

Questions:

Below are shown the photoelectron spectra of the electrons in the second energy level for nitrogen and oxygen. Based on the spectra below which of the following best explains the difference in binding energy of the electrons in nitrogen and oxygen.



- The oxygen electrons have more binding energy because oxygen has more protons in its nucleus than nitrogen does.
- The oxygen electrons in the 2s orbital have higher binding energy because oxygen has more protons, while oxygen's 2p electrons have a lower binding energy due to greater electron-electron repulsion.
- The nitrogen electrons in the 2s orbital are closer to the nucleus and experience a stronger attractive force giving them a higher binding energy.
- The nitrogen electrons have more binding energy because nitrogen has less electron-electron repulsion.

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Answer:

The correct answer is "b". Oxygen has more protons than nitrogen which in general increases the attractive force on the electrons, but oxygen also has 4 electrons in the 2p orbitals. With 4 electrons two of the electrons must share the same orbital causing an increase in electron-electron repulsion which off sets the attractive force of the added proton.