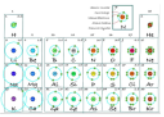
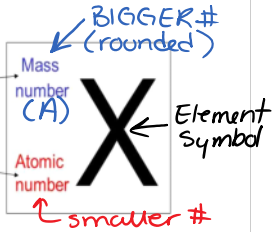
PART D: THE BOHR MODEL

Using Standard Atomic Notation





BIGGER # (rounded)

smaller #

- On the upper left of the element symbol is the **atomic** mass *(rounded to the nearest whole number)*
- On the lower left of the element symbol is the **atomic** number *(number of protons)*.

Ex. Consider the element gold. Its symbol is Au. Its mass number is 197 and its atomic number is 79.

Written in "standard atomic notation" it becomes: $^{197}_{79}Au$

PRACTICE Write the standard atomic notation for germanium, uranium, and colbalt.

72.63

atomic mass → $^{73}_{32}Ge$ ← atomic number

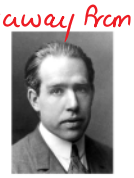
$^{238}_{92}U$

$^{59}_{27}Co$

Modeling Atoms with Bohr Diagrams

- Atoms are so small that in order to study them, we need to create models
- The current atomic model is known as the "electron cloud model"
  - Electrons are always moving in 3D space around the nucleus
- The model that we will learn today represent the atom at a moment in time
  - It's a way of representing the most likely location of electrons in the "cloud"
- It's important to remember that an atomic model is a simplified version of an atom, and it's completely wrong in terms of scale (e⁻ are REALLY far away from nucleus)

Bohr Diagrams



- A Bohr diagram is a diagram that shows how many electrons are in each "shell" surrounding the nucleus.
- Named in honour of Niels Bohr, a Danish physicist who developed several models for showing the arrangement of electrons in atoms.
- There are three main background questions to explore before we start drawing Bohr diagrams.

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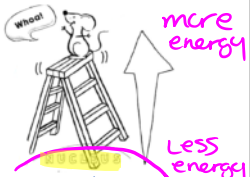
1. Parts of a Bohr Diagram

2. How does an Electron's LOCATION Correspond to its ENERGY?

- Imagine climbing a ladder. As you go up each rung, you gain more and more energy
  - This is similar to the way in which electrons have MORE energy as they orbit FURTHER from the nucleus



extension

- The shells of an atom are named K, L, M, and N going from closest to furthest from the nucleus

3. How do Electrons Fill the Shells?

NOTE: Once the atoms get larger than Calcium (#20) things start to get more complicated

Electrons fill the K shell (level 1) first. The K shell is FULL when it has 2 TWO electrons.

Remaining electrons fill the L shell (level 2) next. The L shell is FULL when it has EIGHT 8e-.

Any remaining electrons fill the M shell (level 3) next. For the first 20 elements, the M shell is full when it has EIGHT electrons.

If there are still remaining electrons, they fill the N shell (level 4). The N shell is full when it has EIGHT electrons.

SHELL	LEVEL	# of electrons to be 'FULL'
K	= 1	2 MAX
L	= 2	8 MAX
M	= 3	8 MAX
N	= 4	8 MAX

(18)
(32)

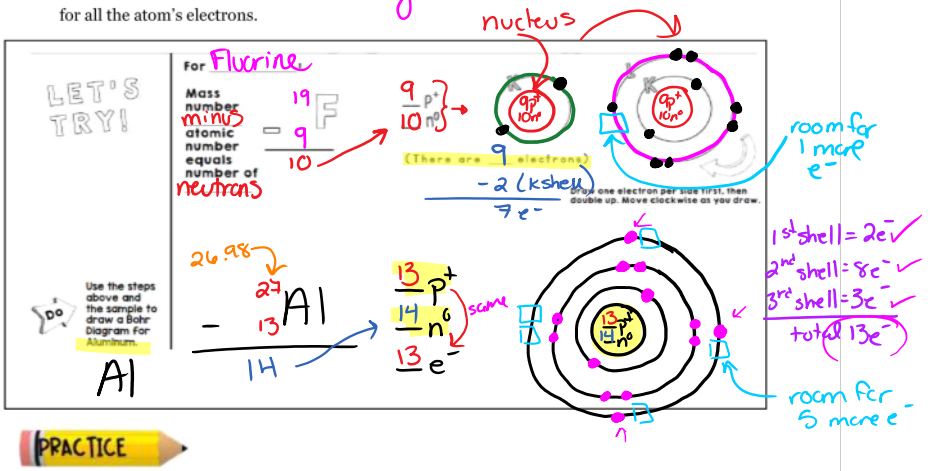
Do Fill in the table above.

(After element #20, the M and N shell can actually hold 18 and 32 electrons...but for now we won't worry about that.)

3-1

Drawing a Bohr Diagram

1. Write the element's symbol with the mass number at the TOP left and the atomic number at the BOTTOM left (standard atomic notation)
2. Calculate the number of neutrons in the atom. Write the number of protons (p^+) and neutrons (n^0) as the nucleus
3. THINK: How many electrons does the neutral atom have? ($p^+ = e^-$)
4. Draw the K shell. Fill the K shell with the first 2 electrons. Make your electrons nice and BIG!
5. Continue drawing each shell and filling with electrons until you have accounted for all the atom's electrons.



PRACTICE

In the diagram below, **identify the elements** by the Bohr model diagrams are shown. Write the symbols of the elements in the spaces provided.

Atomic # → #e⁻ = #p⁺

4e⁻	6e⁻	10e⁻	11e⁻	17e⁻	20e⁻
Be	C	Ne	Na	Cl	Ca

3·2