Atomic Theory:

Dalton's Theory:

- **Elements are composed of extremely small particles called atoms.**
- **Chemical reactions involve the union and separation of atoms. Atoms are not created or destroyed.**
- **A chemical compound is the union of two or more elements.**

Dalton's Theory Derived from the Following Laws:

1. **The Law of Conservation of Mass - Total mass of reactants entering into a chemical reaction must equal the total mass of products.**

2. **Law of Definite Proportions- A pure substance always contains the same elements combined in the same proportions by mass.**

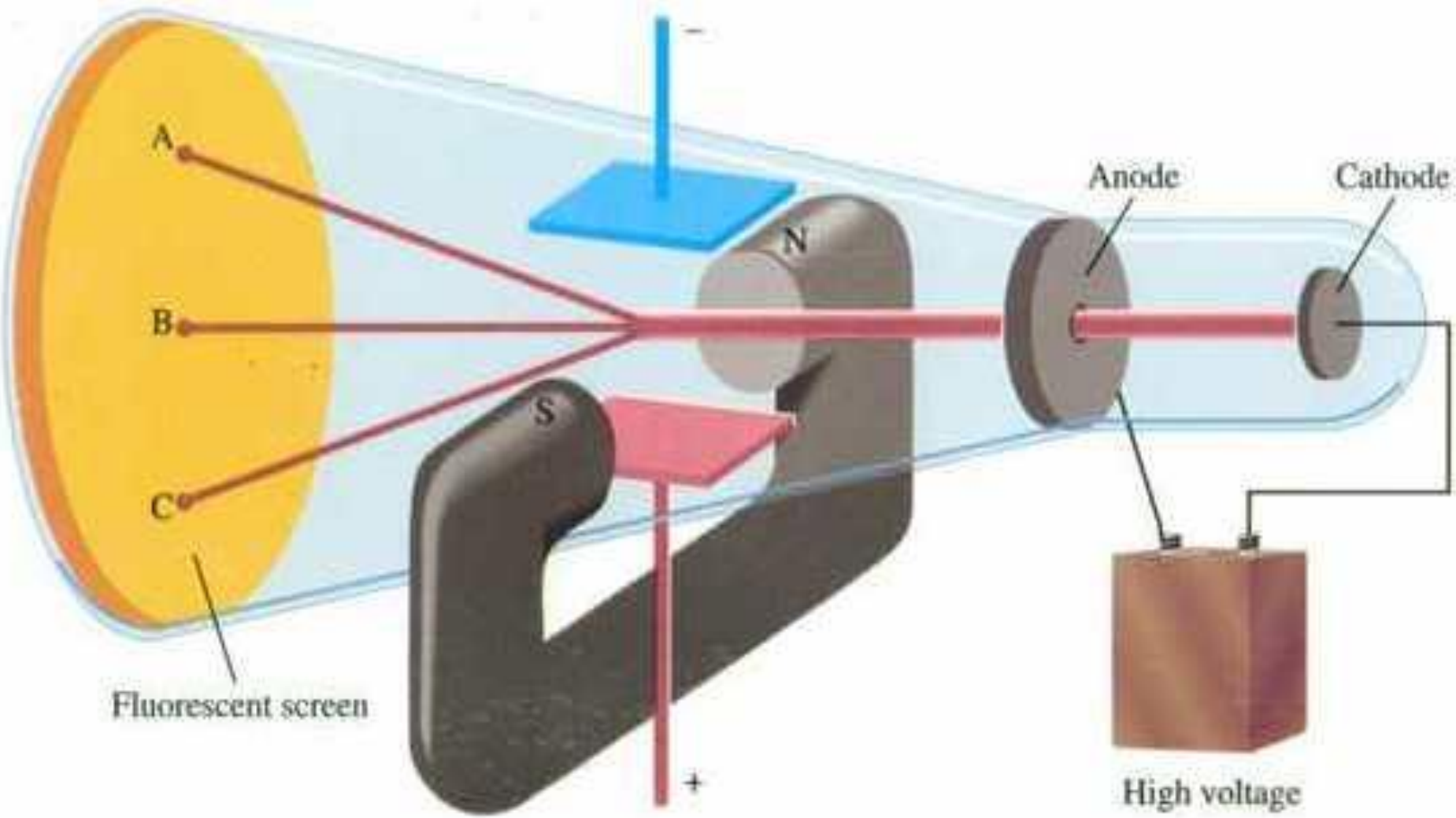
Dalton's Theory Derived from the Following Laws cont..:

3. Law of Multiple Proportions- When a fixed amount of an element A combines with element B to form various compounds, the ratio of B to A always occurs in small whole-number ratios.

Study of the Electron:

- **Faraday- Used electricity to decompose compounds.**
- **J.J. Thomson- Used cathode ray tube to determine the charge to mass ratio(q/m) of electron.**

Cathode Ray Tube:



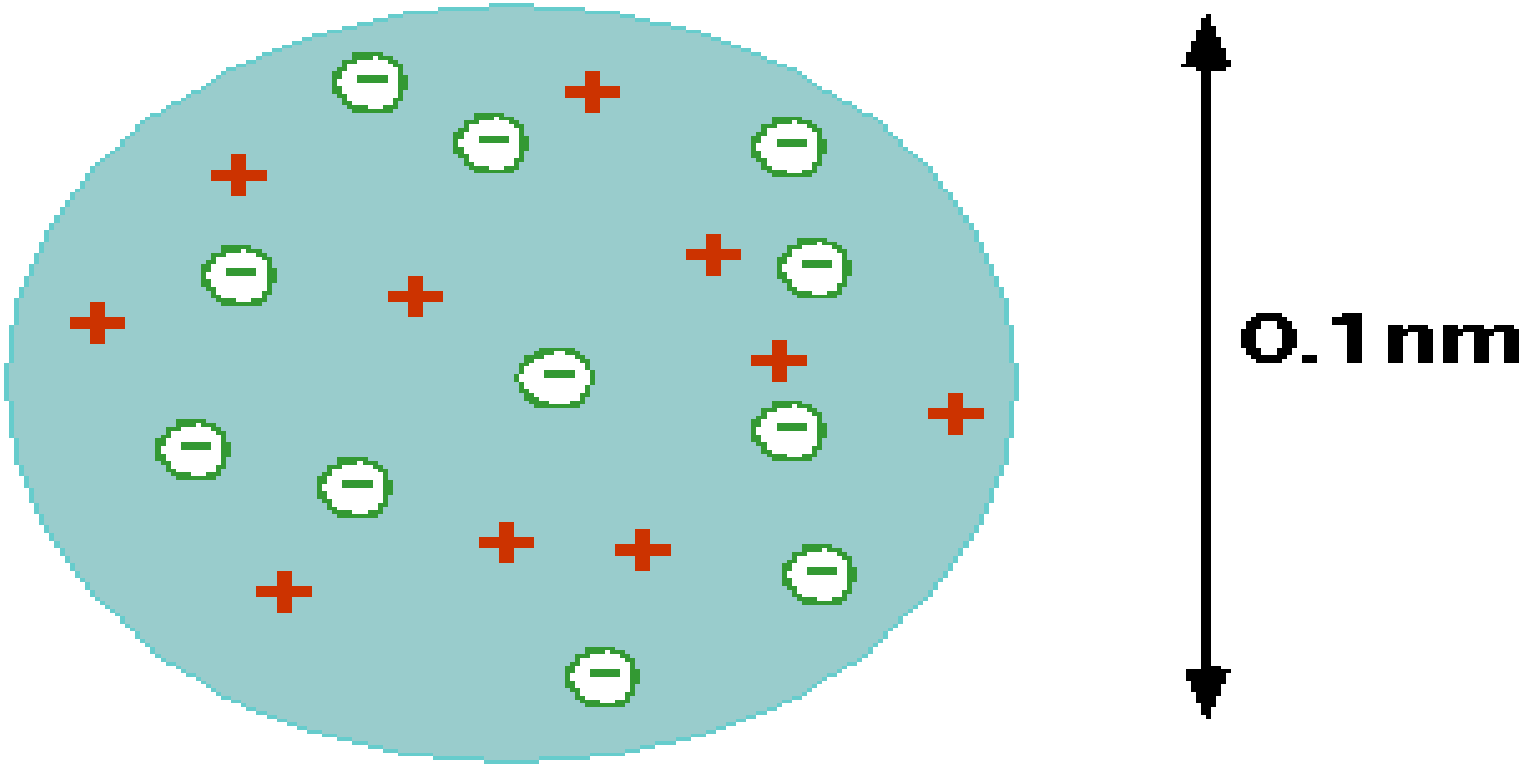
$$q/m = -1.7588\times10^{8}\,C/g$$

Millikan- Oil Drop Experiment:

- **Experiment found the charge of an electron.** $q = -e = -1.6022 \times 10^{-19} C$
- **therefore,** $m = 9.1096 \times 10^{-28} g$

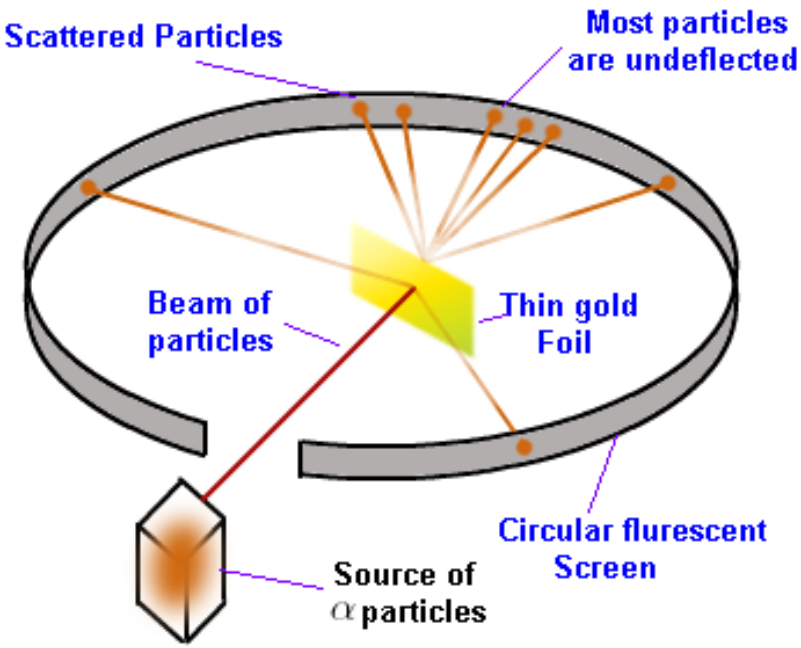
Model of the Atom:

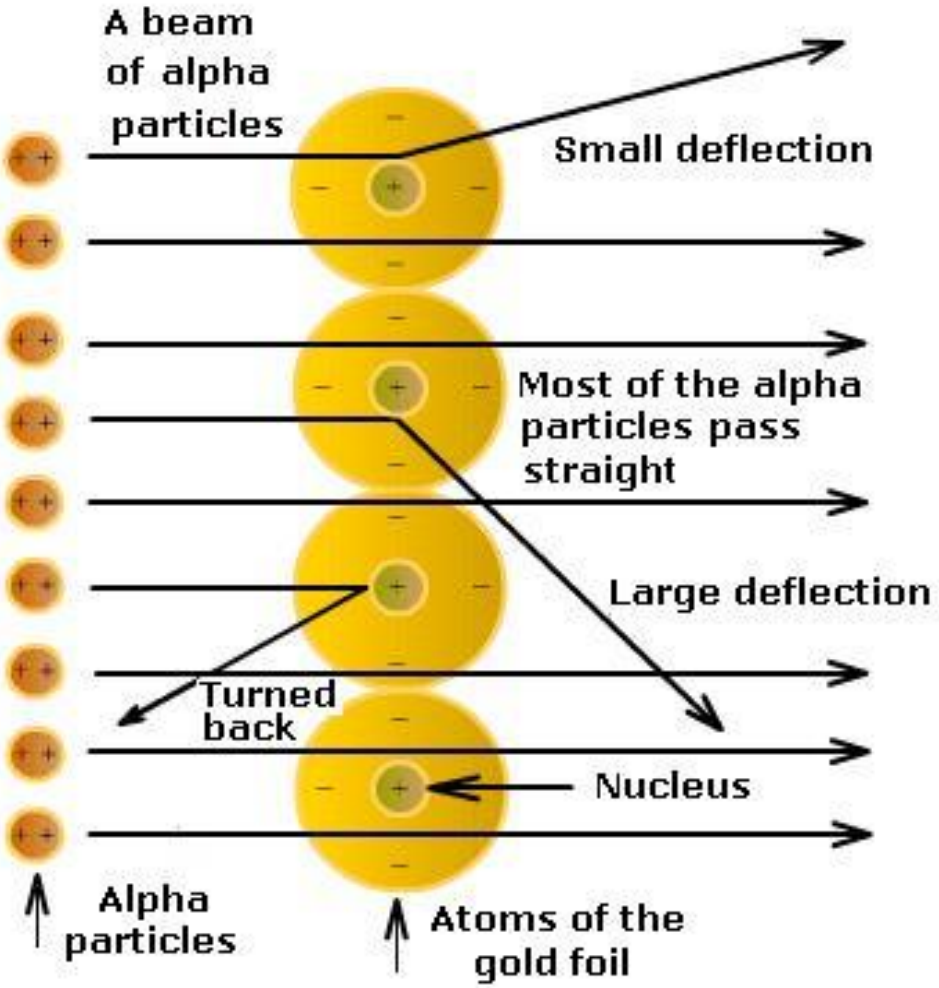
J.J. Thomson Model- Pictured the atom as a positively charged sphere with electrons embedded on the surface.



!!Wrong!!

Rutherford Experiment:

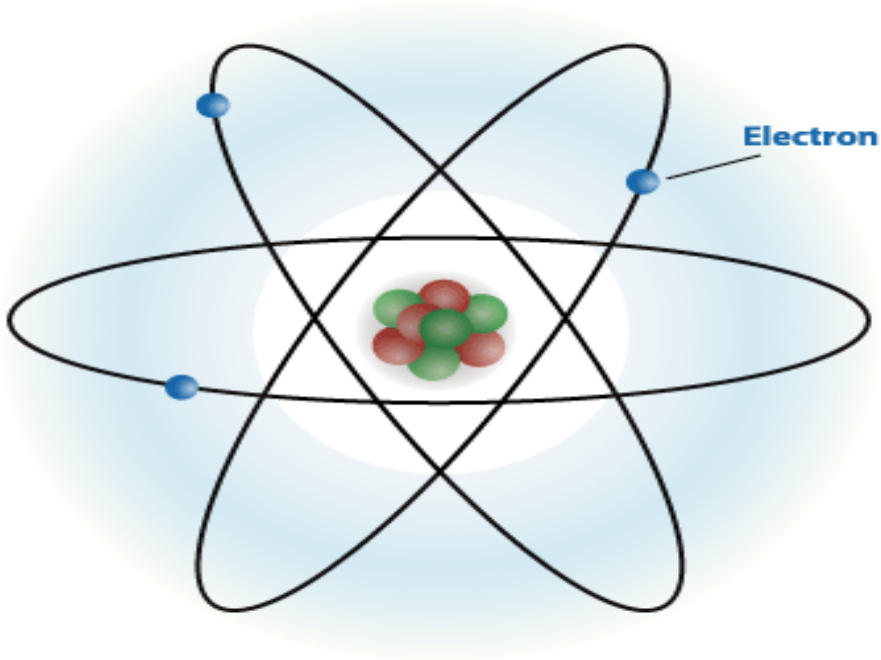




Correct Model!!

Model of the Atom cont...:

Rutherford Model- The atom contains a nucleus at the center containing all the positive charge and most of the mass. The electrons occupy most of the volume and move rapidly around nucleus.



Atomic Symbols:

Atomic number(Z): # protons in the nucleus and equals the # electrons for a neutral atom.

Mass number(A): Total # protons and neutrons in the nucleus.

Denoted as:

$$ {}^{A}_{Z}X $$

X represents the symbol for the element.

Isotopes:

Isotopes - Atoms with the same atomic number but different mass number.

Ex: The element chlorine

$^{35}_{17}Cl$

17 protons

18 neutrons

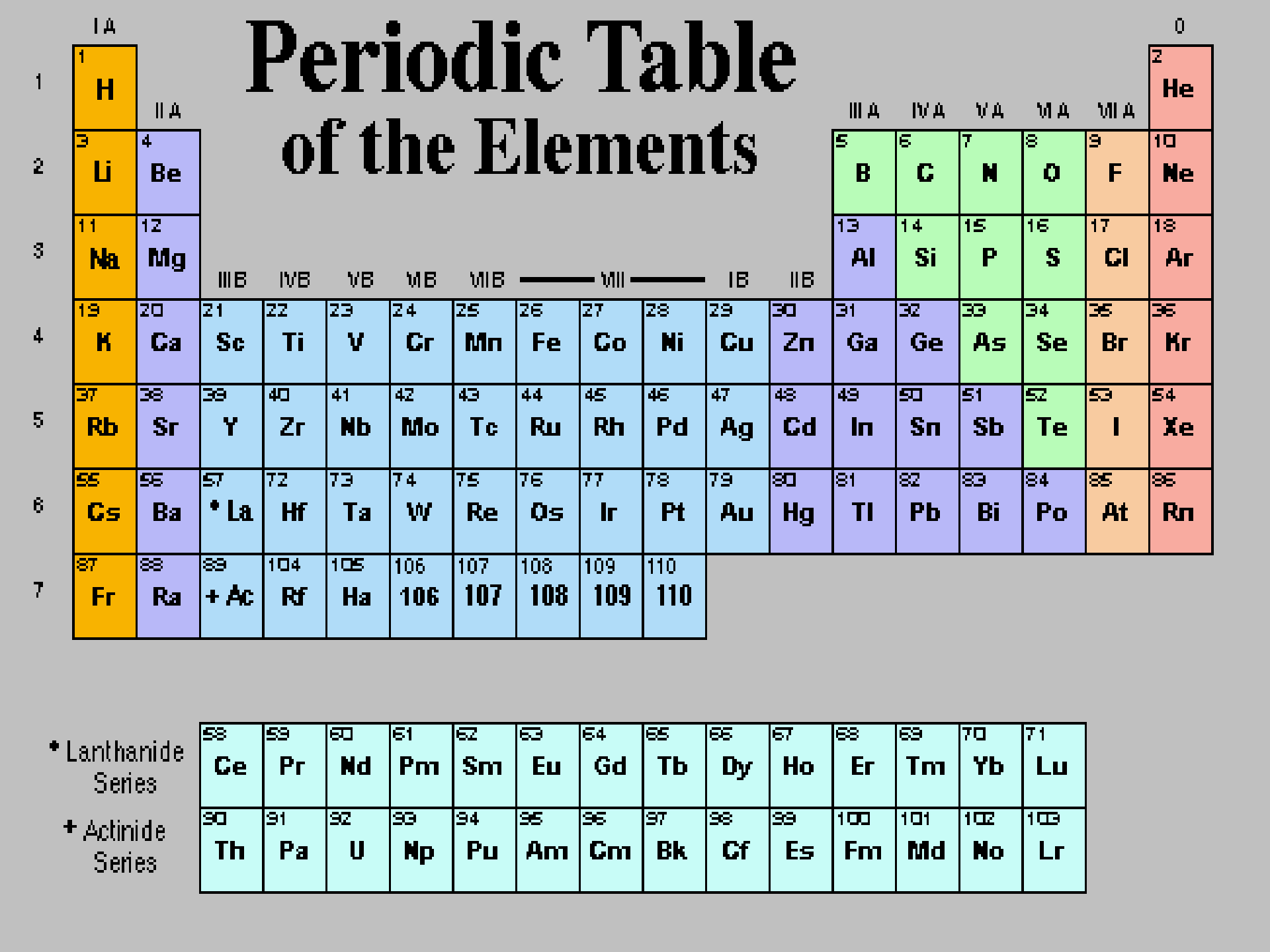
17 electrons

$^{37}_{17}Cl$

17 protons

20 neutrons

17 electrons


Periodic Table
of the Elements
IA
IIA
IIIB
IVB
VB
VIB
VIIB
VIII
IB
IIB
IIIA
IVA
VA
VIA
VIIA
0
1 H
2 He
3 Li
4 Be
5 B
6 C
7 N
8 O
9 F
10 Ne
11 Na
12 Mg
13 Al
14 Si
15 P
16 S
17 Cl
18 Ar
19 K
20 Ca
21 Sc
22 Ti
23 V
24 Cr
25 Mn
26 Fe
27 Co
28 Ni
29 Cu
30 Zn
31 Ga
32 Ge
33 As
34 Se
35 Br
36 Kr
37 Rb
38 Sr
39 Y
40 Zr
41 Nb
42 Mo
43 Tc
44 Ru
45 Rh
46 Pd
47 Ag
48 Cd
49 In
50 Sn
51 Sb
52 Te
53 I
54 Xe
55 Cs
56 Ba
57 * La
72 Hf
73 Ta
74 W
75 Re
76 Os
77 Ir
78 Pt
79 Au
80 Hg
81 Tl
82 Pb
83 Bi
84 Po
85 At
86 Rn
87 Fr
88 Ra
89 + Ac
104 Rf
105 Ha
106 106
107 107
108 108
109 109
110 110
* Lanthanide Series
58 Ce
59 Pr
60 Nd
61 Pm
62 Sm
63 Eu
64 Gd
65 Tb
66 Dy
67 Ho
68 Er
69 Tm
70 Yb
71 Lu
+ Actinide Series
90 Th
91 Pa
92 U
93 Np
94 Pu
95 Am
96 Cm
97 Bk
98 Cf
99 Es
100 Fm
101 Md
102 No
103 Lr