Chapter 4 &5: Modern Model of the Atom and Bonding

Supplemental Instruction
Iowa State University

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Review

1. What is the noble gas configuration of the following atoms and ions?
   a) Ar [Ne] $3s^2 3p^6$ or [Ar]
   b) Na^+ [He] $2s^2 2p^6$ or [Ne]
   c) C^2- [He] $2s^2 2p^4$
   d) O^2- [He] $2s^2 2p^6$ or [Ne]
   e) Ca^2+ [Ne] $3s^2 3p^6$ or [Ar]

New Material

1. Define the following terms and answer associated questions.
   a) Heisenberg uncertainty principle: Principle that states that the position and momentum of a subatomic particle cannot be known simultaneously.

   b) orbital: 3D volume in space, cloud like distribution of electrons.

      -What is its maximum capacity? $2e^-$

   c) covalent bond: Chemical bond where the electrons are shared.

      -What does it represent? The covalent bond represents an energy minimum.
      -Is energy absorbed or released when a covalent bond is formed? Energy is released.

   d) bond length:

      -What causes bond length? the attraction of electrons to the nuclei and repulsion of 2 nuclei.
      -What units is bond length measured in? Å = Angstrom = 10^{-10} Å = 1m

2. How many orbitals are there in any s sublevel? Any p sublevel? Any d sublevel?
   s = 1 orbital - $2e^-$
   p = 3 orbitals - $6e^-$
   d = 5 orbitals - $10e^-$

3. Draw the orbitals for the 2p^5. How many electrons are there in each orbital?

4. Write the following atoms in Lewis Dot notation.
   a) N
   b) H
   c) Xe
   d) Fe