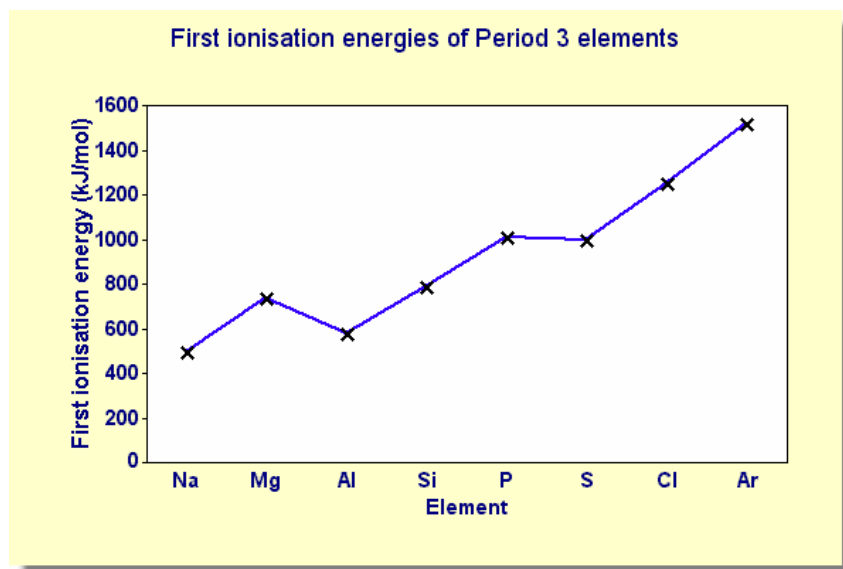


Question #75894, Chemistry / Other / Completed

Explain the reason for the variation of the first ionization energies of the third period elements

Answer:



Going across Period 3:

- there are more protons in each nucleus so the nuclear charge in each element increases
- therefore the force of attraction between the nucleus and outer electron is increased,
- there is a negligible increase in shielding because each successive electron enters the same energy level
- so more energy is needed to remove the outer electron.

Magnesium: $1s^2 2s^2 2p^6 3s^2$... and ... aluminium: $1s^2 2s^2 2p^6 3s^2 3p^1$

The outer electron in aluminium is in a p sub-level. This is higher in energy than the outer electron in magnesium, which is in an s sub-level, so less energy is needed to remove it.

Phosphorus: $1s^2 2s^2 2p^6 3s^2 3p^3$... and ... sulphur: $1s^2 2s^2 2p^6 3s^2 3p^4$

The 3p electrons in phosphorus are all unpaired. In sulphur, two of the 3p electrons are paired. There is some repulsion between paired electrons in the same sub-level. This reduces the force of their attraction to the nucleus, so less energy is needed to remove one of these paired electrons than is needed to remove an unpaired electron from phosphorus.