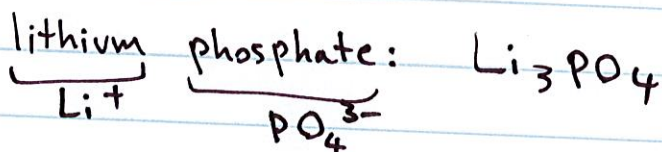
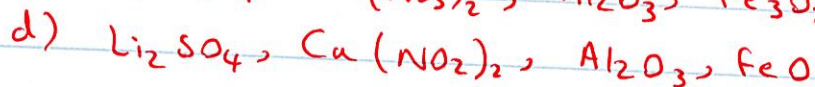
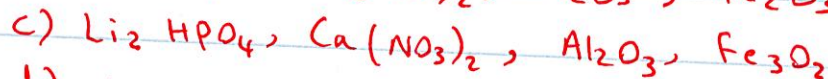
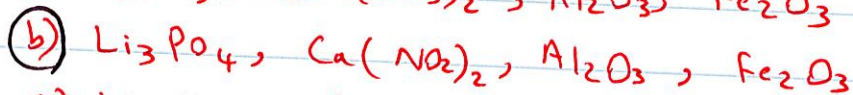
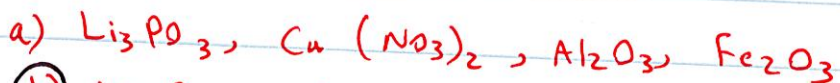
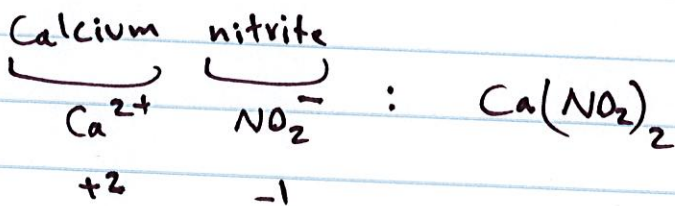


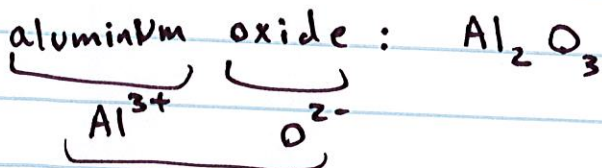
1) What is the correct chemical formula for lithium phosphate, calcium nitrite, aluminum oxide, and iron (III) oxide:



We should have 3 Li ions to generate charge of +3 for the compound to be neutral, meaning the total charge should be zero



we should have 2 of NO_2 to have charge of +2.

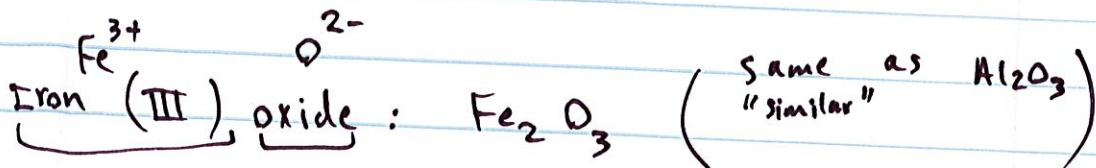


we should find lowest

common denominator between 2 and 3 which is 6

Divide 6 by +3 \Rightarrow +2 \rightarrow You should have 2 Al

Divide 6 by -2 \rightarrow -3 \rightarrow You should have 3 O



2) Which statement is not correct?

a) Matter is ultimately composed of atoms, and those atoms are often combined in compounds.

b) The formula mass of a compound is the sum of ~~charges~~ of all the atoms in the chemical formula for the compound.

atomic masses

c) Besides being the characteristic mass of a molecule or formula units, formula mass is important in many calculations involving the composition of compounds and quantities in chemical reactions.

d) Most of the matter you encounter is in the form of compounds.

3) What is the formula mass of Ccl_2F_2 , hydrobromic acid, phosphorus pentafluoride, and manganese (III) oxide:



a) 120.91, 96.91, 182.97, 102.94

b) 120.91, 80.91, 125.97, 157.88

c) 120.91, 96.91, 182.97, 102.94

d) 120.91, 80.91, 125.97, 196.82

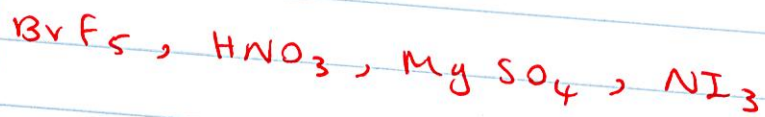
Formula mass of $\text{HBr} = \overset{\text{Atomic mass of}}{\uparrow} \text{H} + \overset{\text{Atomic mass of}}{\uparrow} \text{Br} = 1.01 + 79.90 = 80.91$
 (1xH) + (1xBr)

Formula mass of $\text{PF}_5 = 30.97 + (19 \times 5) = 125.97$
 (1xP) + (5xF)

Formula mass of $\text{Mn}_2\text{O}_3 = (2 \times \text{Mn}) + (3 \times \text{O}) = (2 \times 54.94) + (3 \times 16) = 157.88$

Formula mass of $\text{Ccl}_2\text{F}_2 = (1 \times \overset{12.01}{\uparrow} \text{C}) + (2 \times \overset{35.45}{\uparrow} \text{Cl}) + (2 \times \overset{19}{\uparrow} \text{F}) = 120.91$

4) Imagine we have 10 moles of the following compounds. Which sample is the heaviest and which one is an ionic compound?



a) heaviest = BrF_5 , Ionic = ~~BrF_5~~
No metal, No NH_4^+

b) heaviest = NI_3 , Ionic = ~~NI_3~~
No metal, No NH_4^+

c) heaviest = BrF_5 , Ionic = MgSO_4 ✓

d) heaviest = NI_3 , Ionic = MgSO_4 ✓

Ionic compounds are composed of 1 or more cations paired with 1 or more anions.

In most cases (not Always), the cations are metals and anions are non metals.

NH_4^+ (ammonium) is not a metal but when paired with an anion forms an ionic compound.

$$? \text{ g } \text{BrF}_5 = 10 \text{ mol } \text{BrF}_5 \times \frac{180.47 \text{ g } \text{BrF}_5}{1 \text{ mol } \text{BrF}_5} =$$

$$? \text{ g } \text{NI}_3 = 10 \text{ mol } \text{NI}_3 \times \frac{394.71 \text{ g } \text{NI}_3}{1 \text{ mol } \text{NI}_3} \quad \text{heavier. is } \text{NI}_3$$

Just comparing 180.47 and 394.71, we realize

- 5) Which compound name is correct?
- a) CaO: Calcium ~~(I)~~ oxide
- b) KNO₃: Potassium ~~nitrite~~ nitrate
- c) Fe(OH)₂: Iron ~~(II) oxide~~ hydroxide
- d) NH₄NO₃: Ammonium nitrate

6) We have 10 g of each of the following compounds. Which of them consists of the least grams of oxygen?

- (a) Copper (I) chlorate CuClO₃
- (b) Potassium permanganate KMnO₄
- (c) Lithium hydrogen sulfite LiHSO₃
- (d) All have the same grams of oxygen

Calculating molar masses:

$$\text{CuClO}_3 = 63.55 + 35.45 + 16 \times 3 = 147$$

$$\text{CuClO}_3 = (1 \times \text{Cu}) + (1 \times \text{Cl}) + (3 \times \text{O})$$

$$\text{KMnO}_4 = (1 \times \overset{39.10}{\text{K}}) + (1 \times \overset{54.94}{\text{Mn}}) + (4 \times \overset{16}{\text{O}}) = 158.04$$

$$\text{LiHSO}_3 = (1 \times \overset{6.94}{\text{Li}}) + (1 \times \overset{1.01}{\text{H}}) + (1 \times \overset{32.06}{\text{S}}) + (3 \times \overset{16}{\text{O}}) = 88.01$$

$$? \text{ g O} = 10 \text{ g CuClO}_3 \times \frac{1 \text{ mol CuClO}_3}{147 \text{ g CuClO}_3} \times \frac{3 \text{ mol O}}{1 \text{ mol CuClO}_3} \times \frac{16 \text{ g O}}{1 \text{ mol O}} = 3.26 \text{ g}$$

$$? \text{ g O} = 10 \text{ g KMnO}_4 \times \frac{1 \text{ mol KMnO}_4}{158.04 \text{ g KMnO}_4} \times \frac{4 \text{ mol O}}{1 \text{ mol KMnO}_4} \times \frac{16 \text{ g O}}{1 \text{ mol O}} = 4.05 \text{ g}$$

$$10 \text{ g LiHSO}_3 \times \frac{1}{88.01} \times \frac{3}{1} \times 16 = 5.45 \text{ g}$$

7) Sort option 1, option 2, option 3, and option 4 from smallest to the greatest value:

Option 1: Mass of Cl in 15 g of HClO_2 (chlorous acid)

Option 2: Mass of N in 35 g of HNO_3 (nitric acid)

Option 3: Mass of C in 20 g of $\text{HC}_2\text{H}_3\text{O}_2$ (acetic acid)

Option 4: Mass of S in 20 g of H_2SO_3 (sulfurous acid)

- a) option 1 < option 2 < option 3 < option 4
 b) option 4 < option 3 < option 2 < option 1
 c) option 1 < option 3 < option 4 < option 2
 d) option 1 < option 2 < option 4 < option 3

$$? \text{ g Cl} = 15 \text{ g HClO}_2 \times \frac{1 \text{ mol HClO}_2}{68.46 \text{ g HClO}_2} \times \frac{1 \text{ mol Cl}}{1 \text{ mol HClO}_2} \times \frac{35.45 \text{ g Cl}}{1 \text{ mol Cl}} = 7.767 \text{ option 1}$$

$$\text{HClO}_2 = (1 \times 1.01) + (1 \times 35.45) + (2 \times 16) = 68.46 \frac{\text{g}}{\text{mol}}$$

$$? \text{ g N} = 35 \text{ g HNO}_3 \times \frac{1 \text{ mol HNO}_3}{63.02 \text{ g HNO}_3} \times \frac{1 \text{ mol N}}{1 \text{ mol HNO}_3} \times \frac{14.01 \text{ g N}}{1 \text{ mol N}} = 7.7805 \text{ option 2}$$

$$\text{HNO}_3 = (1 \times 1.01) + (1 \times 14.01) + (3 \times 16) = 63.02$$

$$? \text{ g C} = 20 \text{ g HC}_2\text{H}_3\text{O}_2 \times \frac{1 \text{ mol HC}_2\text{H}_3\text{O}_2}{60.06 \text{ g HC}_2\text{H}_3\text{O}_2} \times \frac{2 \text{ mol C}}{1 \text{ mol HC}_2\text{H}_3\text{O}_2} \times \frac{12.01 \text{ g C}}{1 \text{ mol C}} = 7.998 \text{ option 3}$$

$$\text{HC}_2\text{H}_3\text{O}_2 = (4 \times 1.01) + (2 \times 12.01) + (2 \times 16) = 60.06 \frac{\text{g}}{\text{mol}}$$

$$? \text{ g S} = 20 \text{ g } \cancel{\text{H}_2\text{SO}_3} \times \frac{1 \text{ mol } \cancel{\text{H}_2\text{SO}_3}}{82.08 \text{ g } \cancel{\text{H}_2\text{SO}_3}} \times \frac{1 \text{ mol S}}{1 \text{ mol } \cancel{\text{H}_2\text{SO}_3}}$$
$$\times \frac{32.06 \text{ g S}}{1 \text{ mol S}} = \underbrace{7.8118}_{\text{option 4}}$$

$$\text{H}_2\text{SO}_3 = (2 \times \text{H}) + (1 \times \text{S}) + (3 \times \text{O})$$
$$= (2 \times 1.01) + (1 \times 32.06) + (3 \times 16) = 82.08 \frac{\text{g}}{\text{mol}}$$

option 1 : 7.767 smallest

option 2 : 7.7805

option 3 : 7.998 → largest

option 4 : 7.8118

option 1 < < < option 3

8) Which sample contains the most number of atoms?

a) one gram of cobalt

b) one gram of carbon

c) one gram of lead

d) All have the same number of atoms.

$$? \# \text{ Co atoms} = 1 \text{ g Co} \times \frac{1 \text{ mol Co}}{58.93 \text{ g Co}} \times \frac{6.022 \times 10^{23} \# \text{ Co atoms}}{1 \text{ mol Co}}$$

$$? \# \text{ C atoms} = 1 \text{ g C} \times \frac{1 \text{ mol C}}{12.01 \text{ g C}} \times \frac{6.022 \times 10^{23} \# \text{ C atoms}}{1 \text{ mol C}}$$

$$? \# \text{ Pb atoms} = 1 \text{ g Pb} \times \frac{1 \text{ mol Pb}}{207.2 \text{ g Pb}} \times \frac{6.022 \times 10^{23} \# \text{ Pb atoms}}{1 \text{ mol Pb}}$$

When comparing ratios, the one that has the smallest denominator, has the largest value.

So C has the most number

of atoms.

9) Fluoride is often added to water as sodium fluoride. What is the mass percent composition of F in sodium fluoride. How many grams of sodium fluoride must be added to 1500 L of water to fluoridate it at a level of $1.0 \frac{\text{mg F}}{\text{L}}$?

a) 45%, 3.3 mg

b) 90%, 3.3 g

c) 45%, 3.3 g

d) 90%, 3.3 mg

$$? \text{ g F} = 100 \text{ g NaF} \times \frac{1 \text{ mol NaF}}{41.99 \text{ g NaF}} \times \frac{1 \text{ mol F}}{1 \text{ mol NaF}} \times \frac{19 \text{ g F}}{1 \text{ mol F}}$$

$$= 45.249$$

Mass percent composition
of F is 45.25%
 $\approx 45\%$

From 100 g NaF, 45.25 g is F \Rightarrow

$$\text{NaF} = \overset{\text{Na}}{22.99} + \overset{\text{F}}{19} = 41.99 \frac{\text{g}}{\text{mol}}$$

$$? \text{ g NaF} = 1500 \text{ L} \times \frac{1 \text{ mg F}}{1 \text{ L}} \times \frac{10^{-3} \text{ g F}}{1 \text{ mg F}} \times \frac{1 \text{ mol F}}{19 \text{ g F}}$$

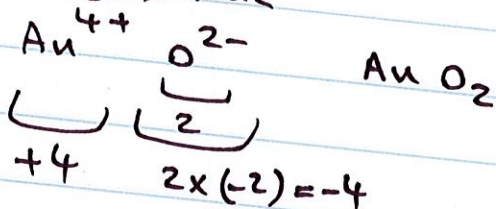
$$\times \frac{1 \text{ mol NaF}}{1 \text{ mol F}} \times \frac{41.99 \text{ g NaF}}{1 \text{ mol NaF}}$$

$$= 3.315 \text{ g} \approx 3.3 \text{ g}$$

10) Which statement is NOT correct:

- a) The molecular formula of sulfur hexafluoride is SF_6 .
- b) HCl is a ionic ~~compound~~ ^{Acid} with H having charge of +1 and Cl having the charge of -1.
- c) Dihydrogen monoxide is the other name of water.
- d) Gold (IV) oxide has the chemical formula of AuO_2 .

Gold(IV) oxide



11) Which statement is NOT correct:

a) The value of an element's molar mass in grams per mole is numerically equal to the element's atomic mass ~~xxx~~ in atomic mass units.

b) The mass of one mole of atoms of an element is its molar mass.

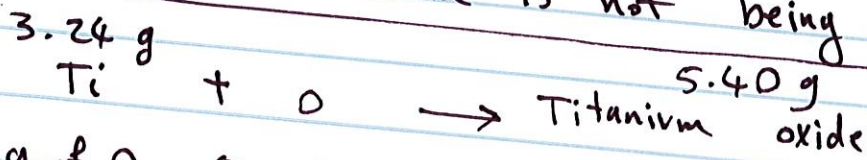
~~constant~~ ^{different changes} c) Just as the weight of 1 doz nails is is mass of 1 mol of atoms is ~~constant~~ ^{changes} for different types of nails, so the is ~~constant~~ ^{changes} for different atoms.

d) Avogadro's number, the number of atoms in a mole, is defined as the number of atoms in exactly 12 g of carbon-12.

12) We are told that 3.24 g sample of titanium reacts with oxygen and forms 5.40 g of the metal oxide. We are told all the oxygen and titanium in this reaction would be consumed to produce metal oxide. We are also given the periodic table of elements. What information CANNOT directly be inferred from this information:

- a) The empirical formula of metal oxide is TiO_2
- b) 2.16 g of oxygen reacts with 3.24 g of titanium
- c) 0.135 mol of oxygen reacts with 0.0677 mol of titanium
- d) The molecular formula of metal oxide is Ti_2O_4

Just by looking at the data given, we realize we cannot find the molecular formula because the molar mass of the molecular formula is not being provided.

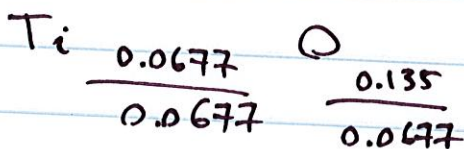
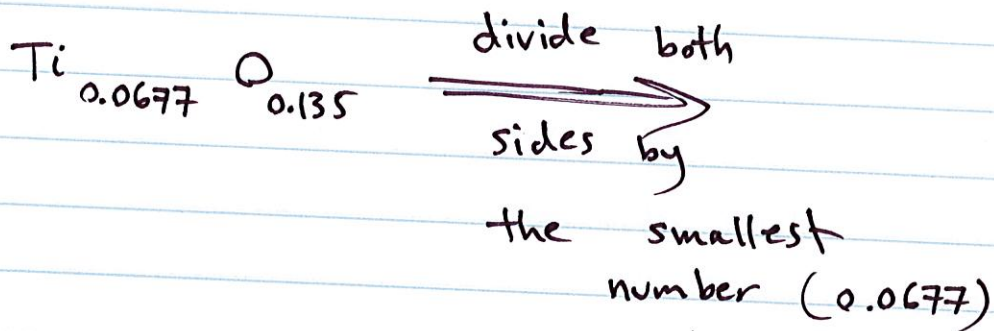


$$\text{g of O} = 5.40 - 3.24 = 2.16 \text{ g} \Rightarrow \text{b is correct}$$

$$? \text{ mol Ti} = 3.24 \text{ g Ti} \times \frac{1 \text{ mol Ti}}{47.88 \text{ g Ti}} = 0.0677$$

$$? \text{ mol O} = 2.16 \text{ g O} \times \frac{1 \text{ mol O}}{16 \text{ g O}} = 0.135$$

} option
(C) is
correct.



Ti O_{1.99} \Rightarrow The numbers should
be whole-numbers

Ti O₂ \Rightarrow Empirical formula \Rightarrow (C)
is
correct.

13) Which of the following consists of only metals?

Nonmetal

a) hydrogen, lithium, sodium, potassium

b) beryllium, magnesium, calcium, silicon ^{Metalloids}
not a metal

c) germanium ^{Metalloid}, tellurium ^{Metalloid}, boron ^{Metalloid}, vanadium
not a metal not a metal not a metal

d) aluminum, copper, zinc, mercury : All metal

d) 14) Sort the following elements based on their atomic mass (remember atomic mass numerically equals molar mass):

C = 12.01 N = 14.01 Ca = 40.08 P = 30.97 Cl = 35.45 Ar = 39.95
Carbon, nitrogen, calcium, phosphorous, chlorine, argon,
palladium, iridium, sodium, potassium
Pd = 106.42 Ir = 192.22 Na = 22.99 K = 39.10

12.01 < 14.01 < 22.99 < 30.97 < 35.45 < 39.10 < 39.95 < 40.08
< 106.42 < 192.22

Carbon < nitrogen < sodium < phosphorous < chlorine < ~~argon~~ potassium < Argon
< calcium < palladium < iridium

option "d" is the answer

15) Which of the following answers contain all metals with invariant charges? Pb^{2+} (lead(II)), Pb^{4+} (lead(IV))

- a) cesium, calcium, silver, zinc, lead
 - b) copper, zinc, sodium, strontium, barium
 - c) tin, mercury, zinc, silver, lead
 - d) silver, aluminum, magnesium, cesium, lithium
- Copper(I) Cu^+ , Copper(II) Cu^{2+}
 tin(II) Sn^{2+} , tin(IV) Sn^{4+}
 mercury(I) Hg_2^+ , mercury(II) Hg^{2+}

Refer to tables 5.4 and 5.5

16) Which statement is correct?

- a) All transition metals form more than one type of ion and as a result form second type of ionic compounds.
 - b) Cr, Fe, Zn, Zr are examples of transition metals that form more than one type of ion
- not all: Zn and Ag are exceptions Zn^{2+} , Ag^+
 have invariant charges

c) Ionic compounds usually consist of a metal and non-metal. If we do not see a metal in a compound, we can be sure it is not an ionic compound. (we should have cation, NH_4^+ is non-metal still forms an ionic compound)

d) We categorize chemical formulas into three types: empirical, molecular, and structural

17) Which statement is NOT correct?

a) Even though atoms combine in whole-number ratios, their mass ratios are not necessarily whole numbers

b) The ratio of hydrogen to oxygen in a mixture is variant

c) The ratio of hydrogen to oxygen in water is fixed

d) Molecular elements ^{do not} normally exist in nature with single atoms as their basic units (Refer to Molecular elements in section 5.4)

18) Which of the following is an ionic compound?

a) NO → Molecular

b) NH_4ClO_4 → composed of NH_4^+ and ClO_4^- ⇒ Ionic
Cation Anion

c) Au ⇒ Metal Not a compound

d) CCl_4 ⇒ Molecular

All correct refer to section 5.2

19) Which of these elements exist as diatomic molecules?

metal group 2A

a) Ba: Barium
metal group 5A

b) Bi: Bismuth

c) Br: Bromine: ~~not~~ nonmetal, group 7A

d) Be: Beryllium: Metal, group 2A

Refer to table 5.2 and figure 5.9

List of elements that occur as Diatomic Molecules:

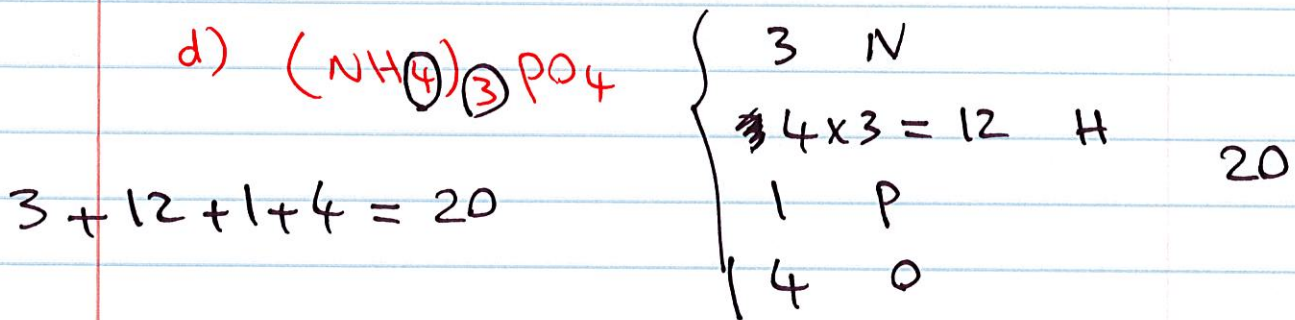
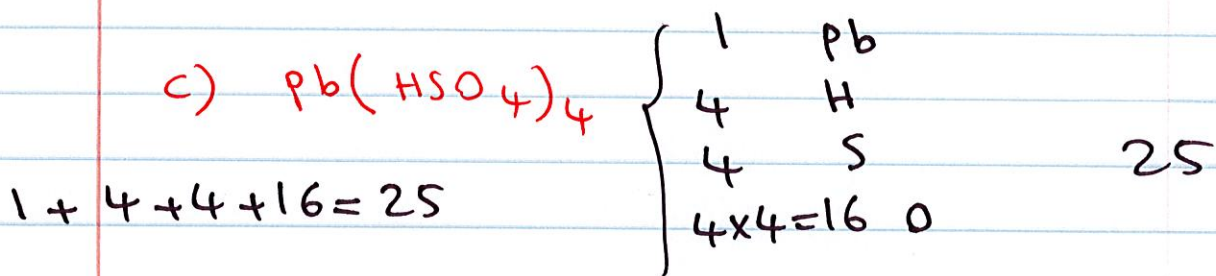
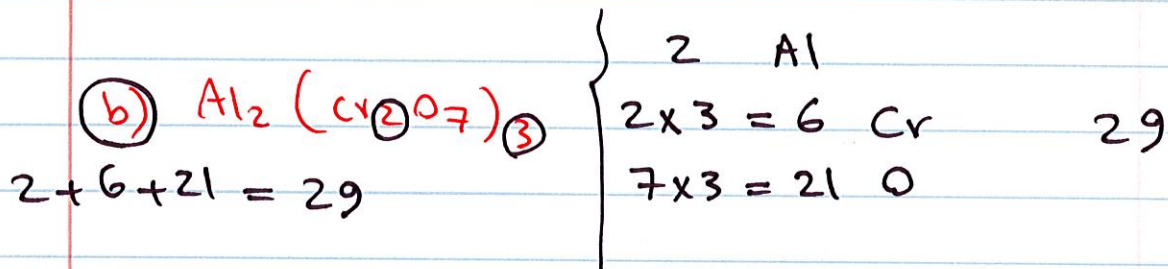
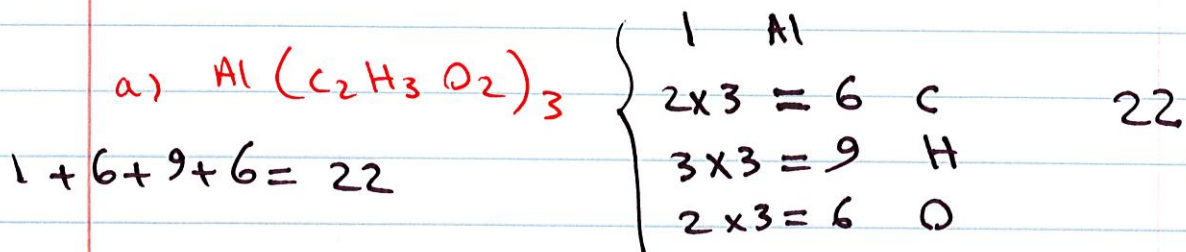
hydrogen	H_2
nitrogen	N_2
oxygen	O_2
fluorine	F_2
chlorine	Cl_2
bromine	Br_2
iodine	I_2

Ba: metal: Group 2A: Barium

Bi: Bismuth: Metal: Group 5A

20) Which formula represents the greatest

total number of atoms?



21) Which of the following is NOT an acid?

a, b, c \Rightarrow All have hydrogen \Rightarrow acid

a) $\text{HC}_2\text{H}_3\text{O}_2$: Acetic acid

b) HCl : Hydrochloric acid

c) HClO_2 : chlorous acid

d) Al_2O_3 \Rightarrow Ionic compound
metal (cation) nonmetal (anion)

22) Which of the following samples has the smallest mass?

a) 2.32 mol CF_4 carbon tetrafluoride

$$? \text{ g CF}_4 = 2.32 \text{ mol CF}_4 \times \frac{88.01 \text{ g CF}_4}{1 \text{ mol CF}_4} = \boxed{204.18} \text{ g CF}_4$$

$$\text{Molar mass of CF}_4 = (1 \times \overset{12.01}{\text{C}}) + (4 \times \overset{19}{\text{F}}) = 88.01 \frac{\text{g}}{\text{mol}}$$

b) 0.66 mol MgF_2 magnesium fluoride

$$? \text{ g MgF}_2 = 0.66 \text{ mol MgF}_2 \times \frac{62.31 \text{ g MgF}_2}{1 \text{ mol MgF}_2} = \boxed{41.12} \text{ g MgF}_2$$

$$\text{Molar mass of MgF}_2 = (1 \times \underset{24.31}{\text{Mg}}) + (2 \times \underset{19}{\text{F}}) = 62.31 \frac{\text{g}}{\text{mol}}$$

c) 1.99 mmol CS_2 carbon disulfide

$$? \text{ g CS}_2 = 1.99 \text{ mmol CS}_2 \times \frac{76.13 \text{ g CS}_2}{10^3 \text{ mmol CS}_2} = 0.1514987 \text{ g CS}_2$$

$$\text{Molar mass of CS}_2 = (1 \times \underset{12.01}{\text{C}}) + (2 \times \underset{32.06}{\text{S}}) = 76.13 \frac{\text{g}}{\text{mol}}$$

$$? \text{ g CS}_2 = 1.99 \text{ mmol CS}_2 \times \frac{10^{-3} \text{ mol CS}_2}{1 \text{ mmol CS}_2} \times \frac{76.13 \text{ g CS}_2}{1 \text{ mol CS}_2} = \boxed{0.151} \text{ g CS}_2$$

d) 2.21 kmol SO_3 sulfur trioxide

$$\begin{array}{l} \text{g SO}_3 \\ \hline 176932.6 \\ \hline \end{array}$$

$$? \text{ g SO}_3 = 2.21 \text{ kmol SO}_3 \times \frac{1000 \text{ mol SO}_3}{1 \text{ kmol SO}_3} \times \frac{8.06 \text{ g SO}_3}{1 \text{ mol SO}_3}$$

$$\text{Molar mass of SO}_3 = (1 \times \overset{32.06}{\text{S}}) + (3 \times \overset{16}{\text{O}}) = 80.06 \frac{\text{g}}{\text{mol}}$$

option C is the smallest number.

23) A mothball is composed of naphthalene ($C_{10}H_8$) and has a mass of 2.32 g.

How many naphthalene molecules does it contain?

- a) 1.09×10^{22}
- b) 8.72×10^{22}
- c) 8.72×10^{23}
- d) 1.09×10^{23}

$$? \quad C_{10}H_8 \text{ molecules} = 2.32 \text{ g } C_{10}H_8 \times \frac{1 \text{ mol } C_{10}H_8}{128.18 \text{ g } C_{10}H_8}$$

$$\times \frac{6.022 \times 10^{23} \text{ \# of } C_{10}H_8 \text{ molecules}}{1 \text{ mol } C_{10}H_8}$$

Molar mass:

$$C_{10}H_8 = (10 \times \overset{12.01}{C}) + (8 \times \overset{1.01}{H}) = 128.18$$

$$? \quad C_{10}H_8 \text{ molecules} = \frac{2.32 \times 6.022 \times 10^{23}}{128.18} = 1.09 \times 10^{22}$$

24) Which sample has the most number of molecules?

Molar mass of each:

a) 10 g H₂O

$$\text{H}_2\text{O} = (\overset{1.01}{\text{H} \times 2}) + (\overset{16}{\text{O}}) = 18.02 \frac{\text{g}}{\text{mol}}$$

b) 100 g N₂

$$\text{N}_2 = (\overset{14.01}{\text{N} \times 2}) = 28.02 \frac{\text{g}}{\text{mol}}$$

c) 100 g CCl₄

$$\text{CCl}_4 = (\overset{12.01}{\text{C}}) + (\overset{35.45}{\text{Cl} \times 4}) = 153.81 \frac{\text{g}}{\text{mol}}$$

d) 30 g C₆H₁₂O₆

$$\text{C}_6\text{H}_{12}\text{O}_6 = (\overset{12.01}{\text{C} \times 6}) + (\overset{1.01}{\text{H} \times 12}) + (\overset{16}{\text{O} \times 6}) = 180.18 \frac{\text{g}}{\text{mol}}$$

$$\begin{aligned} \text{a) ? \# H}_2\text{O molecules} &= 10 \text{ g H}_2\text{O} \times \frac{1 \text{ mol H}_2\text{O}}{18.02 \text{ g H}_2\text{O}} \times \frac{6.022 \times 10^{23} \text{ \# H}_2\text{O molecules}}{1 \text{ mol H}_2\text{O}} \\ &= \frac{10 \times 6.022 \times 10^{23}}{18.02} = \boxed{0.555} \times 6.022 \times 10^{23} \\ &= 3.34 \times 10^{23} \end{aligned}$$

$$\begin{aligned} \text{b) ? \# N}_2 \text{ molecules} &= 100 \text{ g N}_2 \times \frac{1 \text{ mol N}_2}{28.02 \text{ g N}_2} \times \frac{6.022 \times 10^{23} \text{ \# N}_2 \text{ molecules}}{1 \text{ mol N}_2} \\ &= \frac{100}{28.02} \times 6.022 \times 10^{23} = \boxed{3.57} \times 6.022 \times 10^{23} \\ &= 2.15 \times 10^{24} \end{aligned}$$

$$c) \quad ? \# \text{ CCl}_4 \text{ molecules} = 100 \text{ g CCl}_4 \times \frac{1 \text{ mol CCl}_4}{153.81 \text{ g CCl}_4}$$

$$\times \frac{6.022 \times 10^{23} \# \text{ CCl}_4 \text{ molecules}}{1 \text{ mol CCl}_4}$$

$$= \frac{100}{153.81} \times 6.022 \times 10^{23} = \boxed{0.65} \times 6.022 \times 10^{23}$$

$$= 3.9 \times 10^{23}$$

$$d) \quad ? \# \text{ C}_6\text{H}_{12}\text{O}_6 \text{ molecules} = 30 \text{ g C}_6\text{H}_{12}\text{O}_6 \times \frac{1 \text{ mol C}_6\text{H}_{12}\text{O}_6}{180.18 \text{ g C}_6\text{H}_{12}\text{O}_6}$$

$$\times \frac{6.022 \times 10^{23} \# \text{ C}_6\text{H}_{12}\text{O}_6 \text{ molecules}}{1 \text{ mol C}_6\text{H}_{12}\text{O}_6}$$

$$= \frac{30}{180.18} \times 6.022 \times 10^{23} = \boxed{0.166} \times 6.022 \times 10^{23}$$

$$= \boxed{1} \times 10^{23}$$

Since we are only comparing the

answers, we do not need to multiply

the ratios by Avogadro's number.

However, you are welcome to find the molecules in each case.

25) What is the mass percent

Composition of H in $C_2H_8N_2$?

a) 3.36%

b) 13.44%

c) 4.2%

d) 46.6%

$$\text{Mass percent of element X} = \frac{\text{Mass of element X in 1 mol of compound}}{\text{Mass of 1 mol of compound}} \times 100\%$$

$$\text{Mass Percent Composition of H} = \frac{\text{Mass of H in 1 mol of } C_2H_8N_2}{\text{Mass of 1 mol of } C_2H_8N_2} \times 100\%$$

$$\text{Mass Percent Composition of H} = \frac{8 \times \text{molar mass of H}}{\text{molar mass of } C_2H_8N_2} \times 100\%$$

$$= \frac{8 \times 1.01}{(2 \times 12.01) + (8 \times 1.01) + (14.01 \times 2)} \times 100\%$$

$$= \frac{8 \times 1.01}{60.12} \times 100\% = 13.44\%$$