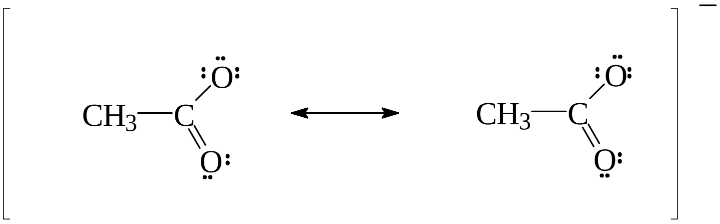
FUNDAMENTALS OF CHEMISTRY 1A (CHEM1001) - June 2005

2005-J-2

- $^{14}_{7}N$

  $^{239}_{93}Np$

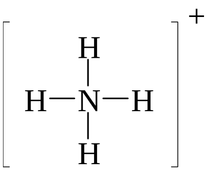
- When more than one Lewis structure can be drawn for a molecule, the true structure is an average (called a resonance hybrid) of all the structures drawn. In some cases one or more structures may be dominant contributors - in other cases there may be only 2 equal contributors. eg acetate ion

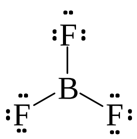


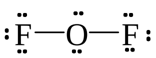
- aluminium
- 5.26×10^{14} Hz 3.49×10^{-19} J

2005-J-3

- Iodine consists of discrete I_2 molecules. The intermolecular forces between these I_2 units are weak dispersion forces, so the solid is soft with a low melting point. (The strength of the I-I bond is essentially irrelevant.) Diamond consists of a giant 3-dimensional array of carbon atoms in a tetrahedral arrangement. Each atom is covalently bonded to its neighbour to give one giant molecule (covalent network solid). The C-C covalent bond is very strong, so diamond is hard with a high melting point.

-  tetrahedral tetrahedral

   trigonal planar trigonal planar

   tetrahedral bent

2005-J-4

- B_5H_9

- potassium sulfate

  $CuCl_2$

  sulfur tetrafluoride

  K_2CrO_4

2005-J-5

- $Fe_2O_3(s) + 3CO(g) \rightarrow 2Fe(s) + 3CO_2(g)$
- 4.00 g

  25.0 mL

2005-J-6

- $NH_4NO_3(s) \rightarrow NH_4^+(aq) + NO_3^-(aq)$

  endothermic

  +26.1 kJ mol^{-1}
- aluminium

  Aluminium can absorb more heat per gram of metal than iron.

2005-J-7

- $2Al(s) + Fe_2O_3(s) \rightarrow Al_2O_3(s) \quad 2Fe(s)$

  559 g
- All reactants and products are in their standard states.

  A reaction at equilibrium has not stopped - the rate of the forward reaction is equal to the rate of the backward reaction - a dynamic situation.

2005-J-8

- 11.0 atm

2005-J-9

- 409 kJ
- Zn(s), $Ag_2O(s)$

I It acts like a salt bridge allowing the migration of ions away from and towards the electrodes. $OH^-(aq)$ ions are produced at the cathode and consumed at the anode.

The overall cell reaction is $Zn(s) + Ag_2O(s) \rightarrow 2Ag(s) + ZnO(s)$
No ions with constantly changing concentrations appear, so the cell produces a constant voltage until one of the reactants is exhausted and it stops functioning.

2005-J-10

- $\frac{[Zn^{2+}]}{[Cr^{2+}]} = 4 \times 10^{-5}$
- Pb(s), $PbSO_4(s)$ is the anode.

  $Pb(s) + SO_4^{2-}(aq) \rightarrow PbSO_4(s) + 2e^-$

  $PbO_2(s)$, $PbSO_4(s)$ is the cathode

  $PbO_2(s) + 4H^+(aq) + SO_4^{2-}(aq) + 2e^- \rightarrow PbSO_4(s) + 2H_2O$

2005-J-11

- 0.045 M