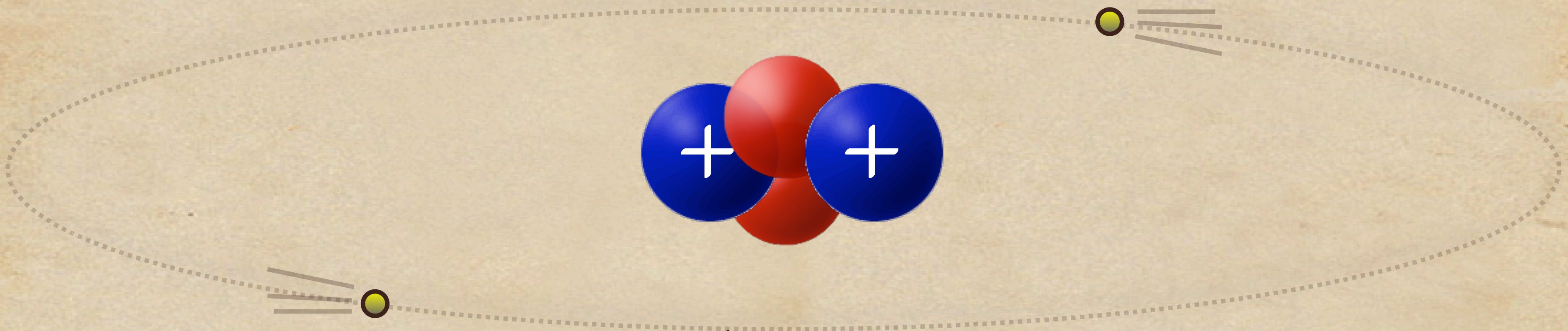
Atomic Structure



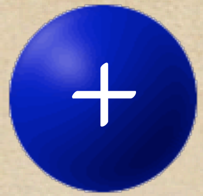
A Helium atom

The Physical Science Series

A Short Review of Atomic Theory

Over the past century scientist have discovered that the atom is composed of 3 subatomic particles:

- Protons
- Neutrons
- Electrons



The Proton

1) Symbol = p+
2) Relative Mass = 1 Atomic Mass Unit (AMU).
   Actual mass = 1.674 x 10 -24 g
3) Location: Inside the nucleus
4) Electrical charge: Positive.
5) Importance: The atomic number which is the identity of the element.
6) Discovered by: Ernest Rutherford in 1909

The Electron

1) Symbol = e-

2) Relative Mass = 1 /1836 Atomic Mass Unit.

Actual mass = 9.11 x 10 -28 g

3) Location: Energy level outside the nucleus

4) Electrical charge: Negative.

5) Importance: The number of electrons located in the last energy level determine the chemical activity of the element.

6) Discovered by: J.J.Thomson in 1897

The Neutron

1) Symbol = n
2) Relative Mass = 1 Atomic Mass Unit (AMU).
   Actual mass = 1.675 x 10 -24 g
3) Location: Inside the nucleus
4) Electrical charge: Neutral.
5) Importance: Is responsible for isotopes (atoms of the same element with different numbers of neutrons.
6) Discovered by: James Chadwick in 1932

An element's Square on the Periodic Table

Atomic Number

# of protons = # of electrons

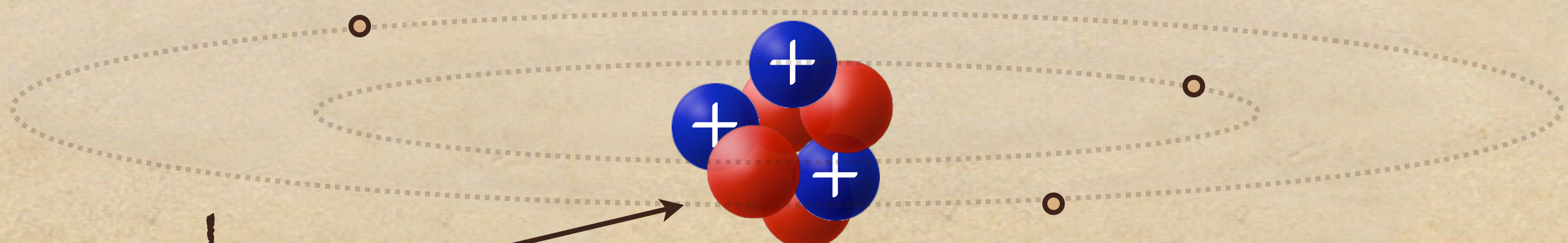
3 protons

3 electrons

4 neutrons

Atomic Mass

When rounded to a whole number it is the total number of protons & neutrons added together.



nucleus

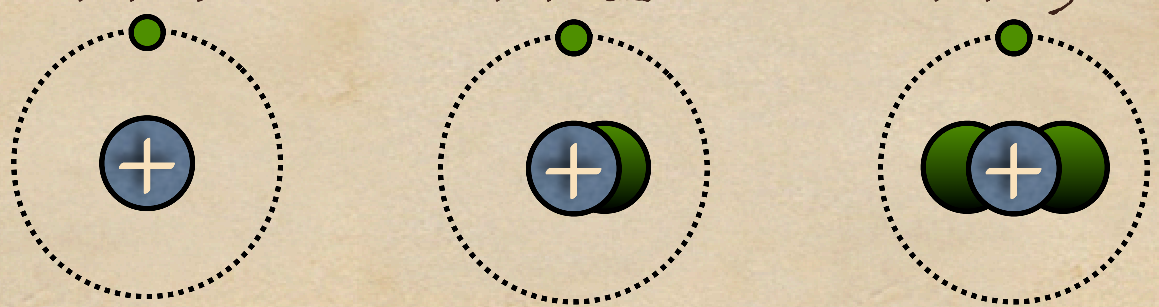
Fill in the table of p+, no and e-.

Element	Protons	Neutrons	Electrons	Element	Protons	Neutrons	Electrons
Silver	47	61	47	Zinc	30	35	30
Potassium	19	20	19	Uranium	92	146	92
Neon	10	10	10	Gold	79	118	79
Hydrogen	1	0	1	Fluorine	9	10	9
Sulfur	16	16	16	Cesium	55	78	55

Isotopes

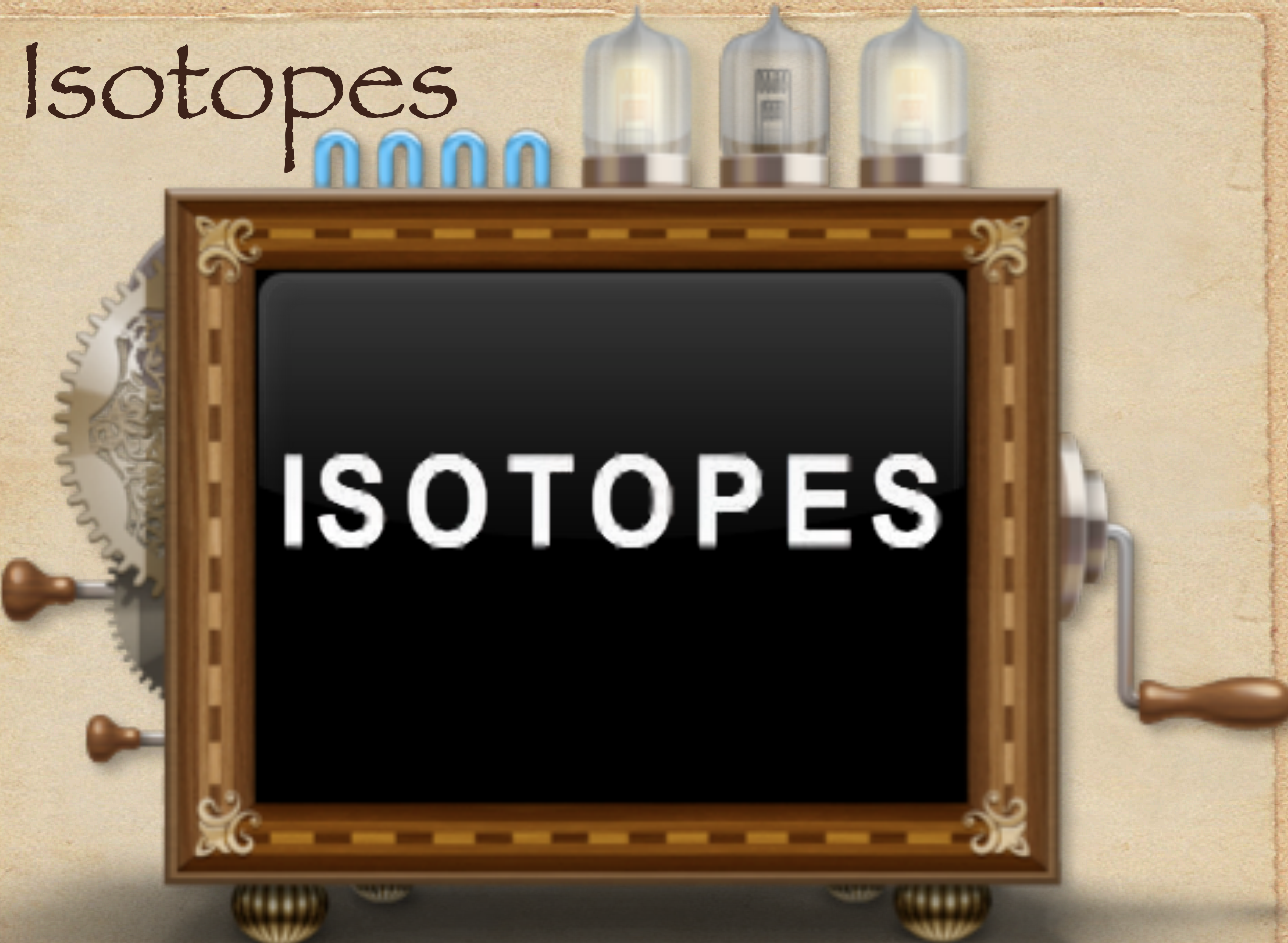
- Isotopes are atoms of the same element that have different masses due to having different numbers of neutrons.
- The atomic mass (weight) on the periodic table is the average of the abundance of all the isotopes of an element.

Isotope:	H-1	H-2	H-3

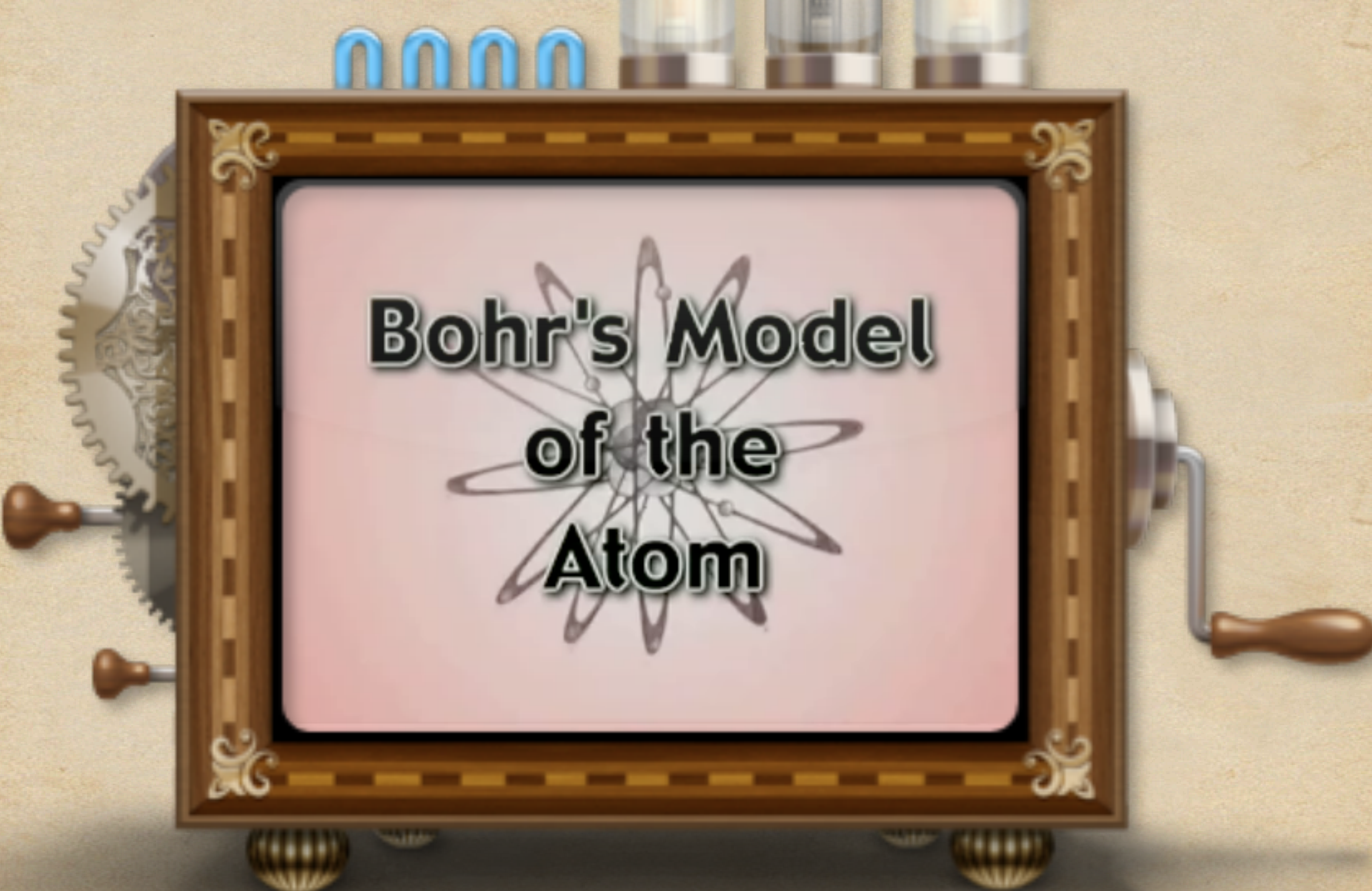


Abundance:	99.985%	0.014%	0.001%

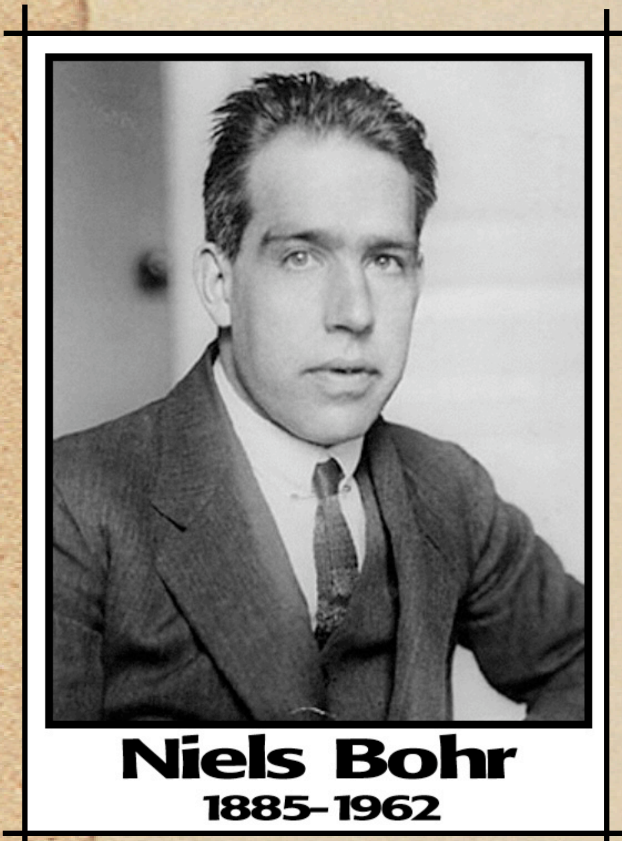
Isotopes



The Bohr Model of the Atom



The Bohr Model of the Atom



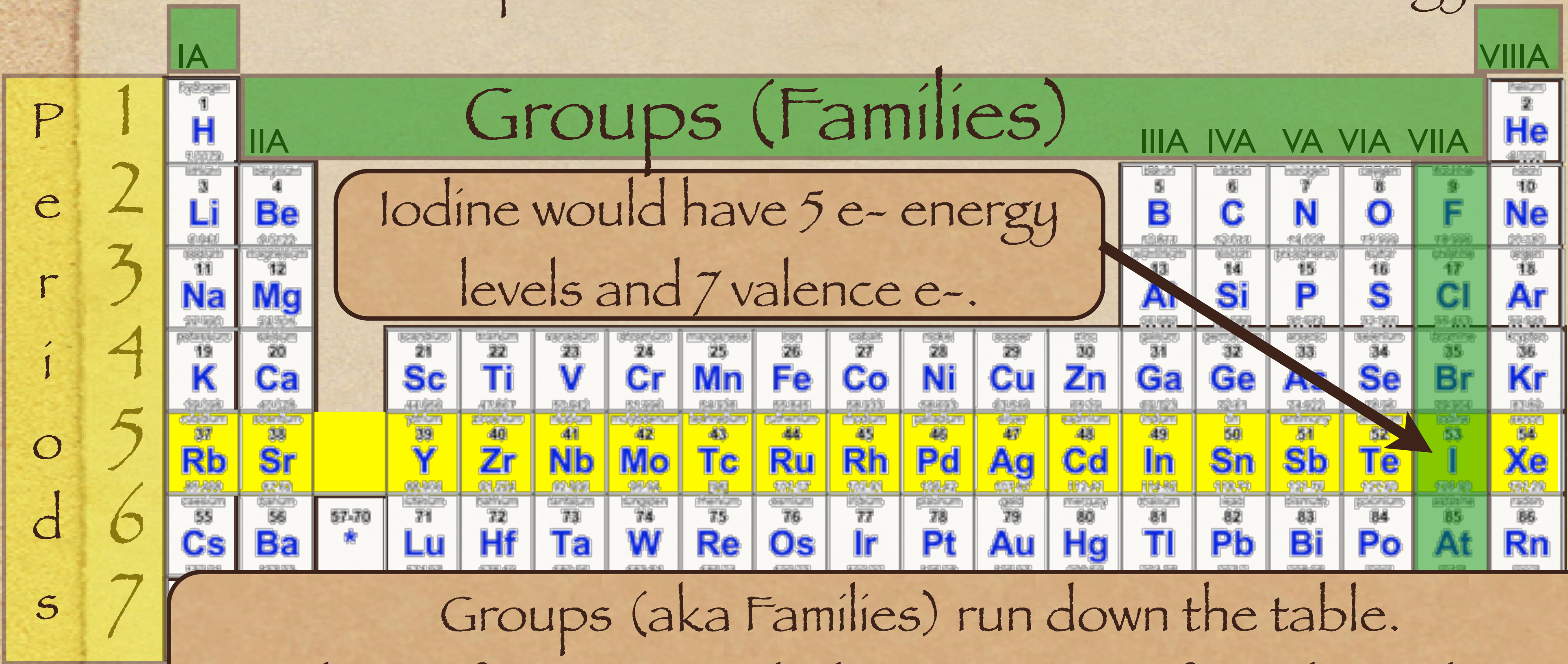
The Bohr Model places protons and neutrons in the nucleus and electrons in <u>energy levels</u> around the nucleus. Before you can learn how to draw a Bohr model of an atom you must learn a little about the Periodic Table of Elements.

Periods and Families

Periods 1-7 run across the periodic table.

The period number is the number of electron energy levels.

All elements of a period have the same number of e- energy levels.



Groups (aka Families) run down the table.

Members of a group (with the exception of He) have the same number of electrons in their outside energy level.

These e- are called valence electrons.

Fill in the table with e- energy levels & valence e-.

element	e- energy levels	valence e-	element	e- energy levels	valence e-
Ca	4	2	C	2	4
F	2	7	P	3	5
Al	3	3	Rn	6	8
K	4	1	H	1	1

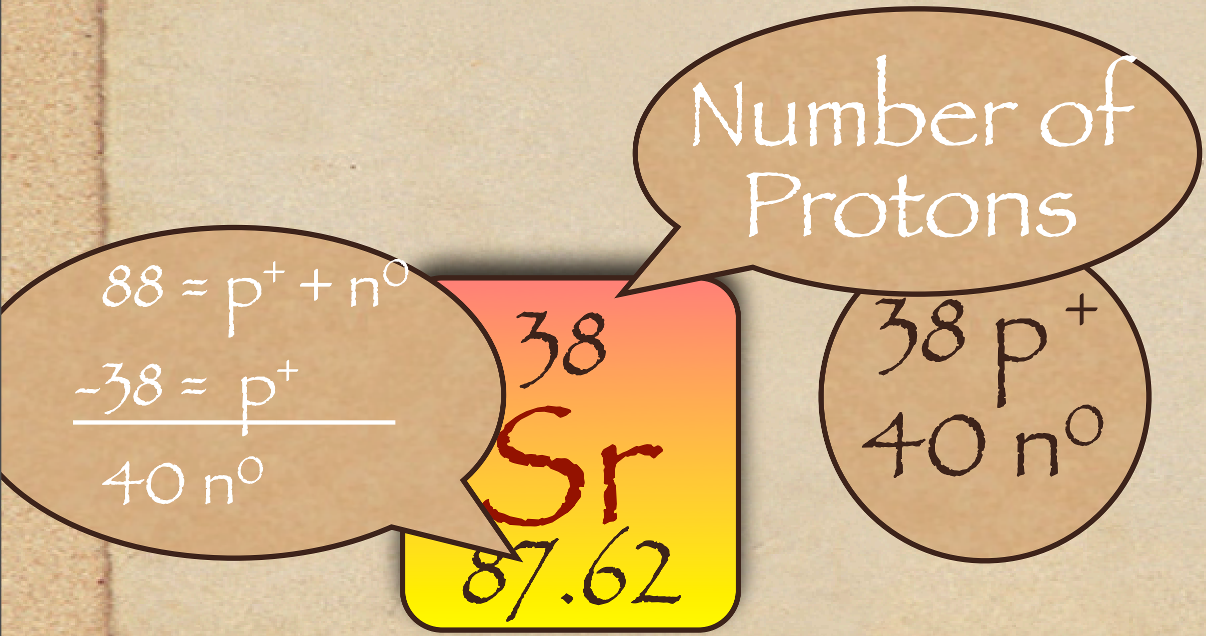
Niels Bohr
1885-1962

Through experimentation Neils Bohr was able to determine the <u>Maximum</u> number of electrons in each energy level:

energy level	1st	2nd	3rd	4th	5th	6th	7th
maximum number of electrons	2	8	18	32	18	8	2

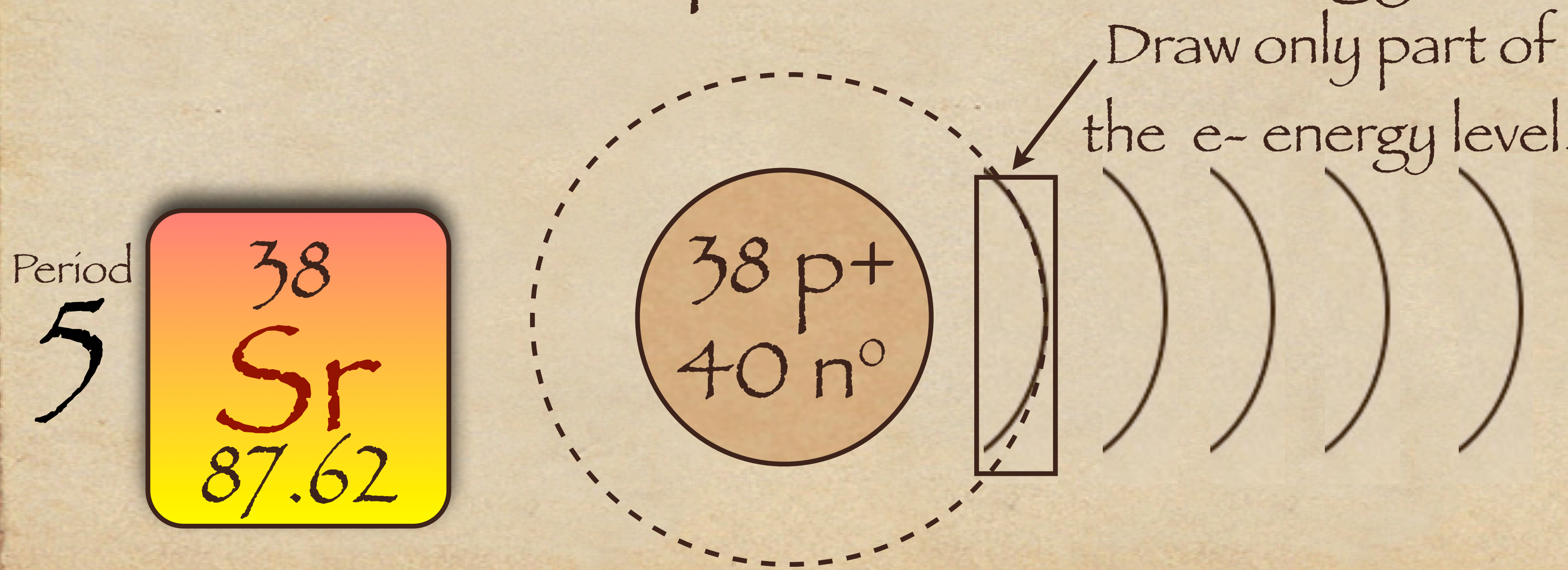
Drawing a Bohr Model of a Strontium atom

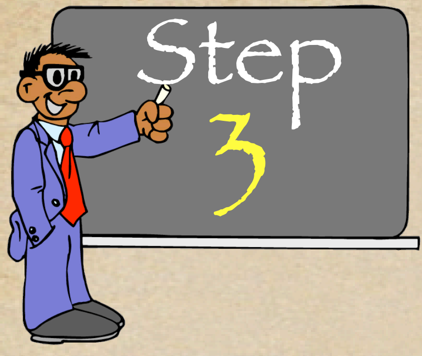
Draw a circle to represent the nucleus. Inside it write in how many protons and neutrons in a strontium atom.



Drawing a Bohr Model of a Strontium atom

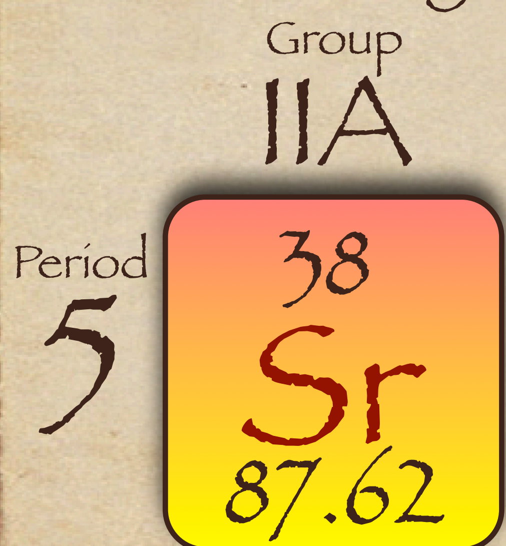
Draw the correct number of e- energy levels in the atom (Period #). Draw only a section of the circle to represent the energy level.

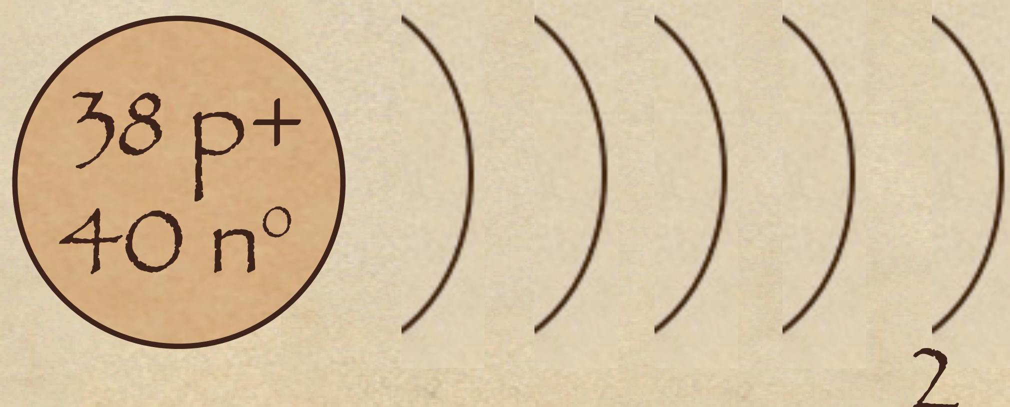


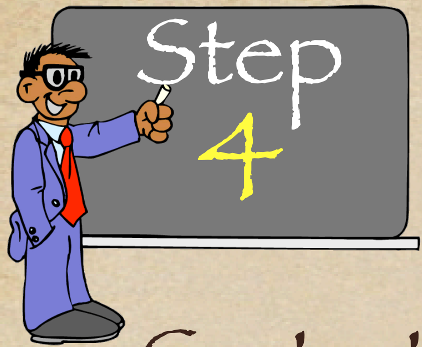


Drawing a Bohr Model of a Strontium atom

Fill in the last energy level with the correct number of electrons (group A number). You always do the last e- energy level first!

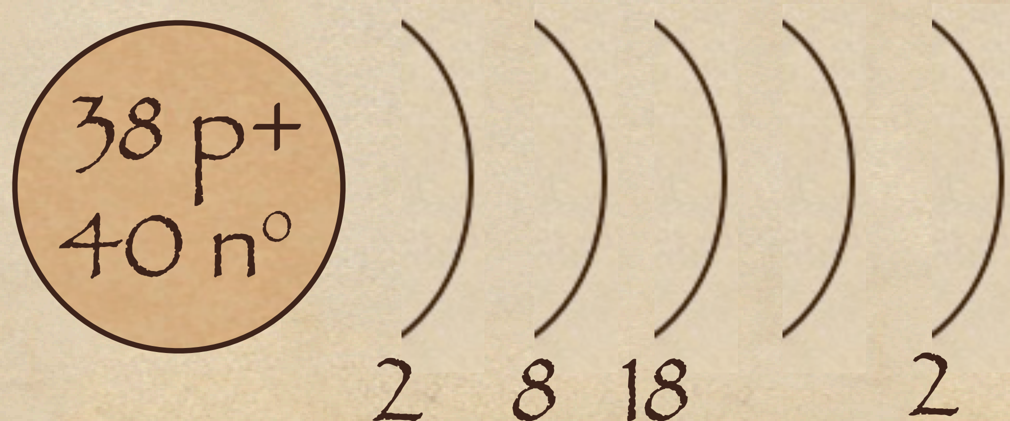


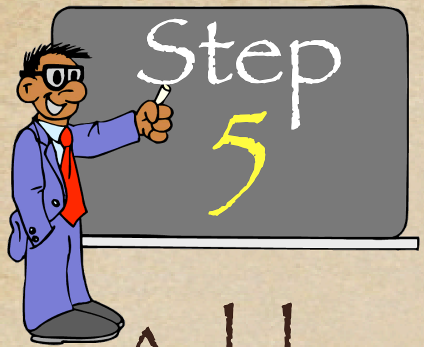




Drawing a Bohr Model of a Strontium atom

Go to the first e- energy level and fill it with the maximum number of electrons. Do this with the others energy levels until you get to the 2nd to the last energy level.

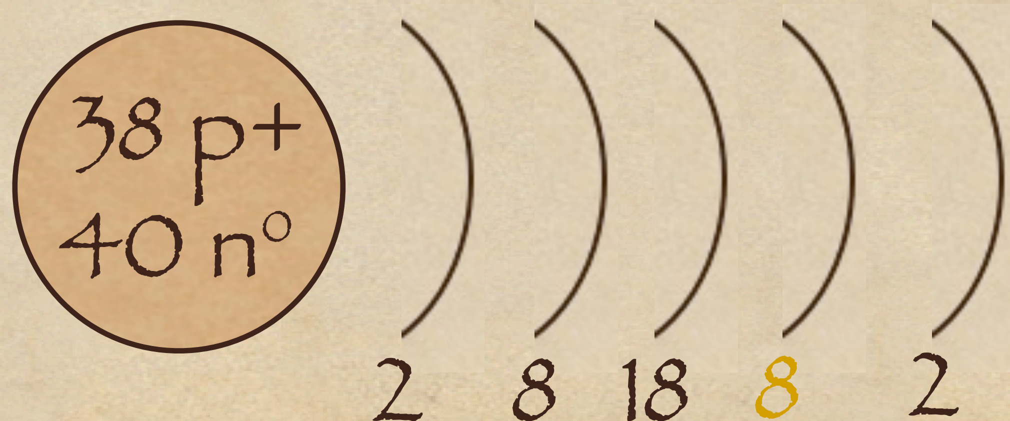




Drawing a Bohr Model of a Strontium atom

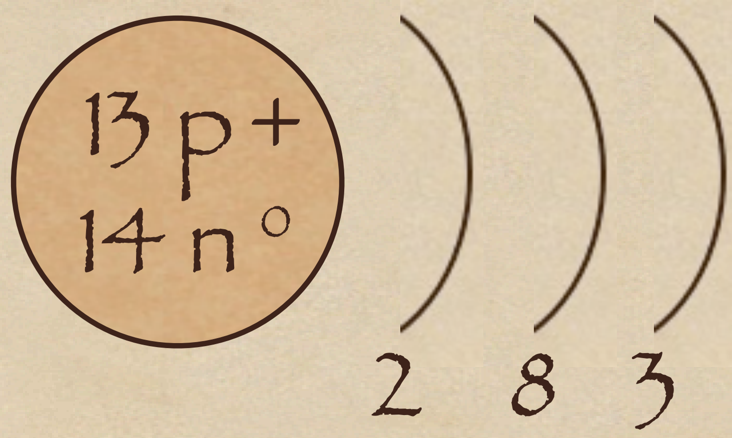
Add up the number of e- you have and subtract it from the total number of e- in a Sr atom (atomic number). Place those e- in that 2nd to thelast energy level.

38 e-
\- 30e-
8 e-



Draw a Bohr Model of:

Aluminum



Bromine