CHEMISTRY 1A (CHEM1101) June 2007

2007-J-2

- ${}^{55}_{25}\mathrm{Mn}$

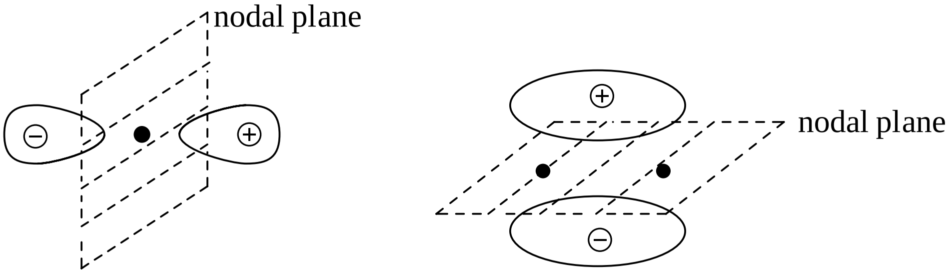
  ${}^{4}_{2}\mathrm{He}$

  ${}^{1}_{0}\mathrm{n}$
- 207.2
- 9.26×10^{9} Ci mol^{-1}

2007-J-3

- (a) No two electrons may occupy the same orbital with the same spin, thereby having the same set of quantum numbers.

  (b) Electrons occupy only discrete circular orbits. Only certain orbits are allowed.
- $1s^2\ 2s^2\ 2p^6$

  $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^5$
- 

2007-J-4

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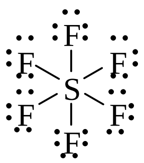
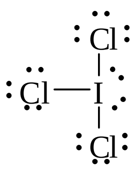
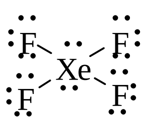
	6	octahedral	octahedral
	5	trigonal bipyramidal	T-shape
	6	octahedral	square planar

- 1.04×10^{-5} m

  1.90×10^{-20} J

2007-J-5

- 861 kJ mol^{-1}

  1.748. The Cl^- ions are already as close-packed as possible and Li^+ is a smaller ion than Na^+. Therefore substitution of Na^+ with Li^+ will result in less stress on the crystal structure and hence LiCl will have the same structure and Madelung constant as NaCl.

2007-J-6

- -5470 kJ mol^{-1}

  32 MJ (*i.e.* 3.2×10^4 kJ)

2007-J-7

- 8.6×10^2 L

2007-J-8

- ion-induced dipole forces

  At low temperatures ΔG is –ve, ΔH is –ve, ΔS is –ve

  At high temperatures ΔG is +ve, ΔH is –ve, ΔS is –ve

2007-J-9

- The reaction is favoured at higher temperatures (*i.e.* increasing the temperature increases the amount of product). Therefore reaction is endothermic.

  2.67×10^{-18} atm 1.00 atm

2007-J-10

- 5.3×10^5 M^{-1}

  1.46×10^{-14} M^{-1}

2007-J-11

- $2K(s) + 2H_2O(l) \rightarrow 2K^+(aq) + 2OH^-(aq) + H_2(g)$

  $3Zn^{2+}(aq) + 2PO_4^{3-}(aq) \rightarrow Zn_3(PO_4)_2(s)$

  $SrCO_3(s) + 2H^+(aq) \rightarrow Sr^{2+}(aq) + CO_2(g) + H_2O(l)$

- The overall reaction for the zinc/silver button battery is:

  $Zn(s) + Ag_2O(s) \rightarrow ZnO(s) + 2Ag(s)$

  All components are solids and hence (from Nernst equation) the voltage will remain constant as concentrations of all products and reactants remains constant.

  In contrast, the overall reaction for the lead acid battery is:

  $PbO_2(s) + Pb(s) + 2H^+(aq) + 2HSO_4^-(aq) \rightarrow 2PbSO_4(s) + 2H_2O$

  Here the concentrations of $H^+(aq)$ and $HSO_4^-(aq)$ decrease as the battery discharges and hence the voltage drops.

2007-J-12

- 1.22 tonne

- anode

  $H_2(g)$

  increases

  $Cl_2(g)$