

Unit B – Matter & Chemical Change

Focusing Questions:

1. What are the properties of materials, and what happens to them during chemical change?
2. How do we know that chemical change occurs?
3. What ideas, theories or models help us explain chemical change?

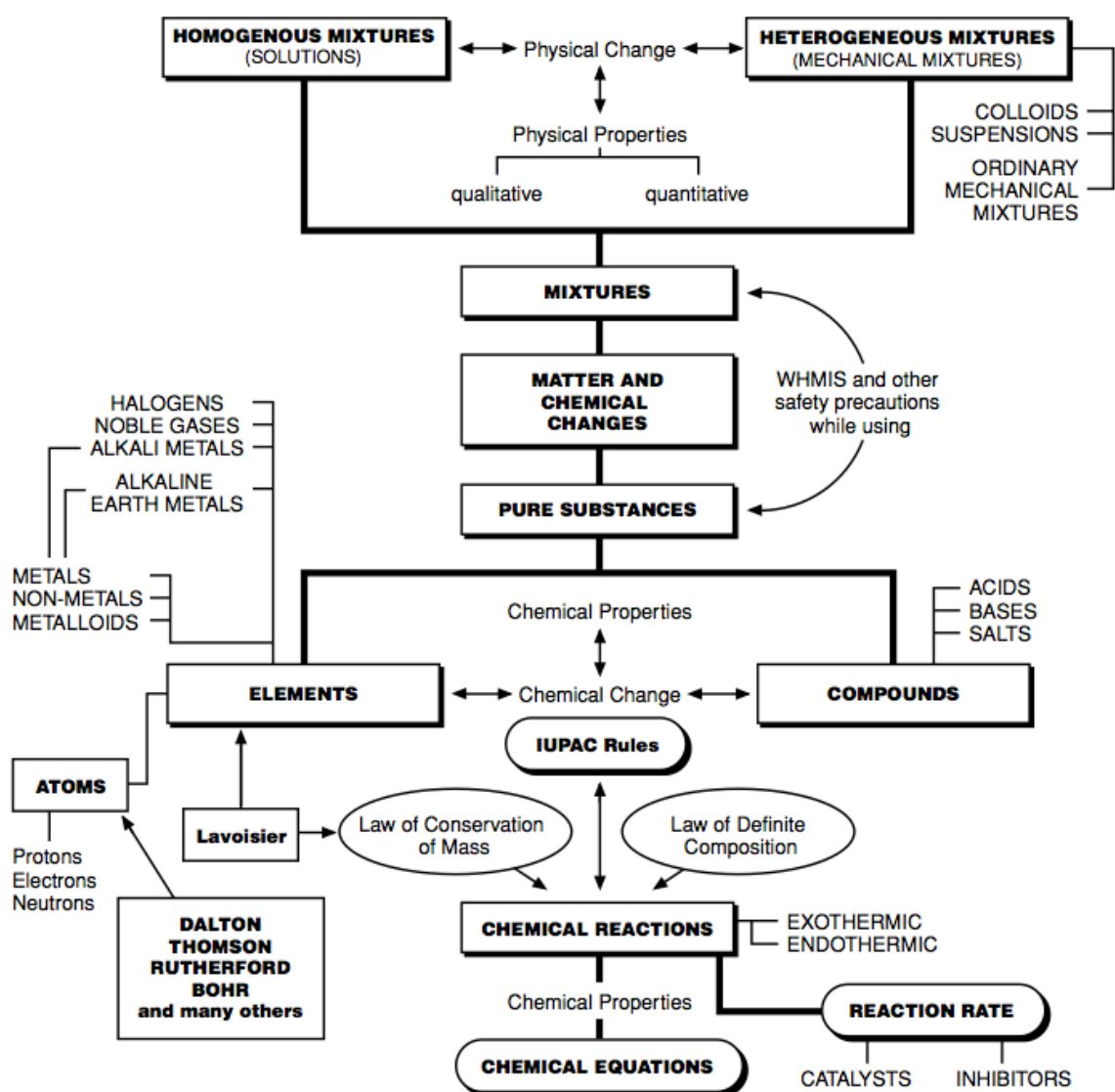
Key concepts:

- Workplace Hazardous Materials Information System (WHMIS) and safety
- substances and properties
- endothermic and exothermic reactions
- reactants and products
- conservation of mass
- factors affecting reaction rates
- periodic table
- elements, compounds and atomic theory
- chemical nomenclature (introductory treatment)

Learning outcomes:

1. Identify and evaluate dangers of caustic materials and potentially explosive reactions.
2. Investigate and describe properties of materials.
3. Describe and apply different ways of classifying materials based on their composition and properties.
4. Distinguish between observation and theory, and provide examples of how models and theoretical ideas are used in explaining observations.
5. Demonstrate understanding of the origins of the periodic table, and relate patterns in the physical and chemical properties of elements to the position in the table.
6. Use the periodic table to identify the number of protons and electrons in each atom, as well as other information about each atom.
7. Use the periodic table to describe the relationship between the structure of atoms in each group and the properties of elements in that group.
8. Distinguish between ionic and molecular compounds, and describe the properties of some common examples of each.
9. Read and interpret chemical formulas for compounds of two elements, and give the IUPAC name and common name of these compounds.
10. Identify and describe chemicals commonly found in the home, and write the chemical symbols.
11. Identify examples of combining ratios/number of atoms per molecule found in some common materials, and use information on ion charges to predict combining ratios in ionic compounds of two elements.

12. Assemble or draw simple models of molecular and ionic compounds.
13. Identify conditions under which properties of a material are changed, and critically evaluate if a new substance has been produced.
14. Observe and describe evidence of chemical change in reactions between familiar materials.
15. Distinguish between materials that react readily and those that do not.
16. Observe and describe patterns of chemical change.
17. Describe familiar chemical reactions, and represent these reactions by using word equations and chemical formulas.



Topic 1 – Exploring Matter

Chemistry:

Caustic:

Safety First:

- List some of the safety equipment in our classroom
- We use labeling systems and data sheets to make the public aware of the potential dangers and the appropriate safety precautions when handling chemicals:

HHPS:



WHMIS:





MATERIAL SAFETY DATA SHEET

5100 W. Henrietta Rd.
West Henrietta, NY 14586
TEL: (866) 252-0501

MSDS No. 9503307
Effective Date: December 1, 2005

9503006 9503009 9503103 9503106
9503108 9503107 9503108
9503307 9503308 9503309
9503310

SECTION I NAME 24 HOUR EMERGENCY ASSISTANCE
415-984-3000

Product	Acetone	Health	2
Chemical Synonyms	2-Propanone; Solvent	Flammability	3
Formula	CH ₃ COCH ₃	Reactivity	0
CAS No.	67-64-1	HAZARD RATING	
		Minimal	1
		Slight	2
		Moderate	3
		Severe	4

SECTION II DANGEROUS INGREDIENTS

Name	%	TLV Units
Acetone	100%	TWA: 500 ppm

DANGER! EXTREMELY FLAMMABLE!

SECTION III PHYSICAL DATA

Melting Point (°C)	-95°C	Specific Gravity (H ₂ O = 1)	0.7855 @ 60°C
Boiling Point (°C)	56°C	Refractive Index (20°C)	1.3572
Vapor Pressure (mm Hg)	180 @ 20°C	Evaporation Rate (Equal to acetone = 1)	> 5.0
Vapor Density (Air=1)	2.00		
Solubility in Water	Soluble		
Appearance & Odor	Colorless liquid; pungent odor.		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Flash point	-20°C (CC)	Flammable Limits in Air % by Volume	Lower 2.5% Upper 13%
Firefighting Procedures	Use dry chemical, CO ₂ , alcohol foam, or water spray. In fire conditions, fire-fighters should wear an appropriate mask or a self-containing breathing apparatus.		

The product is flammable. Extremely flammable in presence of open flames and sparks of heat. Slightly flammable to flammable in presence of oxidizing materials. Very slightly to slightly flammable in presence of oxidizing materials, of combustible materials.

Autoignition Temperature: 465°C

Flammability and Explosion Hazards

TDG Class 3 Flammable liquid, UN1090

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MSDS:

SECTION V REACTIVITY DATA

Chemical Stability	Yes <input checked="" type="checkbox"/> / No <input type="checkbox"/>	Reactivity with oxidizers	Yes <input checked="" type="checkbox"/> / No <input type="checkbox"/>
Incompatible with other products	Yes <input checked="" type="checkbox"/> / No <input type="checkbox"/>	Reactivity with acids, alkalis, moisture	Yes <input checked="" type="checkbox"/> / No <input type="checkbox"/>

These products are carbon oxides.
Slightly reactive to reactive with oxidizing agents, reducing agents. Very slightly to slightly reactive with acids, alkalis, moisture.

SECTION VI TOXICOLOGICAL PROPERTIES

Route of Entry: Ingestion, Skin contact, Inhalation.
TLV: TWA: 500 ppm
Toxicity for animals: N/A

Chronic effects on humans: Repeated or prolonged exposure to the substance can produce target organ damage. The substance is toxic to the blood, kidneys, lung, liver. Target organs: Central nervous system.

Acute effects on humans: Inhalation of vapors cause irritation of the eyes, nose and throat. Slightly toxic by ingestion. Causes severe irritation of the eyes. Causes drying of the skin.

SECTION VII PREVENTIVE MEASURES

Discharge, treatment, or disposal may be subject to local laws. Consult your local or regional authorities.
Keep container in a cool, well ventilated place. Keep container dry. Keep container tightly closed. Keep away from all sources of ignition.
Avoid contact with skin and eyes. Do not breathe vapors or spray. Use with adequate ventilation. Do not ingest.

Spill or leak: Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. Wash spill area with soap and water.

Protective Clothing: Splash goggles, lab coat, vapor respirator, gloves.

SECTION VIII FIRST AID MEASURES

Ingestion: Call Physician or Poison Control Center immediately. Induce vomiting only if advised by the appropriate medical personnel. Eye contact: Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek medical attention. Skin contact: Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Inhalation: Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Allow victim to rest in a well ventilated area. Seek immediate medical attention.

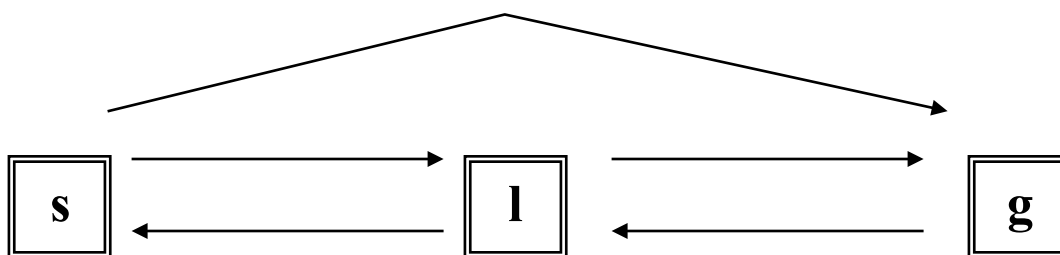
SECTION IX PREPARATION OF THE MSDS

Rev. No. 3 Date December 1, 2005 Approved Michael Raszega

Classifying Matter

Matter:

Classifying Matter According to State: three states of matter include _____, _____ and _____. Each state is determined by the amount of _____ within the particles.



Explain the three states of matter by using the **particle model of matter** (prerequisite knowledge):

Classifying Matter According to Composition:

Flow chart:

1. Pure substances:

a. Elements:

b. Compounds:

2. Mixtures:

a. Homogeneous mixtures:

b. Heterogeneous mixtures:

i. Ordinary Mechanical:

ii. Suspensions:

iii. Colloids:

Topic 2 – Changes in Matter

All matter has **properties** (characteristics ways in which a substance behaves):

Physical properties:

Qualitative :

Quantitative:

Chemical properties:

Ex.

Chemists classify changes in matter into two categories:

Physical change:

Ex.

Chemical change:

Ex.

Evidence of chemical change:

Topic 3 – What are Elements?

Aristotle (400 BC):

- Believed that all matter is made up of only 4 substance “elements: _____, _____, _____ and _____

Alchemists:

Antoine Lavoisier (1743 – 1794):

- Defined elements as pure substances that _____

Law of Conservation of Mass:

- In any chemical reaction _____

- Matter cannot be created or destroyed it only changes form.

Law of Definite Composition:

- Compounds are pure substances that contain two or more elements _____

Decomposition of water: Water can be decomposed into the elements _____ and _____ through the process of _____. Scientists use _____ (batteries) to pass electricity through the water.

Observations:

Dalton's Atomic Theory:

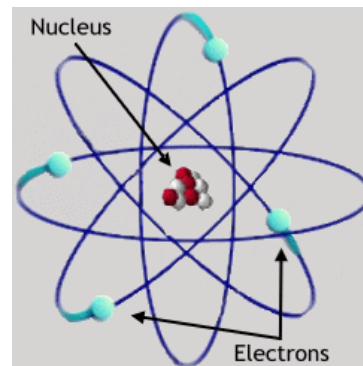
- All matter is made up of _____
- _____, or divided into smaller particles.
- _____ Atoms of one element are different in size and mass of other elements.
- Compounds are atoms of _____

Elements:

Compounds:

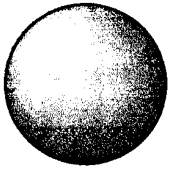
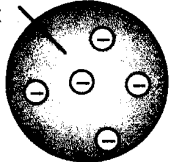
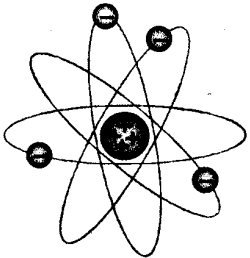
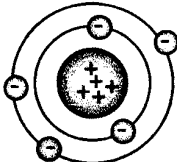
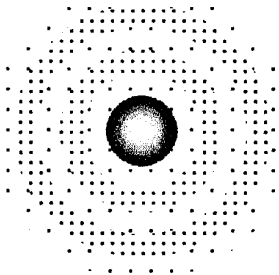
Models of the Atom: complete the chart on the back of this page.

We use the Bohr model in high school. According to this model, the atom is composed of three _____. The protons and neutrons make up most of an atom's mass (electrons are very light in comparison).



Particle	Symbol	Charge	Location
Proton			
Neutron			
Electron			

Models of the Atom

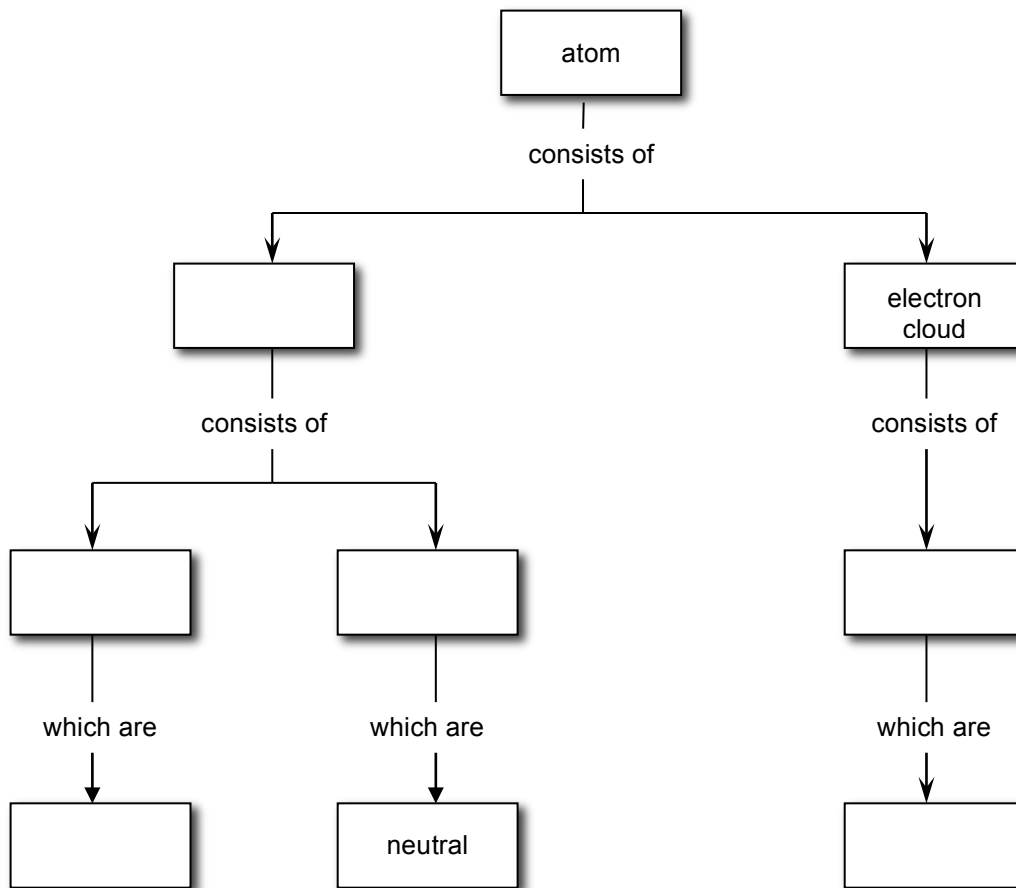
Picture of Model	Scientist and Model Name	Model Characteristics
		
<p>Positively charged matrix</p> 		
		
		
		

Topics 1 – 3 Review

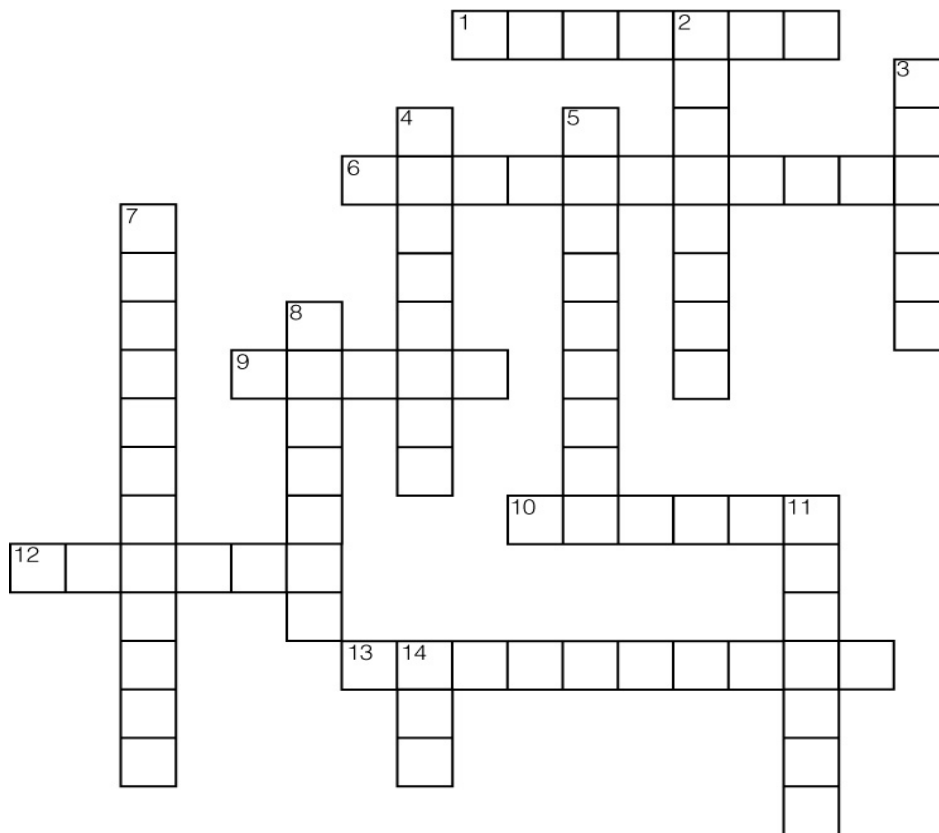
Match the phrase in column A with a term in column B. Write the letter of the response in the blank on the left.

A	B
_____ 1. The mass is 14 g.	a Antoine Lavoisier
_____ 2. A heterogeneous mixture.	b atom
_____ 3. An element is made of one type of ...	c density
_____ 4. A ratio of mass and volume.	d chemical change
_____ 5. Used electrolysis to break down substances.	e suspensions
_____ 6. Developed the first atomic theory.	f molecule
_____ 7. Frying an egg.	g colloid
_____ 8. Tomato juice and dusty air.	h physical change
	i quantitative observation
	j John Dalton

9. Complete this concept map for parts of an atom. Use each of the following terms: electron, negatively charged, neutron, proton, nucleus, positively charged.



10. Crossword:



Across

1. the centre of the atom is called the atomic _____
6. a device now called a battery
9. electrons are most likely found in the electron _____
10. positively charged particle
12. his atomic theory states that all matter is made of small particles
13. tried to change base metals into gold

Down

2. negatively charged particle
3. explains why something happens in chemistry
4. pure substance made of two or more elements
5. his experiments helped establish the law of conservation of mass
7. decomposing a chemical compound by passing an electric current through it
8. pure substance made of one type of atom
11. uncharged particle
14. describes and summarizes what happens in chemistry

Physical Science in Action - The Periodic Table (Video 546)

1. What are atoms made of?
2. What does the nucleus of an atom contain?
3. What makes atoms different from one another?
4. How many protons does sulphur contain? And chlorine?
5. What determines how easily an element can bond with another element?
6. What is an element?
7. The atomic number of sulphur is 16, what does that mean?
8. How do you determine the atomic mass of an element?
9. Horizontal rows are called _____. Every element in each row has the same number of _____
10. Vertical columns are called _____. Every element in each column has the same number of _____ in the outer "shell".

11. What is unique about the flames generated when different elements are burned?

12. Colours in the "modern" periodic table are used to represent different _____

13. Group 1 is called the _____

14. Group 2 is called the _____

15. Groups 3 to 12 are called the _____

16. Why are the rare earth elements separated from the rest of the table?

17. What do metalloids have properties of?

18. Group 17 is called the _____. Many of these are used in _____

19. Group 18 is called the _____. Many of these are used in _____

20. What does it mean when we say elements are stable?

Topic 4 – Classifying Elements

Elements:

We use universal _____ to represent elements and the first letter must be _____.

H = hydrogen	He =	Li =	Be =
B =	C =	N =	O =
F =	Ne =	Na =	Mg =
Al =	Si =	P =	S =
Cl =	Ar =	K =	Ca =

Elements can be classified into 3 major categories: **metals**, **non-metals**, and **metalloids (semi-metals)**:

	State at room temp.	Melting point	Appearance	Conductivity	Malleability and ductility
Metal					
Non-metal					
Metalloids					

Chemical family (groups):

Groups/Families are the vertical columns in the main part of the table. They are numbered left to right with Roman numerals I-VIII or 1 - 18

Family name:	Family properties and group number(s)
Alkali Metals	
Alkaline Earth Metals	
Noble (Inert) Gases	
Halogens	

How does the number of electrons affect reactivity?

Periodic Table (Families)

1																							
	2																						

Legend for Elements

Solid
 Gas
 Liquid

Note: The legend denotes the states of elements at a temperature of 25 °C.

Key

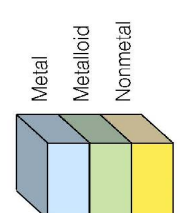
3	6.94	1+	
Atomic number	molar mass	Common ion charges (most common first)	
Li			Name
lithium			

1	1.01		H		1+1-														
	hydrogen																		
3	6.94	4	Li	beryllium	2+														
	lithium																		
11	22.99	12	Na	magnesium	2+														
	sodium																		

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PERIODIC TABLE OF THE ELEMENTS

1 Hydrogen 1 H 1.008	2 Helium 2 He 4.003							
3 Lithium 3 Li 6.941	4 Beryllium 4 Be 9.012	5 Boron 5 B 10.811	6 Carbon 6 C 12.011	7 Nitrogen 7 N 14.007	8 Oxygen 8 O 15.999	9 Fluorine 9 F 18.998	10 Neon 10 Ne 20.180	
11 Sodium 11 Na 22.990	12 Magnesium 12 Mg 24.305	13 Aluminum 13 Al 26.982	14 Silicon 14 Si 28.086	15 Phosphorus 15 P 30.974	16 Sulfur 16 S 32.066	17 Chlorine 17 Cl 35.453	18 Argon 18 Ar 39.948	
19 Potassium 19 K 39.098	20 Calcium 20 Ca 40.078	21 Scandium 21 Sc 44.956	22 Titanium 22 Ti 47.88	23 Vanadium 23 V 50.942	24 Chromium 24 Cr 51.996	25 Manganese 25 Mn 54.938	26 Iron 26 Fe 55.847	27 Cobalt 27 Co 58.933
37 Rubidium 37 Rb 85.468	38 Strontium 38 Sr 87.62	39 Yttrium 39 Y 88.906	40 Zirconium 40 Zr 91.224	41 Niobium 41 Nb 92.906	42 Molybdenum 42 Mo 95.94	43 Technetium 43 Tc 97.907	44 Ruthenium 44 Ru 101.07	45 Rhodium 45 Rh 102.906
55 Cesium 55 Cs 132.905	56 Barium 56 Ba 137.327	57 Lanthanum 57 La 138.906	72 Hafnium 72 Hf 178.49	73 Tantalum 73 Ta 180.948	74 Tungsten 74 W 183.85	75 Rhenium 75 Re 186.207	76 Osmium 76 Os 190.2	77 Iridium 77 Ir 192.22
87 Francium 87 Fr 223.020	88 Radium 88 Ra 226.025	89 Actinium 89 Ac 227.028	104 Rutherfordium 104 Rf (261)	105 Dubnium 105 Db (262)	106 Seaborgium 106 Sg (263)	107 Bohrium 107 Bh (262)	108 Hassium 108 Hs (265)	109 Meitnerium 109 Mt (266)



1 Hydrogen 1 H 1.008	2 Helium 2 He 4.003							
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87 Francium 87 Fr 223.020	88 Radium 88 Ra 226.025	89 Actinium 89 Ac 227.028	104 Rutherfordium 104 Rf (261)	105 Dubnium 105 Db (262)	106 Seaborgium 106 Sg (263)	107 Bohrium 107 Bh (262)	108 Hassium 108 Hs (265)	109 Meitnerium 109 Mt (266)

Lanthanide Series

58 Cerium Ce 140.115	59 Praseodymium Pr 140.908	60 Neodymium Nd 144.24	61 Promethium Pm 144.913	62 Samarium Sm 150.36	63 Europium Eu 151.965
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Actinide Series

88 Radium Ra 226.025	89 Actinium Ac 227.028	90 Thorium Th 232.038	91 Protactinium Pa 231.036	92 Uranium U 238.029	93 Neptunium Np 237.048	94 Plutonium Pu 244.064	95 Americium Am 243.061
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104 Rutherfordium Rf (261)	105 Dubnium Db (262)	106 Seaborgium Sg (263)	107 Bohrium Bh (262)	108 Hassium Hs (265)	109 Meitnerium Mt (266)
110 Ununennium Uun (110)	111 Unbinilium Uub (111)	112 Untrium Uut (112)	(unnamed)	(unnamed)	(unnamed)
114 Ununquadium Uuq (114)	115 Unpentium Uup (115)	116 Unsexium Uus (116)	117 Unseptium Uus (117)	118 Unoctium Uuo (118)	119 Unennium Uue (119)
120 Unbinilium Uub (120)	121 Untrium Uut (121)	122 Untrium Uut (122)	123 Untrium Uut (123)	124 Untrium Uut (124)	125 Untrium Uut (125)
132 Unbinilium Uub (132)	133 Untrium Uut (133)	134 Untrium Uut (134)	135 Untrium Uut (135)	136 Untrium Uut (136)	137 Untrium Uut (137)
148 Unbinilium Uub (148)	149 Untrium Uut (149)	150 Untrium Uut (150)	151 Untrium Uut (151)	152 Untrium Uut (152)	153 Untrium Uut (153)
164 Unbinilium Uub (164)	165 Untrium Uut (165)	166 Untrium Uut (166)	167 Untrium Uut (167)	168 Untrium Uut (168)	169 Untrium Uut (169)
172 Unbinilium Uub (172)	173 Untrium Uut (173)	174 Untrium Uut (174)	175 Untrium Uut (175)	176 Untrium Uut (176)	177 Untrium Uut (177)
184 Unbinilium Uub (184)	185 Untrium Uut (185)	186 Untrium Uut (186)	187 Untrium Uut (187)	188 Untrium Uut (188)	189 Untrium Uut (189)
196 Unbinilium Uub (196)	197 Untrium Uut (197)	198 Untrium Uut (198)	199 Untrium Uut (199)	200 Untrium Uut (200)	201 Untrium Uut (201)
208 Unbinilium Uub (208)	209 Untrium Uut (209)	210 Untrium Uut (210)	211 Untrium Uut (211)	212 Untrium Uut (212)	213 Untrium Uut (213)
228 Unbinilium Uub (228)	229 Untrium Uut (229)	230 Untrium Uut (230)	231 Untrium Uut (231)	232 Untrium Uut (232)	233 Untrium Uut (233)
244 Unbinilium Uub (244)	245 Untrium Uut (245)	246 Untrium Uut (246)	247 Untrium Uut (247)	248 Untrium Uut (248)	249 Untrium Uut (249)
260 Unbinilium Uub (260)	261 Untrium Uut (261)	262 Untrium Uut (262)	263 Untrium Uut (263)	264 Untrium Uut (264)	265 Untrium Uut (265)

Topic 5 - The Periodic Table

Dmitri Mendeleev arranged the known elements of the time according to their increasing _____ (_____). By doing so he discovered the ***Periodic Law***, which is the foundation of the Periodic Table.

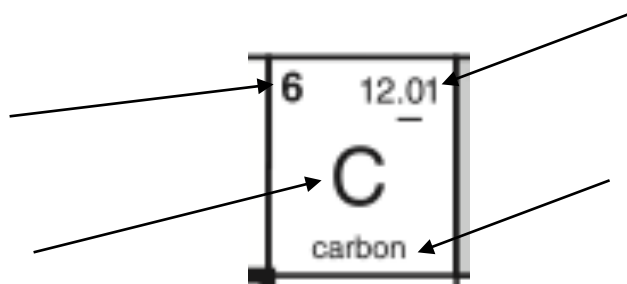
Periodic Law:

Today the table is slightly modified. Instead of mass, we arrange the table according to increasing _____ which refers to the:

How do you calculate the number of electrons in a (neutral) atom?

How do you calculate the number of neutrons in an atom?

Reading information from the Periodic Table:



For the first 18 elements of the periodic table, complete the following chart:

Atom name	Symbol	Atomic number	Atomic mass	Number of protons	Number of electrons	Number of neutrons	Period	Group
Scandium	Sc	21	44.956	21	21	24	4	3

Topic 6 – Chemical Compounds

Compound: pure substance composed of _____

_____. Ex.

The elements of a compound are held together by _____ (when elements gain, lose or share electrons).

Molecular compounds are formed by the _____ of electrons.

Ionic compounds are formed by the _____ of electrons.

Summarize the properties of ionic and molecular compounds:

Ionic Compounds	Molecular Compounds

We use _____ (composed of symbols and numbers) to represent compounds. Note: if there is no number, it means that there is only one atom

Name	Formula	Elements	# of atoms
water	H_2O		
sodium chloride	$NaCl$		
tetraphosphorous decaoxide	P_4O_{10}		
iron (II) chloride	$FeCl_2$		
glucose	$C_6H_{12}O_6$		
calcium carbonate	$CaCO_3$		
sucrose	$C_{12}H_{22}O_{11}$		

Molecular Elements

Molecular elements consist of nonmetallic elements that are commonly found as combinations of two or more atoms.

diatomic molecules:

Ex.

polyatomic molecules:

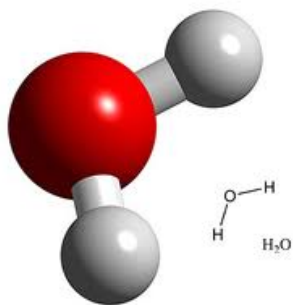
Ex.

Molecular Compounds

Molecular compounds:

Molecular compounds are generally _____ conductors of electricity and are _____, _____, or _____ at room temperature.

Ex. H_2O (water or dihydrogen monoxide) Ex. CH_4 (methane or carbon tetrahydride)



Ex. CO_2 (carbon dioxide)



Ex. NH_3 (ammonia or nitrogen trihydride)

Naming Molecular Compounds

IUPAC naming rules for binary compounds (compounds composed of two elements):

1. Name the first element
2. Name the second element but change the ending to -ide
3. Use a prefix to indicate the number of each element. However, the prefix mono is never used on the first element

Prefixes:

1 = mono	6 = hexa
2 = di	7 = hepta
3 = tri	8 = octa
4 = tetra	9 = nona (ennea)
5 = penta	10 = deca

	Formula	Name
1	SO ₃	
2	N ₂ O ₅	
3	NO	
4	CCl ₄	
5	P ₂ O ₅	
6	ICl ₅	
7	NI ₃	
8	S ₄ N ₂	
9	CO	
10	H ₂ O ₂	
11		carbon dioxide
12		oxygen dibromide
13		sulphur dioxide
14		diphosphorus pentoxide
15		silicon tetrafluoride
16		dinitrogen tetrachloride
17		nitrogen monoxide
18		sulphur dioxide
19		carbon tetrachloride
20		dinitrogen tetraoxide

Note: Br = bromine (bromide) and I = iodine (iodide)

Ionic Compounds

Ionic compounds:

Ex. NaCl

Ionic compounds are _____ at room temperature and are _____
conductors of electricity when dissolved in _____.

Ion:

Why do element become ions?

Ex. Chlorine gains ____ electron to be like _____.

Calcium loses ____ electrons to be like _____.

Ions have an electrical charge because there is now a difference between the
number of _____ and _____.

Ex. Chlorine gains 1 e for a total of 18 e, but it still has only 17 p.

$$\begin{array}{r} 18 (-) \\ 17 (+) \\ \hline 1 (-) \end{array}$$

The ion of chlorine (chloride) has a NET charge of ____.

Note: The number of _____ never changes during a chemical
reaction.

Naming Ionic Compounds

IUPAC naming rules for binary ionic compounds (compounds composed of two elements):

1. Name the metallic element first.
2. Name the nonmetallic element second and change its ending to -ide
3. Subscripts indicate the ratio of ions.

Ex. sodium + chlorine → sodium chloride

magnesium + oxygen → magnesium oxide

calcium + chlorine → calcium chloride

	Formula	Name
1	NaI	
2	LiCl	
3	BaS	
4	Li ₃ P	
5	NaF	
6	AlBr ₃	
7	Li ₂ O	
8	MgS	
9	MgCl ₂	

Know the common names for the following compounds:



Compounds Review

Compound:

	Molecular Compounds	Ionic Compounds
Composition		
State(s) at room temperature		
Conductivity		
Bonding		
Naming Rules		
Examples		

Topics 4–6 Review

1. Match the definitions in column A with a term in column B. Write the letter of the response in the blank space on the left.

A	B
_____ Elements on the periodic table are ordered by ...	a group
_____ Contains elements with similar properties.	b atomic number
_____ The name for a column in the periodic table.	c formula
_____ A horizontal row in the periodic table.	d chemical family
_____ A combination of symbols and numerals.	e metalloids
_____ Malleable, ductile elements that are good conductors.	f non metals
	g period
	h metals

2. Which element does each of these symbols represent?

H _____ He _____ Li _____ Be _____ B _____ C _____
 N _____ O _____ F _____ Ne _____ Na _____ Mg _____
 Al _____ Si _____ P _____ S _____ Cl _____ Ar _____

3. Name each of the following compounds, then identify each as a molecular or ionic compound:

Formula	Name	Ionic or molecular?
NaCl		
H ₂ F		
H ₃ O		
NH ₂		
MgF ₂		
SF ₂		

4. Ionic compounds ...
- (a) are composed of metal ions bonded to other metal ions
 - (b) are formed when metals react with non-metals
 - (c) are substances with low melting points
 - (d) are usually insoluble in water
5. Molecular compounds ...
- (a) are combinations of metals and non-metals
 - (b) are good conductors of electricity
 - (c) result from the transfer of electrons
 - (d) form when electrons are shared

6. When Mendeleev arranged the elements in the first periodic table, he left spaces marked by a question mark. Why did he do this and what did he suggest would happen in the future?

7. Complete #6 page 145

Element	Symbol	Atomic number	Atomic mass

8. complete #7 page 145

9. complete #8 page 145

Topic 7 – Chemical Reactions

Chemical reaction:

Reactants	→	Products
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Describe 5 types of evidence that might indicate a chemical reaction has occurred.

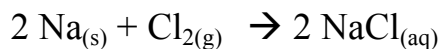
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We explain a chemical reaction by using _____:

Ex. 1 Sodium reacts with chlorine to produce sodium chloride

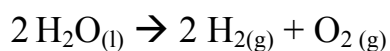
Word equation: sodium + chlorine → sodium chloride

Symbol equation: $\text{Na} + \text{Cl}_2 \rightarrow \text{NaCl}$ (we use **coefficients** to balance)



Ex. 2 Electrolysis decomposes water into hydrogen and oxygen gas

Water → hydrogen + oxygen



Ex. 3 Calcium and oxygen react to form calcium oxide

Ex. 4 The burning of propane

Sometimes the word “energy” is included in a chemical equation.

The burning of methane (natural) gas: $\text{CH}_4 + 2 \text{O}_2 \rightarrow \text{CO}_2 + 2 \text{H}_2\text{O} + \text{energy}$

Photosynthesis in plants: $6\text{H}_2\text{O} + 6\text{CO}_2 + \text{energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$

Exothermic reactions:

Ex. Combustion, respiration, hot packs

Endothermic reactions:

Ex. Cooking, electrolysis, cold packs

Review your understanding of terms used in Topic 7.

1. (a) Substances that go into a chemical reaction are called _____.
(b) Substances produced by a chemical reaction are called _____.
2. Many changes may occur in the properties of substances involved in chemical reactions. List four of the changes.

3. Write the word equation for the reaction between vinegar and baking soda (p. 148)

4. (a) Chemical reactions that give off heat are called _____ reactions.
(b) Chemical reactions that require heat are known as _____ reactions.

5. Fill in the blanks. (Hint: All three blanks need the same word.)

_____ is stored in chemical bonds. To break chemical bonds, _____ must be added.
When chemical bonds form, _____ is released.

6. Write the chemical equation for the burning of methane.

7. Complete #2 on page 152

8. Complete #4 on page 152

Topic 8 – Reaction Rate

Reaction rate:

Explain how each of the following factors affect reaction rate and *draw* a graph to show how the factor affected the time of reaction:

1. Temperature:

2. Stirring:

3. Surface area:

4. Concentration:

5. Catalysts:

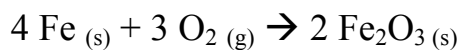
Enzymes:

6. Inhibitors:

Corrosion:

Rust (oxidation):

iron + oxygen → iron (III) oxide



Preventing Corrosion: in addition to keeping the metal dry, cool and clean, you can also do the following:

1. paint:
2. galvanization:
3. electroplating (chrome plating):

Combustion:

Hydrocarbon combustion involves the burning of a compound containing _____ and _____ with _____.

The main products of hydrocarbon combustion include _____, _____ and _____.

Other, non-beneficial products include _____, _____, _____, nitrogen and sulfur _____ (acid rain).

Review your understanding of Topic 8.

Use the clues to fill in the blanks and solve the hidden word.

- 1 _____
- 2 _____ _____
- 3 _____ _____
- 4 _____ _____
- 5 _____ _____
- 6 ____ ____
- 7 ____ _____
- 8 _____ _____
- 9 _____ _____
- 10 _____ _____

Clues

1. Substances are often added to a chemical reaction to speed up a reaction. If such a substance does not get changed in the reaction, it is called a
2. The oxidation of metals or rocks in the presence of air and moisture
3. Natural catalysts such as those in the saliva in your mouth are known as....
4. This slows down a reaction
5. Computer equipment is often shipped with a small package of desiccants. Silica gel is a desiccant used to absorb from the air.
6. Type of corrosion
7. CH_4
8. Coating metals with a thin layer of zinc
9. Fe_2O_3
10. The measure of how fast a reaction occurs is known as the

HIDDEN WORD _____

Topics 7–8 Review

True and False: Write true or false on the line in front of each statement.

- _____ 1. Aluminum oxidizes quickly.
- _____ 2. Coal is a chemical mixture of carbon, silicon, and other elements.
- _____ 3. Electrophoresis is a technique of separating ions.
- _____ 4. Proteases are a group of enzymes.
- _____ 5. The combustion of coal produces coal, gas, and oil.
- _____ 6. Endothermic reactions give off heat and light.
- _____ 7. Catalysts do not get changed during a chemical reaction.
- _____ 8. Inhibitors slow down a chemical reaction.
- _____ 9. Symbols are used in chemical reactions to indicate the state of matter created.
- _____ 10. Enzymes are manufactured by chemists.

Fill in the Blanks: Fill in the correct answer in the following sentences. Be sure to spell the words correctly.

- 11. The chemical name for rust is _____ and the chemical equation for the reaction is _____.
- 12. The process of coating metals with a thin layer of zinc is called _____.
- 13. The process of electroplating uses the chemical reaction of _____.
- 14. Write the chemical reaction for: propane + oxygen \rightarrow carbon dioxide + water + energy (heat)
- 15. Name two conditions that may increase the rate of corrosion of a metal:
(a) _____ (b) _____
- 16. Chemical reactions can be indicated by a change in _____, _____, or _____.
- 17. Write the word equation for this reaction: $2\text{Mg}(\text{s}) + \text{O}_2(\text{g}) \rightarrow 2\text{MgO}(\text{s}) + \text{light}$
- 18. _____
- 19. When baking soda is used in baking cookies, the two gases _____ and _____ are responsible for puffing up the cookies.
- 20. Hair can be bleached using the compound _____.
- 21. _____ is created when sunlight reacts with pollutant chemicals produced by burning fuels.

Unit B Review – “I Can” Statements

I can: (Topic 1)

- Use HHPS to identify the levels of dangers of caustic materials and potentially explosive reactions
- Use WHMIS to identify the dangers of caustic materials and potentially explosive reactions
- Classify matter according to state and identify changes of state
- Distinguish between pure substances (elements and compounds), homogeneous mixtures (solutions) and heterogeneous mixtures (mechanical mixtures)

I can: (Topic 2)

- Identify and describe the physical and chemical properties of matter
- Identify and explain the difference between physical and chemical changes

I can: (Topic 3)

- Explain the Law of Conservation of Mass
- Describe electrolysis
- Use atomic theory to differentiate between elements and compounds and provide examples of each
- Describe the various models of the atom
- Draw and label a Bohr model of the atom

I can: (Topic 4)

- Use symbols to represent elements
- Describe the properties of metals and nonmetals
- Locate metals, nonmetals, families, groups and periods on a periodic table
- Describe the properties of specific families on the periodic table (Alkali Metals, Alkaline Earth Metals, Halogens and Noble Gases)

I can: (Topic 5)

- Explain how Mendeleev used Periodic Law to develop the periodic table.
- Use a periodic table to determine the number of protons, electrons and neutrons of various elements

I can: (Topic 6)

- Describe the properties of ionic and molecular compounds
- Identify the number and types of elements represented in a chemical formula
- Identify and name molecular compounds
- Describe an ion
- Identify and name ionic compounds

I can: (Topic 7)

- Describe chemical reactions i.e. identify the reactants and products in both word and formula reactions.
- Describe evidence of a chemical reaction
- Explain the difference between exothermic and endothermic reactions and provide example of each

I can: (Topic 8)

- Describe reaction rate
- Identify and describe six factors that affect reaction rate
- Explain the process of corrosion
- Describe how the rate of corrosion can be reduced
- Explain the process of combustion