

***NSF GK12
Chemistry Overview
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Periodic Table
of the Elements

1	2											18	19	20											86	87	88	89	90			
H	He											Ne	Ar	Kr	Xe	Rn																
Li	Be											B	C	N	O	F	Ne															
Na	Mg											Al	Si	P	S	Cl	Ar															
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr															
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe															
Cs	Ba	*La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn															
Fr	Ra	+Ac	Rf	Ha	Sg	Ns	Hs	Mt	110	111	112	113																				

* Lanthanide Series
+ Actinide Series

58	59	60	61	62	63	64	65	66	67	68	69	70	71
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
90	91	92	93	94	95	96	97	98	99	100	101	102	103
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

The goal of my course is to guide students in a process of inquiry, analysis, and interpretation of observable properties and interactions through application of the kinetic molecular theory of matter.

State Standards in Chemistry

- ◆ 2.1 Matter has characteristic properties, which are related to its composition and structure
- ◆ 2.2 Energy appears in different forms, and can move (be transferred) and change (be transformed)
- ◆ 2.3 Interactions can produce changes in a system, although the total quantities of matter and energy remain unchanged

Challenges of HS Chemistry



- ◆ Course content entirely depends upon submicroscopic (non-visible) atoms and molecules
- ◆ Abstract and Critical Thinking is essential; kids want fill in the blank type answers
- ◆ Large amount of new vocabulary and total content (almost like a foreign language)
- ◆ Quantitative Analysis can be challenging for many students

Methods and Strategies to Overcome these Challenges

- ◆ Engage the students through demos, content, and/or personality
- ◆ Foster an environment where it is alright to ask questions and get help; Not perfection in understanding, but progress
- ◆ Formative Assessments with quizzes and clickers to bring out misconceptions and reinforce difficult concepts
- ◆ Multiple Methods for Student Learning: Labs, Activities, Web Animations, Lectures, Projects, Debates, Videos, Demos, etc.
- ◆ POGIL: Process Oriented, Guided Inquiry Learning
- ◆ 5 E Lessons

Methods and Strategies to Overcome these Challenges

5 E Lessons

- ◆ Engage
- ◆ Explore
- ◆ Explain
- ◆ Extend
- ◆ Evaluate

Chemistry Outline 1st Semester

Matter - Ch. 2

- ◆ I. States of Matter
- II. Classification of Matter & Scientific Process
- III. Properties & Changes in Matter

Mentos & Coke Design Your Own Lab

Atomic Structure - Ch. 4

- ◆ Atomic Timeline Song
- I. Structure of the Atom
- II. Masses of Atoms, Isotopes

Cadium Isotope Lab

Chemistry Outline

Nuclear Chemistry - Ch. 25

- ◆ I. The Nucleus
- II. Radioactive Decay
- III. Fission & Fusion
- IV. Nuclear Applications

Cloud Chamber & Mantle Th-230 → Ra-226

Measurement - Ch. 3

- ◆ I. Using Measurements
 - II. Units of Measurement & Conversions
- Conversions Lab*

Chemistry Outline

Electrons in Atoms - Ch. 5

- ◆ I. Waves & Particles

- II. Bohr Model of the Atom

- III. Quantum Model of the Atom

- IV. Electron Configuration

Spectroscopy Lab (atomic emission)

Periodic Table - Ch. 6

- ◆ I. History

- II. Organization

- III. Periodic Trends MR EIRO trends

Reactivity of Metals Lab

Chemistry Outline

Chemical Bonding & Nomenclature- Ch. 7 & 9

I. Introduction to Bonding

II. Molecular Compounds

III. Ionic Compounds

IV. Acids

Internet Animations and POGIL Activities

Molecular Structure & Covalent Bonds - Ch. 8

◆ I. Lewis Diagrams

II. Molecular Geometry

III. Molecular Polarity

Molecular Model Kits

Chemistry Outline

The Mole - Ch. 10 & 16

- ◆ I. Molar Conversions
- II. Molarity
- III. Formula Calculations

Counting Atoms in Substance using Moles

Chemical Reactions - Ch. 11

- ◆ I. Intro to Reactions
- II. Balancing Equations
- III. Types of Reactions
- IV. Reaction Energy

Identification Labs for Rxn Types...many precipitate rxns and SR rxns

Chemistry Outline 2nd Semester

Stoichiometry - Ch. 12

- ◆ I. Stoichiometric Calculations
II. Stoichiometry in the Real World

Limiting Reagent Labs

Liquids & Solids, States of Matter - Ch. 13

- ◆ I. Intermolecular Forces
II. Physical Properties
III. Phase Changes, Heating Curves, Phase Diagrams

Liquid N₂ and Dry Ice Labs

Chemistry Outline

Gases - Ch. 14

- ◆ I. Physical Properties of Gases

- II. The Gas Laws

- III. Ideal Gas Law

Gas Toys Analysis & PHET Simulator online

Thermochemistry – Ch. 17

- ◆ I. Calorimetry & Measuring Enthalpy Change

- II. Heat Calculations $Q = mc\Delta T$

Cheeto Calorimetry Lab, Specific Heat Lab

Chemistry Outline

Solutions - Ch. 15 and 16

- ◆ I. Nature of Solutions

- II. Concentration

Kool-Aid Concentration Lab

Acids & Bases - Ch. 19

- ◆ I. Intro to Acids & Bases

- II. pH

- III. Titration

Identification and Neutralization Labs

Redox Reactions & Electrochem- Ch. 20,21

- ◆ I. Assigning Oxidation Numbers

- II. Oxidizing and Reducing Agents

- III. Electrochemical Cell

Questions?

Periodic Table
of the Elements

1	IA 1 H																	2 He	O
2	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne	
3	11 Na	12 Mg	IIIB	IVB	VB	VIB	VII B	VII			IB	IIB	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar	
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr	
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe	
6	55 Cs	56 Ba	57 *La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn	
7	87 Fr	88 Ra	89 +Ac	104 Rf	105 Ha	106 Sg	107 Ns	108 Hs	109 Mt	110	111	112	113						

* Lanthanide Series

58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
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+ Actinide Series

90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr
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