5. Explain the following observations using Coulomb's Law. In each part, your answer must include specific information about both substances.
    a. It requires less energy to remove the first electron from magnesium than the second electron (i.e. $IE_1 <$ IE_2). (2 points)
    b. The ~~first ionization energy~~ electronegativity of sulfur is less than the ~~first ionization energy~~ electronegativity chlorine ~~of phosphorus.~~ (2 points)

    c. The Ca^{2+} and the Cl^- ions are isoelectronic, but Cl^- has a larger radius. (2 points)

(a) Mg's $IE_1 < IE_2$ b/c the increased e^-/e^- repulsion before the first e^- is removed causes the electrons to be farther from the nucleus. Coulomb's law states that the energy of attraction between valence e^- and the nucleus is inversely proportional to the distance between them, so the first e^- removed, being farther from the nucleus, will require less energy to remove.

(b)

(c) Both Ca^{2+} and Cl^- have the same # of e^-, but Cl^- has fewer protons than Ca^{2+}. Coulomb's law states that the energy of attraction between valence e^- and the nucleus is directly proportional to the magnitude of the charges, so fewer p^+ means Cl^-'s valence e^- are less attracted to the nucleus, so they'll be farther away than Ca^{2+}'s valence e^-.

(b.) Sulfur has lower electronegativity (EN) than Cl b/c S has one less p^+ than Cl in its nucleus. Coulomb's law states that the energy of attraction between valence e^- and the nucleus is directly proportional to the magnitude of the charges, so e^- in a bond w/ S would experience less attraction to its nucleus than e^- in a bond w/ Cl.