mod 7 | Key

Molar Mass Notes

- what is a mole?
  - unit of measurement
    - the unit for moles = grams/mol
      ★(g/mol)★

★Avagadro's # - aka the mole
= 6.02×10^{23} ?

- 6.02×10^{23} particles (part)
  atoms
  formula units (f.u.) - compounds
  molecules

★ Constant = the # never changes!
- just like 1 dozen = 12

★ Molar Mass - the mass of 1 mole of any pure substance
(ex: Cl_2, NaCl, NOT NaCl w/ Cl_2 ✗)

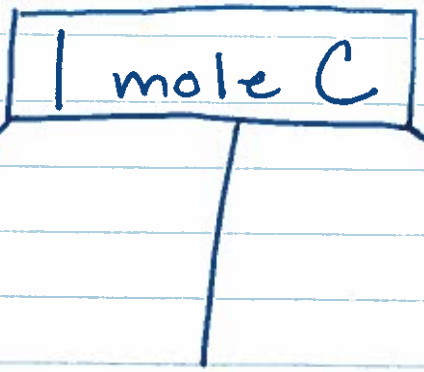
★- Molar Mass of Elements (g/mol)
equals the atomic mass # of the element
- ex: Molar Mass of Carbon? = 12.011 g/mol

6 C 12.011 ← atomic mass

★- Molar Mass of Compounds (g/mol)
equals the sum of molar masses of all elements that make up the compound
- ex: NaCl DO NOT Round!

11 Na 22.990 + 17 Cl 35.453

22.990 + 35.453 = 58.443 g/mol NaCl



6.02×10^{23}
atoms
particles
molecules
f.u.
Constant

12.011 g C
Vary by element
↑
on P. Table!

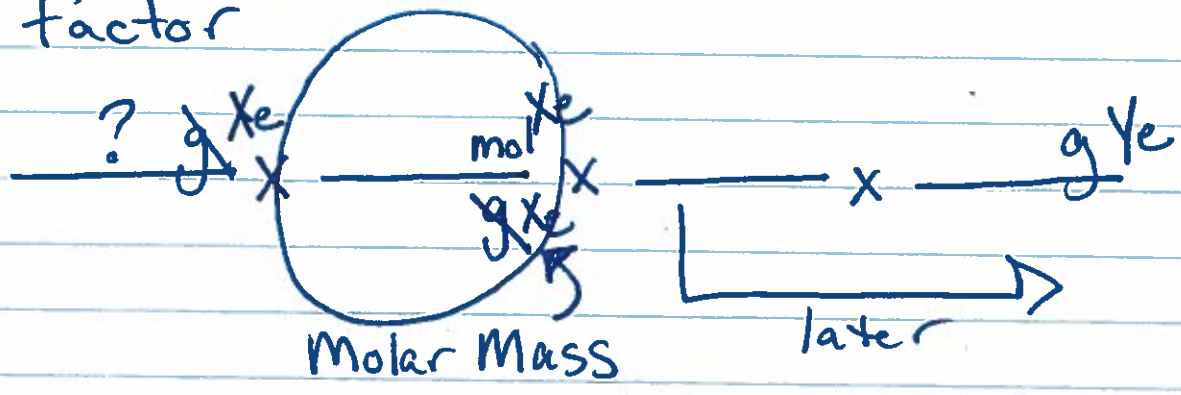
22.4 L
*Constant
*Volume
@ STP

STP = standard temp & pressure

ex: Neon
1 mol = 6.02×10^{23} f.u. Ne
1 mol = 22.4 L Ne
1 mol = 20.179 g Ne *Vary*

Be careful of diatoms
1 mol O = 15.999 g O
1 mol O_2 = 31.998 g O_2
$15.999 \times 2 = 31.998$ g

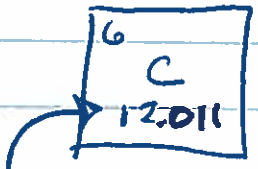
- Molar Mass is used as a conversion factor



- Ex's & Rules

Rules

1st - list elements
2nd - look @ p.table & get mass # for each element
3rd - multiply by the # of each element
4th - Add up #'s for a total g/mol for a compound
5th - Do NOT round!



NaBr

Na	22.99 x 1 = 22.99
Br	79.904 x 1 = + 79.904

102.894 g/mol NaBr

$Zn(C_2H_3O_2)_2$

Zn	65.39 x 1 = 65.39
C	12.011 x 4 = + 48.044
H	1.008 x 6 = 6.048
O	15.999 x 4 = 63.996

183.478 g/mol $Zn(C_2H_3O_2)_2$

- How to get g → mol & mol → g?

Rules

1st - set up conversion factors (tracks)
2nd - plug in #'s (molar mass - g/mol)
3rd - x across top then ÷ by #'s bottom

Start w/ grams

$$\frac{\text{Known \# g C}}{1} \times \frac{1 \text{ mol C}}{12.011 \text{ g C}} = \text{\_\_\_\_ mol C}$$

changes!

Start w/ moles

$$\frac{\text{Known \# mol C}}{1} \times \frac{12.011 \text{ g C}}{1 \text{ mol C}} = \text{\_\_\_\_ g C}$$

Ex:

NaCl

Na	22.990 x 1 = 22.990
Cl	35.453 x 1 = 35.453
	58.443 g/mol NaCl

? 3.54 g NaCl = ? mol NaCl

$$\frac{3.54 \text{ g NaCl}}{1} \times \frac{1 \text{ mol}}{58.443 \text{ g}} = \frac{3.54}{58.443} = \boxed{0.61 \text{ mol NaCl}}$$

g → mol & mol → g ex's

- **NaCl**

NaCl	
Na	22.990 x 1
Cl	35.453 x 1
	58.443 g/mo

- 7.56 g NaCl = ? mol NaCl

$$\frac{7.56\ g\ NaCl}{1} \times \frac{1\ mol\ NaCl}{58.443\ g\ NaCl} = .129\ mol\ NaCl$$

- 2.7 mol NaCl = ? g NaCl

$$\frac{2.7\ mol\ NaCl}{1} \times \frac{58.443\ g\ NaCl}{1\ mol\ NaCl} = 157.796\ g\ NaCl$$

- **$Ca(NO_3)_2$**

$Ca(NO_3)_2$	
Ca	40.078 x 1 = 40.078
N	14.007 x 2 = 28.014
O	15.999 x 6 = 95.994
	164.086 g/mo

- 3.87 g $Ca(NO_3)_2$ = ? mol $Ca(NO_3)_2$

$$\frac{3.87\ g\ Ca(NO_3)_2}{1} \times \frac{1\ mol}{164.086\ g} = .024\ mol\ Ca(NO_3)_2$$

- 10.2 mol $Ca(NO_3)_2$ = ? g $Ca(NO_3)_2$

$$\frac{10.2\ mol}{1} \times \frac{164.086\ g}{1\ mol} = 1673.677\ g\ Ca(NO_3)_2$$