

Welcome to IB Chemistry HL!

This class will be one of the most challenging and rewarding classes you take your high school career. Attached is what I am expecting you to have done over the summer. I realize some of it you haven't had for a while or it might even seem new. Feel free to "google" and look up how to solve some of these problems.

We have a lot of information that has to be taught this year so you are prepared for your IB exam in May. In addition, you will be completing an internal assessment which involves creating, completing and analyzing your own, unique chemistry experiment.

Because we have so much to do in the upcoming school year it is extremely important that you complete your summer homework. I do not plan to spend much time on this material in class, but I do expect you to know and understand it as it is review material from last year.

I look forward to seeing you in August!

Mrs. Wyatt

LESSON 1: Moles and Molar Mass

Objective:

- Calculate Molar Mass (gram formula mass)

1. Put an "M" if the substance is molecular/covalent, an "I" if ionic under the formula listed. Then Fill in the remainder of the table

	Formula	Moles of each atom	Total moles of atoms		Formula	Moles of each atom	Total moles of atoms
a.	HClO ₃ M	1 mol of H atoms 1 mol of Cl atoms 3 mol of O atoms	5 mol of atoms	f.	CaCl ₂		
b.	NH ₄ C ₂ H ₃ O ₂			g.	Mg ₃ (PO ₄) ₂		
c.	Mg(OH) ₂			h.	CH ₃ CH ₂ CH ₃		

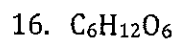
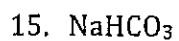
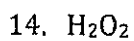
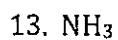
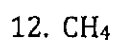
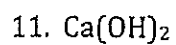
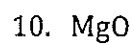
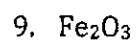
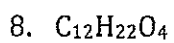
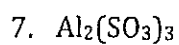
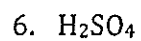
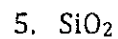
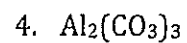
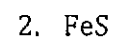
2. Complete the table below. Use Table E!!!

	Ionic Compound	Cation (+ ion)	Anion (- ion)	Total moles of ions		Ionic Compound	Cation (+ ion)	Anion (- ion)	Total moles of ions
a.	NH ₄ C ₂ H ₃ O ₂	NH ₄ ⁺	C ₂ H ₃ O ₂ ⁻	2	e.	CaF ₂			
b.	Ba(NO ₃) ₂				f.	Al ₂ O ₃			
c.	Li ₂ CO ₃				g.	KMnO ₄			
d.	NaHCO ₃				h.	(NH ₄) ₃ PO ₄			

PRACTICE PACKET: Unit 6 Moles & Stoichiometry



Calculate the gram formula mass (molar mass) and don't forget the units!!!



Lesson 2: Calculating Moles

Objective:

- Calculate the number of moles given the grams
- Calculate the number of grams given the moles

Solve for the mass given the moles. (Show your work)

1. 2.00 moles of $C_6H_{12}O_6$

2. 5.00 moles of $SrSO_4$

3. 0.250 moles of CH_4

4. 0.100 moles of NH_3

5. 12.0 moles of SiO_2

6. 0.330 moles of FeS

7. 1.50 moles of MgO

8. 0.500 moles of $ZnCl_2$

PRACTICE PACKET: Unit 6 Moles & Stoichiometry

Find the number of moles in the following measurements: (Show your work)

1. 900. grams $C_6H_{12}O_6$

5. 22 grams of CO_2

2. 24.5 grams H_2SO_4

6. 20. grams of Fe_2O_3

3. 192 grams SiO_2

7. 3.40 grams of H_2O_2

4. 450. grams of $ZnCl_2$

8. 840. grams of $NaHCO_3$

Regents Practice:

1. The molar mass of $Ba(OH)_2$ is

- A) 154.3 g B) 155.3 g
C) 171.3 g D) 308.6 g

2. The gram formula mass of NH_4Cl is

- A) 22.4 g/mole B) 28.0 g/mole
C) 53.5 g/mole D) 93.3 g/mole

3. The gram-formula mass of $(NH_4)_2CO_3$ is

- A) 46.0 g B) 64.0 g C) 78.0 g D) 96.0 g

4. What is the total number of moles in 80.0 grams of C_2H_5Cl (gram-formula mass = 64.5 grams/mole)?

Lesson 3: Mole to Mole Ratios**Objective:**

- Calculate mole ratios in a chemical formula

Use the formula below to answer questions 1-7



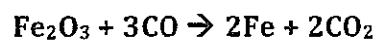
1. If 1.00 mole of water is produced, how many moles of HNO_3 are used?
2. If 1.50 moles of copper are used, how many moles of NO are produced?
3. If 4.50 moles of HNO_3 are used, how many moles of copper (II) nitrate are produced?
4. If 0.200 moles of NO are produced, how many moles of copper (II) nitrate produced?

Challenge Problems

5. If 9.00 grams of water are produced, how many moles of copper were used?
6. If 3.00 moles of copper are mixed with 4 moles of HNO_3 , how many moles of NO can be formed?
7. If 16.0 moles of HNO_3 react with 4.00 moles of copper, how many moles of water are produced?

PRACTICE PACKET: Unit 6 Moles & Stoichiometry

Use the formula below to answer questions 8-13



8. If 3.00 moles of Iron (III) oxide are used, how many moles of Iron are formed?

9. If 2.50 moles of CO are used, how many moles of carbon dioxide are formed?

10. If 8.56 moles of iron were produced, how many moles of the iron ore were used?

Challenge Problems:

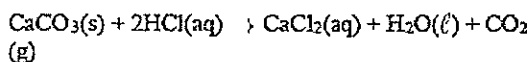
11. If 25.68 grams of iron (III) oxide were used, how many grams of carbon dioxide are formed?

12. If 3.00 moles of iron (III) oxide react with 5.50 moles of CO, how many moles of CO₂ are formed?

13. If 1.00 moles of Fe₂O₃ react with 4.00 moles of CO how many moles of the excess reactant are left over?

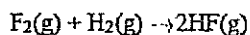
Regents Practice

14. Given the balanced equation:

What is the total number of moles of CO_2 formed when 20. moles of HCl is completely consumed?

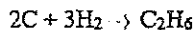
- A) 5.0 mol B) 10. mol
C) 20. mol D) 40. mol

15. Given the balanced equation representing a reaction:

What is the mole ratio of $\text{H}_2(\text{g})$ to $\text{HF}(\text{g})$ in this reaction?

- A) 1:1 B) 1:2 C) 2:1 D) 2:3

16. Given the balanced equation:

What is the total number of moles of C that must completely react to produce 2.0 moles of C_2H_6 ?

- A) 1.0 mol B) 2.0 mol
C) 3.0 mol D) 4.0 mol

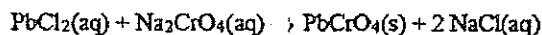
17. Given the reaction:



What is the mole-to-mole ratio between nitrogen gas and hydrogen gas?

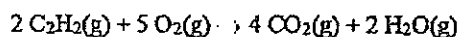
- A) 1:2 B) 1:3 C) 2:2 D) 2:3

18. Given the reaction:

What is the total number of moles of NaCl formed when 2 moles of Na_2CrO_4 react completely?

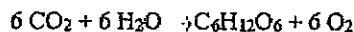
- A) 1 mole B) 2 moles
C) 3 moles D) 4 moles

19. Given the equation:

How many moles of oxygen are required to react completely with 1.0 mole of C_2H_2 ?

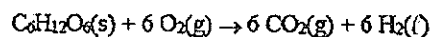
- A) 2.5 B) 2.0 C) 5.0 D) 10

20. Given the reaction:

What is the total number of moles of water needed to make 2.5 moles of $\text{C}_6\text{H}_{12}\text{O}_6$?

- A) 2.5 B) 6.0 C) 12 D) 15

21. Given the reaction:

How many moles of $\text{C}_6\text{H}_{12}\text{O}_6(\text{s})$ are needed to produce 24 moles of carbon dioxide?

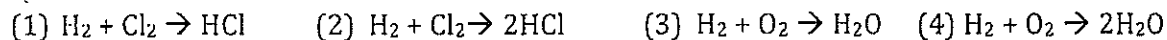
- A) 1.0 moles B) 12 moles
C) 24 moles D) 4.0 moles

Lesson 4: Balancing Reactions

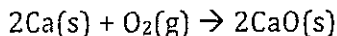
Objective:

- Assess and Balance chemical reactions using coefficients

1. Which equation represents conservation of mass?



2. A 4.86-gram sample of calcium reacted completely with oxygen to form 6.80 grams of calcium oxide. This reaction is represented by the balanced equation below. Determine the total mass of Oxygen that reacted.

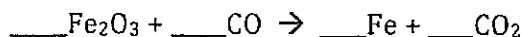


BALANCE THE FOLLOWING REACTIONS

Reaction (fill in the coefficients)	Sum of Coefficients
$\text{C}(s) + \text{H}_2(g) \rightarrow \text{CH}_4$	
$\text{Fe}(s) + \text{O}_2(g) \rightarrow \text{Fe}_2\text{O}_3$	
$\text{NaI}(s) \rightarrow \text{Na}(s) + \text{I}_2(s)$	
$\text{C}_6\text{H}_{12}\text{O}_6(s) \rightarrow \text{C}(s) + \text{H}_2\text{O}(l)$	
$\text{AgNO}_3(aq) + \text{Cu}(s) \rightarrow \text{Ag}(s) + \text{Cu}(\text{NO}_3)_2(aq)$	
$\text{Na}_2\text{CO}_3(aq) + \text{HCl}(aq) \rightarrow \text{NaCl}(aq) + \text{H}_2\text{O}(l) + \text{CO}_2(g)$	
$\text{H}_2(g) + \text{Cl}_2(g) \rightarrow \text{HCl}(g)$	
$\text{N}_2(g) + \text{O}_2(g) \rightarrow \text{N}_2\text{O}_4(g)$	
$\text{CH}_4(g) + \text{O}_2(g) \rightarrow \text{CO}_2(g) + \text{H}_2\text{O}(g)$	
$\text{N}_2(g) + \text{H}_2(g) \rightarrow \text{NH}_3(g)$	
$\text{H}_2\text{O}_2(l) \rightarrow \text{H}_2\text{O}(l) + \text{O}_2(g)$	
$\text{Al}_2\text{O}_3 \rightarrow \text{Al}(s) + \text{O}_2(g)$	
$\text{C}(g) + \text{O}_2(g) \rightarrow \text{CO}_2(g)$	
$\text{CuO}(s) + \text{C}(s) \rightarrow \text{Cu}(s) + \text{CO}_2(g)$	
$\text{Ca}(\text{OH})_2(aq) + \text{HCl}(aq) \rightarrow \text{CaCl}_2(aq) + \text{H}_2\text{O}(l)$	

PRACTICE PACKET: Unit 6 Moles & Stoichiometry

Challenge:



Regents Practice

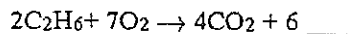
7. Which equation shows a conservation of mass?

- A) $\text{Na} + \text{Cl}_2 \rightarrow \text{NaCl}$ B) $\text{Al} + \text{Br}_2 \rightarrow \text{AlBr}_3$
C) $\text{H}_2\text{O} \rightarrow \text{H}_2 + \text{O}_2$ D) $\text{PCl}_5 \rightarrow \text{PCl}_3 + \text{Cl}_2$

8. All chemical reactions have a conservation of

- A) mass, only
B) mass and charge, only
C) charge and energy, only
D) mass, charge, and energy

9. Given the incomplete equation for the combustion of ethane:



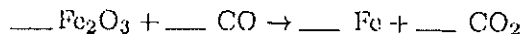
What is the formula of the missing product?

- A) CH_3OH B) HCOOH
C) H_2O D) H_2O_2

10. Which chemical equation is correctly balanced?

- A) $\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O}(\text{g})$
B) $\text{N}_2(\text{g}) + \text{H}_2(\text{g}) \rightarrow \text{NH}_3(\text{g})$
C) $2\text{NaCl}(\text{s}) \rightarrow \text{Na}(\text{s}) + \text{Cl}_2(\text{g})$
D) $2\text{KCl}(\text{s}) \rightarrow 2\text{K}(\text{s}) + \text{Cl}_2(\text{g})$

11. Given the unbalanced equation:

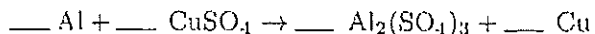


When the equation is correctly balanced using the *smallest* whole-number coefficients, what is the coefficient of CO ?

- A) 1 B) 2 C) 3 D) 4

PRACTICE PACKET: Unit 6 Moles & Stoichiometry

12. Given the unbalanced equation:



When the equation is balanced using the *smallest* whole-number coefficients, what is the coefficient of Al?

- A) 1 B) 2 C) 3 D) 4

13. Given the unbalanced equation:



What is the coefficient of O₂ when the equation is balanced correctly using the *smallest* whole number coefficients?

- A) 1 B) 2 C) 3 D) 4

Types of Reactions

	Equation	Reactant(s)	Product(s)	Type of Reaction
a.	$\text{Cl}_2 + 2\text{NaI} \rightarrow 2\text{NaCl} + \text{I}_2$	Cl ₂ and NaI	NaCl and I ₂	Single replacement
b.	$\text{HNO}_3 + \text{LiOH} \rightarrow \text{H}_2\text{O} + \text{LiNO}_3$			
c.	$2\text{NaN}_3 \rightarrow 2\text{Na} + 3\text{N}_2$			
d.	$\text{Ba}(\text{NO}_3)_2 + \text{K}_2\text{SO}_4 \rightarrow 2\text{KNO}_3 + \text{BaSO}_4$			
e.	$\text{BaO} + \text{SO}_3 \rightarrow \text{BaSO}_4$			
f.	$2\text{Al} + \text{Fe}_2\text{O}_3 \rightarrow \text{Al}_2\text{O}_3 + 2\text{Fe}$			
g.	$\text{P}_4 + 6\text{Cl}_2 \rightarrow 4\text{PCl}_3$			