Tuesday 1/7/20

"Isotopes" POGIL

p^+ + # n^0 = mass

p^+ − # e^- = charge on atom

Isotope symbol for element X

$${}^{\text{mass \#}}_{\text{atomic \#}}X^{\text{charge (if any)}}$$

mass #
− atomic #
---
of n^0

of protons - is solely responsible for chemical and physical characteristic of an atom. Different # of p^+ → different <u>element</u>

# of neutrons - neutrons exert the strong force on p^+ to keep nucleus from falling apart. different # of n^0 → different <u>isotope</u>

# of electrons - electrons are attracted to the p^+ in the nucleus, they tend to balance charge. excess or lack of e^- → <u>ions</u>

Carbon-12 $\longrightarrow$ $^{12}_{6}C$

↑ ↑

element mass#

Boron-11 $\rightarrow$ $^{11}_{5}B$

Wed 1/8/20

H_2
O_2

HO

ratio of O:H $\frac{16g}{2g}$ or $\frac{8}{1}$

Law of Definite proportions → H_2O is always $\frac{2g\ H}{18g\ H_2O}$
regardless of the amount of H_2O

Law of Multiple proportions

→ $\frac{32g\ O}{16g\ O} = 2$

CO → molar mass = 28g
12gC

CO_2 → molar mass = 44g
12gC

$$3\ doz \times \frac{12\ donuts}{1\ doz} = 36\ donuts$$

$$3\ mol \times \frac{6.02 \times 10^{23}\ donuts}{1\ mol} = 18.06 \times 10^{23}\ donuts$$

Dalton's Atomic Theory

① ✓ All matter is composed of atoms.

② All atoms of a particular element are identical ☆ to all other atoms of that element. isotopes n^0

③ Atoms can never be subdivided, created, or destroyed. ☆

p^+, e^-, n^0

④ ✓ Atoms combine in simple, whole-number ratios to form compounds.

⑤ ✓ Chemical reactions occur when atoms are combined, separated and or rearranged.

elemental symbol	atomic #	# of p^+	# n^0	# e^-	mass #	isotope symbol	ion? (y/n) & charge
K					40		Y (+1)
			2	1			
		17	18	18			
	92		143				n
						$^{23}_{11}Na^+$	

$$\%\text{error} = \frac{\left|\text{expermental value} - \text{known value}\right|}{\text{known value}} \times 100\%$$

Metal A	Metal B	Metal C	H_2O
2.70 g/mL	11.3 g/mL	7.30 g/mL	1.00 g/mL

H_2O
↑

1mol = 6.02×10^{23} particles

1mol H = 1.0g
1mol O = 16.0g } from per. table

↙ 1
H_2O
(2xH) = 2.0g
1xO = 16.0g
18.0g/mol

retro H:H_2O $\frac{2.0g}{18.0g}$

retro H:O $\frac{2.0g}{16.0g} = \frac{1}{8}$

KO K_2O K_4O

---

retro K:O

O
1.00g

K
1.22g

K
2.44g

K
4.89g

1.22
2.44
4.89

K
$\frac{2.44}{1.22} = 2$

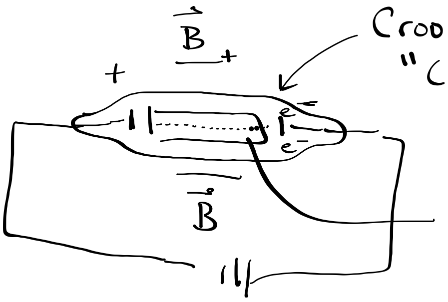
$\frac{4.89}{2.44} \approx 2$

$\frac{4.89}{1.22} = 4$

Thursday 1/9/20

Discovery of the electron (e^-) 1897

J.J. Thomson

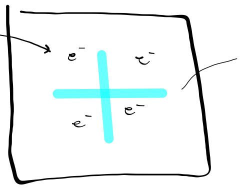


Crooke's tube
"Cathode ray tube"

electron beam deflects in a magnetic field.

Atomic model after Thomson → the "plum-pudding" model

electrons are the "plums"

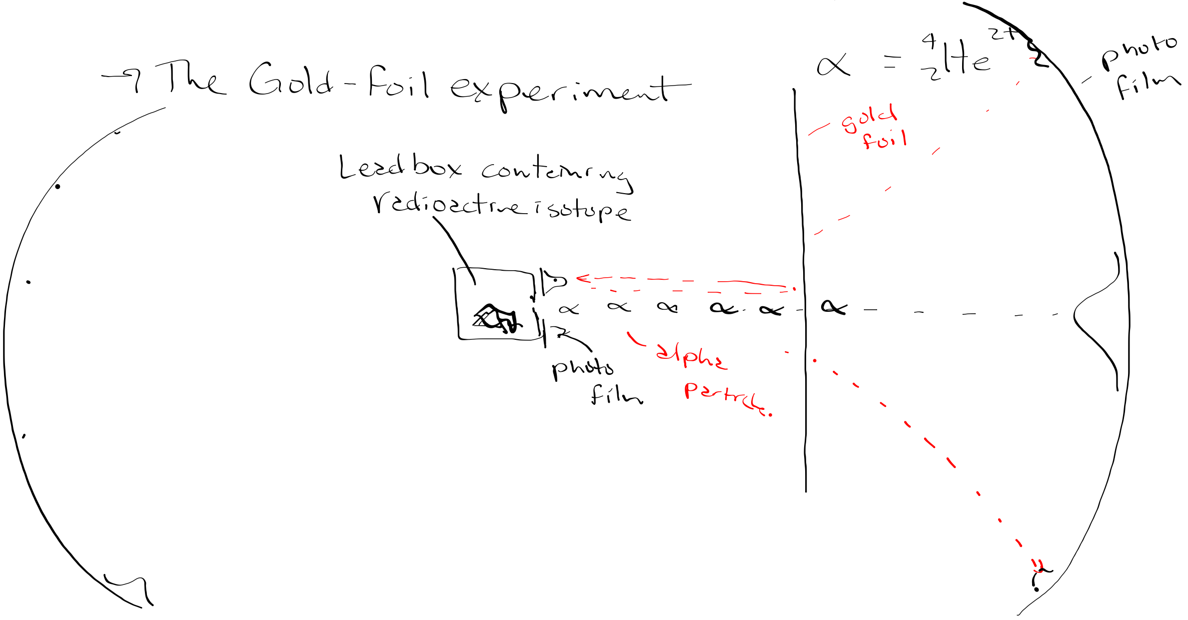


positive charged field

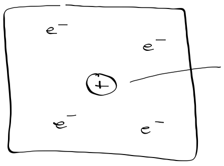
The discovery of the nucleus → E. Rutherford 1911

→ The Gold-Foil experiment

$\alpha = {}^4_2He^{2+}$

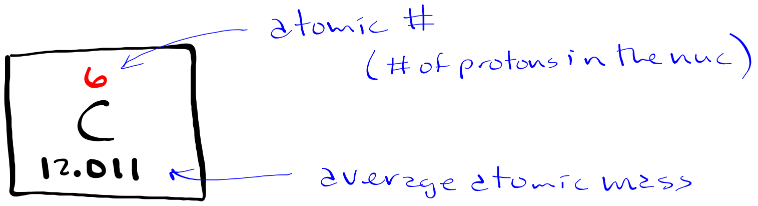


Conclusion:



nucleus -
- contains all of the + charge and most of the mass of the atom

Calculating average atomic mass



Bb - bowling-ball onium

relative abundance

Bb-16 80% are Bb-16

Bb-10 20% are Bb-10

$$\frac{16+16+16+16+16+16+16+16+10+10}{10} = AVG$$

$$\frac{(8 \times 16)}{10} + \frac{(2 \times 10)}{10} =$$

$$\left(\frac{8}{10} \times 16\right) + \left(\frac{2}{10} \times 10\right) =$$

$$(0.80 \times 16) + (0.20 \times 10) = 14.8\#$$

Copper has two isotopes Cu-63 & Cu-65

The masses and rel. abd. for these are as follows

— or amu = the mass of p^+/n^0

	rel. abd.	measured mass (u)
Cu-63	69.15 %	62.929601
Cu-65	30.85%	64.927794

Calculate the average atomic mass of Copper.

$$(0.6915 \times 62.929601u) + (0.3085 \times 64.927794u) = 63.55\,u \text{ or amu}$$

Molar-mass - the mass of one mole of a substance → "substance" = element or compound

$2H_2 + O_2 \rightarrow 2H_2O$

$2.0g\,H_2 + 32.0g\,O_2 \rightarrow 36.0g\,H_2O$

How many molecules are there in 1.50 g H_2O?

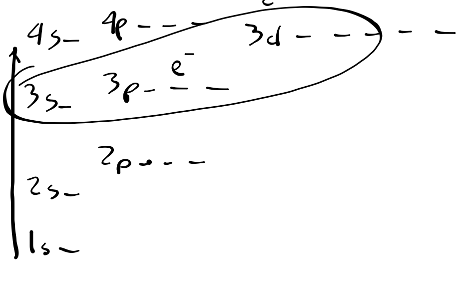
$$1.50g\,H_2O \times \frac{1 \text{ mol } H_2O}{18.0\,g\,H_2O} \times \frac{6.02\times10^{23} \text{ molecules } H_2O}{1 \text{ mol } H_2O} =$$

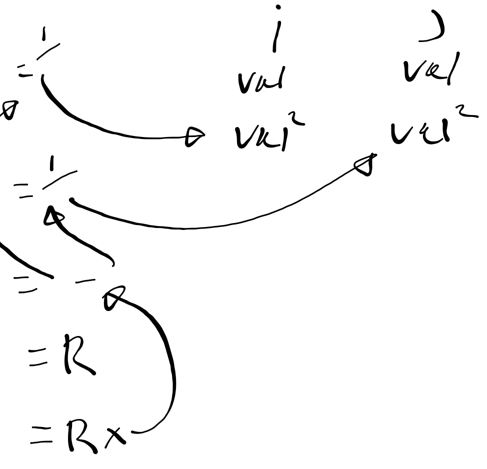
What is the mass of 3.45×10^{22} molecules of O_2?

$$3.45\times10^{22} \text{ molec. } O_2 \times \frac{1 \text{ mol } O_2}{6.02\times10^{20} \text{ molecules } O_2} \times \frac{32.0\,g\,O_2}{1 \text{ mol } O_2} =$$

To the tune of "Take on me"

Take-home test
(Take-home test)
Cry on break
(Take-home test)
Turn it in -
in a day or TWOOOO





Friday 1/10/20

from the hmk #18,19 p.92

18) How many moles of atoms are there in...

a) $\underline{6.022} \times 10^{23}$ atoms Ne $\times \frac{1 \text{ mol Ne}}{6.022 \times 10^{23} \text{ atoms Ne}} = 1.000$ mol Ne

b) 3.011×10^{23} atoms Mg $\times \frac{1 \text{ mol Mg}}{6.022 \times 10^{23} \text{ atoms Mg}} = 0.5000$ mol Mg

c) 3.25×10^{5} g Pb $\times \frac{1 \text{ mol Pb}}{207.2 \text{ g Pb}} = \dot{1}\dot{5}\dot{6}8.53$

1570 mol Pb

1.57×10^{3} mol Pb

d) 4.50×10^{-12} g O $\times \frac{1 \text{ mol O}}{16.0 \text{ g O}} = 2.81 \times 10^{-13}$ mol O

19)

	rel. abd.	mass mass (u)
Ar - 36	0.337%	35.97
Ar - 38	0.063%	37.96
Ar - 40	99.600%	39.96

The answer will be approximately

a) 36u

b) 38u

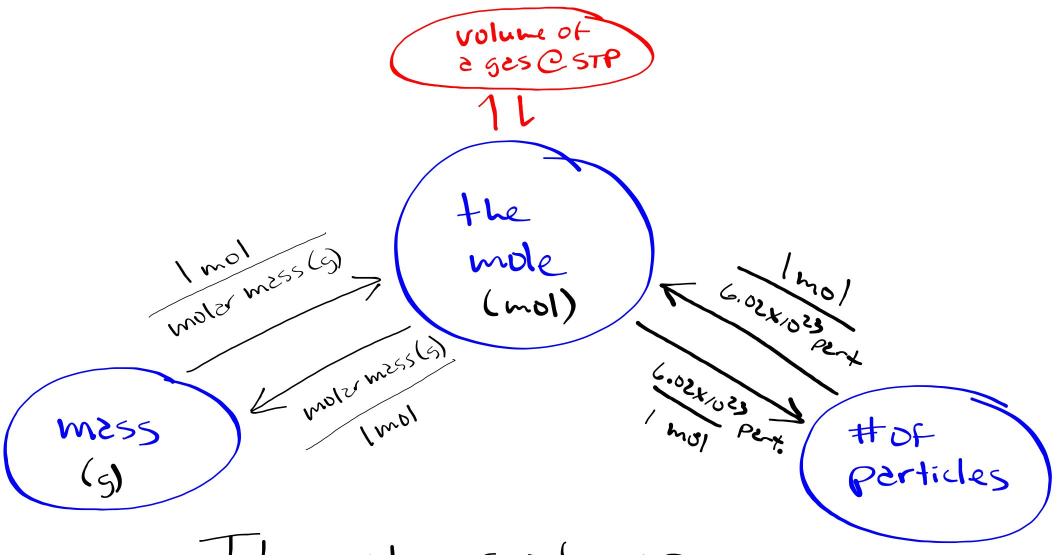
c) 39.96u

d) cannot be determined

$(0.00337 \times 35.97u) + (0.00063 \times 37.96u) + (0.99600 \times 39.96u)$

$0.121u + 0.024u + 39.80 = 39.945$

$\boxed{39.95u}$



The molar road map

How many molecules are there
in . . . .

a) 5.5 moles of H_2O mol → molecules

$$5.5 \cancel{mol}\ H_2O \times \frac{6.02\times10^{23} \text{ molecules } H_2O}{1 \ \cancel{mol\ H_2O}} = 3.3\times10^{24} \text{ molec. } H_2O$$

3 30000000000000000000000 molec. H_2O

b) 3.65 g CO_2 mass → mol → part

$$3.65\,g\,CO_2 \times \frac{1 \text{ mol } CO_2}{44.0\ g\,CO_2} \times \frac{6.02\times10^{23} \text{ molec. } CO_2}{1 \text{ mol } CO_2} = \underline{4.99\times10^{22} \text{ molecules } CO_2}$$

c) 10.5 g N_2O g → mol → molec

$$10.5\,g\,N_2O \times \frac{1 \text{ mol } N_2O}{44.0\ g\,N_2O} \times \frac{6.02\times10^{23} \text{ molecules } N_2O}{1 \text{ mol } N_2O} = 1.44\times10^{23} \text{ molecules } N_2O$$

Mon 1/13/20

21) How many atoms are there in...

a) $$1.50 \text{ mol } N_2 \times \frac{6.02\times10^{23} \text{ atom } N_2}{1 \text{ mol } N_2} = \underline{9.03\times10^{23} \text{ atoms } N_2}$$

c) $$7.02 \text{ g Si} \times \frac{1 \text{ mol Si}}{28.1 \text{ g Si}} \times \frac{6.02\times10^{23} \text{ atoms Si}}{1 \text{ mol Si}} = \underline{1.50\times10^{23} \text{ atoms Si}}$$

22) How many grams in ... ?

atoms → mol → g

a) $$3.011\times10^{23} \text{ } \cancel{\text{atoms}} \text{ F} \times \frac{1 \text{ } \cancel{\text{mol}} \text{ F}}{6.022\times10^{23} \text{ } \cancel{\text{atoms}} \text{ F}} \times \frac{19.0 \text{ g F}}{1 \text{ } \cancel{\text{mol}} \text{ F}} = 9.500 \text{ g F}$$

c) $$4.50\times10^{12} \text{ } \cancel{\text{atoms}} \text{ Cl} \times \frac{1 \text{ } \cancel{\text{mol Cl}}}{6.022\times10^{23} \text{ } \cancel{\text{atoms}} \text{ Cl}} \times \frac{35.5 \text{ g Cl}}{1 \text{ } \cancel{\text{mol Cl}}} = 2.65\times10^{-10} \text{ g Cl}$$

e) $$25 \text{ } \cancel{\text{atoms}} \text{ W} \times \frac{1 \text{ } \cancel{\text{mol W}}}{6.022\times10^{23} \text{ } \cancel{\text{atoms}} \text{ W}} \times \frac{183.8 \text{ g W}}{1 \text{ } \cancel{\text{mol W}}} = 7.63\times10^{-21} \text{ g W}$$

23) Determine the # of atoms in ....

gB → mol → atoms B

a) $$5.40 \text{ g B} \times \frac{1 \text{ mol B}}{10.8 \text{ g B}} \times \frac{6.02\times10^{23} \text{ atoms B}}{1 \text{ mol B}} = 3.01\times10^{23} \text{ atoms B}$$

mol K → atom K

c) $$0.0384 \text{ mol K} \times \frac{6.02\times10^{23} \text{ atoms K}}{1 \text{ mol K}} = 2.31\times10^{22} \text{ atoms K}$$

e) $$1.00\times10^{-10} \text{ } \cancel{\text{g Au}} \times \frac{1 \text{ } \cancel{\text{mol Au}}}{197.0 \text{ } \cancel{\text{g Au}}} \times \frac{6.02\times10^{23} \boxed{\text{atoms}}}{1 \text{ } \cancel{\text{mol Au}}} = 3.06\times10^{11} \text{ atoms Au}$$