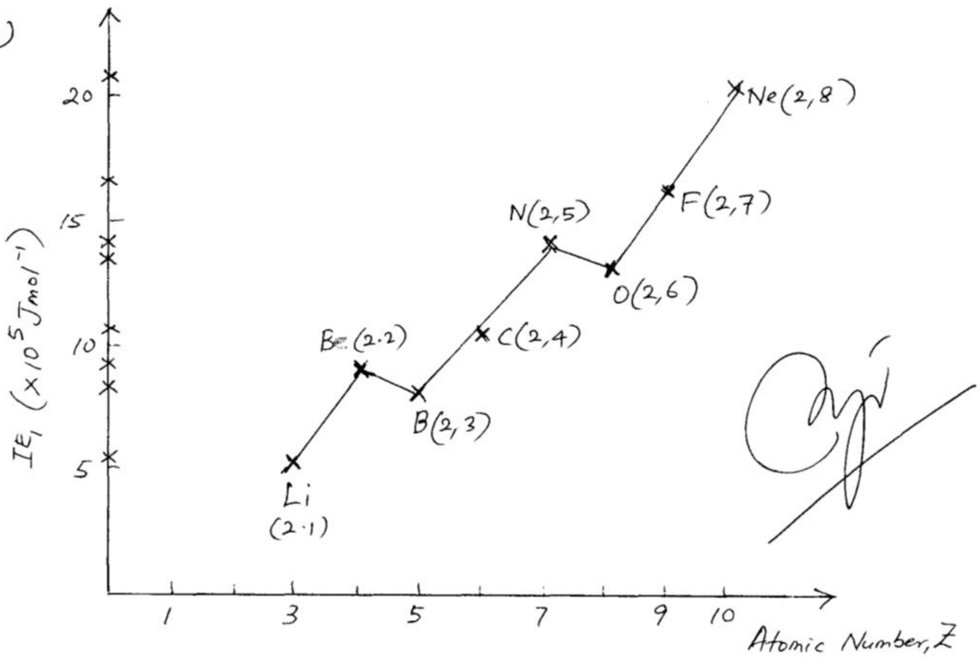
Sem1_2005_2006_Q3c : Electronic Configuration

Q3(c)



- From Li($3p^+$) ⟶ Ne($10p^+$) : Across a period.
  As we move left to right across a period, the orbital's n value stays the same, so Zeff increases, which makes an electron harder to remove. Ionization energy generally increases across a period.
- For B(Z = 5) and O(Z = 8), there is small 'dip' in the otherwise smooth increase in ionization energy.
  $B(1s^2 2s^2 2p^1) \xrightarrow{-e^-} B^+(1s^2 2s^2)$
  stable configuration
  $2p^1$ energy level is higher than $2s^2$ orbital. So the electron in $2p^1$ is pulled off more easily leaving a stable, filled $2s^2$ sublevel.
  $O(1s^2 2s^2 2p^4) \xrightarrow{-e^-} O^+(1s^2 2s^2 2p^3)$
  [↑↓ | ↑ | ↑] $2p^4$ half-filled-stable [↑ | ↑ | ↑] $2p^3$
  The dip in O atom occur because the $2p^4$ electron is the first to pair up with another 2p electron, and electron-electron repulsions raise the orbital energy. Removing the $2p^4$ electron relieves the repulsions and leaves a stable, half-filled $2p^3$ sublevel. So less energy needed for this process.

(1/2)

Sem1_2005_2006_Q3d : Electronic Configuration

Q3 (d) Boron, B (Z = 5)

$1s^2 2s^2 2p^1 \equiv$ (↑↓) 1s (↑↓) 2s (↑)( )( ) 2p

$1s^2$:	$n = 1$	$l = 0$	$m_l = 0$	$m_s = +\frac{1}{2}$
	$n = 1$	$l = 0$	$m_l = 0$	$m_s = -\frac{1}{2}$
$2s^2$:	$n = 2$	$l = 0$	$m_l = 0$	$m_s = +\frac{1}{2}$
	$n = 2$	$l = 0$	$m_l = 0$	$m_s = -\frac{1}{2}$
$2p^1$	$n = 2$	$l = 1$	$m_l = 0$	$m_s = +\frac{1}{2}$

($m_l = 0$) or $m_l = -1$ or $+1$

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