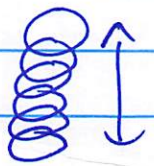
9/14/2018

| | |
|---|---|
| 2 = pair | 20 = score |
| 12 = dozen | 144 = gross |
| 13 = baker's dozen | 10,000 = myriad |

$6.022 \times 10^{23}$ = mole (mol) (a chemist's dozen)

↑ Avogadro's #

1 mol pennies



4 light years.

Why this #?

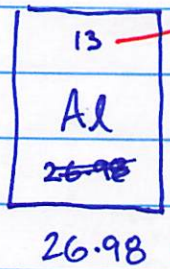
$6.022 \times 10^{23}$ = #atoms in 12-g of $^{12}_{6}C$.

- can use mol as a conversion-factor.

ex: 1 mol Cu = $6.022 \times 10^{23}$ atoms Cu

Q: 2.45 mol Cu → ? atoms

$$2.45 \text{ mol Cu} \times \frac{6.022 \times 10^{23} \text{ atoms Cu}}{1 \text{ mol Cu}} = 1.48 \times 10^{24} \text{ atoms Cu}$$



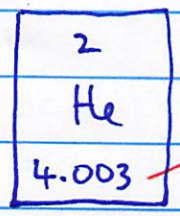

atomic #, $Z = \#p^+$

atomic mass ~> average mass of Al atom in amu or u

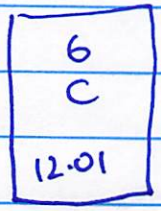
1 atom Al = 26.98u Al

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

602,200,000,000,000,000,000,000 atoms Al = 26.98g Al




1 mol He = $6.022 \times 10^{23}$ He atoms = 4.003g He




1 mol C = 12.01g C

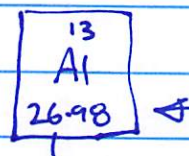
Ex: How many atoms of Al are there in 1.86g Al

PLAN: g —(atomic mass)→ mol —(avog. #)→ #

$$1.86\text{g Al} \times \frac{1\text{ mol Al}}{26.98\text{g Al}} \times \frac{6.022\times10^{23}\text{ atoms Al}}{1\text{ mol Al}}$$

3 s.f. | ∞ s.f. | 4 s.f. | 4 s.f. | ∞ s.f.

$= 4.15 \times 10^{22}$ atoms of Al




26.98g Al = 1 mol Al

1 mol Al = $6.022 \times 10^{23}$ atoms

Q: What mass would $8.70 \times 10^{20}$ atoms of Au weigh?

Plan: #atoms $\xrightarrow{①}$ mol $\rightarrow$ g

| 79 |
| --- |
| Au |
| 196.97 |

① $1 \text{ mol Au} = 6.022 \times 10^{23} \text{ atoms Au}$

② $196.97 \text{ g Au} = 1 \text{ mol Au}$

$$\frac{8.70 \times 10^{20} \text{ atoms}}{1} \left| \frac{1 \text{ mol Au}}{6.022 \times 10^{23} \text{ atoms}} \right| \frac{196.97 \text{ g Au}}{1 \text{ mol Au}} = 0.285 \text{ g Au}$$

# Chapter 3: Molecules, Compounds, + Chemical Equations

Recall: Compounds ~> fixed ratio of elements.
~ formed from whole # combinations of atoms of 2 or more elements BONDED together.

Two kinds of bonds:

(1) Ionic bond (Metal + Non-metal)

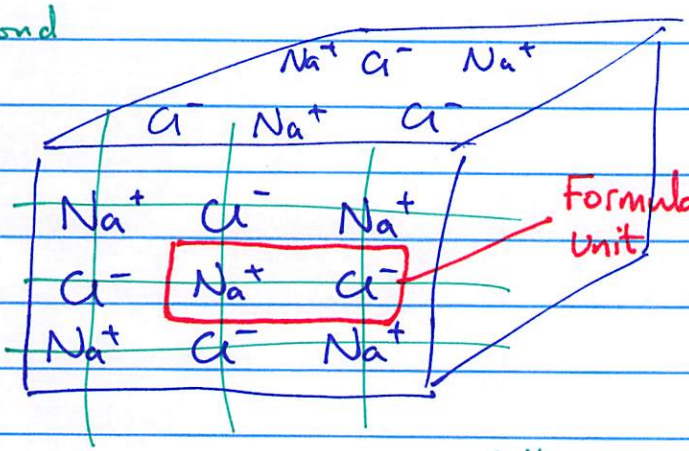
ex: $Na \rightarrow Na^+ + e^-$
$e^- + Cl \rightarrow Cl^-$
ions

$e^-$ transfers from Na to Cl

$Na^+ \equiv Cl^-$
└ ionic bond

SOLID:

ionic compound




crystal lattice

(2) Covalent bond (Non-metal + non-metal)

shared
$e^-$'s shared between atoms.

(+) ↔ $e^-$ ↔ (+)
nucleus nucleus