FUNDAMENTALS OF CHEMISTRY 1A (CHEM1001) - June 2008

2008-J-2

- $^{63}_{28}Ni \rightarrow ^{63}_{29}Cu + ^{0}_{-1}\beta$

  $^{222}_{86}Rn \rightarrow ^{218}_{84}Po + ^{4}_{2}He$
- 9.993×10^{14} s^{-1} $\quad$ 6.622×10^{-19} J

2008-J-3

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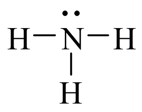
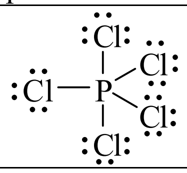
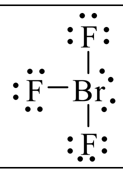
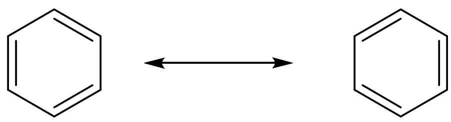
NH_3	PCl_5	BrF_3
ammonia	phosphorus pentachloride	bromine trifluoride
		
3	5	3
1	0	2
trigonal pyramidal	trigonal bipyramidal	T-shaped

2008-J-4

- $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$
- When two or more Lewis structures can be drawn for a molecule, the true structure is none of the structures that is drawn, but a type of average made up of all the resonance contributors. Some structures may contribute more than others.

  e.g. In benzene, the molecule does not consist of a series of alternating double and single bonds, but is an average of the two structures shown. All of the C-C bonds are exactly the same length.
- **A**: 109° $\quad$ **B**: 120° $\quad$ **C**: 109° $\quad$ **D**: 109°

  A (O) and **D** (N)

2008-J-5

- 21 g O_2 required; 0.40 mol CO_2 produced; 0.50 mol H_2O produced
- $BaCO_3$

2008-J-6

- $Pb^{2+}(aq) + 2I^{-}(aq) \rightarrow PbI_2(s)$

  0.0020 mol

  0.010 mol

  0.12 M

2008-J-7

- Dissolve the cadmium chloride in water.

  $CdCl_2(s) \rightarrow Cd^{2+}(aq) + 2Cl^{-}(aq)$

  Add a solution of sodium carbonate. Cadmium carbonate will precipitate.

  $Cd^{2+}(aq) + CO_3^{2-}(aq) \rightarrow CdCO_3(s)$

  Filter off and wash the precipitate and then dissolve it in dilute sulfuric acid.

  $CdCO_3(s) + 2H^{+}(aq) \rightarrow Cd^{2+}(aq) + H_2O(l) + CO_2(g)$

  Evaporate the solution to give cadmium sulfate.

  $Cd^{2+}(aq) + SO_4^{2-}(aq) \rightarrow CdSO_4(s)$

2008-J-8

- $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

  mole fractions: 0.178 N_2, 0.534 H_2, 0.288 NH_3

  partial pressures: 8.9 MPa N_2, 27 MPa H_2, 14 MPa NH_3

  1.3×10^{-5} (pressures must be converted to atmospheres for this calculation)

2008-J-9

- 33.6 kJ mol^{-1}
- 0.013

2008-J-10

- 0.026 M
- 10.7 minutes
- 1.30 V

2008-J-11

- –197.8 kJ mol^{-1}
- 0.129 J g^{-1} K^{-1}
- CH_4 < CH_3CH_3 < $CH_3CH_2OCH_2CH_3$ < CH_3OH < CH_3CH_2OH

  CH_4 and CH_3CH_3 have only weak dispersion forces; CH_3CH_3 has more atoms so has more dispersion forces.

  $CH_3CH_2OCH_2CH_3$ has dispersion forces and dipole-dipole forces.

  CH_3CH_2OH and CH_3OH have relatively strong H-bonds as well as dispersion forces and dipole-dipole forces. CH_3CH_2OH has more atoms so has more dispersion forces and hence the higher bp.

2008-J-12

- -1.48×10^{3} kJ

  NH_4^{+} –III; NO_3^{-} +V; N_2 0