

**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)

**Worksheets to study:**

3.0, 3.1, 3.2, 3.3, 6.0, 6.1, 6.2, and 6.3

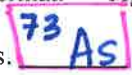
**Practice Problems!** The answer key is posted on the website: [http://blogs.4j.lane.edu/hocken\\_s/](http://blogs.4j.lane.edu/hocken_s/)

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

Subatomic Particle:	Mass (amu)	Charge
proton	1	+1
electron	0	-1
neutron	1	0

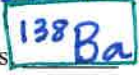
2. For this problem, write symbols using the following format:  $^{107}\text{Ag}$

a. Write the symbol for an arsenic atom with 40 neutrons.



$33 + 40 = 73$

b. Write the symbol for an atom that has a mass number of 138 and has 82 neutrons

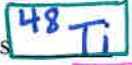


$138 - 82 = 56$   
so Ba

c. Write the symbol for the most common isotope of sodium.



d. Write the symbol for an atom that has 22 protons and 26 neutrons



$22 + 26 = 48$

e. Write the symbol for an atom that has 90 neutrons, and a mass of 153 amu



$153 - 90 = 63$   
so Eu

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

a. Write the symbol for the ion that has 18 electrons, 15 protons, and 16 neutrons



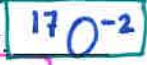
$15 + 16 = 31$

b. Write the symbol for the ion that has 36 electrons, 39 protons, and 48 neutrons



$48 + 39 = 87$

c. Write the symbol for an ion that has a charge of -2, has 10 electrons, and has a mass number of 17



d. Write the symbol for an ion that has a charge of -1 and has 54 electrons and 74 neutrons



e. Write the symbol for an ion that has a charge of +3 and has 54 electrons and a mass of 140



f. Write the symbol for an ion that has a charge of +1 and has 18 electrons and 21 neutrons



g. Write the symbol for an ion that has 24 protons, 22 electrons, and 26 neutrons



$24 + 26 = 50$

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

$^{237}\text{Np}^{+3}$	$^{37}\text{Cl}^{-1}$	$^{80}\text{Br}$	$^{200}\text{Hg}^{+2}$	$^{183}\text{W}^{+4}$	$^{75}\text{As}^{-3}$	$^{107}\text{Ag}$
93 p	17 p	35 p	80 p	74 p	33 p	47 p
90 e	18 e	35 e	78 e	70 e	36 e	47 e
144 n	20 n	45 n	120 n	109 n	42 n	60 n

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

$\text{Np}^{+3}$ ,  $\text{Cl}^{-1}$ ,  $\text{Hg}^{+2}$ ,  $\text{W}^{+4}$ , and  $\text{As}^{-3}$  are ions (they are charged)

$\text{Br}$  and  $\text{Ag}$  are atoms (they are not charged; they are neutral)

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?

Metals:  $\text{Np}^{+3}$ ,  $\text{Hg}^{+2}$ ,  $\text{W}^{+4}$  (Metals form positive ions or "cations")

Nonmetals:  $\text{Cl}^{-1}$  and  $\text{As}^{-3}$  (nonmetals form negative ions 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.)

$\text{Br}$  is a nonmetal so it should gain  $e^-$  when it forms an ion.

$\text{Ag}$  is a metal so it should lose  $e^-$  when it forms an ion.

e. How many protons are in a molecule of fluorine, keeping in mind that fluorine is diatomic? 18

$$\text{F}_2: 2(9) = 18$$

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.

$\emptyset$  (zero!) (atoms are neutral!)  
 $\text{V}^{+2}$

What is the charge on a sulfur atom?

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

$\emptyset$  (zero!)  
 $\text{S}^{-2}$

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

$\text{Zr}^{+3}$

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

$\text{Si}^{-4}$

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 %	<u>12</u>	<u>12</u>
$^{25}\text{Mg}$	24.986	10.00 %	<u>12</u>	<u>13</u>
$^{26}\text{Mg}$	25.983	<u>11.01 %</u>	<u>12</u>	<u>14</u>

a. Fill in all blanks in the above chart.

$$100 - (78.99 + 10.00) = 11.01$$

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

$$(0.7899)(23.985) + (0.1000)(24.986) + (0.1101)(25.983)$$

$$= \boxed{24.305 \text{ amu}}$$

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?

$$100 - (35.1 + 34.8 + 5.8) = \boxed{24.3\%} \text{ of the atoms are } 211.94 \text{ amu}$$

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

$$(0.351)(208.91 \text{ amu}) + (0.348)(209.95 \text{ amu}) + (0.058)(210.94 \text{ amu}) + (0.243)(211.94 \text{ amu}) = 210.12595 \longrightarrow \boxed{210.13 \text{ amu}}$$

### 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.

*(See next page for the answer key to #8)*

PBr <sub>3</sub> _____	MnS <sub>2</sub> O <sub>3</sub> _____
AlBr <sub>3</sub> _____	Mn <sub>2</sub> (S <sub>2</sub> O <sub>3</sub> ) <sub>3</sub> _____
Na <sub>2</sub> O _____	ZnS <sub>2</sub> O <sub>3</sub> _____
Cl <sub>2</sub> O _____	ammonium carbonate _____
sodium phosphide _____	P <sub>4</sub> S <sub>10</sub> _____
chromium III phosphide _____	Te <sub>2</sub> Br _____
lead II phosphate _____	Tin (IV) sulfate _____
chlorine trifluoride _____	copper II phosphate _____
tritellurium difluoride _____	Lithium sulfite _____
ZnF <sub>2</sub> _____	Lead II carbonate _____
SF <sub>2</sub> _____	aluminum bicarbonate _____
N <sub>2</sub> O <sub>3</sub> _____	carbon tetrachloride _____
Al <sub>2</sub> O <sub>3</sub> _____	tetraphosphorus nonasulfide _____
Manganese IV oxide _____	zinc iodide _____
Chromium VI sulfide _____	lithium nitride _____
diphosphorus tetraiodide _____	CrBO <sub>3</sub> _____
tetraphosphorus trisulfide _____	Sn <sub>3</sub> (PO <sub>4</sub> ) <sub>4</sub> _____
KF _____	Sn <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> _____
IF _____	AlPO <sub>4</sub> _____
aluminum carbonate _____	IF <sub>7</sub> _____
gold (I) arsenate _____	TeF <sub>4</sub> _____
AlI <sub>3</sub> _____	PbF <sub>4</sub> _____
FeI <sub>3</sub> _____	silver phosphate _____
PI <sub>3</sub> _____	aluminum sulfate _____
ferrous cyanide _____	cupric nitrate _____

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.

• Ionic compounds will start with a metal or  $\text{NH}_4^+$  ion (ammonium)

• covalent compounds will start with a nonmetal (other than  $\text{NH}_4^+$ )  
(or "manganous thiosulfate")

$\text{PBr}_3$  C phosphorus tribromide

$\text{AlBr}_3$  I aluminum bromide

$\text{Na}_2\text{O}$  I sodium oxide

$\text{Cl}_2\text{O}$  C dichlorine monoxide

sodium phosphide I  $\text{Na}_3\text{P}$

chromium III phosphide I  $\text{CrP}$

lead II phosphate I  $\text{Pb}_3(\text{PO}_4)_2$

chlorine trifluoride C  $\text{ClF}_3$

tritellurium difluoride C  $\text{Te}_3\text{F}_2$

$\text{ZnF}_2$  I zinc fluoride

$\text{SF}_2$  C sulfur difluoride

$\text{N}_2\text{O}_3$  C dinitrogen trioxide

$\text{Al}_2\text{O}_3$  I aluminum oxide

Manganese IV oxide I  $\text{MnO}_2$

Chromium VI sulfide I  $\text{CrS}_3$

diphosphorus tetraiodide C  $\text{P}_2\text{I}_4$

tetraphosphorus trisulfide C  $\text{P}_4\text{S}_3$

$\text{KF}$  I potassium fluoride

$\text{IF}$  C iodine monofluoride

aluminum carbonate I  $\text{Al}_2(\text{CO}_3)_3$

gold (I) arsenate I  $\text{Au}_3\text{AsO}_4$

$\text{AlI}_3$  I aluminum iodide

$\text{FeI}_3$  I iron III iodide \*

$\text{PI}_3$  C phosphorus triiodide

ferrous cyanide I  $\text{Fe}(\text{CN})_2$

$\text{MnS}_2\text{O}_3$  I manganese II thiosulfate

$\text{Mn}_2(\text{S}_2\text{O}_3)_3$  I manganese III thiosulfate

$\text{ZnS}_2\text{O}_3$  I zinc thiosulfate <sup>or "manganic thiosulfate"</sup>

ammonium carbonate I  $(\text{NH}_4)_2\text{CO}_3$

$\text{P}_4\text{S}_{10}$  C tetraphosphorus decasulfide

$\text{Te}_2\text{Br}$  C ditellurium monobromide

Tin (IV) sulfate I  $\text{Sn}(\text{SO}_4)_2$

copper II phosphate I  $\text{Cu}_3(\text{PO}_4)_2$

Lithium sulfite I  $\text{Li}_2\text{SO}_3$

Lead II carbonate I  $\text{PbCO}_3$

aluminum bicarbonate I  $\text{Al}(\text{HCO}_3)_3$

carbon tetrachloride C  $\text{CCl}_4$

tetraphosphorus nonasulfide C  $\text{P}_4\text{S}_9$

zinc iodide I  $\text{ZnI}_2$

lithium nitride I  $\text{Li}_3\text{N}$

$\text{CrBO}_3$  I Chromium III borate (Chromic borate)

$\text{Sn}_3(\text{PO}_4)_4$  I Tin (IV) phosphate (stannic phosphate)

$\text{Sn}_3(\text{PO}_4)_2$  I Tin (II) phosphate (stannous phosphate)

$\text{AlPO}_4$  I aluminum phosphate

$\text{IF}_7$  C iodine heptafluoride

$\text{TeF}_4$  C tellurium tetrafluoride

$\text{PbF}_4$  I lead (IV) fluoride (plumbic fluoride)

silver phosphate I  $\text{Ag}_3\text{PO}_4$

aluminum sulfate I  $\text{Al}_2(\text{SO}_4)_3$

cupric nitrate I  $\text{Cu}(\text{NO}_3)_2$

\* or ferric iodide