9/4/2019 | Reminders

Mastering Homework: Up FRI @ 5pm
Due Mon @ NOON

PRE-LABS : Due on Bb @ noon on lab day

Quizzes : @ 2:30 in MAS 212 on lab day!
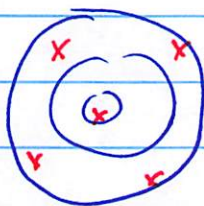
Accuracy + Precision

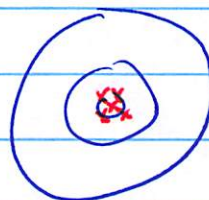Accuracy ~ how close our measurements are to TRUE value

Precision ~ " ———————————————————— " each other.
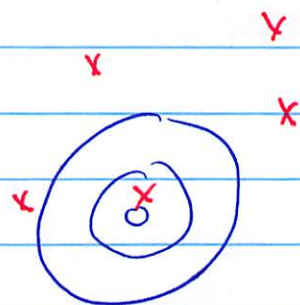
dartboard analogy
- aiming for bullseye

A ✗   A ✓   A ✓   A ✗
P ✓   P ✗   P ✓   P ✗
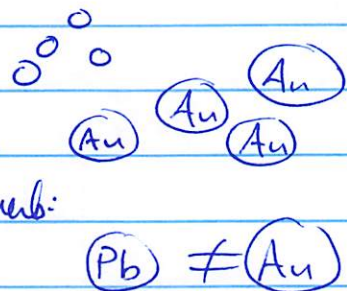
read 1.8, 1.9

Chapter 2 : Atoms + elements.

Atomos : uncuttable : $\frac{o|o}{o|o}$
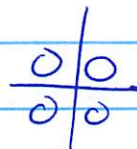
John Dalton, 1808 : "Atomic theory"

1. Elements consist of atoms :
2. Atoms of a given element : same .
&u - diff't from atoms of other elements:

(Pb) ≠ (Au)

Measure the mass of a 10.00 g lead block

	Student A	Student B	Student C
Trial 1	10.49 g	9.78 g	10.03 g
Trial 2	9.79 g	9.82 g	9.99 g
Trial 3	9.92 g	9.75 g	10.03 g
Trial 4	10.31 g	9.80 g	9.98 g
Average	10.13 g	9.79 g	10.01 g

Student A:
⊗ Inaccurate
⊗ Imprecise

Student B:
⊗ Inaccurate
✓ Precise

Student C:
✓ Accurate
✓ Precise

3. Atoms combine in simple, whole # ratios to form compounds:

ex: water (H)(O)(H)   methane: (H)(C)(H) with (H) above and (H) below

2 'H' : 1 'O'   1 'C' : 4 'H'
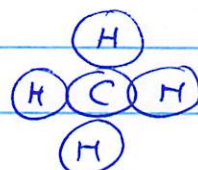
4. Chem rxns: shuffling around atoms... changing bonds!

ex: (H) above (H)(C)(H) (H) below   (O O) (O O) $\longrightarrow$ (O)(C)(O)   (H)(O)(H)

burning methane   (H)(O)(H)
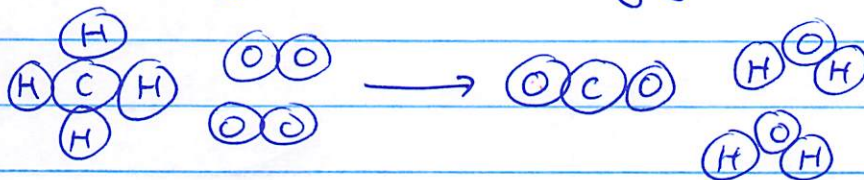
read 2.4 : discovery of e^-.

Structure of the atom

Rutherford gold-foil xpt

detector screen

v. few

gold foil

some

radioactive α-particle source

most

Nuclear model
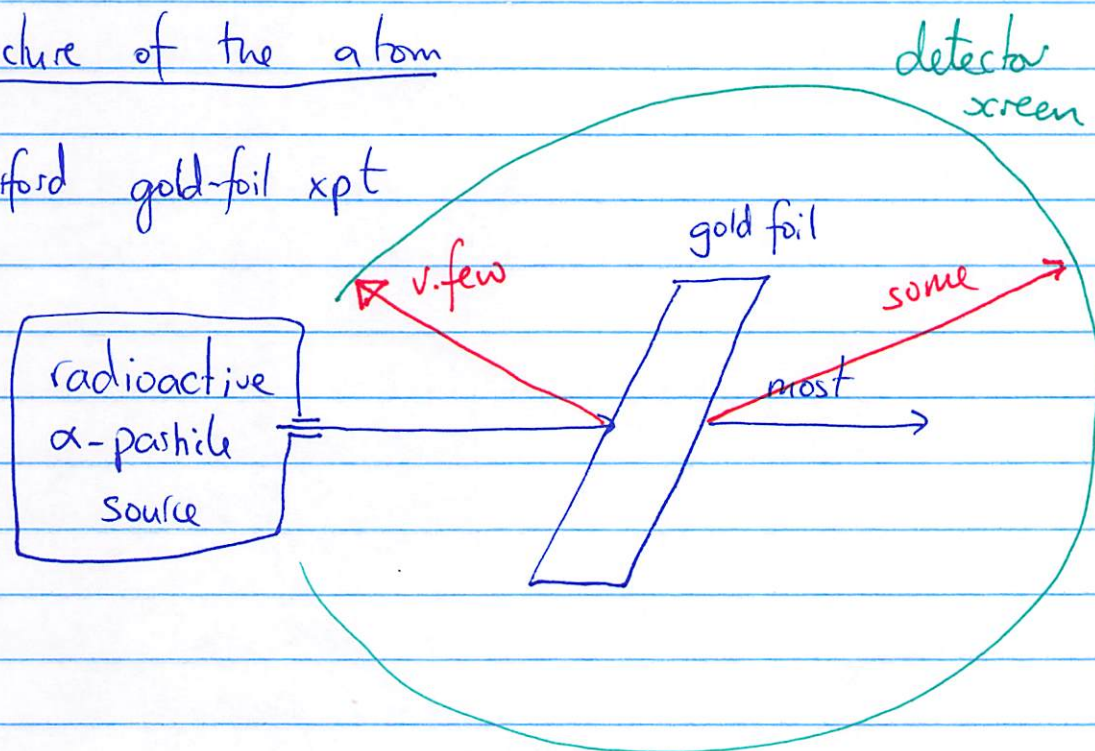

direct hit

electron cloud "fluffy"
< 1% mass
-ve charge

nucleus
> 99% mass of atom
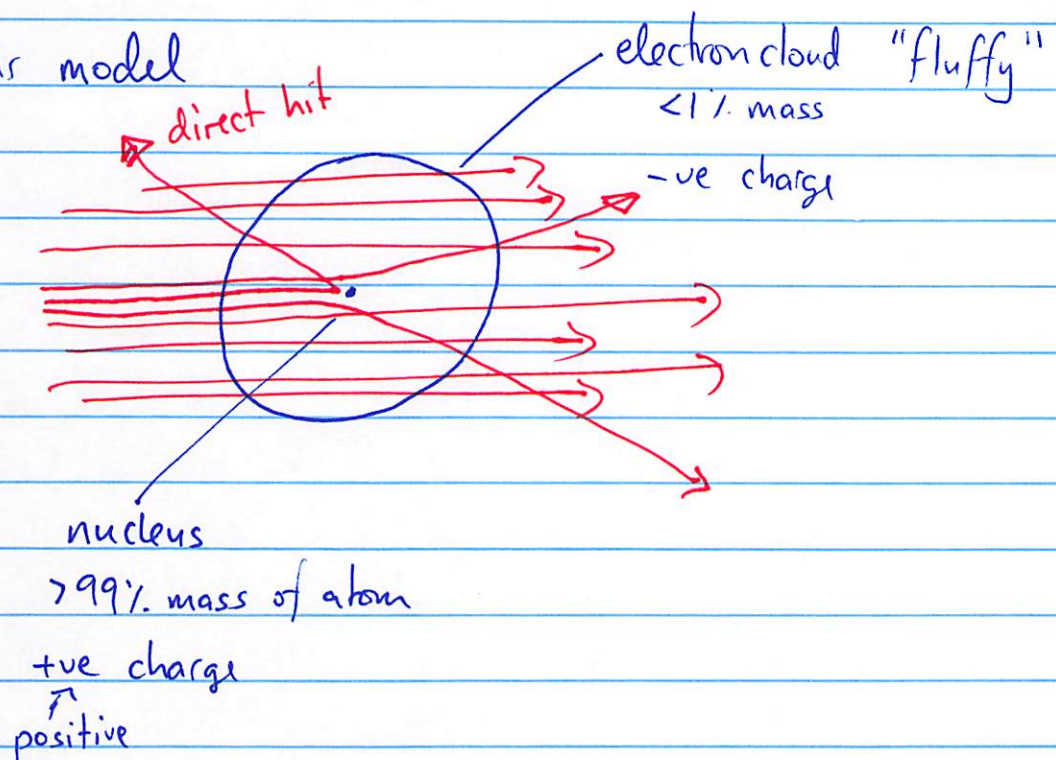
+ve charge
positive

Sub-atomic particles

later work showed the existance of 3 simpler particles inside atoms.

	mass (u)	relative charge	
protons, p^+	$1.007u \approx 1u$	$+1$	found in nucleus
neutrons, n^0	$1.009u \approx 1u$	0	
electrons, e^-	$0.00055u \approx 0u$	-1	e^- cloud

same # of $p^+ = e^-$ in our neutral atoms

$$1u = 1amu = 1.67 \times 10^{-27} Kg = \frac{1}{12} \text{ mass of carbon-12 atom}$$
(atomic mass unit)

Rutherford's Gold Foil Experiment

Positively charged α particles are directed at an ultrathin sheet of gold foil.

A few α particles are deflected through large angles.

Most α particles pass through with little or no deflection.

Gold foil

Alpha particles

Source

Lead

Detector

Electron

Sphere of positive charge

Plum-pudding model

Plum-pudding atom

Predicted Result

Actual Result

Alpha particles

Nucleus   Electron cloud

Plum-pudding model

Nuclear model

● Proton
● Neutron

TABLE 2.1 ■ Subatomic Particles

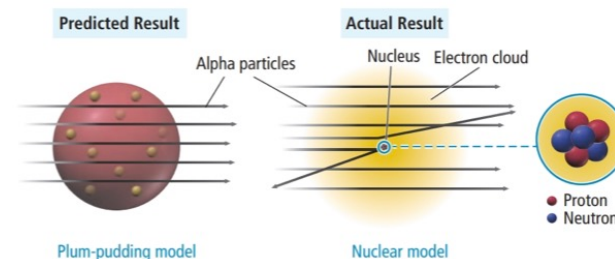|	Mass (kg)	Mass (amu)	Charge (relative)	Charge (C)
Proton	1.67262×10^{-27}	1.00727	+1	$+1.60218 \times 10^{-19}$
Neutron	1.67493×10^{-27}	1.00866	0	0
Electron	0.00091×10^{-27}	0.00055	−1	-1.60218×10^{-19}

The Periodic Table

Know these elements!

Atomic number (Z)

4
Be
beryllium

Chemical symbol

Name

1 H hydrogen																	2 He helium
3 Li lithium	4 Be beryllium											5 B boron	6 C carbon	7 N nitrogen	8 O oxygen	9 F fluorine	10 Ne neon
11 Na sodium	12 Mg magnesium											13 Al aluminum	14 Si silicon	15 P phosphorus	16 S sulfur	17 Cl chlorine	18 Ar argon
19 K potassium	20 Ca calcium	21 Sc scandium	22 Ti titanium	23 V vanadium	24 Cr chromium	25 Mn manganese	26 Fe iron	27 Co cobalt	28 Ni nickel	29 Cu copper	30 Zn zinc	31 Ga gallium	32 Ge germanium	33 As arsenic	34 Se selenium	35 Br bromine	36 Kr krypton
37 Rb rubidium	38 Sr strontium	39 Y yttrium	40 Zr zirconium	41 Nb niobium	42 Mo molybdenum	43 Tc technetium	44 Ru ruthenium	45 Rh rhodium	46 Pd palladium	47 Ag silver	48 Cd cadmium	49 In indium	50 Sn tin	51 Sb antimony	52 Te tellurium	53 I iodine	54 Xe xenon
55 Cs cesium	56 Ba barium	57 La lanthanum	72 Hf hafnium	73 Ta tantalum	74 W tungsten	75 Re rhenium	76 Os osmium	77 Ir iridium	78 Pt platinum	79 Au gold	80 Hg mercury	81 Tl thallium	82 Pb lead	83 Bi bismuth	84 Po polonium	85 At astatine	86 Rn radon
87 Fr francium	88 Ra radium	89 Ac actinium	104 Rf rutherfordium	105 Db dubnium	106 Sg seaborgium	107 Bh bohrium	108 Hs hassium	109 Mt meitnerium	110 Ds darmstadtium	111 Rg roentgenium	112 Cn copernicium	113 Nh nihonium	114 Fl flerovium	115 Mc moscovium	116 Lv livermorium	117 Tn tennessine	118 Og oganesson

58 Ce cerium	59 Pr praseodymium	60 Nd neodymium	61 Pm promethium	62 Sm samarium	63 Eu europium	64 Gd gadolinium	65 Tb terbium	66 Dy dysprosium	67 Ho holmium	68 Er erbium	69 Tm thulium	70 Yb ytterbium	71 Lu lutetium
90 Th thorium	91 Pa protactinium	92 U uranium	93 Np neptunium	94 Pu plutonium	95 Am americium	96 Cm curium	97 Bk berkelium	98 Cf californium	99 Es einsteinium	100 Fm fermium	101 Md mendelevium	102 No nobelium	103 Lr lawrencium

▲ **FIGURE 2.8 The Periodic Table** Each element is represented by its symbol and atomic number. Elements in the same column have similar properties.

Elements + #p$^+$

Pb   Au

elements are determined by #p$^+$ in nucleus
- atomic #, Z

Z

| 82 ← | → 79 |
| Pb | Au |

82p$^+$ 79p$^+$
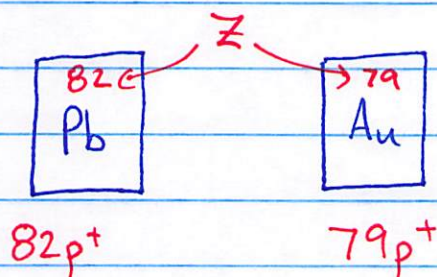
Element symbol : 1 or 2 letter symbol
       1st = CAPITAL   Cobalt
       if 2nd = lowercase   ex: Co   CO
                                                     ✓   ✗

Fig 2-8, p61
          - memorize: 1-36
     also know: Rb, Sr, Cs, Ba, Fr, Ra
                      Pb, Ag, Cd, Pt, Au, Hg   _symbols + names!_
                      In, Sn, I, Xe, Tl, Pb, Bi, Rn
flashcards!   U
                               Latin
             Na ~ sodium   (natrium)
             Ag ~ silver   (argentum)