INTRODUCTION TO NATURAL SCIENCE

CHEMISTRY HOMEWORK - WEEK 5 - WINTER QUARTER

Chapter 8

(25) C < B < Al < Na < K

(27) (a) Cl (b) Al (c) In

~~(30) (c) Li < Si < C < Ne~~

(30) K < Li < C < N

(32) (a) Al (b) Al (c) C (d) Al < B < C

(33) (a) S < O < F

S has valence electrons in the 3rd energy level ($n=3$) compared with O and F ($n=2$ is the valence level). It is easier to remove electrons from $n=3$ than from $n=2$ since $n=3$ is further away from the nucleus. ∴ S has the lowest IE of the three.

F is smaller in size than O. Valence electrons in F are

(b) O. does.

Valence electrons in O are in $n=2$. Those in S and Se are in $n=3$ and 4 respectively. It is harder to remove electrons from $n=2$ than from $n=3$ & 4 since $n=2$ is closer to the nucleus. ∴ IE of O is the highest.

(c) Cl is more electronegative. Since its valence orbital is $n=3$ (that of Br and Se is $n=4$) it attracts electrons better than Br & Se.

(d) F has a smaller radius than F^-.

	F^-	O^{2-}
# of $\bar{e}$	10	10
# of p	9	8

∴ F^- is smaller in radius than O^{2-}

∴ O^{2-} has the largest radius.

$F < F^- < O^{2-}$

$\longrightarrow$ radius

(3#) (a) $F < O < S$

$n=2$ $n=2$ $n=3$ ← valence energy level.

S has the valence level furthest away from the nucleus. ∴ S is largest.

In F and O, valence $\bar{e}$ are filling into the

same $n=2$ level. F has 9 protons attracting the electrons, O has only 8 of them. ∴ F is smaller in size than O.

(b) S is hardest to ionize among the 4.

Se has valence $\bar{e}$ in $n=4$,
Si, P, S all have valence $\bar{e}$ in $n=3$ } ∴ Se is the easiest to ionize. Lowest I.E.

Ionization energy increases across a period in general therefore

I.E. of Si < I.E. of P < I.E. of S

<u>but</u> there is an exception between P and S

P $3s^2 3p^3$ 3s [↑↓] 3p [↑] [↑] [↑]

S $3s^2 p^4$ 3s [↑↓] 3p [↑↓] [↑] [↑]

Due to $\bar{e}$-$\bar{e}$ repulsion, it is easier to remove an $\bar{e}$ from S than from P.

∴ S has the highest I.E.

(c)

	O^{2-}	N^{3-}	F^-
# of $\bar{e}$	10	10	10
# of P	8	7	9

F^- is smallest since it has more protons to attract 10 $\bar{e}$. N^{3-} is largest since it has only 7 p to attract the 10 $\bar{e}$

$F^- < O^{2-} < N^{3-}$

4

Cs Ba Sr

Valence energy level } n = 6 n = 6 n = 5

↑ inner energy level.

∴ hardest to remo
an ē ⇒ Highest I.

Cs is larger in size than Ba, making it easier to remove an ē from Cs than Ba

∴ I.E. Cs < I.E. Ba

(48) [Ar] $4s^2$ is Ca = A

[Ar] $3d^{10} 4s^2 4p^5$ is Br = B

(a) metal (b) non-metal (c) B (d) B

(50) K^+, Cl^-, S^{2-} and Ca^{2+} all have the same electron configuration as Ar, with 18 ē

	Ca^{2+}	K^+	Cl^-	S^{2-}
# of ē	18	18	18	18
# of p	20	19	17	16

∴ Ca^{2+} has the highest p : ē ratio, making it the smallest in size. S^{2-} has the lowest p : ē ratio making it the largest in size

$Ca^{2+} < K^+ < Cl^- < S^{2-}$ ⟶ Size