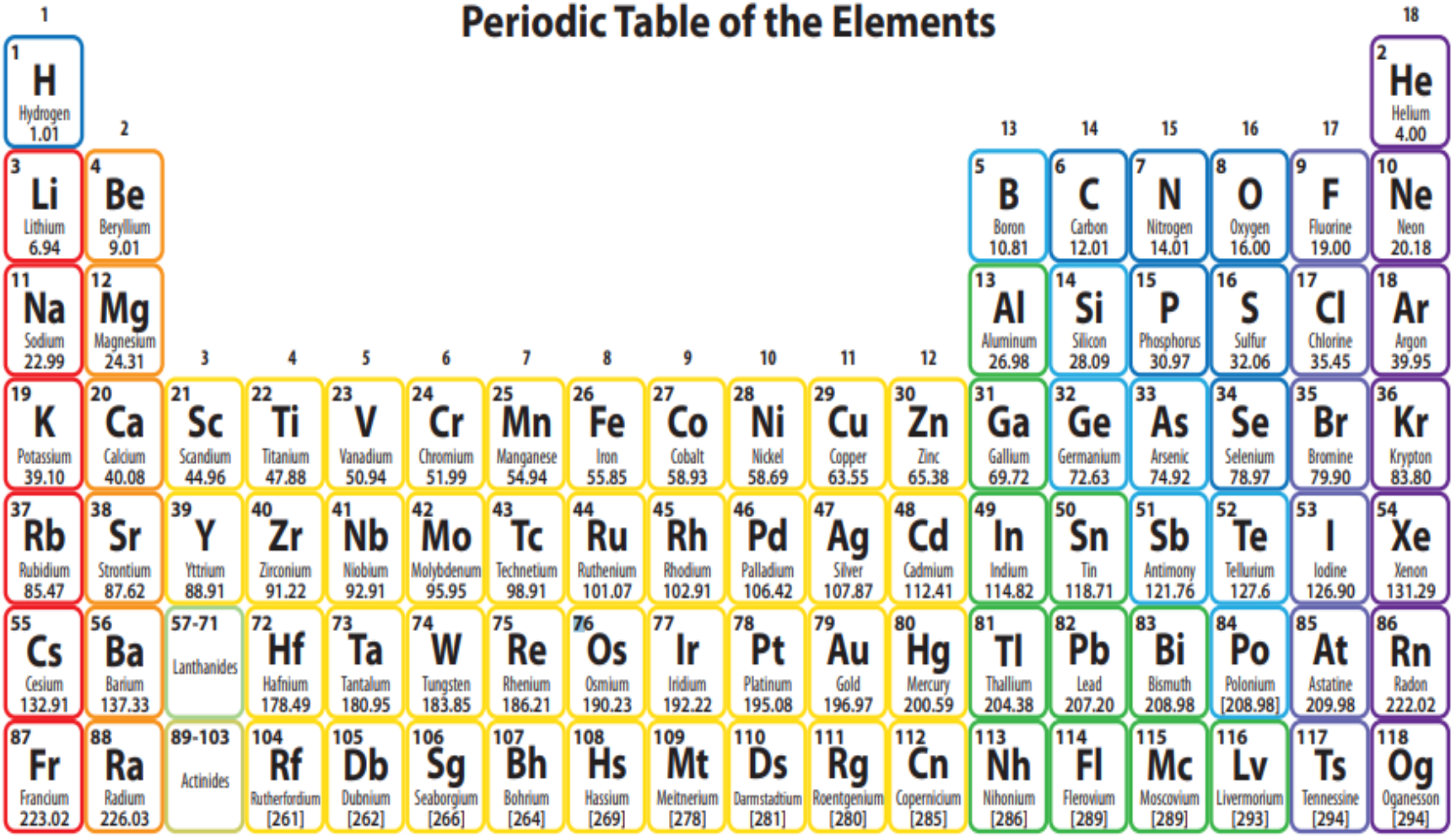
Name:

Due Date:

Part 4 Work Bundle

Periodic Table of the Elements



Part 4 Lesson 1 the Mole and Molar Mass

Mole (mol): A standard scientific unit for measuring large quantities of _____ entities such as atoms.

1 mol = _____

Mole: The number of atoms determined to be found in 12 grams of _____. Also called Avogadro's number

How many atoms are in a mole?
Write in long hand _____

The number of atoms in a mole is the _____ for all substances.
It is the molecular weight of that substance in grams.

Please complete the following during the slideshow Part 4 about molar mass.

What is the molar mass of NaOH?	What is the molar mass of NH_4?	What is the molar mass of SO_2?

Part 4 Lesson 2 Molar Conversions -Complete the notes below as described in the slideshow.

Convert from moles to atoms, _____ the molar amount by Avogadro's number.

Convert from atoms to moles, _____ the atom amount by Avogadro's number

Please convert from grams to moles below

$$100\text{ g of water} \times \frac{1\text{ mole of water}}{\text{____ gram of water}} = \text{_____ mole of water}$$

Please convert from moles to grams below

$$6\text{ moles of } O_2 \times \frac{\text{_____g of } O_2}{1\text{ mole of } O_2} = \text{_____ g of } O_2$$

If a scientist wants to know how many atoms are in six moles of sodium…

$$6\text{ moles} \times \frac{6.02 \times 10^{23}}{1\text{ mole}} = \text{_____} \times 10^{24}\text{ atoms of Na}$$

What's the molecular mass of Na_3PO_4?

3(____ g/mol) + 31 g/mol + 4 (____ g/mol) = _____

How many atoms are in 6.2 moles of Al?

$$6.2\text{ moles of Al} \times \frac{\text{atoms Al}}{1\text{ mole Al}} = \text{_____} \times 10^{24}$$

How many atoms are in 3.5 moles of Tin (Sn)?

$$\text{_____ mols Sn} \times \frac{\text{atoms Sn}}{1\text{ mol Sn}} = \text{_____} \times 10^{24}$$

How many moles are in 90 grams of NaOH? NaOH 1 mol = ____ grams

$$\text{_____grams NaOH} \times \frac{1\text{ mole}}{\text{____ grams}} = \text{_____ mol NaOH}$$

How many mols are in 10 grams of Nickel? Find molar mass of Ni

$$\text{_____ g Ni} \times \frac{1 \text{ mol Ni}}{\text{_____}} = \text{_____ mol Ni}$$

How many atoms are in .17 mol of Ni?

$$\text{____ mol Ni} \times \frac{\text{atoms of Ni}}{1 \text{mol Ni}} = \text{_____} \times 10^{23} \text{ atoms Ni}$$

Calculate the number of moles in 40 g of CO (carbon monoxide)?

Molar mass of CO = 12.01 + 16.0 = g/mol

$$\text{____ gram of CO} \times \frac{\text{Mole}}{\text{_____ grams}} = \text{_____ moles}$$

How many grams are in 1.25 moles of Neon gas?

Neon has molar mass of ____ g/mol.

$$\text{_____ moles Ne} \times \frac{\text{grams}}{\text{mole}} = \text{_____ grams}$$

Convert 3 moles of As_2S_3 to grams. Molar Mass of As_2S_3 is _____ g/mol

$$\text{___ mol } As_2S_3 \times \frac{\text{g } As_2S_3}{\text{mol } As_2S_3} = \text{_____ g } As_2S_3$$

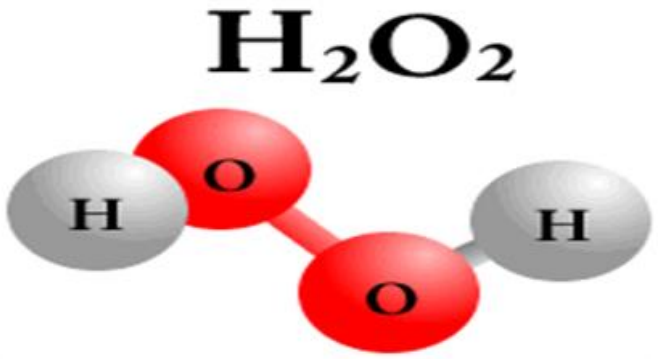
- Converting from mass (grams) to moles: _____ your initial mass by the _____mass of the compound as determined by the periodic table.
- Converting from moles to mass (grams): _____ your initial mole value by the_____ of the compound as determined by the periodic table.
- Converting from volume (liters) to moles: Divide your initial volume by the molar volume constant, 22.4 L.
- Converting from moles to volume (liters): Multiply your mole value by the molar volume constant, 22.4L.
- Converting from particles (atoms, molecules, or formula units) to moles: _____ your particle value by _____ number, _____.
- Converting from moles to particles (atoms, molecules, or formula units): _____your mole value by _____ number, 6.02×10^{23}.

Part 4 Lesson 3 Subscripts and Coefficients

Coefficients tell us the number of _____. (The number of Moles)

Subscripts tell us how many _____ or ions there are within a compound.
Subscripts of _____ are _____ written – they're understood.

Which are the subscripts? And which are the coefficients below?

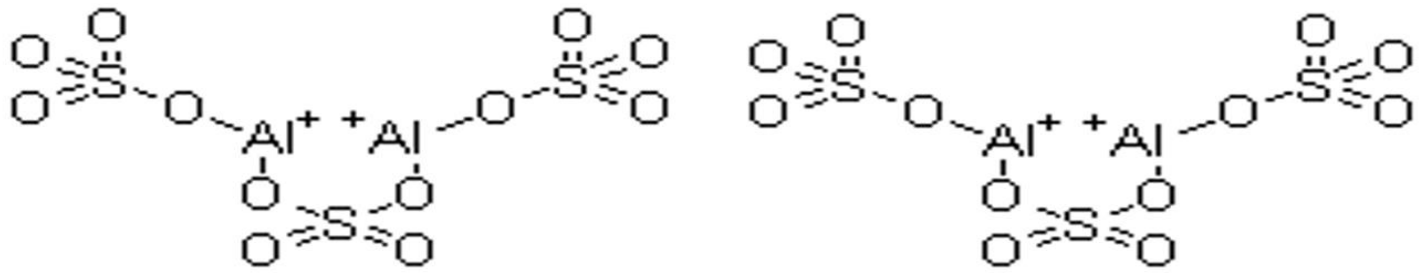
How many hydrogen atoms are in hydrogen peroxide? 	How many hydrogen atoms are in 2 hydrogen peroxide? 
How many elements are in the molecule below? Name each one? 	How many hydrogen, Chlorine, and Oxygen <u>atoms</u> are in $4HClO_4$? 

How many <u>elements</u> are in $2Al_2(SO_4)_3$?

$$2Al_2(SO_4)_3$$

How many Aluminum, Sulfur, and Oxygen atoms are in $2Al_2(SO_4)_3$?

$$2Al_2(SO_4)_3$$



How many total atoms and atoms of each element are in the molecules below. **Hint-the total atoms and atoms of each element when added together need to be the same. Law Conservation of Matter!**

$2KClO_3$	Total Atoms=	K= Cl= O=
$6H_2O$	Total Atoms=	O= H=
$4Al_2O_3$	Total Atoms=	Al= O=
$2C_6H_8O_7$	Total Atoms=	C= H= O=
$6Na_3C_6H_5O_7$	Total Atoms=	Na= C= H= O=
$3CCl_4$	Total Atoms=	C= Cl=
$12HNO_3$	Total Atoms=	N= H= O=

Be proactive and work in your journal in real time to get the answers. These are hard.

- https://www.youtube.com/watch?v=PQamMsq79F0

Please view the video for assistance on the first four questions and then you're on your own for 6-10.

Molecule	# of Total Atoms	Atoms of each Element			
$8H_2O$		H=	O=		
$3CCl_4$		C=	Cl=		
$11Be(OH)_2$		Be=	O=	H=	
$5\ (NH_4)_3PO_4$		N=	H=	P=	O=
H_2SO_4		H=	S=	O=	
$Si(HCO_3)_4$		Si=	H=	C=	O=
$2Al(CO_2)_3$		Al=	C=	O=	
$2HNO_3$		H=	N=	O=	
$KMnO_4$		K=	Mn=	O=	
K_2SO_4		K=	S=	O=	
$7H_3PO_4$		P=	H=	O=	
$4Na_2CO_3$		Na=	C=	O=	

Molecule	# of Total Atoms	Atoms of each Element
$5AgNO_3$		Ag= N= O=
$Ni(CH_3CO_2)_2$		Ni= C= O= H=
$2NH_4NO_2$		N= O= H=
$CO_2(SO_4)_3$		S= C= O=
$4LiClO_3NH_3$		Li= Cl= O= N= H=
$4SF_2$		S= F=
$NCl_3Fe(CHCO_2)_2$		N= Cl= Fe= C= O= H=
$5NaHCO_3$		Na= C= O= H=
2 Carbon Tetrachloride		C= Cl=
$2Ag_2CrO_4$		Ag= Cr= O=
$\frac{1}{2}\ P_2O_5$		P= O=

Part 4 Lesson 4 Balancing Chemical Equations

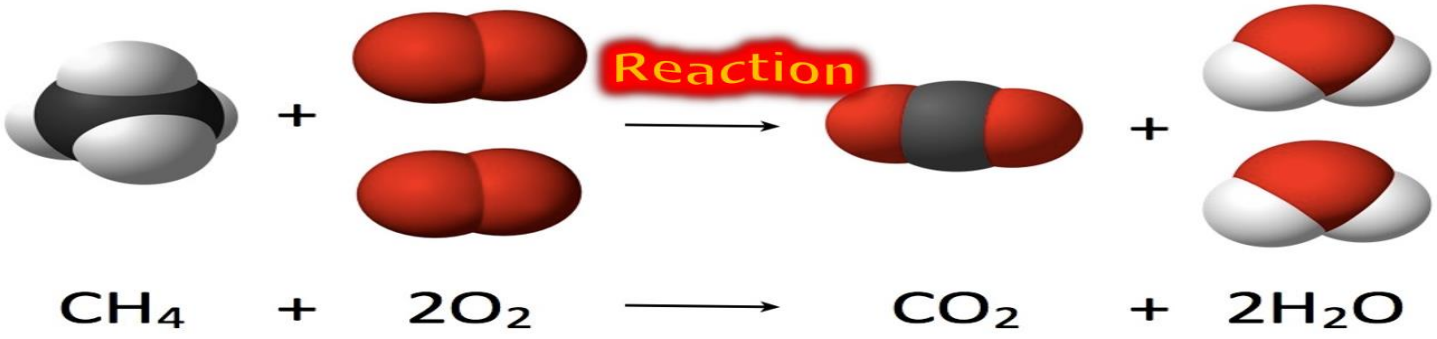
Chemical Change: The change of substances into other substances through a _____of the atoms.

Balancing Chemical Equations.

This is what happens in a chemical _____
It describes what you _____ with…and _____ with.
It also describes the _____ of each (s) (l) (g)
It also describes the _____of each.

Balancing a chemical equation refers to establishing the mathematical relationship between the quantity of _____ and _____.

Which are the reactants? And which are the products?

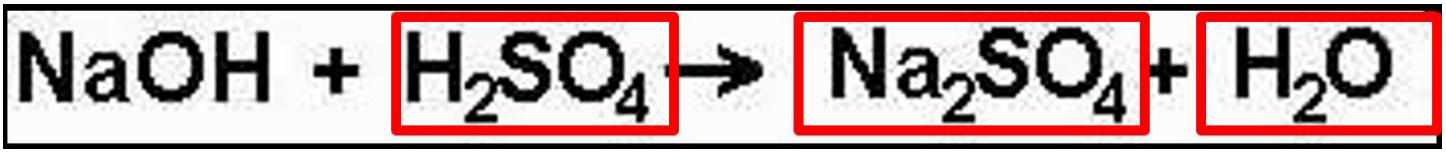


In any physical or chemical change, matter is neither _____ nor _____

Matter can be changed from one form to another.

That means we need to have the same amount of chemicals on each side of the →.

For this reason, put a square around the chemical formulas.



Begin balancing chemical equations by putting numbers (coefficients) in front of them.

Example H_2O on one side could become $2H_2O$

Remember that each side needs to have same number of Hydrogen and Oxygen

Note – Don't change the subscript

Example H_2O becomes H_3O

Please use the provided spaces to balance the chemical equations covered in class.
We'll end up doing this first one twice 😊

$NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$

Element	Before	After
Na		
O		
H		
S		

$NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$

Element	Before	After
Na		
O		
H		
S		

$\_\_CH_4 + \_\_O_2 \rightarrow \_\_CO_2 + \_\_H_2O$

Element	Before	After
C		
H		
O		

$\_\_\_ NaCl + \_\_ BeF_2 \rightarrow \_\_ NaF + \_\_ BeCl_2$

Element	Before	After
Na		
Cl		
Be		
F		

$\_\_Mg + \_\_Mn_2O_3 \rightarrow \_\_MgO + \_\_Mn$

Element	Before	After
Mg		
Mn		
O		

An easy one…?

$\_\_\_ Na + \_\_\_Cl \rightarrow \_\_\_\_ NaCl$

Why?

Please try and balance these two unbalanced chemical equations.

____ H_2 +___ O_2 → ___ H_2O

Element	Before	After

Element	Before	After

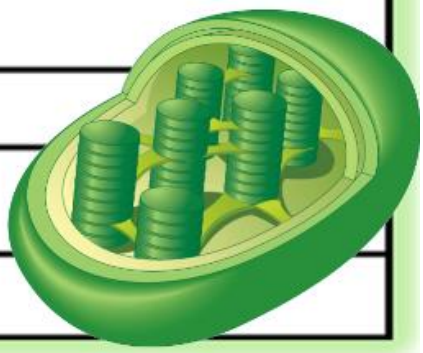
___ Al +___Cl_2 → ___$AlCl_3$

Element	Before	After

Element	Before	After

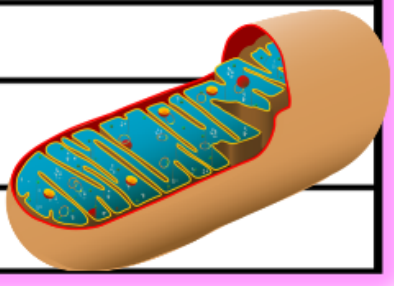
____CO_2 + ____H_2O = __$C_6H_{12}O_6$ + __O_2

Element	Before	After
C		
H		
O		



____ $C_6H_{12}O_6$ + __O_2 = Released energy + __CO_2 + __H_2O

Element	Before	After
C		
H		
O		



Please try and balance these two unbalanced chemical equations.

____ N_2 + ____ H_2 → ____ NH_3	____ H_2 + ____ O_2 → ____ H_2O
__Na + ___H_2O → __NaOH + __H_2	___$KClO_3$ → ___KCl + ___ O_2
__NaCl + __F_2 →__NaF+__Cl_2	___ Al + ___O_2 →___ Al_2O_3
___ Al + ___ HCl → ___ AlCl3 + ___ H2	___NH_4NO_3 → ___ N_2 + ___ O_2+ __ H_2O

$\square NaNO_3 + PbO \rightarrow Pb(NO_3)_2 + Na_2O$

$\square AgI + Fe_2(CO_3)_3 \rightarrow \square FeI_3 + \square Ag_2CO_3$

$C_2H_4O_2 + \square O_2 \rightarrow \square CO_2 + \square H_2O$

$ZnSO_4 + Li_2CO_3 \rightarrow ZnCO_3 + Li_2SO_4$

$V_2O_5 + \square CaS \rightarrow \square CaO + V_2S_5$

$Mn(NO_2)_2 + BeCl_2 \rightarrow Be(NO_2)_2 + MnCl_2$

$\square AgBr + GaPO_4 \rightarrow Ag_3PO_4 + GaBr_3$

$\square H_2SO_4 + \square B(OH)_3 \rightarrow B_2(SO_4)_3 + \square H_2O$

$S_8 + \square O_2 \rightarrow \square SO_2$

$Fe + \square AgNO_3 \rightarrow Fe(NO_3)_2 + \square Ag$

$\square AlBr_3 + \square K \rightarrow \square KBr + \square Al$

$\square FeO + \square PdF_2 \rightarrow \square FeF_2 + \square PdO$

$\square P_4 + \square Br_2 \rightarrow \square PBr_3$

$\square LiCl + \square Br_2 \rightarrow \square LiBr + \square Cl_2$

$\square PbBr_2 + \square HCl \rightarrow \square HBr + \square PbCl_2$

$\square CoBr_3 + \square CaSO_4 \rightarrow \square CaBr_2 + \square Co_2(SO_4)_3$

$\square Na_3P + \square CaF_2 \rightarrow \square NaF + \square Ca_3P_2$

$\square Mn + \square HI \rightarrow \square H_2 + \square MnI_3$

$\square Li_3PO_4 + \square NaBr \rightarrow \square Na_3PO_4 + \square LiBr$

$\square CaF_2 + \square Li_2SO_4 \rightarrow \square CaSO_4 + \square LiF$

Part 4 Review Game

Name:

1-10 = 10 pts * = Bonus + 1 pt, Lesson 8

Due: Today

(Secretly write owl in correct space +1 pt)

Score ____ / 100

Final Question = 5 pt wager

THE SCRIPT KEEPER	THE MORE YOU KNOW	BALANCNING ACT	BLANK STARE	NAME THAT COMPOUND Bonus round 1 pt each
1)	6)	11)	16)	*21)
2)	7)	12)	17)	*22)
3)	8)	13)	18)	*23)
4)	9)	14)	19)	*24)
5)	10)	15)	20)	*25)

Final Question Wager ___ /5 Answer: _____

Part 4 Work Bundle

Name:

Due Date:

hydrogen 1 H 1.0079																	helium 2 He 4.0026
lithium 3 Li 6.941	beryllium 4 Be 9.0122											boron 5 B 10.811	carbon 6 C 12.011	nitrogen 7 N 14.007	oxygen 8 O 15.999	fluorine 9 F 18.998	neon 10 Ne 20.180
sodium 11 Na 22.990	magnesium 12 Mg 24.305											aluminum 13 Al 26.982	silicon 14 Si 28.086	phosphorus 15 P 30.974	sulfur 16 S 32.065	chlorine 17 Cl 35.453	argon 18 Ar 39.948
potassium 19 K 39.098	calcium 20 Ca 40.078	scandium 21 Sc 44.956	titanium 22 Ti 47.867	vanadium 23 V 50.942	chromium 24 Cr 51.996	manganese 25 Mn 54.938	iron 26 Fe 55.845	cobalt 27 Co 58.933	nickel 28 Ni 58.693	copper 29 Cu 63.546	zinc 30 Zn 65.39	gallium 31 Ga 69.723	germanium 32 Ge 72.61	arsenic 33 As 74.922	selenium 34 Se 78.96	bromine 35 Br 79.904	krypton 36 Kr 83.80
rubidium 37 Rb 85.468	strontium 38 Sr 87.62	yttrium 39 Y 88.906	zirconium 40 Zr 91.224	niobium 41 Nb 92.906	molybdenum 42 Mo 95.94	technetium 43 Tc [98]	ruthenium 44 Ru 101.07	rhodium 45 Rh 102.91	palladium 46 Pd 106.42	silver 47 Ag 107.87	cadmium 48 Cd 112.41	indium 49 In 114.82	tin 50 Sn 118.71	antimony 51 Sb 121.76	tellurium 52 Te 127.60	iodine 53 I 126.90	xenon 54 Xe 131.29
caesium 55 Cs 132.91	barium 56 Ba 137.33	lutetium 71 Lu 174.97	hafnium 72 Hf 178.49	tantalum 73 Ta 180.95	tungsten 74 W 183.84	rhenium 75 Re 186.21	osmium 76 Os 190.23	iridium 77 Ir 192.22	platinum 78 Pt 195.08	gold 79 Au 196.97	mercury 80 Hg 200.59	thallium 81 Tl 204.38	lead 82 Pb 207.2	bismuth 83 Bi 208.98	polonium 84 Po [209]	astatine 85 At [210]	radon 86 Rn [222]
francium 87 Fr [223]	radium 88 Ra [226]	lawrencium 103 Lr [262]	rutherfordium 104 Rf [261]	dubnium 105 Db [262]	seaborgium 106 Sg [266]	bohrium 107 Bh [264]	hassium 108 Hs [269]	meitnerium 109 Mt [268]	unnilnilium 110 Uun [271]	unnunnium 111 Uuu [272]	ununbium 112 Uub [277]		ununquadium 114 Uuq [289]				
		89-102 **	57-70 *														

*Lanthanide series

lanthanum 57 La 138.91	cerium 58 Ce 140.12	praseodymium 59 Pr 140.91	neodymium 60 Nd 144.24	promethium 61 Pm [145]	samarium 62 Sm 150.36	europium 63 Eu 151.96	gadolinium 64 Gd 157.25	terbium 65 Tb 158.93	dysprosium 66 Dy 162.50	holmium 67 Ho 164.93	erbium 68 Er 167.26	thulium 69 Tm 168.93	ytterbium 70 Yb 173.04
actinium 89 Ac [227]	thorium 90 Th 232.04	protactinium 91 Pa 231.04	uranium 92 U 238.03	neptunium 93 Np [237]	plutonium 94 Pu [244]	americium 95 Am [243]	curium 96 Cm [247]	berkelium 97 Bk [247]	californium 98 Cf [251]	einsteinium 99 Es [252]	fermium 100 Fm [257]	mendelevium 101 Md [258]	nobelium 102 No [259]

**Actinide series

Part 4 Lesson 1 the Mole and Molar Mass

Mole (mol): A standard scientific unit for measuring large quantities of small entities such as atoms.

$1 \text{ mol} = 6.02 \times 10^{23}$

Mole: The number of atoms determined to be found in 12 grams of Carbon-12. Also called Avogadro's number

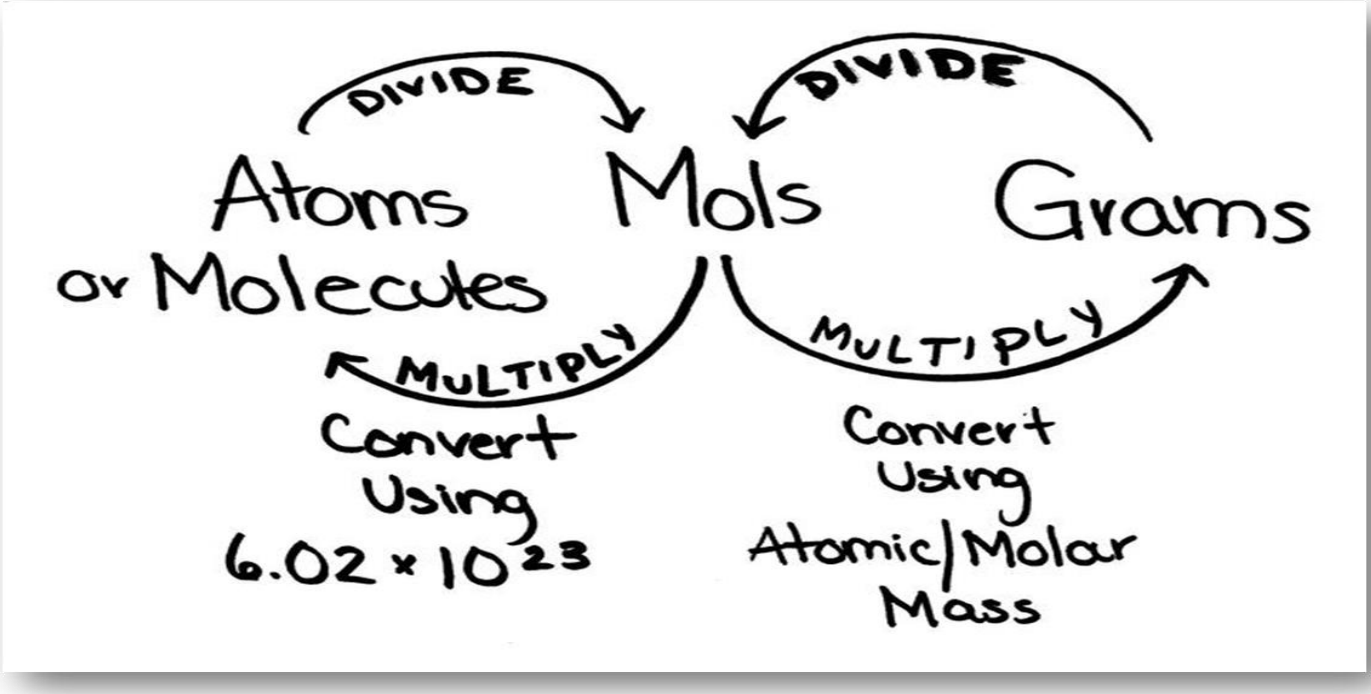
How many atoms are in a mole?
Write in long hand 602 000 000 000 000 000 000 000

The number of atoms in a mole is the same for all substances.
It is the molecular weight of that substance in grams.

Please complete the following during the slideshow Part 4 about molar mass.

What is the molar mass of NaOH? **Na is 23 + O is 16 + H is 1 =** Molar of Sodium Hydroxide = 40 g/mol	What is the molar mass of NH_4? N is 14, the 4 H's are 1 14+1+1+1+1 = 18 g/mol	What is the molar mass of SO_2? 32+16+16 = 64 g/mol

Part 4 Lesson 2 Molar Conversions -Complete the notes below as described in the slideshow.



Convert from moles to atoms, multiply the molar amount by Avogadro's number.

Convert from atoms to moles, divide the atom amount by Avogadro's number

Please convert from grams to moles below

$$101\text{ g of water} \times \frac{1\text{ mole of water}}{18\text{ gram of water}} = 5.56\text{ mole of water}$$

Please convert from moles to grams below

$$6\text{ moles of } O_2 \times \frac{32\text{ g of } O_2}{2\text{ mole of } O_2} = 192\text{ g of } O_2$$

If a scientist wants to know how many atoms are in six moles of sodium…

$$6\text{ moles} \times \frac{6.02 \times 10^{23}}{1\text{ mole}} = 3.61 \times 10^{24}\text{ atoms of Na}$$

What's the molecular mass of Na_3PO_4?

3(23 g/mol) + 31 g/mol + 4 (16 g/mol) = 164 g/mol

How many atoms are in 6.2 moles of Al?

$$6.2\text{ moles of Al} \times \frac{6.02 \times 10^{23}\text{ atoms Al}}{1\text{ mole Al}} = 3.7 \times 10^{24}$$

How many atoms are in 3.5 moles of Tin (Sn)?

$$3.5\text{ mols Sn} \times \frac{6.02 \times 10^{23}\text{ atoms Sn}}{1\text{ mol Sn}} = 2.1 \times 10^{24}$$

How many moles are in 90 grams of NaOH? NaOH 1 mol = 40 grams

$$90\text{ grams NaOH} \times \frac{1\text{ mole}}{40\text{ grams}} = 2.25\text{ mol NaOH}$$

How many mols are in 10 grams of Nickel? Find molar mass of Ni

$$10 \text{ g Ni} \times \frac{1 \text{ mol Ni}}{58.69 \text{ g Ni}} = .17 \text{ mol Ni}$$

How many atoms are in .17 mol of Ni?

$$.17 \text{ mol Ni} \times \frac{6.02 \times 10^{23} \text{ atoms of Ni}}{1 \text{mol Ni}} = 1.02 \times 10^{23} \text{ atoms Ni}$$

Calculate the number of moles in 40 g of CO (carbon monoxide)?

Molar mass of CO = 12.01 + 16.0 = 28.01 g/mol

$$40 \text{ gram of CO} \times \frac{\text{Mole}}{28.01 \text{ grams}} = 1.43 \text{ moles}$$

How many grams are in 1.25 moles of Neon gas?

Neon has molar mass of 20 g/mol.

$$1.25 \text{ moles Ne} \times \frac{20 \text{ grams}}{\text{mole}} = 25 \text{ grams}$$

Convert 3 moles of As_2S_3 to grams. Molar Mass of As_2S_3 is 246 g/mol

$$3 \text{ mol } As_2S_3 \times \frac{246 \text{ g } As_2S_3}{\text{mol } As_2S_3} = 738 \text{ g } As_2S_3$$

- Converting from mass (grams) to moles: Divide your initial mass by the molar mass of the compound as determined by the periodic table.
- Converting from moles to mass (grams): Multiply your initial mole value by the molar mass of the compound as determined by the periodic table.
- Converting from volume (liters) to moles: Divide your initial volume by the molar volume constant, 22.4 L.
- Converting from moles to volume (liters): Multiply your mole value by the molar volume constant, 22.4L.
- Converting from particles (atoms, molecules, or formula units) to moles: Divide your particle value by Avogadro's number, 6.02×10^{23}.
- Converting from moles to particles (atoms, molecules, or formula units): Multiply your mole value by Avogadro's number, 6.02×10^{23}.

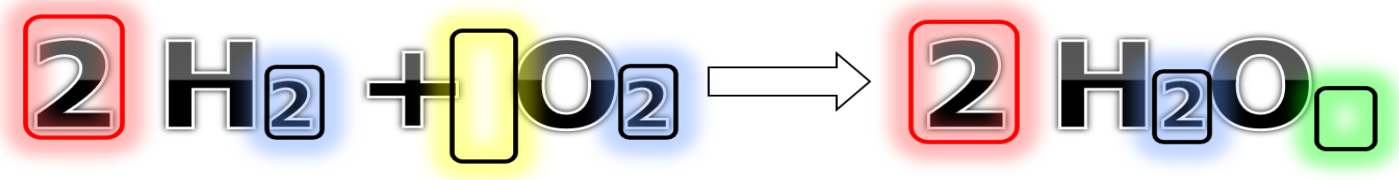
Part 4 Lesson 3 Subscripts and Coefficients

Coefficients tell us the number of molecules. (The number of Moles)

Subscripts tell us how many atoms or ions there are within a compound.
Subscripts of 1 are never written – they're understood.

Which are the subscripts? And which are the coefficients below?

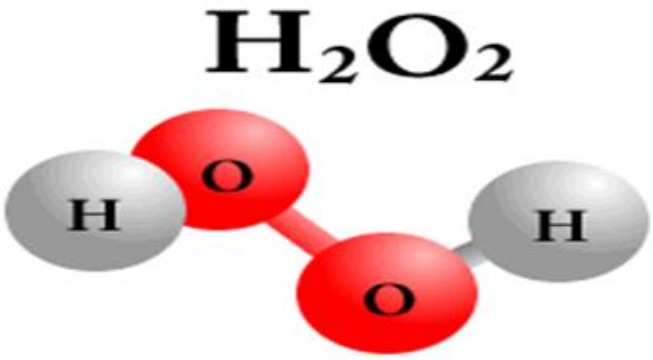
Coefficients of 1 are never written - they are understood.



Coefficients tell us the number of molecules.

Subscripts tell us how many atoms or ions there are within a compound.

Subscripts of 1 are never written – they're understood

How many hydrogen atoms are in hydrogen peroxide?  **2 hydrogen, 2 oxygen**	How many hydrogen atoms are in 2 hydrogen peroxide? $2H_2O_2$ **4 hydrogen, 4 oxygen**

How many elements are in the molecule below? Name each one? $4HClO_4$ 3 Elements, Hydrogen Chlorine Oxygen	How many hydrogen, Chlorine, and Oxygen <u>atoms</u> are in $4HClO_4$? $4HClO_4$ 4 Hydrogen, 4 Chlorine, 16 Oxygen

How many <u>elements</u> are in $2Al_2(SO_4)_3$?

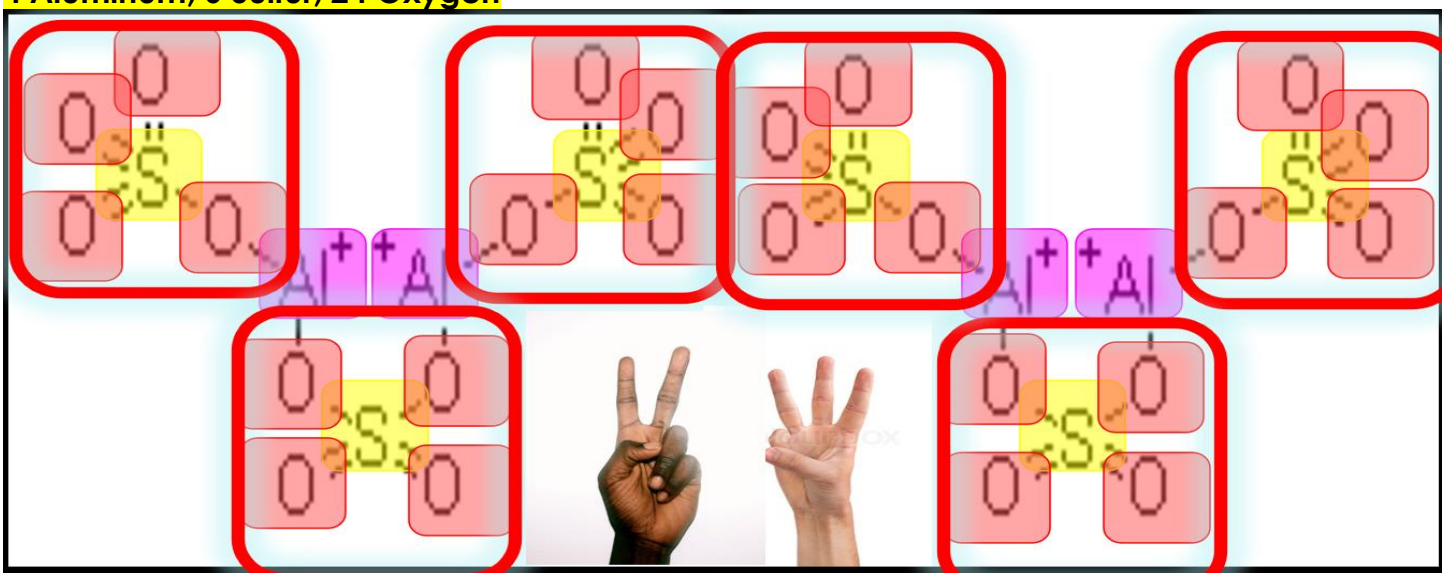
$2Al_2(SO_4)_3$

3 Elements - **Aluminum, Sulfur, Oxygen**

How many Aluminum, Sulfur, and Oxygen atoms are in $2Al_2(SO_4)_3$?

$2Al_2(SO_4)_3$

4 Aluminum, 6 Sulfur, 24 Oxygen



$2KClO_3$	Total Atoms=10	K= 2 Cl=2 O=6
$6H_2O$	Total Atoms=18	O=6 H=12
$4Al_2O_3$	Total Atoms=20	Al=8 O=12
$2C_6H_8O_7$	Total Atoms=42	C=12 H=16 O=14
$6Na_3C_6H_5O_7$	Total Atoms=126	Na=18 C=36 H=30 O=42
$3CCl_4$	Total Atoms=15	C= 3 Cl=12
$12HNO_3$	Total Atoms=60	N=12 H= 12 O=36

How many total atoms and atoms of each element are in the molecules below. **Hint-the total atoms and atoms of each element when added together need to be the same. Law Conservation of Matter!**

Be proactive and work in your journal in real time to get the answers. These are hard.

- https://www.youtube.com/watch?v=PQamMsq79F0

Please view the video for assistance on the first four questions and then you're on your own for 6-10.

Molecule	# of Total Atoms	Atoms of each Element
$8H_2O$	24	H= 16 O= 8
$3CCl_4$	15	C= 3 Cl= 12
$11Be(OH)_2$	55	Be= 11 O= 22 H= 22
$5\ (NH_4)_3PO_4$	100	N= 15 H= 60 P= 5 O= 20
H_2SO_4	7	H= 2 S= 1 O= 4
$Si(HCO_3)_4$	21	Si= 1 H= 4 C= 4 O= 12
$2Al(CO_2)_3$	20	Al= 2 C= 6 O= 12
$2HNO_3$	10	H= 2 N= 2 O= 6
$KMnO_4$	6	K= 1 Mn= 1 O= 4
K_2SO_4	7	K= 2 S= 1 O= 4
$7H_3PO_4$	56	P= 7 H= 21 O= 28
$4Na_2CO_3$	24	Na= 8 C= 4 O= 12

Molecule	# of Total Atoms	Atoms of each Element
$5AgNO_3$	25	Ag= 5 N= 5 O= 15
$Ni(CH_3CO_2)_2$	15	Ni= 1 C= 4 O= 4 H= 6
$2NH_4NO_2$	16	N= 4 O= 4 H= 8
$CO_2(SO_4)_3$	18	S= 3 C= 1 O= 14
$4LiClO_3NH_3$	36	Li= 4 Cl= 4 O= 12 N= 4 H= 12
$4SF_2$	12	S= 4 F= 8
$NCl_3Fe(CHCO_2)_2$	15	N= 1 Cl= 3 Fe= 1 C= 4 O= 4 H= 2
$5NaHCO_3$	30	Na= 5 C= 5 O= 15 H= 5
2 Carbon Tetrachloride $2CCl_4$	10	C= 2 Cl= 8
$2Ag_2CrO_4$	14	Ag= 4 Cr= 2 O= 8
½ P_2O_5	**Trick, you can't have half an atom.**	

Part 4 Lesson 4 Balancing Chemical Equations

Chemical Change: The change of substances into other substances through a rearrangement of the atoms.

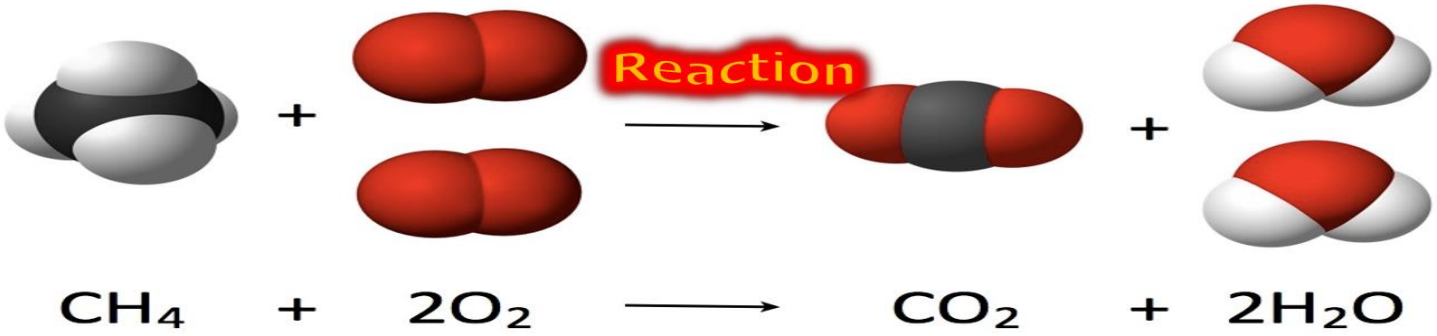
Balancing Chemical Equations.

This is what happens in a chemical reactions
It describes what you start with…and end with.
It also describes the state of matter of each (s) (l) (g)
It also describes the amount of each.

Balancing a chemical equation refers to establishing the mathematical relationship between the quantity of reactants and products.

Which are the reactants? And which are the products?

REACTANTS	PRODUCTS

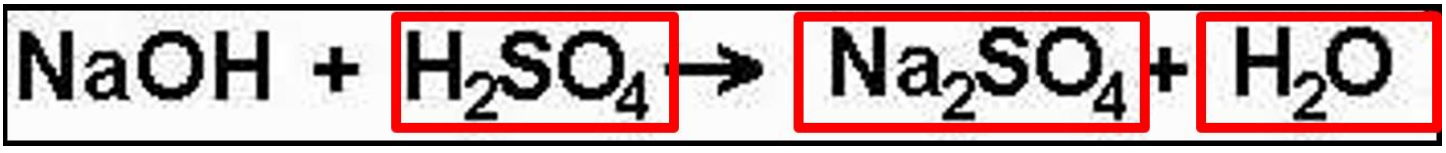


In any physical or chemical change, matter is neither created nor destroyed

Matter can be changed from one form to another.

That means we need to have the same amount of chemicals on each side of the →.

For this reason, put a square around the chemical formulas.



Begin balancing chemical equations by putting numbers (coefficients) in front of them.

Example H_2O on one side could become $2H_2O$

Remember that each side needs to have same number of Hydrogen and Oxygen

Note – Don't change the subscript

Example H_2O becomes H_3O

Please use the provided spaces to balance the chemical equations covered in class.

We'll end up doing this first one twice 😊

$2\ NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2\ H_2O$

Element	Before	After
Na	2	2
O	6	6
H	4	4
S	1	1

$NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$

Element	Before	After
Na		
O		
H		
S		

$1\ CH_4 + 2\ O_2 \rightarrow 1\ CO_2 + 2\ H_2O$

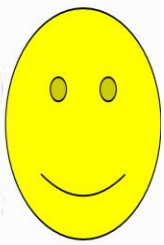
Element	Before	After
C	1	1
H	4	4
O	4	4

$2\ NaCl + 1\ BeF_2 \rightarrow 2\ NaF + 1\ BeCl_2$

Element	Before	After
Na	2	2
Cl	2	2
Be	1	1
F	2	2

$3\ Mg + 1\ Mn_2O_3 \rightarrow 3\ MgO + 2\ Mn$

Element	Before	After
Mg	3	3
Mn	2	2
O	3	3



An easy one…?

$2\ Na + \_\_\_Cl_2 \rightarrow 2\ NaCl$

- The original equation is Na + Cl = NaCl.
- The thing is, chlorine is one of 7 elements that doesn't like to be alone, so it's always 'Cl_2', making the equation Na + Cl_2 = NaCl.
- However, this is no longer balanced. So what you do is add a '2' onto 2 Na, making it 2 Na + Cl_2 = 2NaCl.
- Now the chlorine is balanced, but the sodium isn't.
- After that, to balance the sodium, you add a '2' in front of 'Na' making the equation 2Na + Cl_2 = 2NaCl.

Please try and balance these two unbalanced chemical equations.

2 H_2 + ___ O_2 → **2** H_2O

Inventory Box

Element	Before	After
Hydrogen	2	2
Oxygen	2	1

Inventory Box

Element	Before	After
Hydrogen	2	2
Oxygen	2	2

2 Al + **3** Cl_2 → **2** $AlCl_3$

Inventory Box

Element	Before	After
Aluminum	1	1
Chlorine	2	3

Inventory Box

Element	Before	After
Aluminum	2	2
Chlorine	6	6

6 CO_2 + **6** H_2O ⟹ ___ $C_6H_{12}O_6$ + **6** O_2

Element	Before	After
C	6	6
H	12	12
O	18	18

___ + $C_6H_{12}O_6$ + **6** O_2 ⟹ Released energy + **6** CO_2 + **6** H_2O

Element	Before	After
C	6	6
H	12	12
O	18	18

$2NaCl + \_\_ BeF_2 \rightarrow 2NaF + \_\_ BeCl_2$

Sodium	2	2
Chlorine	2	2
Beryllium	1	1
Fluorine	2	2

$3Mg + \_\_ Mn_2O_3 \rightarrow 3MgO + 2Mn$

Magnesium	3	3
Oxygen	3	3
Manganese	2	2

Please try and balance these two unbalanced chemical equations.

$\_\_\_\_ N_2 + \_\_3\_\_ H_2 \rightarrow \_\_2\_\_ NH_3$

Element	Before	After

Element	Before	After

$\_\_2\_\_ H_2 + \_\_\_\_ O_2 \rightarrow \_\_2\_\_ H_2O$

Element	Before	After

Element	Before	After

$2Na + 2H_2O \rightarrow 2NaOH + \_\_H_2$

$2KClO_3 \rightarrow 2KCl + 3O_2$

$2NaCl + \_\_F_2 \rightarrow 2NaF + \_\_Cl_2$

$4Al + 3O_2 \rightarrow 2Al_2O_3$

$2Al + 6HCl \rightarrow 2AlCl3 + 3H2$

$2NH_4NO_3 \rightarrow \_\_\_ N_2 + \_\_\_ O_2 + 4H_2O$

$2\ NaNO_3 + PbO \rightarrow Pb(NO_3)_2 + Na_2O$

$6\ AgI + Fe_2(CO_3)_3 \rightarrow 2\ FeI_3 + 3\ Ag_2CO_3$

$C_2H_4O_2 + 2\ O_2 \rightarrow 2\ CO_2 + 2\ H_2O$

$ZnSO_4 + Li_2CO_3 \rightarrow ZnCO_3 + Li_2SO_4$

$V_2O_5 + 5\ CaS \rightarrow 5\ CaO + V_2S_5$

$Mn(NO_2)_2 + BeCl_2 \rightarrow Be(NO_2)_2 + MnCl_2$

$3\ AgBr + GaPO_4 \rightarrow Ag_3PO_4 + GaBr_3$

$3\ H_2SO_4 + 2\ B(OH)_3 \rightarrow B_2(SO_4)_3 + 6\ H_2O$

$S_8 + 8\ O_2 \rightarrow 8\ SO_2$

$Fe + 2\ AgNO_3 \rightarrow Fe(NO_3)_2 + 2\ Ag$

1 $AlBr_3$ + **3** $K \rightarrow$ **3** KBr + **1** Al

1 FeO + **1** $PdF_2 \rightarrow$ **1** FeF_2 + **1** PdO

1 P_4 + **6** $Br_2 \rightarrow$ **4** PBr_3

2 $LiCl$ + **1** $Br_2 \rightarrow$ **2** $LiBr$ + **1** Cl_2

1 $PbBr_2$ + **2** $HCl \rightarrow$ **2** HBr + **1** $PbCl_2$

2 $CoBr_3$ + **3** $CaSO_4 \rightarrow$ **3** $CaBr_2$ + **1** $Co_2(SO_4)_3$

2 Na_3P + **3** $CaF_2 \rightarrow$ **6** NaF + **1** Ca_3P_2

2 Mn + **6** $HI \rightarrow$ **3** H_2 + **2** MnI_3

1 Li_3PO_4 + **3** $NaBr \rightarrow$ **1** Na_3PO_4 + **3** $LiBr$

1 CaF_2 + **1** $Li_2SO_4 \rightarrow$ **1** $CaSO_4$ + **2** LiF

Part 4 Review Game

Name:

1-10 = 10 pts * = Bonus + 1 pt, Lesson 8

Due: Today

(Secretly write owl in correct space +1 pt)

Score ____ / 100

Final Question = 5 pt wager

THE SCRIPT KEEPER	THE MORE YOU KNOW	BALANCNING ACT	BLANK STARE	NAME THAT COMPOUND Bonus round 1 pt each
1) 1 mol = 6.02×10^{23} Also called Avogadro's number	6) $Al2(SO_4)_3$ 2 Aluminum, 3 Sulfur, 12 Oxygen	11) C.) Shows the increasing amount of products compared to reactants.	16) ___$Fe_2O_3(s)$ + 3 CO(g) → 2 Fe(l) + 3 $CO_2(g)$	*21) Flubber
2) 189.8 g/mol	7) C.) CH_3COOH	12) A=Reactants B=Products	17) 2 NH_4NO_3 → 2 N_2 + __O_2 + 4 H_2O	*22) Oobleck
3) Multiply Divide	8) B.) H_2CO_3	13) Created or Destroyed +1 Owl	18) __SiO2 + 4 HF → __SiF_4 + 2 H_2O	*23) Fun Dip
4) .15 mol	9) Answer 15 Nickel= 1 Carbon= 4 Oxygen= 4 Hydrogen= 6	14) False, Don't ever do that. That thing, just don't do it… I'm serious!	19) 2 H_2SO_4 +__$Pb(OH)_4$ →__$Pb(SO_4)_2$ +4 H_2O	*24) Dinosaur Eggs
5) Subscript is blue Coefficient is red	10) A.) $C_6H_{12}O_6$	15) 2As + 6 NaOH -> 2Na_3AsO_3 + 3H_2	20) 2 $N_2(g)$ + 5 $O_2(g)$ + 2 H_2O →4 HNO_3 (aq)	*25) Phish Food

Final Question Wager ____/5 Answer: 3 $Hg(OH)_2$ + __H_3PO_4 → 2 $Hg_3(PO_4)_2$ + 6 H_2O