

General Chemistry Syllabus 2009–2010^{QAS}

Instructor: Mr. Xu Duan

Textbook: Conceptual Chemistry –

Understanding Our World of Atoms and Molecules by John Suchocki (2nd edition)

Theme	Topic	Lab	Chapter
Chemistry as a Central Science	<ul style="list-style-type: none">• Scientific method: deductive hypothetical reasoning• Unit & conversions: math & scientific notation• State and conversion• Physical vs. chemical processes		1
			2
The Periodic Table & Nomenclature	<ul style="list-style-type: none">• The arrangements of the periodic table and elemental ‘clusters’• Element, molecule, compounds and ions• Purity vs. impure mixtures• Nomenclature patterns: molecules & simply binary compounds		2
Atoms & Subatomic Particles	<ul style="list-style-type: none">• The classic Rutherford’s atom• Subatomic particles & their properties• Subatomic particles & the periodic table• Isotopes vs. allotropes• Dalton Atomic Theory and its modern interpretations		3
Chemical Reactions & Patterns	<ul style="list-style-type: none">• Classic observation of chemical reaction• Matter & mass conservation in chemical reactions• Chemical equations: reading, typing & balancing• Chemical equations: writing by reaction patterns• Chemical reaction profile & effects of catalysts• Chemical reactions: other factoring influencing rate of reaction• Chemical reaction: exothermic vs. exothermic		2
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Theme / Mega-Topic	Topic	Lab	Chapter
	Moles <ul style="list-style-type: none"> • Avogadro number and counting in chemistry • Molar mass of a molecule: math • Mole & mass conversion: math • National Mole Day 		9
	Properties of Acids & Bases <ul style="list-style-type: none"> • Common acids and bases & households products • Neutralization reaction • pH of a solution & computation: math • Proton transfer: relative acidity & amphoterism • Acid & base titration: math • Acid rain: formation & effects • Buffer solution: composition & effects 		10
	Atomic Models & Electron Configuration <ul style="list-style-type: none"> • Electromagnetic spectrum & energy • Atoms & unique lights they emit • Quantum theory & energy levelsof electrons • Electron configurations: main shell, subshells, and noble gas core subshell • Electron configuration: shielding effects & effective nuclear charge • Periodicity: electron configuration • Periodicity: ionization energy 		5
	Chemical Bonds & Molecular Geometry <ul style="list-style-type: none"> • Valance shell electrons & electron dot structure • Ionic bonds & ionic compounds • Crystals and structures • Covalent bonds: single, double & triple • Lewis dot structure • VSEPR principle • Electro-negativity and polarity of a bond • Molecular geometry of common molecules & its implications 		6

Theme / Mega-Topic	Topic	Lab	Chapter
Molecule Mixing & Solution	<ul style="list-style-type: none"> • Types of IMF & real life implication • IMF in macro-molecules: soap & cell membrane • Hydrogen bonds • Solution: its components & saturation • Solution: solubility curve • Solution: molarity – math 		7
Properties of Water	<ul style="list-style-type: none"> • IMF and connection: l vs. s • Density by temperature • Study of a lake in winter • Forces: adhesive, cohesive, surface tension & capillary action • Beneficial usage of phase changes • Specific heat of water • Heating and cooling curves 		8
REDOX Reaction & Electrochemistry	<ul style="list-style-type: none"> • REDOX reaction & half equations • A Cu/Zn electrochemical cell & its implications • Electrochemical cells in daily life • Electrolysis • Metal corrosions • Metal activity series 		11
Organic Compounds	<ul style="list-style-type: none"> • Hydrocarbons • Formulas, saturation, naming an structural formulas • Functional groups • Alcohols vs. ethers • Ketones vs. aldehydes • Carboxlic acids vs. esters • Benzene vs. phenols • Organic reactions • Polymers: additions vs. condensations 		12

Theme / Mega-Topic	Topic	Lab	Chapter
Vital Macro-organic Compounds for Life	<ul style="list-style-type: none"> • Carbohydrates <ul style="list-style-type: none"> ✓ Representatives in mono, di- and polysaccharides • Lipids <ul style="list-style-type: none"> ✓ Structural insights ✓ Saturated vs. unsaturated • Proteins <ul style="list-style-type: none"> ✓ Amino acids & peptide bonds ✓ 4 level of organization of protein • Nucleic acids <ul style="list-style-type: none"> ✓ Insight of a nucleotide ✓ DNA structure & IMF • Vitamins & mineral for life • Food pyramid <ul style="list-style-type: none"> ✓ Nutrition facts and calories ✓ Healthy diet ✓ Insights of lipoproteins 		13