

**Chem Quiz Study Guide! Our Quiz will be on \_\_\_\_\_**

**Quiz Topics:**

Subatomic particles (protons, neutrons, and electrons)

Know the mass and charge of each subatomic particle (to the nearest whole number).

Be able to use the periodic table to determine the number protons in an element, and the atomic mass of the element.

Know that atoms are neutral, and that ions are charged (cations are positive, anions are negative)

Determine the charge on an ion, based on the number of electrons lost/gained, and vice versa.

Determine the number of protons, neutrons, electrons in an atom or ion, based on the symbol, and vice versa.

What does "diatomic" mean?

Calculate the mass of an element using a weighted average.

Identify an element as a metal or nonmetal.

Which elements (metals elements nonmetals) tend to lose electrons when they form ions,  
and which elements tend to gain electrons when they form ions?

Classify compounds as ionic or covalent.

Name ionic and covalent compounds (if given the formula)

Write formulas for ionic and covalent compounds (if given the name)

**Data Given:** You will have the "yellow data sheet" to use on the quiz.  
A half-size version of this is shown on page 4 of this study guide.

**Worksheets to study:** 3.0, 3.1, 3.2, 3.3, 6.0, 6.1, 6.2, and 6.3

**Practice Problems!** The answer key is posted on the website: [http://blogs.4j.lane.edu/hocken\\_s/](http://blogs.4j.lane.edu/hocken_s/)

**1a.** Fill in the masses and charges of the following subatomic particles.  
(OK to round to the nearest whole numbers.)

<b>Subatomic Particle:</b>	<b>Mass (amu)</b>	<b>Charge</b>
proton	_____	_____
electron	_____	_____
neutron	_____	_____

**2.** For this problem, write symbols using the following format:  $^{107}\text{Ag}$

- Write the symbol for an arsenic atom with 40 neutrons. \_\_\_\_\_
- Write the symbol for an atom that has a mass number of 138 and has 82 neutrons. \_\_\_\_\_
- Write the symbol for the most common isotope of sodium. \_\_\_\_\_
- Write the symbol for an atom that has 22 protons and 26 neutrons \_\_\_\_\_
- Write the symbol for an atom that has 90 neutrons, and a mass of 153 amu \_\_\_\_\_

**3.** For this problem, write symbols using the following format:  $^{107}\text{Ag}^{+1}$

- Write the symbol for the ion that has 18 electrons, 15 protons, and 16 neutrons. \_\_\_\_\_
- Write the symbol for the ion that has 36 electrons, 39 protons, and 48 neutrons. \_\_\_\_\_
- Write the symbol for an ion that has a charge of -2, has 10 electrons, and has a mass number of 17. \_\_\_\_\_
- Write the symbol for an ion that has a charge of -1 and has 54 electrons and 74 neutrons. \_\_\_\_\_
- Write the symbol for an ion that has a charge of +3 and has 54 electrons and a mass of 140. \_\_\_\_\_
- Write the symbol for an ion that has a charge of +1 and has 18 electrons and 21 neutrons. \_\_\_\_\_
- Write the symbol for an ion that has 24 protons, 22 electrons, and 26 neutrons. \_\_\_\_\_

4a. How many protons, electrons, and neutrons are in each of these?



b. Of the atoms/ions shown in part a, which ones are atoms, and which ones are ions?

c. Of the ones that are ions, which are metals and which are non metals?

Are the metal ions the cations or the anions? Are then nonmetal ions the cations or anions?

d. Of the two atoms in part a, predict whether you'd expect them to gain or lose electrons when they form ions, based on whether they are metal or nonmetals. (You should be able to answer this without looking at the ion sheet.)

e. How many protons are in a molecule of fluorine, keeping in mind that fluorine is diatomic? \_\_\_\_\_

5. For this problem, you can write symbols in this format:  $\text{Ag}^{+1}$

Vanadium (V) is element #23. What is the charge on a vanadium atom? \_\_\_\_\_

Write the symbol for the ion that will form if vanadium loses 2 electrons. \_\_\_\_\_

What is the charge on a sulfur atom? \_\_\_\_\_

Write the symbol for the ion that sulfur will form when it gains 2 electrons. \_\_\_\_\_

Write the symbol for the ion that Zirconium (Zr) would form if it lost 3 electrons. \_\_\_\_\_

Write the symbol for the ion that Silicon (Si) would form if it gained 4 electrons. \_\_\_\_\_

6. Consider the following data for the three isotopes of magnesium:

Isotope	Mass (amu):	Natural Abundance	Number of protons	Number of neutrons
$^{24}\text{Mg}$	23.985	78.99 %	_____	_____
_____	24.986	10.00 %	_____	_____
_____	25.983	_____	_____	_____

a. Fill in all blanks in the above chart.

b. Use the data given to calculate the atomic mass of magnesium. Report your answer to 3 decimal places.

7. Suppose that an element has 4 isotopes: 35.1 % of the isotopes have a mass of 208.91 amu, 34.8% have a mass of 209.95 amu, 5.8% have a mass of 210.94 amu, and the remainder of atoms have a mass of 211.94 amu.

a. What is the natural abundance of this element's most massive isotope?

b. Calculate the atomic mass of this element. Report your answer to 2 decimal places.

### 8. Formula Writing and Naming Practice!

On the first blank, classify the compound as ionic (I) or covalent (C).

On the second blank, write the missing name/formula for the compound.

PBr<sub>3</sub> \_\_\_\_\_

AlBr<sub>3</sub> \_\_\_\_\_

Na<sub>2</sub>O \_\_\_\_\_

Cl<sub>2</sub>O \_\_\_\_\_

sodium phosphide \_\_\_\_\_

chromium III phosphide \_\_\_\_\_

lead II phosphate \_\_\_\_\_

chlorine trifluoride \_\_\_\_\_

tritellurium difluoride \_\_\_\_\_

ZnF<sub>2</sub> \_\_\_\_\_

SF<sub>2</sub> \_\_\_\_\_

N<sub>2</sub>O<sub>3</sub> \_\_\_\_\_

Al<sub>2</sub>O<sub>3</sub> \_\_\_\_\_

Manganese IV oxide \_\_\_\_\_

Chromium VI sulfide \_\_\_\_\_

diphosphorus tetraiodide \_\_\_\_\_

tetraphosphorus trisulfide \_\_\_\_\_

KF \_\_\_\_\_

IF \_\_\_\_\_

aluminum carbonate \_\_\_\_\_

gold (I) arsenate \_\_\_\_\_

AlI<sub>3</sub> \_\_\_\_\_

FeI<sub>3</sub> \_\_\_\_\_

PI<sub>3</sub> \_\_\_\_\_

ferrous cyanide \_\_\_\_\_

MnS<sub>2</sub>O<sub>3</sub> \_\_\_\_\_

Mn<sub>2</sub>(S<sub>2</sub>O<sub>3</sub>)<sub>3</sub> \_\_\_\_\_

ZnS<sub>2</sub>O<sub>3</sub> \_\_\_\_\_

ammonium carbonate \_\_\_\_\_

P<sub>4</sub>S<sub>10</sub> \_\_\_\_\_

Te<sub>2</sub>Br \_\_\_\_\_

Tin (IV) sulfate \_\_\_\_\_

copper II phosphate \_\_\_\_\_

Lithium sulfite \_\_\_\_\_

Lead II carbonate \_\_\_\_\_

aluminum bicarbonate \_\_\_\_\_

carbon tetrachloride \_\_\_\_\_

tetraphosphorus nonasulfide \_\_\_\_\_

zinc iodide \_\_\_\_\_

lithium nitride \_\_\_\_\_

CrBO<sub>3</sub> \_\_\_\_\_

Sn<sub>3</sub>(PO<sub>4</sub>)<sub>4</sub> \_\_\_\_\_

Sn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> \_\_\_\_\_

AlPO<sub>4</sub> \_\_\_\_\_

IF<sub>7</sub> \_\_\_\_\_

TeF<sub>4</sub> \_\_\_\_\_

PbF<sub>4</sub> \_\_\_\_\_

silver phosphate \_\_\_\_\_

aluminum sulfate \_\_\_\_\_

cupric nitrate \_\_\_\_\_

PLEASE DO NOT WRITE ON THIS SHEET!  
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Latin Prefixes:

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

Activity Series

- Li
- K
- Ba
- Sr
- Ca
- Na
- Mg
- Al
- H(H<sub>2</sub>O)
- Zn
- Cr
- Fe
- Co
- Ni
- Sn
- Pb
- H(acid)
- Cu
- Ag
- Hg
- Pt
- Au

Activity Series

- F<sub>2</sub>
- Cl<sub>2</sub>
- Br<sub>2</sub>
- I<sub>2</sub>



$h = 6.63 \times 10^{-34} \text{ Js}$   
1 mole = 6.02 x 10<sup>23</sup>

Metric Prefix	Symbol	Meaning
Mega-	M	10 <sup>6</sup>
kilo-	k	10 <sup>3</sup>
deci-	d	10 <sup>-1</sup>
centi-	c	10 <sup>-2</sup>
milli-	m	10 <sup>-3</sup>
micro-	μ	10 <sup>-6</sup>
nano-	n	10 <sup>-9</sup>

Other Conversions

- 1 inch = 2.54 cm (exactly)
- 1 foot = 12 inches (exactly)
- 1 hour = 60 minutes (exactly)
- 1 minute = 60 seconds (exactly)
- 1 mile = 5280. feet
- 1 mile = 1.61 km
- 1 pound = 453.6 grams
- 1 mL = 1 cm<sup>3</sup> (exactly)

Hydrogen 1 H 1.0079																				8A (18) Helium 2 He 4.0026
1A (1)		2A (2)												3A (13)	4A (14)	5A (15)	6A (16)	7A (17)		
Lithium 3 Li 6.941	Beryllium 4 Be 9.0122											Boron 5 B 10.811	Carbon 6 C 12.011	Nitrogen 7 N 14.0067	Oxygen 8 O 15.9994	Fluorine 9 F 18.9984	Neon 10 Ne 20.1797			
Sodium 11 Na 22.9898	Magnesium 12 Mg 24.3050											Aluminum 13 Al 26.9815	Silicon 14 Si 28.0855	Phosphorus 15 P 30.9738	Sulfur 16 S 32.066	Chlorine 17 Cl 35.4527	Argon 18 Ar 39.948			
Potassium 19 K 39.0983	Calcium 20 Ca 40.078	Scandium 21 Sc 44.9559	Titanium 22 Ti 47.867	Vanadium 23 V 50.9415	Chromium 24 Cr 51.9961	Manganese 25 Mn 54.9380	Iron 26 Fe 55.845	Cobalt 27 Co 58.9332	Nickel 28 Ni 58.6934	Copper 29 Cu 63.546	Zinc 30 Zn 65.38	Gallium 31 Ga 69.723	Germanium 32 Ge 72.61	Arsenic 33 As 74.9216	Selenium 34 Se 78.96	Bromine 35 Br 79.904	Krypton 36 Kr 83.80			
Rubidium 37 Rb 85.4678	Strontium 38 Sr 87.62	Yttrium 39 Y 88.9059	Zirconium 40 Zr 91.224	Niobium 41 Nb 92.9064	Molybdenum 42 Mo 95.96	Technetium 43 Tc (97.907)	Ruthenium 44 Ru 101.07	Rhodium 45 Rh 102.9055	Palladium 46 Pd 106.42	Silver 47 Ag 107.8682	Cadmium 48 Cd 112.411	Indium 49 In 114.818	Tin 50 Sn 118.710	Antimony 51 Sb 121.760	Tellurium 52 Te 127.60	Iodine 53 I 126.9045	Xenon 54 Xe 131.29			
Cesium 55 Cs 132.9055	Barium 56 Ba 137.327	Lanthanum 57 La 138.9055	Hafnium 72 Hf 178.49	Tantalum 73 Ta 180.9479	Tungsten 74 W 183.84	Rhenium 75 Re 186.207	Osmium 76 Os 190.23	Iridium 77 Ir 192.22	Platinum 78 Pt 195.084	Gold 79 Au 196.9666	Mercury 80 Hg 200.59	Thallium 81 Tl 204.3833	Lead 82 Pb 207.2	Bismuth 83 Bi 208.9804	Polonium 84 Po (208.98)	Astatine 85 At (209.99)	Radon 86 Rn (222.02)			
Francium 87 Fr (223.02)	Radium 88 Ra (226.0254)	Actinium 89 Ac (227.0278)	Rutherfordium 104 Rf (267)	Dubnium 105 Db (268)	Seaborgium 106 Sg (271)	Bohrium 107 Bh (272)	Hassium 108 Hs (270)	Meitnerium 109 Mt (276)	Darmstadtium 110 Ds (281)	Roentgenium 111 Rg (280)	Copernicium 112 Cn (285)	Ununtrium 113 Uut Discovered 2004	Ununquadium 114 Uuq Discovered 1999	Ununpentium 115 Uup Discovered 2004	Ununhexium 116 Uuh Discovered 1999	Ununseptium 117 Uus Discovered 2010	Ununoctium 118 Uuo Discovered 2002			

Cerium 58 Ce 140.116	Praseodymium 59 Pr 140.9076	Neodymium 60 Nd 144.242	Promethium 61 Pm (144.91)	Samarium 62 Sm 150.36	Europium 63 Eu 151.964	Gadolinium 64 Gd 157.25	Terbium 65 Tb 158.9254	Dysprosium 66 Dy 162.50	Holmium 67 Ho 164.9303	Erbium 68 Er 167.26	Thulium 69 Tm 168.9342	Ytterbium 70 Yb 173.054	Lutetium 71 Lu 174.9668
Thorium 90 Th 232.0381	Protactinium 91 Pa 231.0359	Uranium 92 U 238.0289	Neptunium 93 Np (237.0482)	Plutonium 94 Pu (244.064)	Americium 95 Am (243.061)	Curium 96 Cm (247.07)	Berkelium 97 Bk (247.07)	Californium 98 Cf (251.08)	Einsteinium 99 Es (252.08)	Fermium 100 Fm (257.10)	Mendelevium 101 Md (258.10)	Nobelium 102 No (259.10)	Lawrencium 103 Lr (262.11)

## Table of Common Ions !

### Cations

Al <sup>+3</sup>	aluminum
NH <sub>4</sub> <sup>+1</sup>	ammonium
Sb <sup>+3</sup>	antimony
Ba <sup>+2</sup>	barium
Bi <sup>+3</sup>	bismuth
Cd <sup>+2</sup>	cadmium
Ca <sup>+2</sup>	calcium
Cr <sup>+2</sup>	chromium II (chromous)
Cr <sup>+3</sup>	chromium III (chromic)
Co <sup>+2</sup>	cobalt
Cu <sup>+1</sup>	copper I (cuprous)
Cu <sup>+2</sup>	copper II (cupric)
Au <sup>+1</sup>	gold I (aurous)
H <sup>+1</sup>	hydrogen
H <sub>3</sub> O <sup>+1</sup>	hydronium
Fe <sup>+2</sup>	iron II (ferrous)
Fe <sup>+3</sup>	iron III (ferric)
Pb <sup>+2</sup>	lead II (plumbous)
Pb <sup>+4</sup>	lead IV (plumbic)
Li <sup>+1</sup>	lithium
Mg <sup>+2</sup>	magnesium
Mn <sup>+2</sup>	manganese II (manganous)
Mn <sup>+3</sup>	manganese III (manganic)
Hg <sub>2</sub> <sup>+2</sup>	mercury I (mercurous)
Hg <sup>+2</sup>	mercury II (mercuric)
Ni <sup>+2</sup>	nickel
K <sup>+1</sup>	potassium
Ag <sup>+1</sup>	silver
Na <sup>+1</sup>	sodium
Sr <sup>+2</sup>	strontium
Sn <sup>+2</sup>	tin II (stannous)
Sn <sup>+4</sup>	tin IV (stannic)
Zn <sup>+2</sup>	zinc

### Anions (monoatomic)

Br <sup>-1</sup>	bromide
Cl <sup>-1</sup>	chloride
F <sup>-1</sup>	fluoride
H <sup>-1</sup>	hydride
I <sup>-1</sup>	iodide
N <sup>-3</sup>	nitride
O <sup>-2</sup>	oxide
P <sup>-3</sup>	phosphide
S <sup>-2</sup>	sulfide

### Anions (polyatomic)

C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> <sup>-1</sup>	acetate
AsO <sub>4</sub> <sup>-3</sup>	arsenate
HCO <sub>3</sub> <sup>-1</sup>	bicarbonate
HSO <sub>4</sub> <sup>-1</sup>	bisulfate
HSO <sub>3</sub> <sup>-1</sup>	bisulfite
BO <sub>3</sub> <sup>-3</sup>	borate
BrO <sub>3</sub> <sup>-1</sup>	bromate
BrO <sub>2</sub> <sup>-1</sup>	bromite
CO <sub>3</sub> <sup>-2</sup>	carbonate
ClO <sub>3</sub> <sup>-1</sup>	chlorate
ClO <sub>2</sub> <sup>-1</sup>	chlorite
CrO <sub>4</sub> <sup>-2</sup>	chromate
CN <sup>-1</sup>	cyanide
OCN <sup>-1</sup>	cyanate
Cr <sub>2</sub> O <sub>7</sub> <sup>-2</sup>	dichromate
OH <sup>-1</sup>	hydroxide
BrO <sup>-1</sup>	hypobromite
ClO <sup>-1</sup>	hypochlorite
NO <sub>3</sub> <sup>-1</sup>	nitrate
NO <sub>2</sub> <sup>-1</sup>	nitrite
C <sub>2</sub> O <sub>4</sub> <sup>-2</sup>	oxalate
ClO <sub>4</sub> <sup>-1</sup>	perchlorate
MnO <sub>4</sub> <sup>-1</sup>	permanganate
O <sub>2</sub> <sup>-2</sup>	peroxide
PO <sub>4</sub> <sup>-3</sup>	phosphate
SiO <sub>3</sub> <sup>-2</sup>	silicate
SO <sub>4</sub> <sup>-2</sup>	sulfate
SO <sub>3</sub> <sup>-2</sup>	sulfite
SCN <sup>-1</sup>	thiocyanate
S <sub>2</sub> O <sub>3</sub> <sup>-2</sup>	thiosulfate

Negative Ions (Anions)	+	Positive Ions (Cations)	→	Compounds with the Solubility:
Essentially all		Alkali ions (Li <sup>+</sup> , Na <sup>+</sup> , K <sup>+</sup> , Rb <sup>+</sup> , Cs <sup>+</sup> , Fr <sup>+</sup> )		soluble
Essentially all		hydrogen ion [H <sup>+</sup> (aq)]		soluble
Essentially all		ammonium ion (NH <sub>4</sub> <sup>+</sup> )		soluble
Nitrate, NO <sub>3</sub> <sup>-</sup>		essentially all		soluble
Acetate, CH <sub>3</sub> COO <sup>-</sup> / C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> <sup>-1</sup>		essentially all		soluble
Chloride, Cl <sup>-</sup> Bromide, Br <sup>-</sup> Iodide, I <sup>-</sup>	}	Ag <sup>+</sup> , Pb <sup>2+</sup> , Hg <sub>2</sub> <sup>2+</sup> , Cu <sup>+</sup> Tl <sup>+</sup>		NOT soluble
		all others (including Cu <sup>+2</sup> )		soluble
Sulfate, SO <sub>4</sub> <sup>2-</sup>		Ca <sup>2+</sup> , Sr <sup>2+</sup> , Ba <sup>2+</sup> , Pb <sup>2+</sup> Ra <sup>2+</sup>		NOT soluble
		all others		soluble
Sulfide, S <sup>2-</sup>		alkali ions, H <sup>+</sup> (aq), NH <sub>4</sub> <sup>+</sup> , Be <sup>2+</sup> , Mg <sup>2+</sup> , Ca <sup>2+</sup> , Sr <sup>2+</sup> , Ba <sup>2+</sup> , Ra <sup>2+</sup>		soluble
		all others		NOT soluble
Hydroxide, OH <sup>-</sup>		alkali ions, H <sup>+</sup> (aq), NH <sub>4</sub> <sup>+</sup> Sr <sup>2+</sup> , Ba <sup>2+</sup> , Ra <sup>2+</sup> , Tl <sup>+</sup>		soluble
		all others		NOT soluble
Phosphate, PO <sub>4</sub> <sup>3-</sup> Carbonate, CO <sub>3</sub> <sup>2-</sup> Sulfite, SO <sub>3</sub> <sup>2-</sup>	}	alkali ions, H <sup>+</sup> (aq), NH <sub>4</sub> <sup>+</sup>		soluble
		all others		NOT soluble

\* "Soluble" means that at least 0.10 mole of compound can dissolve per liter of solution.

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