7.4 notes

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7.4: Using the Bohr Theory

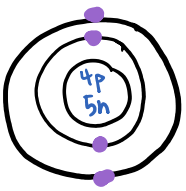
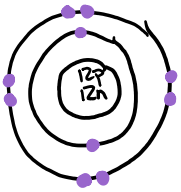
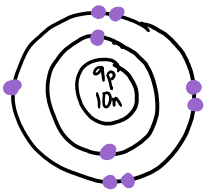
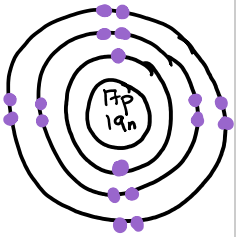
- Through a variety of experiments, chemists have been able to determine the ion charges of most of the elements on the periodic table, very valuable information for understanding the inner workings of chemical reactions!
- Recall that Bohr's theory of the atom places protons and neutrons in the nucleus of an atom, and electrons orbiting around the nucleus in distinct energy levels, or shells
- There is a maximum number of electrons 2, 8, 8, 18, 18... which can be found in each shell, and the shells will always be filled from the innermost to outermost
- The electrons in the outermost shell are referred to as valence electrons and they are the electrons involved in bonding and chemical reactions.
- We can draw helpful Bohr diagrams to show exactly what is going on with the electrons

Bohr Diagrams

- Bohr diagrams are models of an atom that help to demonstrate exactly where the electrons in an atom or ion are located
- When drawing them you will find it helpful to follow these steps:
  - Locate the element in question on the p. table
  - Look at the atomic # of this element, this will indicate to you how many PROTONS you will put in the nucleus. Write this number beside a "p" in there.
  - Look at the atomic mass of the element. Do some quick math to figure out how many neutrons belong in the nucleus. Write this number beside an "n" in there.
    - Recall: # neutrons = atomic mass − atomic number
  - Look at the period that the element is in; draw this many shells around the nucleus
    - Recall: period = # of shells.

★ There are (7) periods on the table...

- If you are drawing a Bohr diagram for a neutral atom, fill the shells (starting near the nucleus) with the same number of electrons as protons you just put in the nucleus. Electrons are drawn as a dot.
  - If your Bohr diagram is for an ION you will not be drawing an equal number of electrons to protons in the nucleus
    - If your ION is positive, you will draw less electrons than protons
    - If your ION is negative, you will draw more electrons than protons.
- EX: Draw a Bohr Diagram for

Be	Mg^{2+}	F	Cl^-
$p^+ = 4$, $e^- = 4$, $n^0 = 5$ = atom	$p^+ = 12$, $e^- = 10$, $n^0 = 12$ = ion	$p^+ = 9$, $e^- = 9$, $n^0 = 10$	= ion $p^+ = 17$, $e^- = 18$, $n^0 = 36 - 17 = 19$
			

- As you can see, when ions are formed the outermost shell either gains or loses enough electrons to become full. This is when an ion becomes stable, and will not longer react.
- The general rule is that all ions are trying to achieve a full outer shell. This means that they all want to be like the noble Gases, which always have a full valence shell and are therefore unreactive!!!
- The two reactive groups of elements on the periodic table are the group (1) metals (alkali metals) and the group (17) halogens non-metals
  - Alkali metals: have (1) valence e^- in their valence shell. They will react and LOSE this electron, explaining why they always form +1 ion. They are the most reactive metals
  - Halogens: have (7)/(17) valence e^- in their valence shell. They will react and GAIN one electron, explaining why they always form -1 ions. They are the most reactive non-metals.

P. 223 # 2-7, 9-13 do this now

Ionic Compounds

- When a _____ reacts with a _____ atom, they form what is known as an _____.
- This happens because metals and non-metals have complementary numbers of _____ available for _____.
- The metal atom will _____ its valence electrons to the non-metal. The metal atom will become a _____, and the non-metal atom will become a _____. They will both have _____ outer shells, just like the _____(their idols!)
- The metal and non-metal ions in an _____ are held together by attractive _____ existing between oppositely charged particles. This is how a _____ is created!
- Picture: Li and F

Molecular Compounds

- When a _____ atom reacts with another _____ atom they form what is known as a _____ compound.
- Covalent compounds do not cause the formation of _____, since no electrons are _____ in their formation
- Since all non-metals are _____ to having full _____, none of them want to _____ electrons in order to become _____
- Rather than transferring electrons, covalent compounds are formed when both atoms _____. Sharing electrons gives each atom a full outer shell, without either having to lose any electrons!
- Picture: O_2

Do CYUS p. 223 #3-13