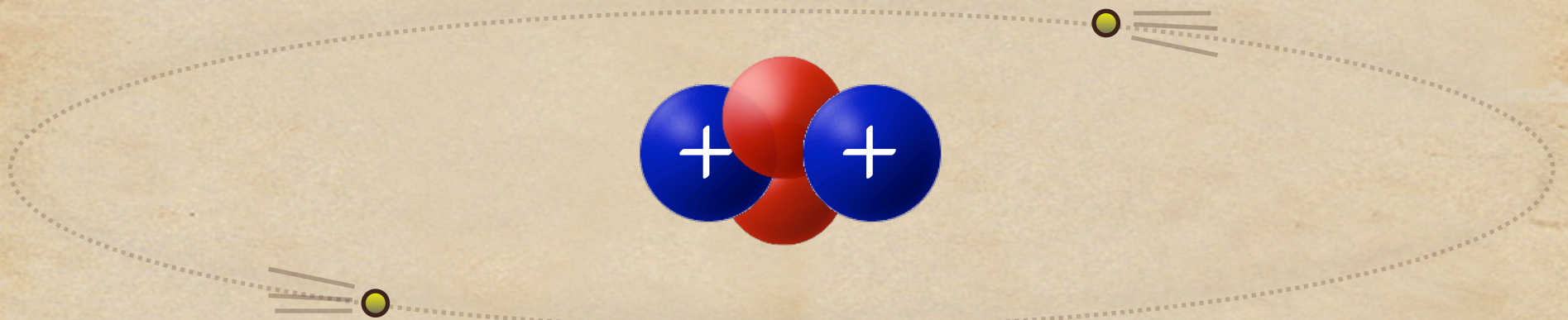
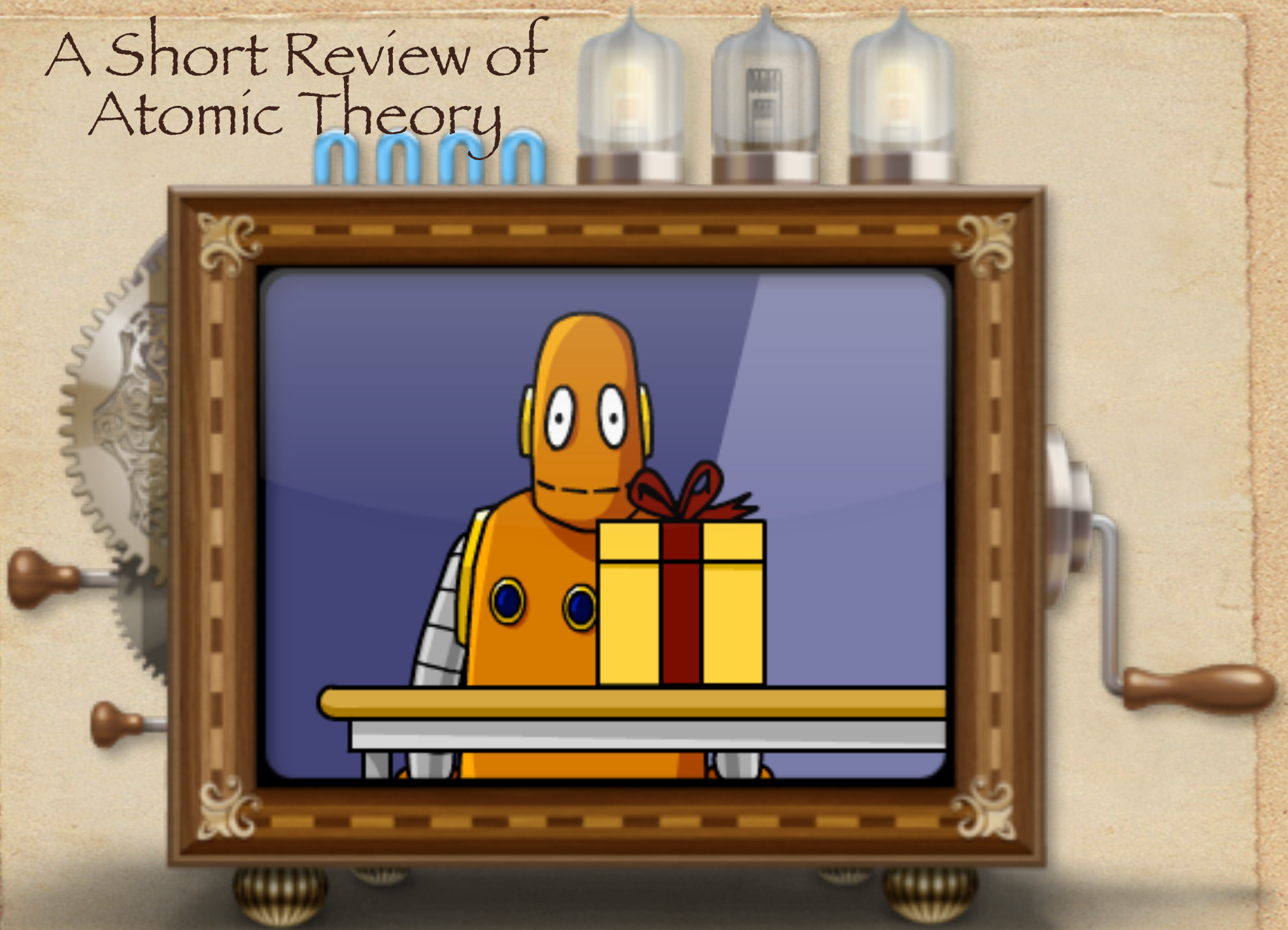


Atomic Structure



A Helium atom

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 = 1.674×10^{-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.

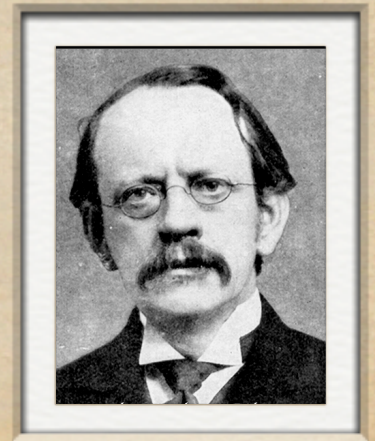
Actual mass = 9.11×10^{-28} g

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 = 1.675×10^{-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

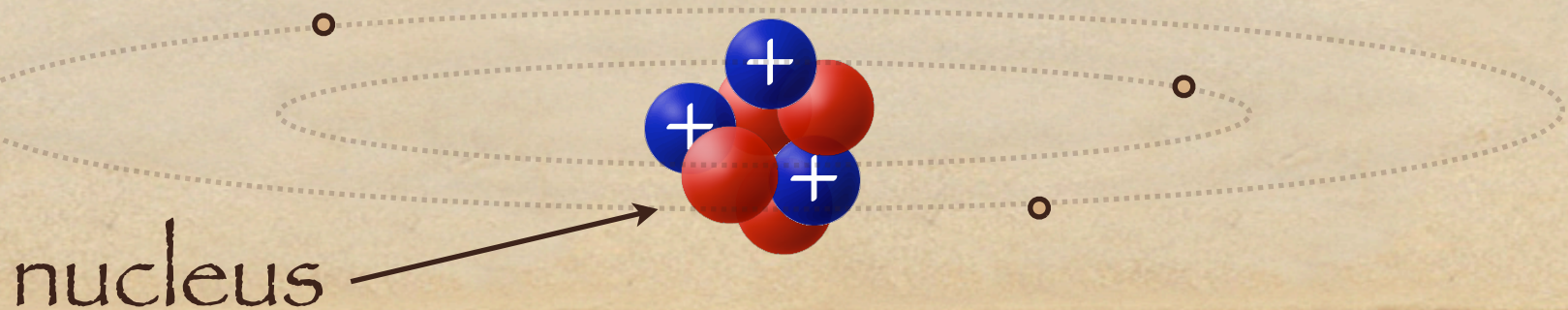


An element's Square on the Periodic Table

Atomic Number → 3 ← 3 protons
of protons = 3 electrons
of electrons
6.941 ← 4 neutrons

Atomic Mass

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



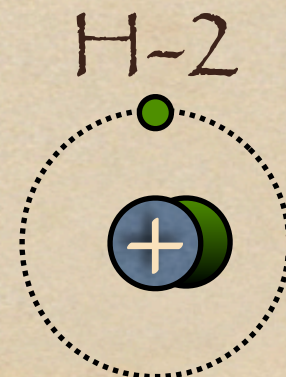
Fill in the table of p^+ , n^0 and e^- .

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:



Abundance: 99.985%

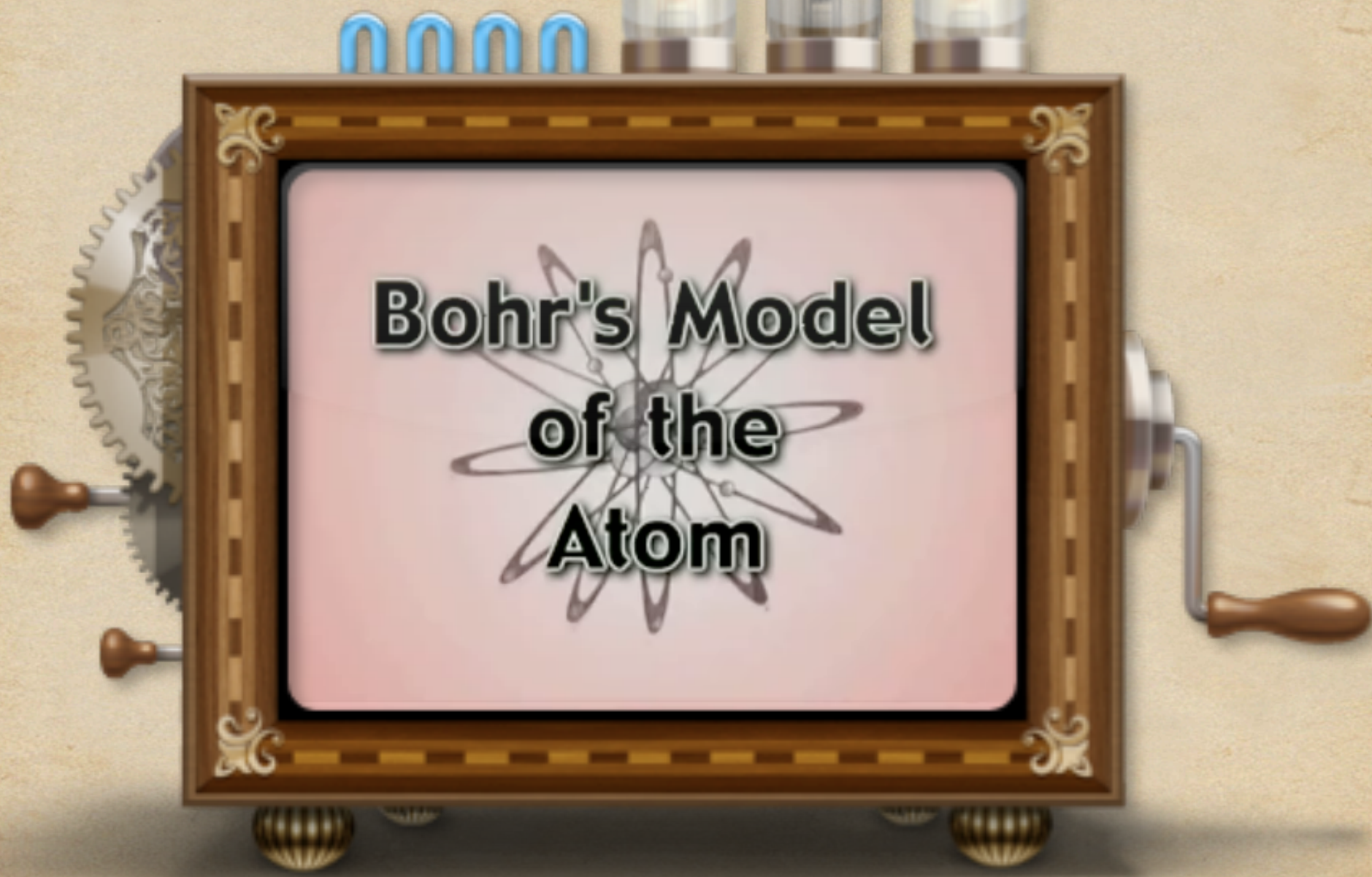
0.014%

0.001%

Isotopes



The Bohr Model of the Atom

A vintage-style mechanical device, possibly a radio or a small television, is centered on a textured, light-brown background. The device has a brown wooden frame with decorative corner pieces. On top, there are three glass vacuum tubes and four blue knobs. On the left side, there are two large gears and two wooden knobs. On the right side, there is a large wooden handle for a crank. The central screen is pink and displays the text "Bohr's Model of the Atom" in a bold, black, sans-serif font. Below the text is a diagram of a Bohr atom, showing a central nucleus with a grey and white speckled texture, surrounded by several elliptical orbits in shades of grey and brown, with small spheres representing electrons on the orbits.

**Bohr's Model
of the
Atom**

The Bohr Model of the Atom

The Bohr Model places

protons and neutrons in the nucleus and electrons in energy levels 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.



Niels Bohr
1885-1962

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 (Families)																		
		IA											IIIA	IVA	VA	VIA	VIIA	VIIIA		
P e r i o d s	1	1 H	Groups (Families)																2 He	
	2	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne	
	3	11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar	
	4	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	
	5	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	
	6	55 Cs	56 Ba	57-70 *	71 Lu	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
	7																			

Iodine would have 5 e⁻ energy levels and 7 valence e⁻.

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
Niels Bohr was able to
determine the
Maximum 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.

Number of Protons

$$\begin{array}{r} 88 = p^+ + n^0 \\ -38 = p^+ \\ \hline 40 n^0 \end{array}$$



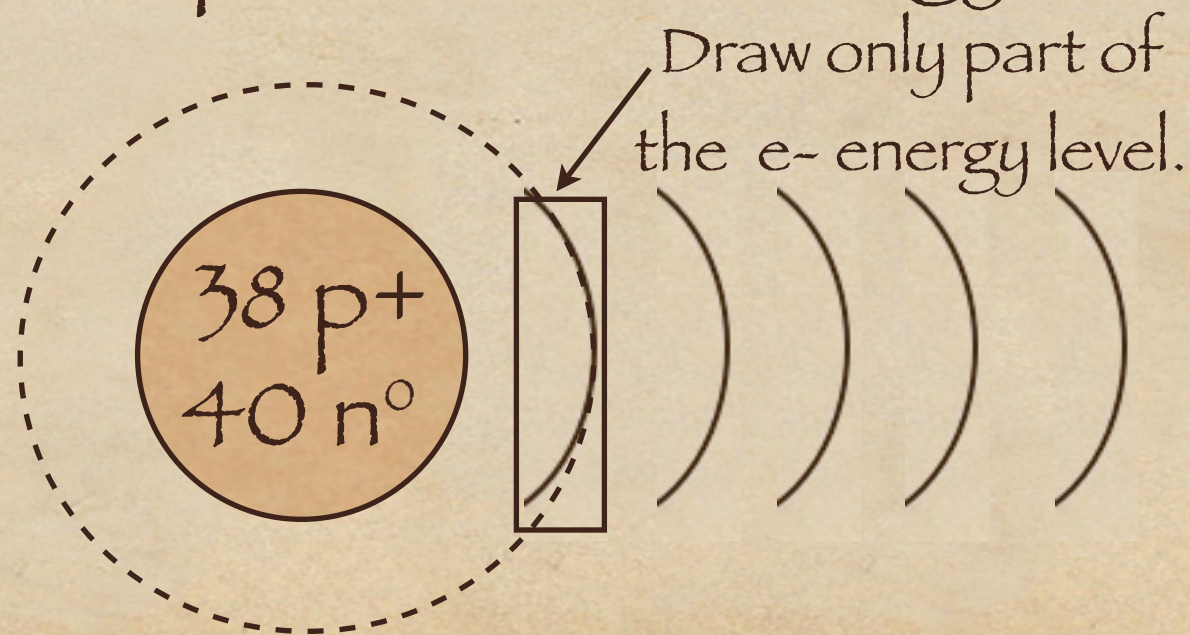
38 p⁺
40 n⁰



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.

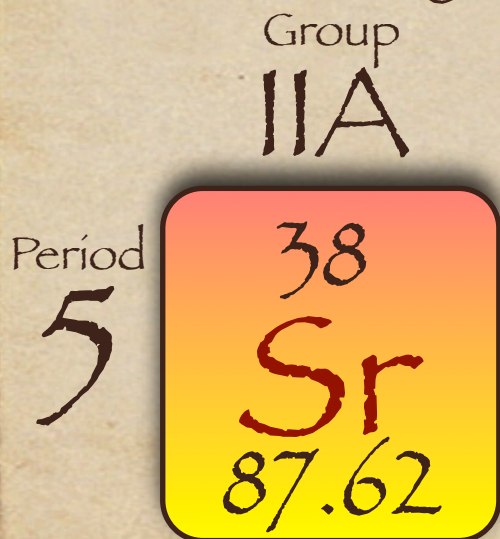
Period
5





Drawing a Bohr Model of a Strontium atom

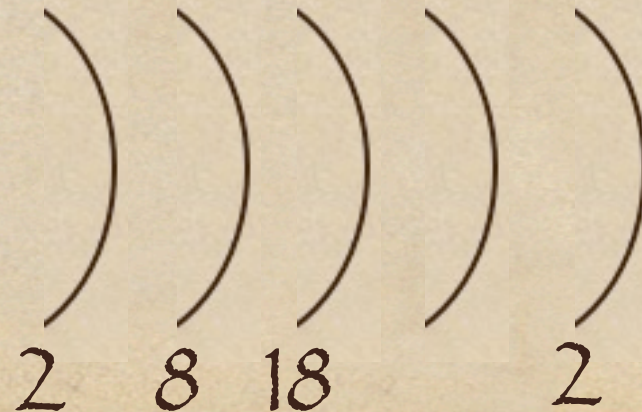
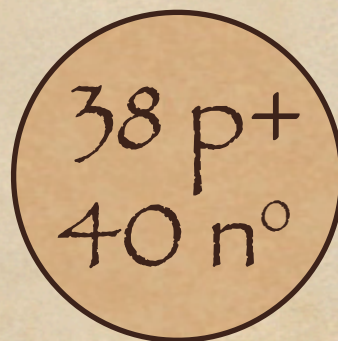
Fill in the last energy level with the correct number of electrons (group A number).
You always do the last e- energy level first!

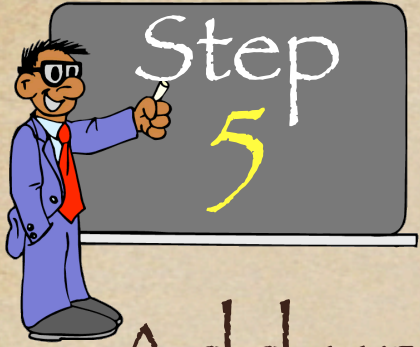




Drawing a Bohr Model of a Strontium atom

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.

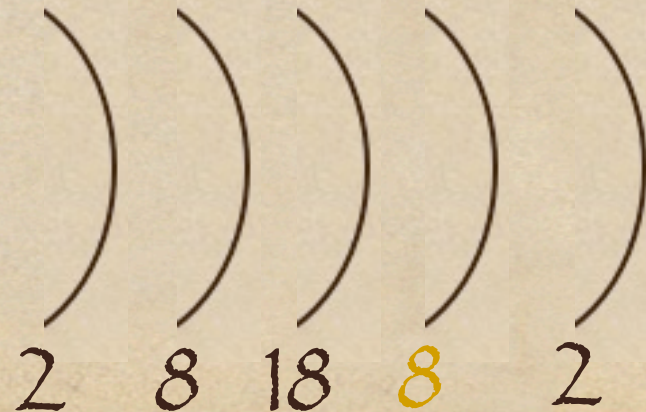
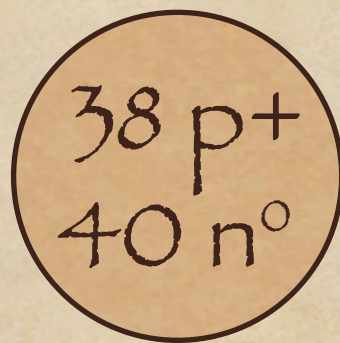




Drawing a Bohr Model of a Strontium atom

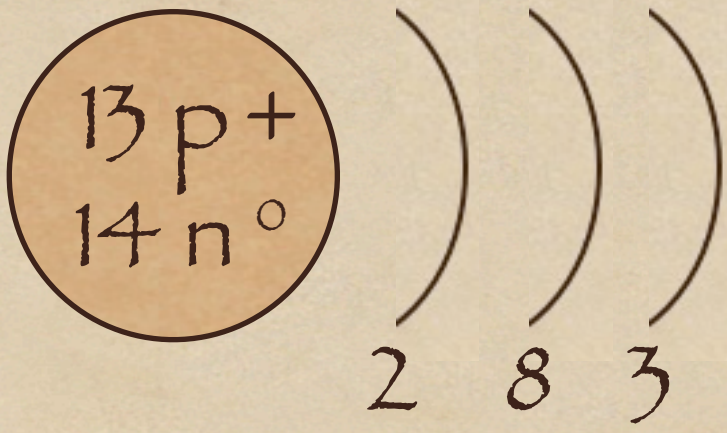
Add up the number of e^- you have and subtract it from the total number of e^- in a Sr atom (atomic number). Place those e^- in that 2nd to the last energy level.

$$\begin{array}{r} 38 e^- \\ - 30 e^- \\ \hline 8 e^- \end{array}$$



Draw a Bohr Model of:

Aluminum



Bromine

