

Atomic Theory 6: Bohr Model

Name: Key

Date:

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Where do we find the electrons in an atom?

- Before the development of the Bohr model by Neils Bohr, there was no explanation for why the negatively charged electrons didn't crash into the positively charged protons
- We now know that we find the electrons in the outer shells surrounding the nucleus of the atom, also known as electron energy levels

How many electrons fit in each energy level?

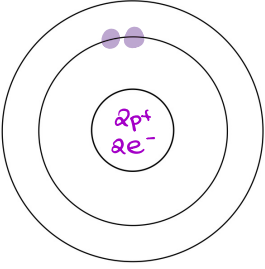
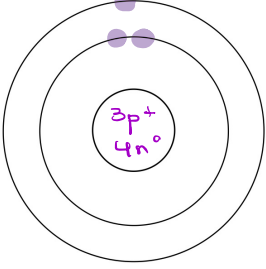
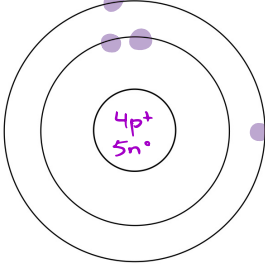
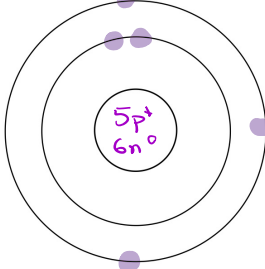
- The first electron shell holds a maximum of 2 electrons.
- Each of the next shells holds a maximum of 8 electrons.
- Shells cannot be created until the lower shell is completely filled
- Valence electrons are the outermost electrons: the electrons in the shell farthest from the nucleus. Elements in the same group or family have the same number of valence electrons.

How do we draw a Bohr model?

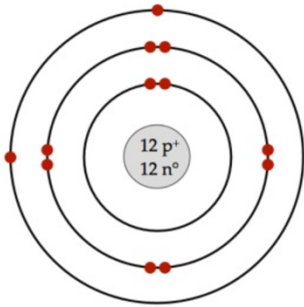
- Protons (p or p^+) and neutrons (n or n^0) are written in the middle, representing the nucleus.
- Electrons (e or e^-) are drawn in the shells surrounding the nucleus: 2 in the first shell, then 8 in the following shell(s)
- Electrons are added starting at the top and moving clockwise 
- Electrons are added 1 at a time before they are paired up

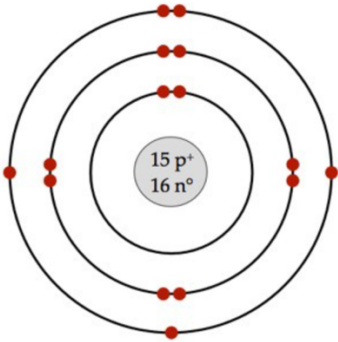


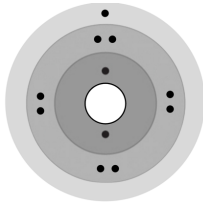
Examples:

Element	Helium	Lithium	Beryllium	Boron
Mass	4	7	9	11
Atomic #	2	3	4	5
n^0	$2n^0$	$4n^0$	$5n^0$	$6n^0$
p^+	$2p^+$	$3p^+$	$4p^+$	$5p^+$
e^-	$2e^-$	$3e^-$	$4e^-$	$5e^-$
Bohr model				

Practice: Fill in the blanks for the following atoms:

	Element name	Magnesium
	Atomic #	12
	Atomic mass	24
	e ⁻	12
	n ⁰	12
	p ⁺	12
	# valence e ⁻	2

	Element name	Phosphorus
	Atomic #	15
	Atomic mass	31
	e ⁻	15
	n ⁰	16
	p ⁺	15
	# valence e ⁻	5

	e ⁻	11
	n ⁰	12
	p ⁺	11
	Element name	Sodium

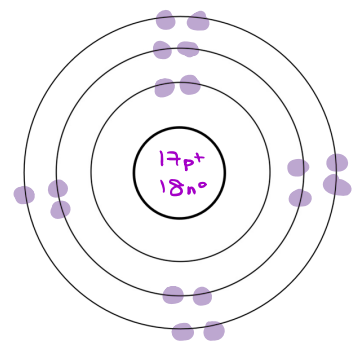
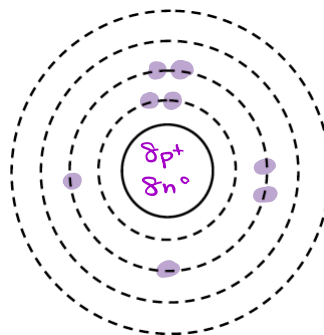
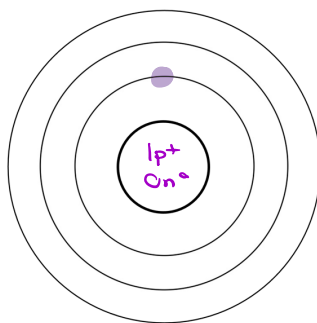
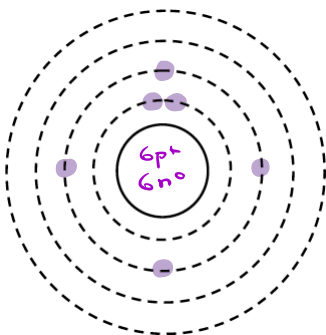
Practice: complete the Bohr models for the following elements

1. Carbon

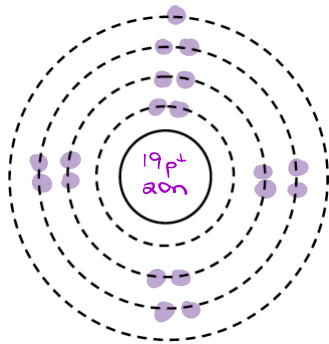
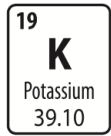
2. Hydrogen

3. Oxygen

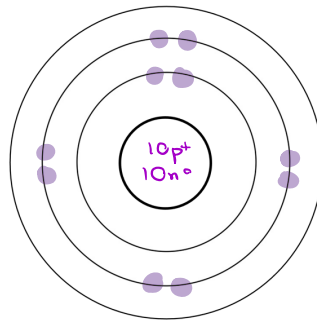
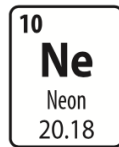
4. Chlorine



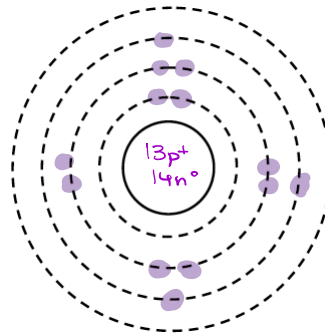
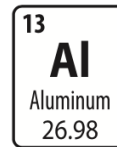
5. Potassium



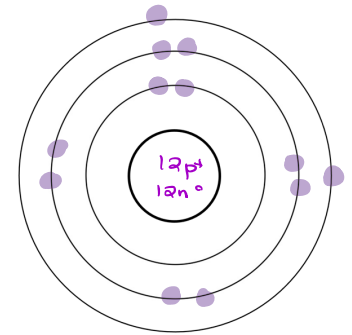
6. Neon



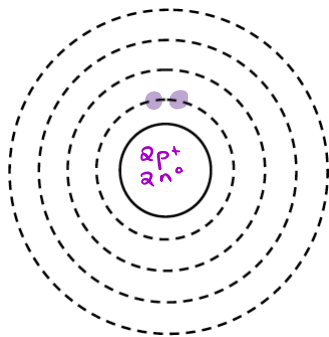
7. Aluminum



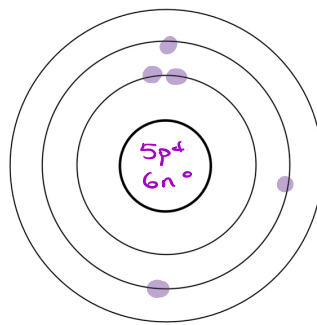
8. Magnesium



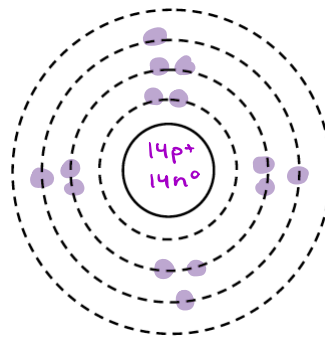
9. Helium



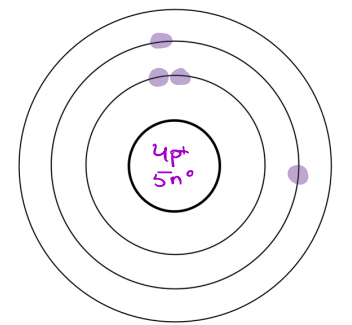
10. Boron



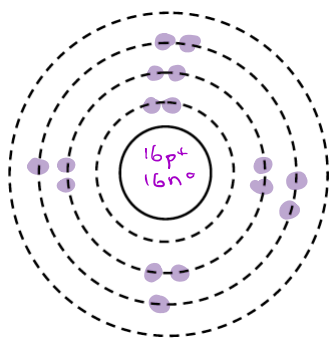
11. Silicon



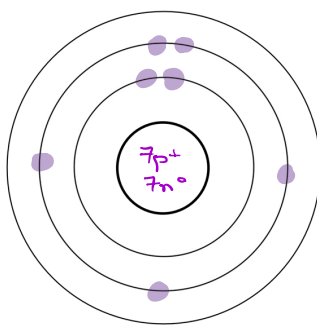
12. Beryllium



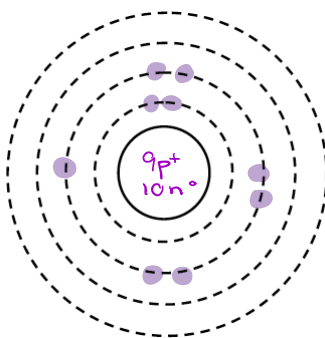
13. Sulfur



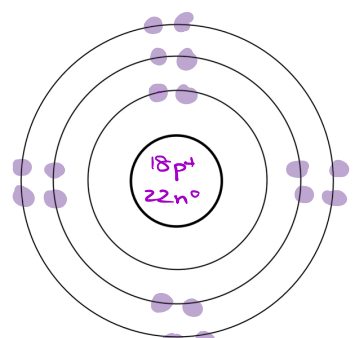
14. Nitrogen



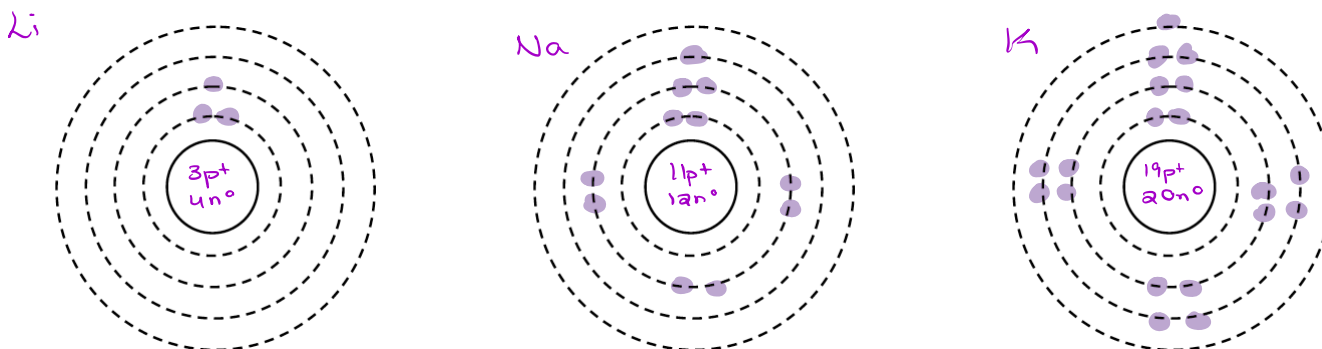
15. Fluorine



16. Argon



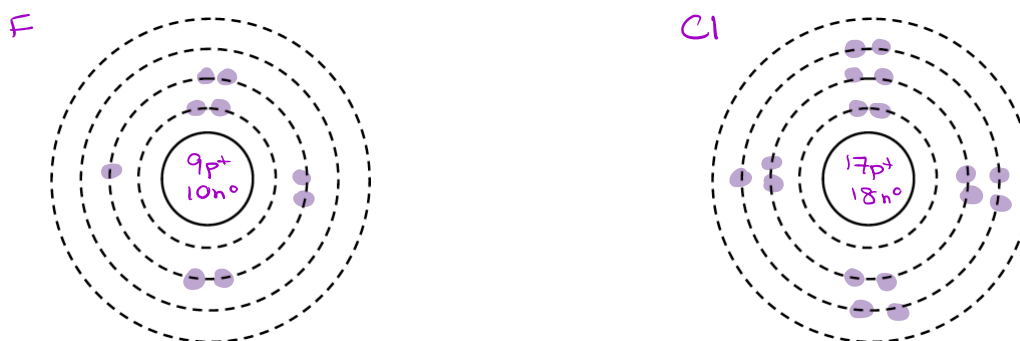
Draw the Bohr diagrams for Li, Na, K (group 1, called the Alkali metals)



What do you notice about the **number of electrons** on the OUTERMOST shell?

They all have 1 valence electron (they are all in group 1)

Draw the Bohr diagrams for F and Cl (group 17, called the halogens)



What do you notice about the **number of electrons** on the OUTERMOST shell?

They all have 7 valence electrons (they are in group 17)

How many electrons do you think are on the outermost shell for the following sets of elements?

a) Be, Mg, Ca Group 2 \rightarrow 2 valence e^-

b) He, Ne, Ar Group 18 \rightarrow 8 valence e^- (except He \rightarrow 2 valence e^-)

c) B, Al Group 13 \rightarrow 3 valence e^-

What is the term for the electrons on the outermost shell?

Valence electrons