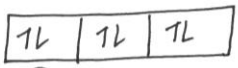
KSCP (2003/04) : Electronic Configuration

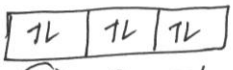
Q_2 (a) Fe atom ($Z = 26$) : $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^2$

$l = 0$ (s orbital) : There are 4 filled s subshells : $1s^2 2s^2 3s^2 4s^2$
– 8 electrons

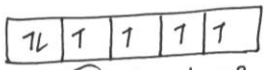
$m_l = 1$: can has $l = 1$ and $l = 2$

For $l = 1$ (p orbitals) : $2p^6$, $3p^6$

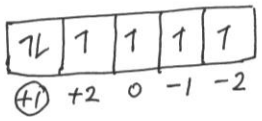
$2p^6$:  = 2 electrons in $2p^6$ has $m_l = 1$

$3p^6$:  = 2 electrons in $3p^6$ has $m_l = 1$

For $l = 2$ (d-orbitals) :

$3d^6$: 

= 1 electron in $3d^6$ has $m_l = 1$

(or)  = 2 electrons in $3d^6$ has $m_l = 1$

Therefore Fe atom has 5 electrons with $m_l = 1$
(or 6 electrons with $m_l = 1$ – depending on the configuration shown above)

Q_2 (b)

N 2.5	N^{3-} 2.8 ($7p^+ 10e^-$)	O 2.6	O^{2-} 2.8 ($8p^+, 10e^-$)
Mg 2.82	Mg^{2+} 2.8 ($12p^+, 10e^-$)	F 2.7	F^- 2.8 ($9p^+, 10e^-$)
Na 2.8.1	Na^+ 2.8 ($11p^+, 10e^-$)	Ne 2.8 ($10p^+, 10e^-$)	

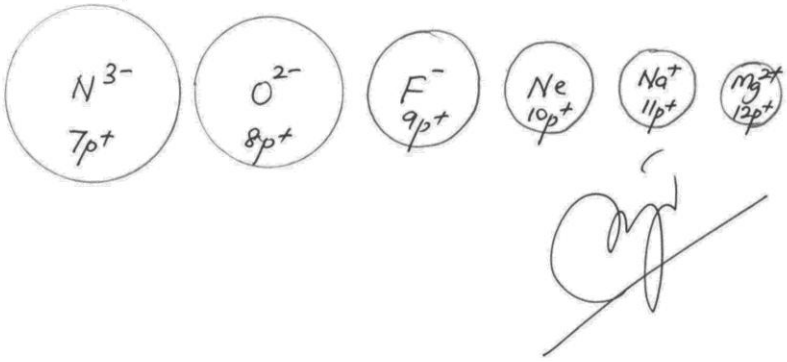
KSCP (2003/04): Electronic Configuration

N^{3-}, O^{2-}, F^-, Ne, Na^+, Mg^{2+} : isoelectronic ion/atom
(same electronic configuration : $1s^2 2s^2 2p^6$)

N^{3-} ; O^{2-} ; F^- ; Ne ; Na^+ ; Mg^{2+}
(7p+) (8p+) (9p+) (10p+) (11p+) (12p+)

——— size of ion decreases ⟶

As the amount/number of protons in the nucleus increases, electrons in the orbitals are more strongly attracted towards the nucleus. Therefore the sizes of the ion decreases as the no. of proton increases.



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