Number.

Understand that energy is exchanged or transformed in all chemical reactions and physical changes of matter.

Understand that chemical processes either release (exothermic) or absorb (endothermic) thermal energy.

Understand that energy is released when a material condenses or freezes and is absorbed when a material evaporates, melts, or sublimates.

Understand that most acids, bases, and salts, when dissolved into water, conduct electric current and form ions in water solutions. Understand the observable properties of acids, bases, and salt solutions.

Understand that among other definitions of acids and bases, acids are hydrogen-ion-donating and bases are hydrogen-ion-accepting substances.

Use the pH scale to characterize acidic and basic solutions. Understand the definition of pH as the negative logarithm of the hydrogen ion concentration, and understand what the log scale means.

Distinguish between chemical compounds and solutions and mixtures. Differentiate between solute and solvent.

Understand the concentration of a solute in terms of molarity, parts per million, and percent composition.

Understand that an electrically neutral object has particles within it that are charged, but their charges balance each other out.

Know the first two laws of thermodynamics: (1) Energy is conserved (neither created nor destroyed) and (2) Heat flows naturally from a hot object to a cold object; heat will not flow spontaneously from a cold object to a hot object.

Recount the concept of entropy and know that entropy in the universe as a whole always increases.

Understand the principles of air pressure and fluid dynamics. Understand Archimedes' Principle and Bernoulli's Principle.

Understand that air pressure decreases as altitude increases.

Understand that the electrical force is a universal force that exists between any two charged objects.

Understand the causes of disruptions: changes in climate, human activity, introduction of nonnative species, changes in population size, sudden natural disasters.

Required Materials

Laboratory notebook
Spiral notebook
Student handbook





Textbook

Holt Chemistry, Holt, Rinehart and Winston, New York, 2004

Laboratory Reports

The following needs to be prepared for each laboratory investigation, by every student, in a "Composition Notebook" or typed on computer. (Cutting and pasting allowed.)

Title Page- <i>1/2 page minimum</i>	5 pts
Give a name to the lab, date it was done, class hour, and student name. Illustration or creative design may be added.	
Purpose- <i>3 sentence minimum</i>	5 pts
Concise reason for the investigation. What objectives are to be discovered, what and why are these materials necessary for this study, and how will a conclusion be made.	
Materials- <i>Single list of reagents and apparatus needed</i>	2 pts
Procedure- <i>Beginning to end</i>	3 pts
Give the steps required to complete the lab and obtain conclusive results.	
Data- <i>Chart, spreadsheet, or checklist</i>	10 pts
Document observations, record instrument readings and findings from procedure section, and do final assessment of products in the laboratory.	
Calculations- <i>Mathematics required</i>	5 pts
Results and Answers- <i>Provide final analysis</i>	10pts
Supply the question (or answer the question in writing complete sentences) to help communicate one's understanding of the investigation.	
Conclusion- <i>1/2 page minimum</i>	10 pts
Use complete sentences to describe what was done, what happened, what was learned, and was this lab worth doing.	
Total=	<hr/> 50 pts

Outstanding	45-50	
Good	40-44	
Average	35-39	
Poor	< 35	

Quizzes

Elements of the Periodic Table

Learning the elements found on the Periodic table is essential for communicating chemistry. Below are listed assigned chemical names, symbol, and date to be quizzed.

The inside back cover of your textbook contains a complete listing for study as does pg 124 of the handbook

1. Atomic numbers 1-10, Hydrogen through Neon, H-Ne: Sept. 3/7
2. Atomic Numbers 1-20, adding Sodium through Calcium, Na-Ca: Sept. 21/22
3. Atomic Numbers 1-20, 24-30, & 33-36, adding Chromium through Krypton, Cr-Kr (skipping 5 elements): Oct. 5/8
4. Atomic Numbers 1-20, 24-30, 33-36, 37, 38, 40, 42, 46, 47, 48, 50, 51, & 53, adding Rubidium through Iodine, Rb-I (skipping 6 elements): Oct. 25/26
5. Atomic Numbers 1-20, 24-30, 33-36, 37, 38, 40, 42, 46, 47, 48, 50, 51, 53, 54, 55, 56, 57, 74, 78, 79, 80, 82, 85, 86, 88, 89, 92, & 94, Xenon through Plutonium: Nov. 3/4

Polyatomic Ions

Table A-7 on page 831 Nov. 10/13

Additional Quizzes

The occasional need to discover how you are progressing will require the occurrence of a quiz or two depending on the difficulty of the unit. There may not be a formalized or verbalized notice for a quiz. Test Schedule for Fall 2005

Tests:

- Test 1: Laboratory techniques, safety precautions, physical change, chemical change, volume, mass, weight, chemical properties, mixtures, compounds, Law of Conservation of Energy, Kelvin, Celsius, heat, temperature, scientific notation, significant figures,- Sept. 17/1**
- Test 2: Dalton's atomic theory, electrons, protons, neutrons, isotopes, quantum model, quantum numbers, electron configuration, molar mass, Avogadro's number- Oct. 7/8**
- Test 3: Periodic table, periodic law, physical properties, Law of Octaves, chemical properties, families, periodic trends, transuranium elements- Oct. 28/29**
- Test 4: Nomenclature, valence electrons, cation, anion, ionic compounds, covalent compound, Lewis Structures, VSEPR, acids-Nov. 19/18**
- Test 5: Chemical equations, Conservation of Mass/Matter, combustion, synthesis, decomposition, single displacement, double-displacement, total ionic equation, net ionic equation-Dec. 15/16**
- Test 6: Mole, mole ratio, average atomic mass, formula mass, percent composition, stoichiometry, limiting reactant, percent yield-Jan. 13/14**
- Test 7: Gas characteristics, kinetic-molecular theory, Boyle's Law, Charles' Law, Gay-Lussic's Law, Dalton's Law of Partial pressure, Ideal Gas Law, Avogadro's Law, Graham's Law, and reactions between gases-Feb. 17/16**
- Test 8: Aqueous solutions, solubility, electrolyte strength, colligative properties, molarity, freezing point depression, boiling point elevation, solution equilibrium, polar/non-polar properties, oxidation-reduction reactions, half reactions, and strengths of oxidation.-March 16/17**

Test 9: Acid/Base properties, Arrhenius bases, Brønsted-Lowry acids, Lewis acid/base, neutralization, titration, pH, and indicators—April 15/16

Test 10: Reaction energy, reaction kinetics, enthalpy, entropy, free energy, activated complex, chemical equilibrium, acid-ionization constants, buffers, solubility product constant—May 5/6

Test 11: Electrochemical cell, voltaic cell, electrolytic cell, cathode/anode, electroplating, standard electrode potentials, auto-oxidation, radioactive decay, nuclear fission, nuclear fusion, and nuclear stability.—May 20/21

Comprehensive Final included/added to Test 6 and Test 11. Weighted to 15% of Semester Grade.

Classroom Procedures

1. Start the beginning task written on the board.
2. Discipline yourself to listen first.
3. Life long learning comes one step at a time.
4. Write names on the upper right on any assignment along with the class period.
5. Do your own work, share your thoughts, and avoid temptation to take from others.

Scale Percentages

The grading scale used in the chemistry class is designed to the standards set by the administration. Students are assessed using the following scale:

A ⁺	—>	98-100%
A	—>	94-97%
A ⁻	—>	92-93%
B ⁺	—>	90-91%
B	—>	87-89%
B ⁻	—>	85-86%
C ⁺	—>	83-84%
C	—>	79-82%
C ⁻	—>	77-78%
D ⁺	—>	75-76%
D	—>	72-74%
D ⁻	—>	70-71%
F	—>	≤ 69%

Portfolio Component

Students are to select work to be kept in their portfolio that show the relevance of inorganic chemistry to them. In conclusion of each unit covered, students will be given time to archive up to four pieces with reflection on why the addition. A sheet of current point totals for graded work will also be included. Maintaining a current portfolio will be assessed 1.5% to the accumulative Quarter grade of the student.

Final Grade

To achieve a final grade it will be tabulated from

Homework/Worksheet	:15%
Quizzes	:20%
Laboratory Reports	:20%
Tests	:30%
Final Exam	<u>:15%</u>
	100%

Instructor Contact

I can be reached through e-mail at dladehoff@cusd4.org, in B154 before school Monday, Tuesday, and Wednesday,