If you are a student that **HAS** access to technology, this is not the packet for you. This packet is for students who pick up and drop off their work at the front office every week. If you have access to technology, please go back to your teacher's website and complete the correct assignment.

Name: _____ Period: _____ Teacher: J. Richardson

Distance Learning
Week 5: May 4th to May 10th

Assignment 5.1 – What is a Mole?

Please read the following:

- The **mole** is a counting unit (similar to a dozen)
  - Except instead of 12, it's 602 billion trillion 602,000,000,000,000,000,000,000
  - It is commonly written as: 6.02×10^{23} (in scientific notation)
- The mole works just like other counting units
  - 1 dozen cookies = 12 cookies — 1 mole of cookies = 6.02×10^{23} cookies
  - 1 dozen cars = 12 cars — 1 mole of cars = 6.02×10^{23} cars
  - 1 pair of shoes = 2 shoes — 1 mole of shoes = 6.02×10^{23} cars
- This number is named in honor of **Amedeo AVOGADRO (born 1776 – died 1856),** who studied quantities of gases and discovered that no matter what the gas was, there were the same number of molecules present
  - So 6.02×10^{23} is known as Avogadro's Number

Learning Check – *please circle the correct answer*

1. How many sulfur atoms are in a mole of sulfur atoms?
   a. 12 atoms
   b. 602 atoms
   c. 6.02×10^{23} atoms
   d. 6.02×10^{12} atoms

2. Suppose we invented a new collection unit called a rapp. One rapp contains 8 objects. How many oranges are in 2.0 rapps?
   a. 8 oranges
   b. 12 oranges
   c. 16 oranges
   d. 6.02×10^{23} oranges

The coolest thing about the mole: you can find the mass of 1 mole of an atom by looking up its atomic mass from the periodic table! The mass of a mole of any compound is equivalent to the sum of the atomic masses of the elements that make up that compound! This means:

1 mole of atoms is 6.02×10^{23} atoms and has a mass of that atom's atomic mass!

Assignment 5.2: Calculating Molar Mass

How to calculate Molar mass:

1. Look at the chemical formula of the compound
2. Find the Atomic Mass for each element (there is a periodic table on the last page of this packet!)
3. Add the totals together
4. Round to the nearest 0.01 place

Example 1:

Find the Molar Mass of SO_3

1 S atom x 32.066 = 32.066 g/mol
3 O atoms x 15.999 = 47.997 g/mol

32.066 g/mol + 47.997 g/mol =80. 063 g/mol

The molar mass of SO_3 is 80.06 g/mol

Example 2:

Find the Molar Mass of $Ba(NO_3)_2$

1 Ba atom x 137.327= 137.327 g/mol
2 N atoms x 14.007 = 28.014 g/mol
6 O atoms x 15.999=95.994 g/mol

137.327 g/mol + 28.014 g/mol + 95.994 g/mol
= 261.335 g/mol

The molar mass of $Ba(NO_3)_2$ is 261.34 g/mol

Calculate the molar mass and mass of 1 mole of each compound.
Show you work and don't forget units. Molar mass is in **grams/mole**. Mass is in **grams.**

1. **N_2** Molar mass of N_2 _____.
   1 mole of N_2 has a mass of _____.

2. **H_2O** Molar mass of H_2O _____.
   1 mole of H_2O has a mass of _____.

3. **$CuCl_2$** Molar mass of $CuCl_2$ _____.
   1 mole of $CuCl_2$ has a mass of _____.

4. **$C_6H_{12}O_6$** Molar mass of $C_6H_{12}O_6$ _____.
   1 mole of $C_6H_{12}O_6$ has a mass of _____.

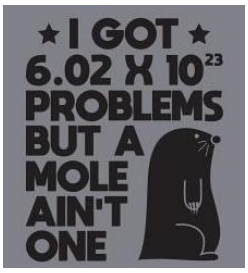
5. **$CaCO_3$** Molar mass of $CaCO_3$ _____.
   1 mole of $CaCO_3$ has a mass of _____.

6. **$(NH_4)_2O$** Molar mass of $(NH_4)_2O$ is _____
   1 mole of $(NH_4)_2O$ has a mass of _____.

Assignment 5.3: Moles and Mass Wrap Up

If you need additional space, show work on a separate page and turn in your work with your packet.

Part 1: Reviewing the mole



1. If I have "one mole" of atoms, how many atoms do I have?
2. If I have 3 moles of donuts, how many donuts do I have?
3. If I have ½ a mole of carbon, how many carbon atoms do I have?

Part 2: Molar Mass

Calculate the molar mass of each of the following. <u>You must show all of your work to get credit for these problems.</u> "I just did it in my calculator" is not an acceptable response. **<u>A periodic table is included as the last page of this packet!!!</u>**

4. KF
5. H_2S
6. $NaNO_3$
7. $Mg(OH)_2$
8. $Al_2(SO_4)_3$

Part 3: Using Molar Mass

Use the molar masses you calculated in part 2 above to answer the following questions. The table below shows an example problem. <u>You must show all of your work to get credit for these problems.</u> "I just did it in my calculator" is not an acceptable response.

*Example***:** If I have 1 mole of KF, how much will it weigh? How many molecules will it be? What about 2 moles?

Moles KF	**Mass/Weight**	**Molecules**
1 mole KF	58.096 grams	6.02×10^{23} molecules
2 moles KF	$2 \times 58.096 = 116.192$ grams	$2 \times (6.02 \times 10^{23}) = 12.04 \times 10^{23}$ molecules

9. How much will 1 mole of H_2S weigh?
10. How much will 0.50 moles of $NaNO_3$ weigh?
11. How much will 3 moles of $Mg(OH)_2$ weigh?
12. If I have about 68.2 grams of H_2S, how many moles do I have?
13. If I have about 342.15 grams of $Al_2(SO_4)_3$, how many *molecules* do I have?

5.1

1) 6.02 x 10^{23} atoms
2) 16 oranges

5.2

1. N_2 Molar mass of N_2 28.01 g/mol.
1 mole of N_2 has a mass of 28.01g.

2. H_2O Molar mass of H_2O 18.02g/mol.
1 mole of H_2O has a mass of 18.02g.

3. $CuCl_2$ Molar mass of $CuCl_2$ 134.45g/mol.
1 mole of $CuCl_2$ has a mass of 134.45g.

4. $C_6H_{12}O_6$ Molar mass of $C_6H_{12}O_6$ 180.16g/mol.
1 mole of $C_6H_{12}O_6$ has a mass of 180.16g.

5. $CaCO_3$ Molar mass of $CaCO_3$ 100.09g/mol.
1 mole of $CaCO_3$ has a mass of 100.09g.

6. $(NH_4)_2O$ Molar mass of $(NH_4)_2O$ is 52.08g/mol
1 mole of $(NH_4)_2O$ has a mass of 52.08g.

5.3

Part 1

1. If I have "one mole" of atoms, how many atoms do I have? 6.02 x 10^{23} atoms
2. If I have 3 moles of donuts, how many donuts do I have? 3 x 6.02 x 10^{23} atoms = 1.81 x 10^{24}donuts
3. If I have ½ a mole of carbon, how many carbon atoms do I have? 6.02 x 10^{23} atoms / 2 = 3.01 x 10^{23} carbon atoms

Part 2

4. KF = 58.10 g/mol
5. H_2S =34.10 g/mol
6. $NaNO_3$ = 84.99 g/mol
7. $Mg(OH)_2$ = 58.32 g/mol
8. $Al_2(SO_4)_3$ =342.15g/mol

Part 3

9. How much will 1 mole of H_2S weigh? 34.10 g
10. How much will 0.50 moles of $NaNO_3$ weigh? 42.50 g
11. How much will 3 moles of $Mg(OH)_2$ weigh? 174.96 g
12. If I have about 68.2 grams of H_2S, how many moles do I have? 2 moles (2.00 mols with sigfigs!)
13. If I have about 342.15 grams of $Al_2(SO_4)_3$, how many *molecules* do I have? 6.02 x 10^{23} molecule

Periodic Table of Elements

14.																*18*
1 H Hydrogen 1.008	*2*											*13*	*14*	*15*	*16*	*17*	2 He Helium 4.003
3 Li Lithium 6.941	4 Be Beryllium 9.012											5 B Boron 10.81	6 C Carbon 12.01	7 N Nitrogen 14.01	8 O Oxygen 16.00	9 F Fluorine 19.00	10 Ne Neon 20.18
11 Na Sodium 22.99	12 Mg Magnesium 24.31	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	13 Al Aluminum 26.98	14 Si Silicon 28.09	15 P Phosphorus 30.97	16 S Sulfur 32.07	17 Cl Chlorine 35.45	18 Ar Argon 39.95
19 K Potassium 39.10	20 Ca Calcium 40.08	21 Sc Scandium 44.96	22 Ti Titanium 47.88	23 V Vanadium 50.94	24 Cr Chromium 52.00	25 Mn Manganese 54.94	26 Fe Iron 55.85	27 Co Cobalt 58.93	28 Ni Nickel 58.69	29 Cu Copper 63.55	30 Zn Zinc 65.41	31 Ga Gallium 69.72	32 Ge Germanium 72.59	33 As Arsenic 74.92	34 Se Selenium 78.96	35 Br Bromine 79.90	36 Kr Krypton 83.80
37 Rb Rubidium 85.47	38 Sr Strontium 87.62	39 Y Yttrium 88.91	40 Zr Zirconium 91.22	41 Nb Niobium 92.91	42 Mo Molybdenum 95.94	43 Tc Technetium (98)	44 Ru Ruthenium 101.1	45 Rh Rhodium 102.9	46 Pd Palladium 106.4	47 Ag Silver 107.9	48 Cd Cadmium 112.4	49 In Indium 114.8	50 Sn Tin 118.7	51 Sb Antimony 121.8	52 Te Tellurium 127.6	53 I Iodine 126.9	54 Xe Xenon 131.3
55 Cs Cesium 132.9	56 Ba Barium 137.3	57 La Lanthanum 138.9	72 Hf Hafnium 178.5	73 Ta Tantalum 180.9	74 W Tungsten 183.9	75 Re Rhenium 186.2	76 Os Osmium 190.2	77 Ir Iridium 192.2	78 Pt Platinum 195.1	79 Au Gold 197.0	80 Hg Mercury 200.6	81 Tl Thallium 204.4	82 Pb Lead 207.2	83 Bi Bismuth 209.0	84 Po Polonium (209)	85 At Astatine (210)	86 Rn Radon (222)
87 Fr Francium (223)	88 Ra Radium 226	89 Ac Actinium (227)	104 Rf Rutherfordium (261)	105 Db Dubnium (262)	106 Sg Seaborgium (266)	107 Bh Bohrium (264)	108 Hs Hassium (277)	109 Mt Meitnerium (268)	110 Ds Darmstadtium (269)	111 Rg Roentgenium (272)	112 Uub Ununbium (277)	113 Uut Ununtrium (284)	114 Uuq Ununquadium (289)	115 Uup Ununpentium (288)	112 Uub Ununhexium		

Key:

6 — Atomic Number
C — Symbol
Carbon — Name
12.01 — Average Atomic Mass

**Note, lanthanide and actinides have been removed so it fits on one page