Molar Mass

- Mole (mol) – amount of a substance that contains as many atoms, molecules, or other particles as there are atoms in 12g of carbon-12 isotope
  - Ie: calcium

what you want

$$12.5\,g\ Ca \times \frac{1\ mol\ Ca}{40.08\,g\ Ca} = 0.3119\ mol\ Ca$$

what's given

atomic mass of calcium

Avogadro's Number

$N_A = 6.022 \times 10^{23}$

g → mol → atoms

- Avogadro's number – experimental number of how many atoms of a substance are equal to that of 12g of carbon-12 isotope
  - Ie: aluminum

Avogadro's number

$$10.0\,g\ Al \times \frac{1\ mol\ Al}{26.98\,g\ Al} \times \frac{6.022 \times 10^{23}}{1\ mol} = 2.23\ atoms\ Al$$

  - One step further: how many protons are in 10.0g Al?

Al atomic number

$$2.23\ atoms\ Al \times \frac{13\ p^+}{Al\ molecule} = 2.90 \times 10^{24}\ protons$$

Molecular Mass

- Molecular mass – (AKA molecular weight) the sum of the atomic masses (in amu) in a molecule
  - Ie: H_2O
    = 2(atomic mass of H) + 1(atomic mass of O)
    = 2(1.008 amu) + 1(16.00 amu)
    = 18.02 amu
- Molecular mass is equal to molar mass
  - Ie: 18.02 amu H_2O = 18.02g H_2O

- Ideal Gas Law $PV=nRT$
  - Pressure-volume-temperature relationship

P = 1 atm

V = ?

n = 1.37 mol

R = 0.0821

T = 273.15 K

$$V = \frac{nRT}{P} = \frac{(1.37\ mol)(0.082\ \frac{L \cdot atm}{mol \cdot K})(273.15\ K)}{1\ atm} = 30.7\ L$$

- Dalton's Law $P_T = P_1 + P_2 + P_3...$
  - Partial pressure
  - Above sealevel = <1, below sea level = >1

$P_{O_2} = .100$

$P_{H_2} = .111$

$P_{N_2} = .692$

$P_{CO_2} = .010$

$P_{He_2} = \frac{.087}{1.0\ atm}$ ← at sealevel!

- Standard Temperature and Pressure $g \rightarrow mol \rightarrow L$
  - 1 mol of any gas = 22.4 L
  - Ie:

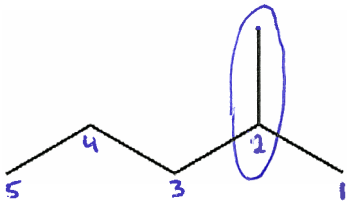
$$10.0_g\ O_2 \times \frac{1\ mol\ O_2}{32.00_g\ O_2} \times \frac{22.4\ L}{1\ mol\ O_2} = 7\ L$$

Molar Mass of a Gaseous Substance $M = dRT / P$

- Ie:

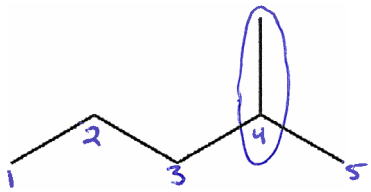
$$M = \frac{(2.21\ g/L)(0.0821\ \frac{L \cdot atm}{mol \cdot K})(300.15\ K)}{1\ atm} = 54.5\ g/mol$$

3. The alkyl groups are organized by the smallest number first when naming.



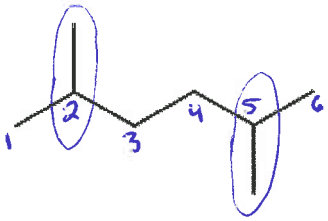
2-methylpentane

NOT:



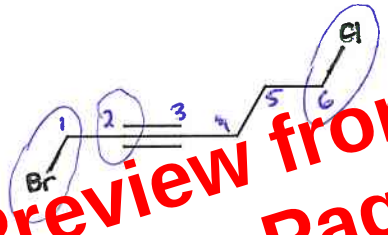
4-methylpentane

4. Prefixes (di-, tri-, etc.) are used when there is more than one of the same group.



2,5-dimethylhexane

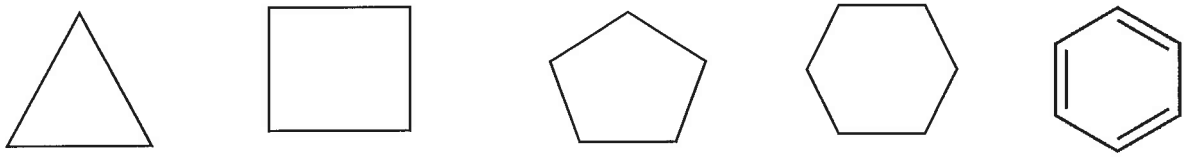
5. Names of substituents (bromo, chloro, etc.) are used in alphabetical order



1-bromo-6-chloro-3-hexyne

- Cycloalkanes

cyclopropane cyclobutane cyclopentane cyclohexane benzene



Functional Groups

- Reactivity of a compound is determined by the number and type of functional group
- Alcohol R–O–H
- Ether