Balancing Chemical Equations

Reminder: Signs of a Chemical Rxn

Change in Properties

Color Change		Formation of a Gas	
Odor Change		Formation of a Precipitate	

Change in Energy

Absorbing/ Releasing Heat		Releasing Light	

Law of Conservation of Mass

In normal chemical reactions *(not nuclear rxns),*

- **Total mass of reactants is equal to total mass of products**
- **Nothing can magically appear**
- **Nothing can magically disappear**

Science not Magic!

Ways to Write Equations

Word Equations

Written with the names of the compounds

hydrogen gas and chlorine gas
combine to form hydrogen chloride gas

Skeleton Equations

Written with formulas

$H_2(g) + Cl_2(g) \rightarrow 2HCl\ (g)$

Parts of Equations

$$A + B \rightarrow C + D$$

Reactants
(starting materials)

Products
(ending materials)

Phases

$$A_{(g)} + B_{(s)} \rightarrow C_{(l)} + D_{(aq)}$$

g = gas

s = solid

l = liquid

aq = “aqueous” – ions in water

Diatomic Gases

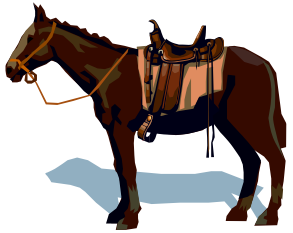
H_2 Cl_2

N_2 Br_2

O_2 I_2

F_2

Horses Need
Oats For Clear
Brown “Eyes”



Rules for Balancing

1) Write the skeleton equation

2) Count atoms on each side of arrow
(look at the subscripts & the coefficients!)

3) Change <u>coefficients</u> so the atoms are balanced; ***<u>NEVER</u> change subscripts!***

4) Make sure coefficients are in lowest ratio possible

5) Check your work!

USE PENCIL!!!

Tips for Balancing that (sometimes) Help!

- **Stuck? Erase and start over!**
- **Try to balance atoms that appear in the fewest number of places first**
- **Try to leave any diatomics until the end**
- **Oxygens are often the hardest to balance**
- **Try to balance polyatomic ions as a "chunk"**
- **Combustion reactions – put a "2" in front of the hydrocarbon and THEN count & balance (may need to reduce your coefficients at the end, but it makes it easier!)**

Practice Problems

Show your work in your notes the way I do!

Yes, eventually you should be able to do these mostly in your head.

BUT you need to be able to show your work when asked, or when you get a hard problem.
SO PRACTICE SHOWING YOUR WORK!

USE PENCIL!!!

USE PENCIL ! ! ! ! !


BRACE YOURSELF
IT IS GOING TO GET WORSE BEFORE
IT GETS BETTER
makeameme.org

#1

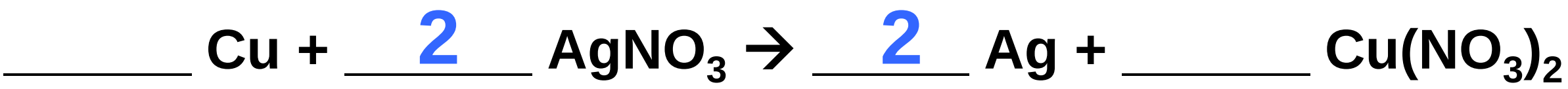
Count each atom – BEFORE, DURING, and AFTER!

2 ZnS (aq) + ____ O_2 (g) → 2 ZnO (aq) + 2 S (s)

Zn:	~~1~~	2	2	Zn:	~~1~~	2	2
S:	~~1~~	2	2	S:	~~1~~	2	2
O:	2		2	O:	~~1~~	2	2

#2

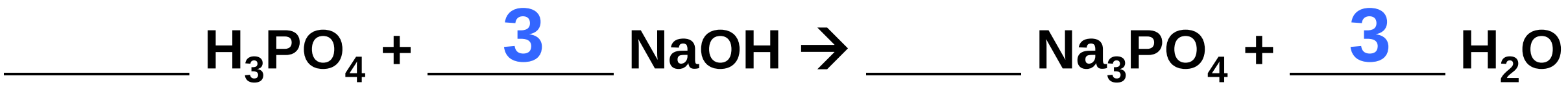
Count each atom – BEFORE, DURING, and AFTER!



Cu:	1		1	Cu:	1		1
Ag:	~~1~~	2	2	Ag:	~~1~~	2	2
N:	~~1~~	2	2	N:	2		2
O:	~~3~~	6	6	O:	6		6

#3

Count each atom – BEFORE, DURING, and AFTER!



H:	~~4~~	6		6	H:	~~2~~	6
P:	1			1	P:	1	
Na:	~~1~~	3		3	Na:	3	
O:	~~5~~	7		7	O:	~~5~~	7

#4

Count each atom – BEFORE, DURING, and AFTER!

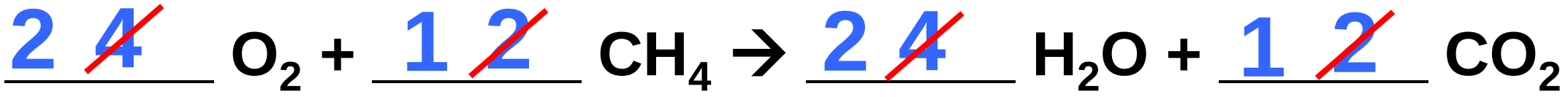
$$\_\_\_\_\_\ Ca_3(PO_4)_2 + \underline{\ 3\ }\ H_2SO_4 \rightarrow \underline{\ 3\ }\ CaSO_4 + \underline{\ 2\ }\ H_3PO_4$$

Ca:	3		3		Ca:	~~1~~ 3		3
P:	2		2		P:	~~1~~ 2		2
O:	~~12~~	20	20		O:	~~8~~ ~~16~~	20	20
H:	~~2~~	6	6		H:	~~3~~ 6		6
S:	~~1~~	3	3		S:	~~1~~ 3		3

#5

Count each atom – BEFORE, DURING, and AFTER!

*Tip! Combustion reaction! Hydrocarbon reacting with oxygen to make carbon dioxide and water. Put a 2 in front of hydrocarbon and THEN count and start the problem



O:	2 ~~4~~	8	8	O:	~~3~~ ~~5~~	8	8
C:	2		2	C:	~~1~~ 2		2
H:	8		8	H:	~~2~~ 8		8

REDUCE!!!!!!!!

#6

Count each atom – BEFORE, DURING, and AFTER!

How to turn it into a multiple choice question?

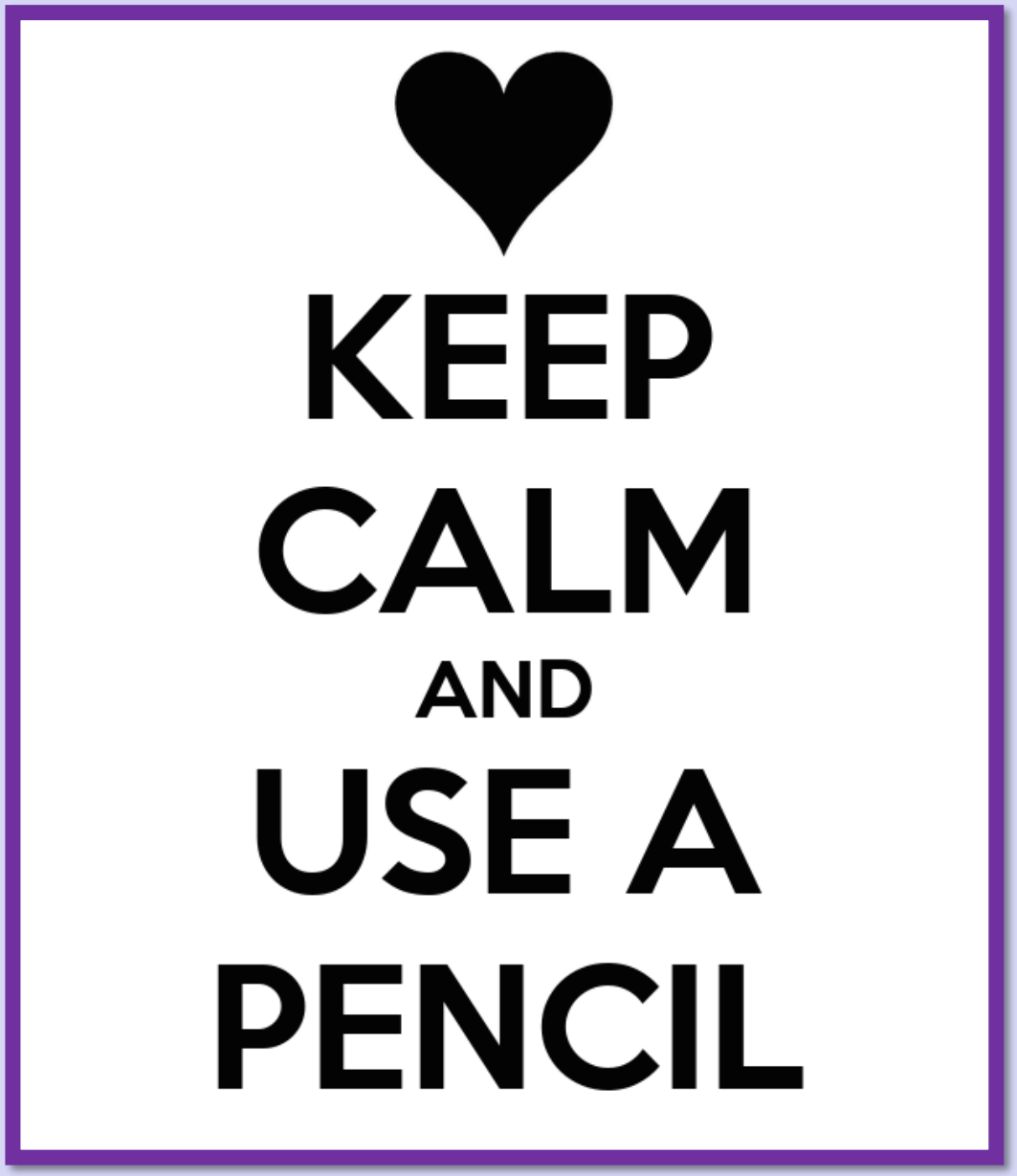
$$\underline{\;1\;}\ Cl_2 + \underline{\;2\;}\ NaBr \rightarrow \underline{\;2\;}\ NaCl + \underline{\;1\;}\ Br_2$$

Cl:	2		2		Cl:	~~1~~ 2	2
Na:	~~1~~ 2		2		Na:	~~1~~ 2	2
Br:	~~1~~ 2		2		Br:	2	2

What is the SUM of the coefficients? 6

List the coefficients: 1, 2, 2, 1

Can't forget that there are 1's when you don't have a # for a coefficient!


KEEP
CALM
AND
USE A
PENCIL

Link to YouTube Presentation

https://youtu.be/xUY2iKdn7jw