

Guide to Mrs. Lewis' Chemistry packet:

- Pg. 1 (front):
 - instructions on ch. 7 vocab (please define all words)
 - Read Ch. 6 and 7
 - Focus on sample problems AND practice problems listed on these pages from your textbook
- Pg. 1 (back)
 - Polyatomic reference page
 - Includes a video link as an added resource
- Pg. 2 (front/back)
 - List of polyatomic ions (formulas and names) and flow chart on naming compounds
- Pg. 3 (front/back)
 - Periodic table (for reference purposes)
- Pg. 4-7 (front/back)
 - "Activity: e- configuration coloring....Who doesn't love to color?!?" with blank periodic table (will need colored pencils to complete)
 - This is a review of electron configuration
 - Follow the procedure (parts 1-4) to color/label/draw charts and then answer associated questions.
- Pg. 8 (front/back):
 - "Chemistry color by element type" (will need crayons/markers/colored pencils to complete)
 - "Naming covalent compounds worksheet" (16 questions)
- Pg. 9-11 (front/back; actually numbered 1-6)
 - "Naming Molecular Compounds"
 - Work through the packet and answer all questions using included reference pages/your textbook/the packet you already obtained from me that explains

Ch. 7 Vocab - Define the following

Pg. 234

binary compounds

monatomic ions

nomenclature

oxyanions

salt

oxidation numbers

oxidation states

formula mass

percentage composition

empirical formula

Ch. 6 Sample Problems AND Practice Problems

↳ Read, review, and comprehend

Pg. 163 6-1

Pg. 170 6-2

p. 171 6-3

p. 174 6-4

Ch. 7 Sample Problems AND Practice Problems

Read, Review, and comprehend

p. 207 7-1

p. 209 7-2

p. 211 7-3

p. 213 7-4

p. 217 7-5

p. 222 7-6 → If we are

p. 223 7-7 out past

p. 224 7-8 → Spring

p. 225 7-9 → Break

p. 227 7-10, 7-11

p. 230 7-12 p. 231 7-13 p. 232 7-14

letter true lowercase (4) Memorize elements #1-42, 46-58, 78-92

POLYATOMIC IONS: MEMORIZE NAME, FORMULA, AND CHARGE!

Per ___ate	___ate	___ite	hypo___ite	Monatomic anions For REFERENCE
ClO_4^- <u>perchlorate</u>	ClO_3^- <u>chlorate</u>	ClO_2^- <u>chlorite</u>	ClO^- <u>hypochlorite</u>	Cl^- <u>chloride</u>
BrO_4^- <u>perbromate</u>	BrO_3^- <u>bromate</u>	BrO_2^- <u>bromite</u>	BrO^- <u>hypobromite</u>	Br^- <u>bromide</u>
IO_4^- <u>periodate</u>	IO_3^- <u>iodate</u>	IO_2^- <u>iodite</u>	IO^- <u>hypoiodite</u>	I^- <u>iodide</u>
xxx	NO_3^- <u>nitrate</u>	NO_2^- <u>nitrite</u>	xxx	N^{3-} <u>nitride</u>
xxx	SO_4^{2-} <u>sulfate</u>	SO_3^{2-} <u>sulfite</u>	xxx	S^{2-} <u>sulfide</u>
xxx	PO_4^{3-} <u>phosphate</u>	PO_3^{3-} <u>phosphite</u>	xxx	P^{3-} <u>phosphide</u>
xxx	CO_3^{2-} <u>carbonate</u>	xxx	xxx	C^{4-} <u>carbide</u>
xxx	CrO_4^{2-} <u>chromate</u>	xxx	xxx	xxx

per ___ate: has one more oxygen than "ATE"

___ate: most common form

___ite: one less oxygen than "ATE"

hypo___ite: two less oxygens than "ATE"

Video:

<https://youtu.be/69ZbHNNcfz0>

OTHERS:

MnO_4^-	permanganate	$\text{Cr}_2\text{O}_7^{2-}$	dichromate
$\text{C}_2\text{H}_3\text{O}_2^-$	acetate	OH^-	hydroxide
HCO_3^-	hydrogen carbonate (bicarbonate)	CN^-	cyanide
NH_4^+	ammonium	(note positive charge)	

NOTE: The number should be shown before the charge BUT you would not lose credit if you had the charge first!
Also, if a charge is either +1 or -1, you may show just the sign (+ or -). The 1 is not required to be shown.

POLYATOMIC IONS (charged building blocks)

Polyatomic ions are mostly made of two non-metals.

<u>Ions with -1 charge</u>	
perbromate	BrO_4^{-1}
bromate	BrO_3^{-1}
bromite	BrO_2^{-1}
hypobromite	BrO^{-1}
perchlorate	ClO_4^{-1}
chlorate	ClO_3^{-1}
chlorite	ClO_2^{-1}
hypochlorite	ClO^{-1}
periodate	IO_4^{-1}
iodate	IO_3^{-1}
iodite	IO_2^{-1}
hypoiodite	IO^{-1}

nitrate	NO_3^{-1}
nitrite	NO_2^{-1}
hydroxide	OH^{-1}
cyanide	CN^{-1}
acetate	$\text{C}_2\text{H}_3\text{O}_2^{-1}$
Permanganate	MnO_4^{-1}
bicarbonate	HCO_3^{-1}

Ions with a -2 Charge

carbonate	CO_3^{-2}
sulfate	SO_4^{-2}

sulfite	SO_3^{-2}
chromate	CrO_4^{-2}
dichromate	$\text{Cr}_2\text{O}_7^{-2}$
oxalate	$\text{C}_2\text{O}_4^{-2}$

Ions with a -3 Charge

phosphate	PO_4^{-3}
phosphite	PO_3^{-3}
arsenate	AsO_4^{-3}

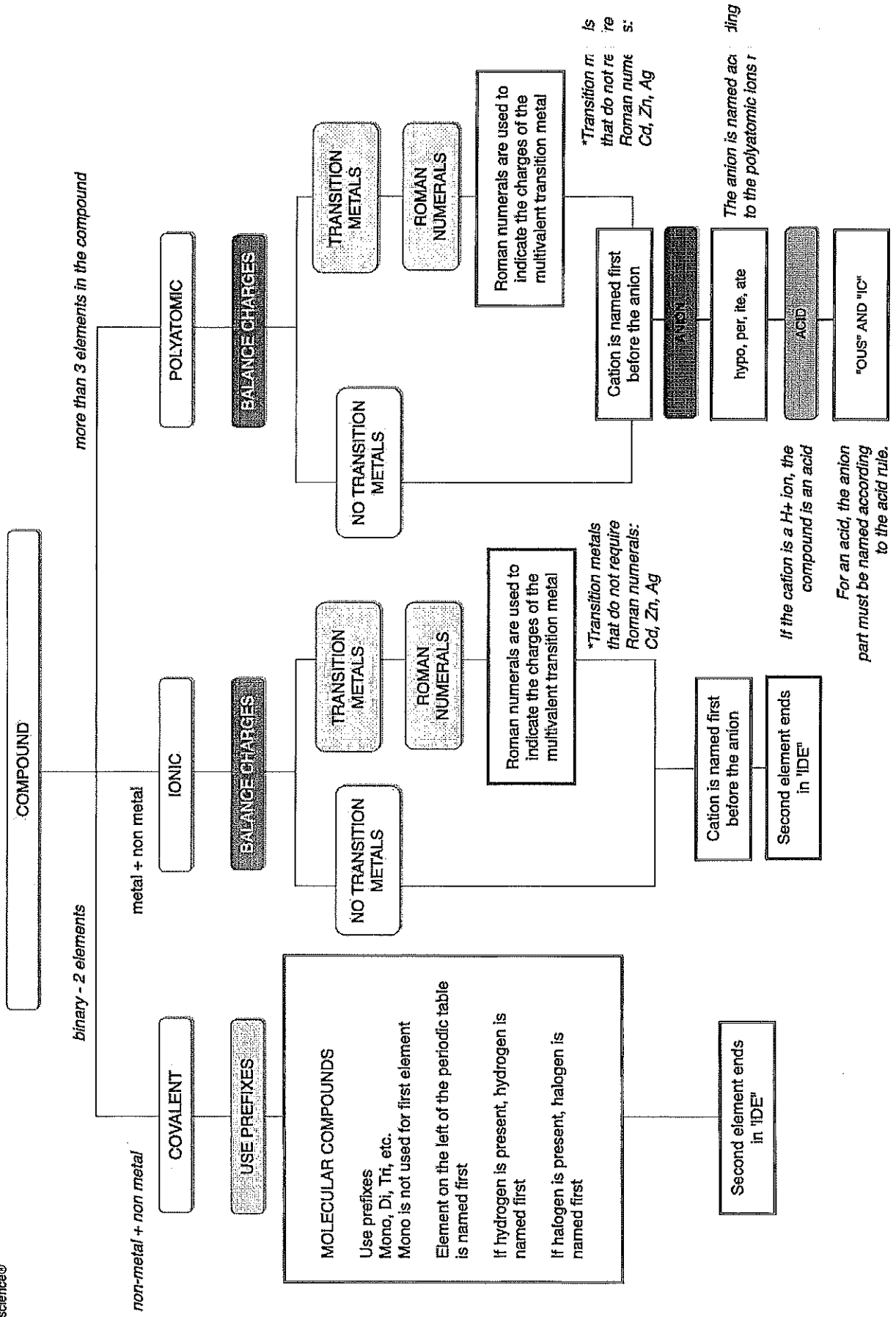
Ions with +1 charge

ammonium ion	NH_4^{+1}
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Flow chart for naming compounds

Vizscience®



Group 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

Periodic Table of the Elements

This table gives information about the chemical elements. Elements are grouped into ten classes according to their properties. Each class is shown in a different color. The elements are arranged in order of increasing atomic number. Vertical numbers headed by Arabic numerals are called groups. A horizontal sequence of elements is called a Period. The most active elements are at the top right and bottom left of the table.

Period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18																		
1	H Hydrogen 1.008	He Helium 4.002602																	Ne Neon 20.1797																	
2	Li Lithium 6.94	Be Beryllium 9.012	B Boron 10.811	C Carbon 12.011	N Nitrogen 14.007	O Oxygen 15.999	F Fluorine 18.998	Ne Neon 20.1797											Ar Argon 39.948																	
3	Na Sodium 22.99	Mg Magnesium 24.305	Al Aluminum 26.981	Si Silicon 28.086	P Phosphorus 30.973	S Sulfur 32.06	Cl Chlorine 35.45	Ar Argon 39.948	K Potassium 39.0983	Ca Calcium 40.078	Sc Scandium 44.955	Ti Titanium 47.867	V Vanadium 50.9415	Cr Chromium 51.9961	Mn Manganese 54.938	Fe Iron 55.845	Co Cobalt 58.933	Ni Nickel 58.6934	Cu Copper 63.546	Zn Zinc 65.38	Ga Gallium 69.723	Ge Germanium 72.63	As Arsenic 74.9216	Se Selenium 78.971	Br Bromine 79.904	Kr Krypton 83.80										
4	K Potassium 39.0983	Ca Calcium 40.078	Sc Scandium 44.955	Ti Titanium 47.867	V Vanadium 50.9415	Cr Chromium 51.9961	Mn Manganese 54.938	Fe Iron 55.845	Co Cobalt 58.933	Ni Nickel 58.6934	Cu Copper 63.546	Zn Zinc 65.38	Ga Gallium 69.723	Ge Germanium 72.63	As Arsenic 74.9216	Se Selenium 78.971	Br Bromine 79.904	Kr Krypton 83.80	Rb Rubidium 85.4678	Sr Strontium 87.62	Y Yttrium 88.90584	Zr Zirconium 91.224	Nb Niobium 92.90637	Mo Molybdenum 95.95	Tc Technetium (98)	Ru Ruthenium 101.07	Rh Rhodium 102.905	Pd Palladium 106.42	Ag Silver 107.8682	Cd Cadmium 112.414	In Indium 114.818	Sn Tin 118.710	Sb Antimony 121.757	Te Tellurium 127.6	I Iodine 126.905	Xe Xenon 131.29
5	Rb Rubidium 85.4678	Sr Strontium 87.62	Y Yttrium 88.90584	Zr Zirconium 91.224	Nb Niobium 92.90637	Mo Molybdenum 95.95	Tc Technetium (98)	Ru Ruthenium 101.07	Rh Rhodium 102.905	Pd Palladium 106.42	Ag Silver 107.8682	Cd Cadmium 112.414	In Indium 114.818	Sn Tin 118.710	Sb Antimony 121.757	Te Tellurium 127.6	I Iodine 126.905	Xe Xenon 131.29	Ba Barium 137.327	La Lanthanum 138.90	Hf Hafnium 178.49	Ta Tantalum 180.94	W Tungsten 183.84	Re Rhenium 186.207	Os Osmium 190.23	Ir Iridium 192.222	Pt Platinum 195.084	Au Gold 196.967	Hg Mercury 200.59	Tl Thallium 204.38	Pb Lead 207.2	Bi Bismuth 208.98	Po Polonium (209)	At Astatine (210)	Rn Radon (222)	
6	Cs Cesium 132.90	Ba Barium 137.327	La Lanthanide Series 57-71	Hf Hafnium 178.49	Ta Tantalum 180.94	W Tungsten 183.84	Re Rhenium 186.207	Os Osmium 190.23	Ir Iridium 192.222	Pt Platinum 195.084	Au Gold 196.967	Hg Mercury 200.59	Tl Thallium 204.38	Pb Lead 207.2	Bi Bismuth 208.98	Po Polonium (209)	At Astatine (210)	Rn Radon (222)	Pb Barium 137.327	La Lanthanum 138.90	Hf Hafnium 178.49	Ta Tantalum 180.94	W Tungsten 183.84	Re Rhenium 186.207	Os Osmium 190.23	Ir Iridium 192.222	Pt Platinum 195.084	Au Gold 196.967	Hg Mercury 200.59	Tl Thallium 204.38	Pb Lead 207.2	Bi Bismuth 208.98	Po Polonium (209)	At Astatine (210)	Rn Radon (222)	
7	Fr Francium (223)	Ra Radium (226)	Ac Actinide Series 89-103	Rf Rutherfordium (261)	Db Dubnium (268)	Sg Seaborgium (266)	Bh Bohrium (264)	Hs Hassium (277)	Mt Meitnerium (268)	Ds Darmstadtium (281)	Rg Roentgenium (280)	Cn Copernicium (285)	Nh Nihonium (284)	Fl Flerovium (289)	Mc Moscovium (288)	Lv Livermorium (293)	Ts Tennessine (294)	Og Oganesson (294)	Ra Radium (226)	Ac Actinium (227)	Rf Rutherfordium (261)	Db Dubnium (268)	Sg Seaborgium (266)	Bh Bohrium (264)	Hs Hassium (277)	Mt Meitnerium (268)	Ds Darmstadtium (281)	Rg Roentgenium (280)	Cn Copernicium (285)	Nh Nihonium (284)	Fl Flerovium (289)	Mc Moscovium (288)	Lv Livermorium (293)	Ts Tennessine (294)	Og Oganesson (294)	



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COMMON IONS

Acetate	$\text{C}_2\text{H}_3\text{O}_2^-$
Bicarbonate	HCO_3^-
Bisulfate	HSO_4^-
Carbonate	CO_3^{2-}
Chlorate	ClO_3^-
Chromate	CrO_4^{2-}
Ferricyanide	$\text{Fe}(\text{CN})_6^{3-}$
Ferrocyanide	$\text{Fe}(\text{CN})_6^{4-}$
Hypochlorite	ClO^-
Nitrate	NO_3^-
Nitrite	NO_2^-
Permanganate	MnO_4^-
Phosphate	PO_4^{3-}
Sulfate	SO_4^{2-}
Sulfite	SO_3^{2-}

SCIENTIFIC NOTATION

Multiplication by a positive power of 10 corresponds to moving the decimal point to the right; multiplication by a negative power of 10 corresponds to moving the decimal point to the left.

1.33×10^4 is 13,300
 1.33×10^{-4} is 0.000133

Numbers expressed with powers of 10 cannot be added or subtracted directly unless the powers of 10 are the same.

$1.23 \times 10^4 + 1.23 \times 10^5 =$
 $1.23 \times 10^4 + 12.3 \times 10^4 = 13.5 \times 10^4$
 $1.23 \times 10^4 - 1.23 \times 10^5 =$
 $1.23 \times 10^4 - 0.123 \times 10^4 = 1.11 \times 10^4$

When the powers of 10 are multiplied, exponents are added; when divided, exponents are subtracted.

$(1.23 \times 10^4) \times (1.23 \times 10^5) =$
 $(1.23 \times 1.23) \times (10^4 \times 10^5) = 1.51 \times 10^9$
 $\frac{1.23 \times 10^{-4}}{1.23 \times 10^{-5}} = \left(\frac{1.23}{1.23}\right) \times \left(\frac{10^{-4}}{10^{-5}}\right) = 1.00 \times 10^1$

SOME ACID-BASE INDICATORS

Indicator	Color Change	
	Acid	Basic
Alizarin Yellow	Yellow	Red
Bromocresol Green	Yellow	Blue
Litmus	Red	Blue
Methyl Orange	Red	Yellow
Methyl Red	Red	Yellow
Phenolphthalein	Colorless	Pink
Thymol Blue	Red	Yellow

PRESSURES AND DENSITIES

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

1 column of water 1 foot deep = 62.4 pounds per square foot, or 0.433 pounds per square inch. **1 column of water 1 centimeter deep** = 1 gram per square centimeter.

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

area. An increase in pressure is transmitted equally through the liquid.

Specific Gravity = number of times a substance is as heavy as an equal body of water, or Specific gravity (liquid) =

$$\frac{\text{Weight of Liquid}}{\text{weight of equal volume of water}}$$

Specific Gravity (Solid) =

$$\frac{\text{Weight of Body}}{\text{loss of weight in water}}$$

OR Specific Gravity (Solid)

$$\frac{\text{Weight of Body}}{\text{weight of equal volume of water}}$$

One cubic yard of air weighs about 2 pounds. Atmospheric pressure at sea level = about 15 pounds per square inch.

DEFINITIONS:

CONCENTRATION OF SOLUTIONS

- 1) Mole Fraction:** The number of moles of solute per total moles of solution.
- 2) Molarity:** The number of moles of solute per liter of solution.
- 3) Molality:** The number of moles of solute per 1,000 g. of solvent.
- 4) Formality:** The number of formula weights of solute per liter of solution.
- 5) Normality:** The number of equivalents of solute per liter of solution.

UNITS OF MEASUREMENT

Kilo - means one thousand (10^3)
Centi - means one-hundredth (10^{-2})
Milli - means one-thousandth (10^{-3})
Micro - means one-millionth (10^{-6})
1 Kilometer (km) = 1,000 meters = 0.621 mile
1 Meter (m) = 100 centimeters = 39.4 inches
1 Centimeter (cm) = 10 millimeters (mm) = 0.394 inches
1 Kilogram (kg) = 1,000 grams = 2.20 pounds
1 Gram (g) = 1,000 milligrams (mg) = 0.0353 ounce.
1 Liter (l) = 1,000 milliliters = 1.06 quarts
1 Milliliter (ml) = 1 cubic centimeter (cc)
1 Atomic Mass Unit = 1.66×10^{-24} g
Avogadro's Number = 6.022×10^{23}

TEMPERATURE MEASUREMENTS

In scientific work, the Celsius or Centigrade ($^{\circ}\text{C}$) and Kelvin (K) scales are most commonly used. The Kelvin scale is an absolute temperature scale, in which zero degrees ideally represents the lowest attainable temperature.

Comparison of Various Temperature Scales

212° \square 373.15 \square 100° \square BP
 32° \square 273.15 \square 0° \square FP

ZERO
 $(^{\circ}\text{F})$ Fahrenheit (K) Kelvin ($^{\circ}\text{C}$) Celsius
 Zero degrees Kelvin is the lowest possible temp.

In Kelvin absolute temperature scale:
 water boils at 373K, freezes at 273K.

Fahrenheit - Celsius: Conversions
 $C = 5/9(F - 32)$
 $F = 9/5C + 32$

BASIC LAWS AND DEFINITIONS

Boyle's Law:

$P_1 \times V_1 = P_2 \times V_2$ at constant temperature.

Charles Law: $\frac{V_1}{V_2} = \frac{T_1}{T_2}$ at constant pressure.

Ideal Gas Law:

$$PV = nRT$$

The number of moles of a gas is directly related to the pressure, volume and temperature of the gas.

Mechanical Equivalent of Heat is the work required to produce a unit quantity of heat.
 0.427 kilogram-meter (kg-m) = 1 calorie

$$\frac{\text{Work}}{\text{mechanical equivalent of heat}} = \text{heat}$$

One Btu is the heat required to raise the temperature of 1 pound of water through 1 degree Fahrenheit.

One calorie is the heat required to raise the temperature of 1 gram of water through 1 degree Celsius.

Specific Heat: heat required to raise the temperature of a unit mass of that substance through 1 degree. If q is total heat and m is mass,

$$q = m \times s(t_2 - t_1).$$

Heat of melting, or heat of fusion, L , is the quantity of heat needed to melt one unit weight of a substance without changing its temperature, or $q = m \times L$

80 calories of heat is required to melt 1 gram of ice without raising its temperature.

Boiling Point of Liquid: that temperature at which the vapor pressure is equal to the pressure above the liquid.

Studying to gain knowledge is strong.
 Knowing how to put the elements together to help others is Army Strong.

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Name: _____ Period: _____ Date: _____

ACTIVITY: e⁻ Configuration Coloring ... Who Doesn't Love to Color?!?

PURPOSE:

To find the relationship between electron configuration and organization of the periodic table.

MATERIALS:

- Copy of the periodic table
- Colored pencils
- List of electron configurations for elements 1-54

PROCEDURE:

Part 1:

1. For each electron configuration, circle (or highlight) the energy level with the highest number. This represents the **OUTERMOST ENERGY LEVEL (OR VALENCE ELECTRONS)** and may involve either one or two sub orbitals (s & p).
2. Write the number of valence electrons in the empty column.

Part 2:

1. On a new sheet of paper, make eight columns. Label them 1-8 for the valence electrons.
2. For each element, where the configuration ends in s or p only, place the atomic number and symbol under the appropriate column depending on what you circled in Step 1.
3. For each element that you have placed in columns 1 & 2; color their boxes on the **PERIODIC TABLE** red.
4. For each element that you placed in columns 3-8; color their boxes on the **PERIODIC TABLE** blue.

Name: _____ Period: _____ Date: _____

Part 3:

1. In a separate table make two horizontal rows, label them 3d and 4d.
2. In the 3d row, place all elements that have only 3d electrons BUT NO 4p ELECTRONS.
3. In the 4d row, place all elements that have only 4d electrons BUT NO 5p ELECTRONS.
4. For each element that you have placed in 3d and 4d, color their boxes on the PERIODIC TABLE purple.

Part 4:

1. For each of the sections that you have already colored (Groups 1 & 2, Groups 3-12, Groups 13-18 on the periodic table) extend the shading to the bottom of each column. Ex: Color elements 55, 56, 87, & 88 the same color as the ones above them.
2. There should only be one section of the periodic table that is uncolored, at this point, at the very bottom of the table. Please, color these two rows of boxes on the PERIODIC TABLE green.

QUESTIONS:

1. How many horizontal rows are there on the periodic table? How many energy levels are there in the electron cloud?
2. How many columns did you make on your first chart? How many "A" columns are there on the periodic table?
3. How many columns are there in the "red" section on the periodic table? What is the significance of this number?
4. How many columns are there in the "blue" section on the periodic table? What is the significance of this number?
5. Add the answers from questions 3-4 together. What is the significance of this number?

Name: _____ Period: _____ Date: _____

6. How many elements are in any horizontal row that you created on your second chart? How many elements are there in any "purple" section on the periodic table?
7. Which column from your first chart would you place Cesium in?
8. Write the electron configuration for Cesium (Cs).
9. Look at the "green" section at the bottom of the table –the Lanthanide and Actinide Series. How many elements are there in the row that contains Lanthanum? What is the significance of this number?
10. Using your responses to the questions above, offer an explanation for the organization of the periodic table.

Challenge!

11. Write the electron configuration for Lanthanum (La).
12. Write the electron configuration for Cerium (Ce).
13. Write the electron configuration for Praseodymium (Pr).
14. Write the electron configuration for Lutetium (Lu).
15. Write the electron configuration for Lead (Pb).
16. Predict the electron configuration for element #118.

Name: _____ Period: _____ Date: _____

Element	Electrons	Electronic Configuration
Hydrogen (H)	1	1s ¹
Helium (He)	2	1s ²
Lithium (Li)	3	1s ² 2s ¹
Beryllium (Be)	4	1s ² 2s ²
Boron (B)	5	1s ² 2s ² 2p ¹
Carbon (C)	6	1s ² 2s ² 2p ²
Nitrogen (N)	7	1s ² 2s ² 2p ³
Oxygen (O)	8	1s ² 2s ² 2p ⁴
Fluorine (F)	9	1s ² 2s ² 2p ⁵
Neon (Ne)	10	1s ² 2s ² 2p ⁶
Sodium (Na)	11	1s ² 2s ² 2p ⁶ 3s ¹
Magnesium (Mg)	12	1s ² 2s ² 2p ⁶ 3s ²
Aluminum (Al)	13	1s ² 2s ² 2p ⁶ 3s ² 3p ¹
Silicon (Si)	14	1s ² 2s ² 2p ⁶ 3s ² 3p ²
Phosphorous (P)	15	1s ² 2s ² 2p ⁶ 3s ² 3p ³
Sulfur (S)	16	1s ² 2s ² 2p ⁶ 3s ² 3p ⁴
Chlorine (Cl)	17	1s ² 2s ² 2p ⁶ 3s ² 3p ⁵
Argon (Ar)	18	1s ² 2s ² 2p ⁶ 3s ² 3p ⁶
Potassium (K)	19	1s ² 2s ² 2p ⁶ 3s ² 3p ⁶ 4s ¹
Calcium (Ca)	20	1s ² 2s ² 2p ⁶ 3s ² 3p ⁶ 4s ²
Scandium (Sc)	21	1s ² 2s ² 2p ⁶ 3s ² 3p ⁶ 4s ² 3d ¹
Titanium (Ti)	22	1s ² 2s ² 2p ⁶ 3s ² 3p ⁶ 4s ² 3d ²
Vanadium (V)	23	1s ² 2s ² 2p ⁶ 3s ² 3p ⁶ 4s ² 3d ³
Chromium (Cr)	24	1s ² 2s ² 2p ⁶ 3s ² 3p ⁶ 4s ¹ 3d ⁵
Manganese (Mn)	25	1s ² 2s ² 2p ⁶ 3s ² 3p ⁶ 4s ² 3d ⁵
Iron (Fe)	26	1s ² 2s ² 2p ⁶ 3s ² 3p ⁶ 4s ² 3d ⁶
Cobalt (Co)	27	1s ² 2s ² 2p ⁶ 3s ² 3p ⁶ 4s ² 3d ⁷
Nickel (Ni)	28	1s ² 2s ² 2p ⁶ 3s ² 3p ⁶ 4s ² 3d ⁸

Name: _____ Period: _____ Date: _____

Copper (Cu)	29	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^{10}$
Zinc (Zn)	30	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10}$
Gallium (Ga)	31	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^1$
Germanium (Ge)	32	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^2$
Arsenic (As)	33	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^3$
Selenium (Se)	34	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^4$
Bromine (Br)	35	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^5$
Krypton (Kr)	36	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6$
Rubidium (Rb)	37	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^1$
Strontium (Sr)	38	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2$
Yttrium (Y)	39	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^1$
Zirconium (Zr)	40	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^2$
Niobium (Nb)	41	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^1 4d^4$
Molybdenum (Mb)	42	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^1 4d^5$
Technetium (Tc)	43	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^5$
Ruthenium (Ru)	44	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^1 4d^7$
Rhodium (Rh)	45	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^1 4d^8$
Palladium (Pd)	46	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 4d^{10}$
Silver (Ag)	47	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^1 4d^{10}$
Cadmium (Cd)	48	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10}$
Indium (In)	49	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^1$
Tin (Sn)	50	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^2$
Antimony (Sb)	51	$1s^2 2s^2 2p^6 3s^2 3p^5 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^3$
Tellurium (Te)	52	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^4$
Iodine (I)	53	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^5$
Xenon (Xe)	54	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6$

Periodic Table of the Elements

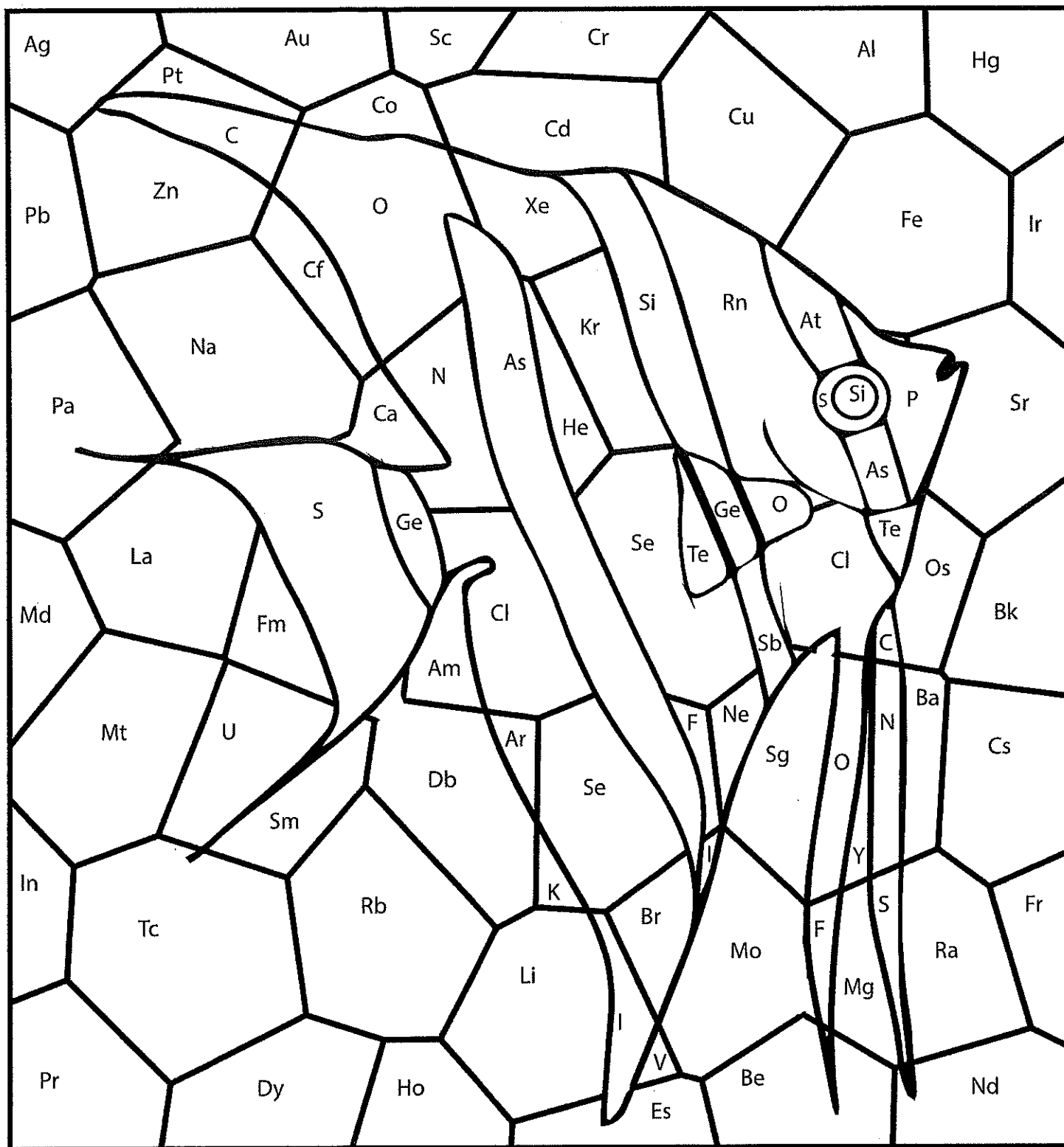
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91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108
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847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864
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1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026
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1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116
1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134
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1261	1262	1263	1264	1265	1266	1267	1268	1269	1270	1271	1272	1273	1274	1275	1276	1277	1278
1279	1280	1281	1282	1283	1284	1285	1286	1287	1288	1289	1290	1291</					

Name: _____

Class: _____

Date: _____

Chemistry Color-by-Element Type



In the puzzle above, color using the key below. You can choose which color to use!

metal = blue,

nonmetal = white/light gray

metalloid = black

Fun Fact: Almost all vertebrates, including fish, have hemoglobin, a molecule in their blood that binds to iron and carries oxygen. But there is one fish called the crocodile icefish that does not have any hemoglobin!

Naming Covalent Compounds Worksheet

Write the formulas for the following covalent compounds:

1) antimony tribromide _____

2) hexaboron silicide _____

3) chlorine dioxide _____

4) hydrogen iodide _____

5) iodine pentafluoride _____

6) dinitrogen trioxide _____

7) ammonia _____

8) phosphorus triiodide _____

Write the names for the following covalent compounds:

9) P_4S_5 _____

10) O_2 _____

11) SeF_6 _____

12) Si_2Br_6 _____

13) SCl_4 _____

14) CH_4 _____

15) B_2Si _____

16) NF_3 _____

Naming Molecular Compounds

How are the chemical formula and name of a molecular compound related?

Why?

When you began chemistry class this year, you probably already knew that the chemical formula for carbon dioxide was CO_2 . Today you will find out why CO_2 is named that way. Naming chemical compounds correctly is of paramount importance. The slight difference between the names carbon monoxide (CO , a poisonous, deadly gas) and carbon dioxide (CO_2 , a greenhouse gas that we exhale when we breathe out) can be the difference between life and death! In this activity you will learn the naming system for molecular compounds.

Model 1 – Molecular Compounds

Molecular Formula	Number of Atoms of First Element	Number of Atoms of Second Element	Name of Compound
ClF			Chlorine monofluoride
ClF_5	1	5	Chlorine pentafluoride
CO			Carbon monoxide
CO_2			Carbon dioxide
Cl_2O			Dichlorine monoxide
PCl_5			Phosphorus pentachloride
N_2O_5			Dinitrogen pentoxide

1. Fill in the table to indicate the number of atoms of each type in the molecular formula.
2. Examine the molecular formulas given in Model 1 for various molecular compounds.
 - a. How many different *elements* are present in each compound shown?
 - b. Do the compounds combine metals with metals, metals with nonmetals, or nonmetals with nonmetals?
 - c. Based on your answer to *b*, what type of bonding must be involved in molecular compounds?
3. Find all of the compounds in Model 1 that have chlorine and fluorine in them. Explain why the name “chlorine fluoride” is not sufficient to identify a specific compound.
4. Assuming that the name of the compound gives a clue to its molecular formula, predict how many atoms each of these prefixes indicates, and provide two examples.

mono-

di-

penta-

Model 2 – Prefixes and Suffixes

Prefix	Numerical Value
mono-	
di-	
tri-	
tetra-	
penta-	
hexa-	
hepta-	
octa-	
nona-	
deca-	

Molecular Formula	Name of Compound
BCl_3	Boron trichloride
SF_6	Sulfur hexafluoride
IF_7	Iodine heptafluoride
NI_3	Nitrogen triiodide
N_2O_4	Dinitrogen tetroxide
Cl_2O	Dichlorine monoxide
P_4O_{10}	Tetraphosphorus decoxide
B_5H_9	Pentaboron nonahydride
Br_3O_8	Tribromine octoxide
ClF	Chlorine monofluoride

- Examine the prefixes in Model 2. Fill in the numerical value that corresponds to each prefix.
- What suffix (ending) do all the compound names in Model 2 have in common?




- Carefully examine the names of the compounds in Model 2. When is a prefix NOT used in front of the name of an element?
- Consider the compound NO.
 - Which element, nitrogen or oxygen, would require a prefix in the molecule name? Explain your answer.

b. Name the molecule NO.

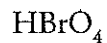


- Find two compounds in Model 2 that contain a subscript of “4” in their molecular formula.
 - List the formulas and names for the two compounds.
 - What is different about the spelling of the prefix meaning “four” in these two names?

10. Find two compounds in Model 2 that contain the prefix “mono-” in their names.
- List the formulas and names for the two compounds.
 - What is different about the spelling of the prefix meaning “one” in these two names?
11. Identify any remaining names of compounds in Model 2 where the prefixes that do not exactly match the spelling shown in the prefix table.
12. Use your answers to Questions 9–11 to write a guideline for how and when to modify a prefix name for a molecular compound. Come to a consensus within your group.
13. Would the guideline you wrote for Question 12 give you the correct name for NI_3 as it is given in Model 2? If not, modify your guideline to include this example.
14. All of the compounds listed in Model 2 are binary molecular compounds. Compounds such as CH_3OH or PF_2Cl_3 are not binary, and compounds such as NaCl or CaCl_2 are not molecular. Propose a definition for “binary molecular compounds.”
-  15. Collaborate with your group members to write a list of rules for recognizing and naming binary molecular compounds from their chemical formulas.



16. For each of the following compounds, indicate whether or not your naming rules from Question 15 will apply. If not, explain why the naming rules do not apply.



17. Using the rules your group developed in Question 15, name each of the following molecular compounds.

Molecular Formula	Molecule Name
PBr_3	
SCl_4	
N_2F_2	
SO_3	
BrF	

18. Write molecular formulas for the following compounds.

Molecular Formula	Molecule Name
	Disulfur decafluoride
	Carbon tetrachloride
	Oxygen difluoride
	Dinitrogen trioxide
	Tetraphosphorus heptasulfide



Extension Questions

19. This activity focused on molecular (covalent) compounds, while an earlier activity addressed ionic compounds. Notice that the formulas for both types of compounds can look very similar, even though their names are quite different:

Chemical Formula	Type of Compound/Bonding	Compound Name
MgF ₂	Ionic	Magnesium fluoride
CuF ₂	Ionic	Copper(II) fluoride
SF ₂	Molecular (covalent)	Sulfur difluoride
NaBr	Ionic	Sodium bromide
AuBr	Ionic	Gold(I) bromide
IBr	Molecular (covalent)	Iodine monobromide

Identify two differences between the names or formulas for ionic compounds versus those for binary molecular compounds. Also identify two similarities.

	Names and Formulas of Ionic Compounds	Names and Formula of Molecular (Covalent) Compounds
Differences		
Similarities		

20. Use complete sentences to explain why AlCl₃ is called "aluminum chloride" (no prefix required), but BCl₃ is called "boron trichloride."

21. In the table below, first identify the type of bonding present in each compounds. Then fill in the missing name or formula for each compound using the appropriate set of rules.

Chemical Formula	Type of Compound/Bonding	Compound Name
CS_2		
PbI_2		
BaCl_2		
Se_2S_6		
		Xenon tetrafluoride
		Sodium phosphide
		Dinitrogen pentoxide
		Cobalt(III) bromide

Name:

Class:

Date:

Determine the number of valence electrons of each atom by looking at your periodic table.

Valence Electron Determination

Cl

Valence number?

1. 7

O

Valence number?

2. _____

F

Valence number?

3. _____

P

Valence number?

4. _____

Al

Valence number?

5. _____

Be

Valence number?

6. _____

B

Valence number?

7. _____

Na

Valence number?

8. _____

H

Valence number?

9. _____

Mg

Valence number?

10. _____

K

Valence number?

11. _____

He

Valence number?

12. _____

Ar

Valence number?

13. _____

C

Valence number?

14. _____

S

Valence number?

15. _____

Si

Valence number?

16. _____

Li

Valence number?

17. _____

N

Valence number?

18. _____

Ne

Valence number?

19. _____

Ca

Valence number?

20. _____

21. When an atom reacts, its "goal" is to become more stable by filling its outer electron shell. What are three ways that an atom can fulfill this goal?

22. If an atom, like a metal atom, has fewer valence electrons, what method(s) is it likely to use to reach its goal?

23. If an atom, like a nonmetal atom, has more valence electrons, what method(s) is it likely to use to reach its goal?

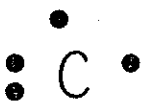
Name:

Class:

Date:

For each of the atoms below, draw the Lewis dot diagram. Then draw the diagrams for the ions below as well.

Electron Dot Diagrams: Atoms and Ions

1. Cl	2. O	3. F	4. P	5. Al	6. Be
7. B	8. Na	9. H	10. Mg	11. K	12. He
13. Ar	14. Ca	15. S	16. Si	17. Li	18. N
19. Ne	Carbon's electron dot diagram is shown below. 	20. Why are two of the electrons written in a pair? _____ _____			

For each ion below, draw in the proper electron dot diagrams.

21. chloride ion, Cl^-	22. sodium ion, Na^+	23. hydride ion, H^-	24. hydrogen ion, H^+
25. aluminum ion, Al^{+3}	26. nitride ion, N^{-3}	27. oxide ion, O^{-2}	28. calcium ion, Ca^{+2}

Name:

Class:

Date:

For each element, rewrite it with its oxidation state and predict the binary compound that can form between the two elements.

Binary Ionic Compound Predictions

Na O	Na Cl	Ca O	Ca Cl
1a. Oxidation states	2a. Oxidation states	3a. Oxidation states	4a. Oxidation states
Na ⁺ O ⁻²			
b. Predict the binary compound that can form from these two elements:	b. Predict the binary compound that can form from these two elements:	b. Predict the binary compound that can form from these two elements:	b. Predict the binary compound that can form from these two elements:
Na ₂ O			
Mg F	Mg O	Mg P	H O
5a. Oxidation states	6a. Oxidation states	7a. Oxidation states	8a. Oxidation states
b. Predict the binary compound that can form from these two elements:	b. Predict the binary compound that can form from these two elements:	b. Predict the binary compound that can form from these two elements:	b. Predict the binary compound that can form from these two elements:
Al O	Al P	Al Cl	Li S
9a. Oxidation states	10a. Oxidation states	11a. Oxidation states	12a. Oxidation states
b. Predict the binary compound that can form from these two elements:	b. Predict the binary compound that can form from these two elements:	b. Predict the binary compound that can form from these two elements:	b. Predict the binary compound that can form from these two elements:
Fe O	Fe O	Cu O	Cu O
13a. Oxidation states	14a. Oxidation states	15a. Oxidation states	16a. Oxidation states
Fe ⁺²	Fe ⁺³	Cu ⁺	Cu ⁺²
b. Predict the binary compound that can form from these two elements:	b. Predict the binary compound that can form from these two elements:	b. Predict the binary compound that can form from these two elements:	b. Predict the binary compound that can form from these two elements:

For each of the compounds below, draw the correct Lewis structure. Use different color pencils to show which electrons came from different atoms.

Electron Dot Diagrams: Binary Ionic Compounds

1. sodium chloride, NaCl

2. calcium chloride, CaCl₂

3. aluminum chloride, AlCl₃

4. magnesium oxide, MgO

5. magnesium bromide, MgBr₂

6. magnesium nitride, Mg₃N₂

7. magnesium chloride, MgCl₂

8. sodium oxide, Na₂O

9. sodium phosphide, Na₃P

10. aluminum oxide, Al₂O₃

11. sodium nitride, Na₃N

12. beryllium phosphide, Be₃P₂

Name:

Class:

Date:

For each set of ions below, predict the chemical compound that will form from a combination of them and write its chemical formula in the blank.

More Compound Predictions

1. $\text{Na}^+ \text{HCO}_3^-$	2. $\text{Na}^+ \text{CO}_3^{-2}$	3. $\text{Na}^+ \text{PO}_4^{-3}$
4. $\text{Mg}^{+2} \text{CN}^-$	5. $\text{Mg}^{+2} \text{SO}_4^{-2}$	6. $\text{Mg}^{+2} \text{PO}_4^{-3}$
7. $\text{Fe}^{+3} \text{MnO}_4^-$	8. $\text{Fe}^{+3} \text{CrO}_4^{-2}$	9. $\text{Fe}^{+3} \text{PO}_4^{-3}$
10. $\text{Pb}^{+4} \text{C}_2\text{H}_3\text{O}_2^-$	11. $\text{Pb}^{+4} \text{SO}_4^{-2}$	12. $\text{Pb}^{+4} \text{PO}_4^{-3}$
13. $\text{NH}_4^+ \text{SCN}^-$	14. $\text{NH}_4^+ \text{CO}_3^{-2}$	15. $\text{NH}_4^+ \text{PO}_4^{-3}$
16. $\text{Hg}_2^{+2} \text{NO}_3^-$	17. $\text{Hg}_2^{+2} \text{CrO}_4^{-2}$	18. $\text{Hg}_2^{+2} \text{PO}_4^{-3}$

For each chemical formula, write the chemical's name in the blank space below. When a cation has more than one possible oxidation state, an asterisk is written in the corner of the box.

Chemical Names from Chemical Formulas (With Polyatomic Ions)

1.	NaNO_2	2.	NH_4NO_3	3.	HClO_3	4.	AgClO_4	5.	KClO_2
6.	CuClO *	7.	Rb_3PO_4	8.	LiHCO_3	9.	Li_2CO_3	10.	NH_4MnO_4
11.	FeSO_4 *	12.	$\text{Be}(\text{NO}_3)_2$	13.	$\text{Ca}_3(\text{PO}_3)_2$	14.	$\text{Mg}(\text{ClO}_4)_2$	15.	PbSO_3 *
16.	$\text{Zn}(\text{OH})_2$	17.	CrSO_4 *	18.	$\text{Ba}(\text{NO}_2)_2$	19.	$\text{Sn}(\text{SCN})_2$ *	20.	CdCrO_4
21.	$\text{Cr}_2(\text{CO}_3)_3$ *	22.	$\text{Al}(\text{NO}_3)_3$	23.	$\text{Fe}_2(\text{SO}_4)_3$ *	24.	BiPO_4	25.	$\text{Co}(\text{OH})_3$ *
26.	$\text{Ni}(\text{NO}_3)_2$ *	27.	$\text{Ni}(\text{NO}_3)_3$ *	28.	$\text{Hg}_2(\text{NO}_3)_2$ *	29.	$\text{Hg}(\text{NO}_3)_2$ *	30.	$\text{K}_2\text{Cr}_2\text{O}_7$

Name:

For each chemical name, write the chemical formula

Chemical Formulas from Chemical Names (With Polyatomic Ions)

1. lithium hydroxide	2. beryllium phosphate	3. potassium chlorate	4. magnesium sulfite	5. magnesium sulfate
6. sodium carbonate	7. sodium bicarbonate	8. magnesium permanganate	9. sodium nitrite	10. sodium nitrate
11. lead (IV) hydroxide	12. lead (II) hydroxide	13. copper (II) phosphate	14. copper (I) nitrate	15. iron (III) chlorate
16. zinc hypochlorite	17. aluminum chlorite	18. silver chlorate	19. ammonium chlorate	20. ammonium carbonate
21. potassium chromate	22. potassium dichromate	23. mercury (I) nitrite	24. mercury (II) nitrite	25. ammonium phosphate
26. nickel (II) sulfate	27. manganese (II) phosphate	28. tetraphosphorus trisulfide	29. cadmium hydroxide	30. cobalt (II) acetate

Name:

Class:

Date:

For each of the compounds below, follow the directions for each box.

Electron Dot Diagrams: Polyatomic Ions #1

Step 1: Calculate the number of valence electrons needed in the structure.

Step 2: Draw the molecule, making sure you draw in all of the electrons you calculated in the previous step.

Step 3: Draw the molecule, replacing the shared pair(s) with bond lines, and draw in proper ion formation.

1. ammonium ion, NH_4^+

2. hydronium ion, H_3O^+

3. hydroxide ion, OH^-

4. nitrate ion, NO_3^-

5. nitrite ion, NO_2^-

6. cyanide ion, CN^-

Name:

Class:

Date:

For each chemical formula, write the chemical's name in the blank space below. When a cation has more than one possible oxidation state, an asterisk is written in the corner of the box.

Chemical Names from Chemical Formulas

1. NaCl	2. SrBr ₂	3. MgO	4. Na ₃ P	5. Al ₂ O ₃
6. Li ₂ S	7. Be ₃ N ₂	8. KI	9. Ca ₃ N ₂	10. MgI ₂
11. FeBr ₂ *	12. FeCl ₃ *	13. Cu ₂ O *	14. CuO *	15. PbS *
16. H ₂ O	17. H ₂ S	18. NO ₂	19. CO ₂	20. CO
21. CH ₄	22. NH ₃	23. SiCl ₄	24. BeH ₂	25. PCl ₅
26. CS ₂	27. NH ₄ ⁺	28. CN ⁻	29. H ₃ O ⁺	30. BH ₃

Name:

For each chemical name, write the chemical formula

Chemical Formulas from Chemical Names

1. lithium oxide	2. beryllium phosphide	3. potassium chloride	4. calcium phosphide	5. magnesium bromide
6. sodium iodide	7. barium chloride	8. magnesium sulfide	9. sodium nitride	10. aluminum sulfide
11. lead (IV) fluoride	12. lead (II) phosphide	13. copper (II) fluoride	14. copper (I) fluoride	15. iron (III) phosphide
16. sulfur tetrafluoride	17. sulfur hexafluoride	18. nitrogen tribromide	19. xenon tetroxide	20. arsenic trichloride
21. hydrogen chloride	22. tetraphosphorus hexoxide	23. disulfur dichloride	24. chlorine dioxide	25. hydrogen fluoride
26. nitrogen trioxide	27. diphosphorus pentoxide	28. tetraphosphorus trisulfide	29. dinitrogen tetroxide	30. sulfur dioxide

Name:

Class:

Date:

For each of the compounds below, follow the directions for each box. Draw different atoms and their original electrons with different colored pencils. Draw bond lines in red.

Electron Dot Diagrams: Simple Covalent Molecules

Step 1: Draw each atom in the molecule separately.

Step 2: Draw the molecule, showing all paired and nonpaired electrons

Step 3: Draw the molecule, replacing the shared pair(s) with bond lines.

1. hydrogen gas, H_2

2. fluorine gas, F_2

3. hydrochloric acid, HCl

4. water, H_2O

5. methane, CH_4

6. ammonia, NH_3

7. silicon tetrachloride, $SiCl_4$

Name:

Class:

Date:

For each of the compounds below, follow the directions for each box. Draw different atoms and their original electrons with different colored pencils. Draw bond lines in red.

Electron Dot Diagrams: Double/Triple Bonds

Step 1: Draw each atom in the molecule separately.

Step 2: Draw the molecule, showing all paired and nonpaired electrons

Step 3: Draw the molecule, replacing the shared pair(s) with bond lines.

1. oxygen gas, O_2

2. nitrogen gas, N_2

3. carbon dioxide, CO_2

4. hydrogen cyanide, HCN

5. formaldehyde, H_2CO

6. carbon disulfide, CS_2

7. carbon monoxide, CO

Ch. 7 p. 214
p. 210

Remember OH⁻ is hydroxide
* Skip

Name:

Class:

Date:

For each chemical name, write the formula for each acid or base.

Common Acids and Bases
Formula Writing Practice

1. hydrochloric acid	2. carbonic acid	3. nitrous acid	4. nitric acid	5. sulfurous acid
6. sulfuric acid	7. acetic acid	8. hydrobromic acid	9. phosphoric acid	10. phosphorous acid *
11. Column 15 sodium hydroxide - p. 210	12. potassium hydroxide	13. Column 20 calcium hydroxide - p. 210	14. lithium hydroxide	15. rubidium hydroxide
Na ⁺ OH ⁻ NaOH		Ca ²⁺ OH ⁻ Swap charges Ca(OH) ₂		
16. cesium hydroxide	17. strontium hydroxide	18. barium hydroxide	19. ammonia *	20. carbonate ion p. 210
21. bicarbonate ion p. 210	22. hydrofluoric acid	23. pyridine *	24. hydroiodic acid	25. perchloric acid
26. hydrocyanic acid *	27. formic acid *	28. hydrogen sulfate ion *	29. hydrogen sulfide	30. water

