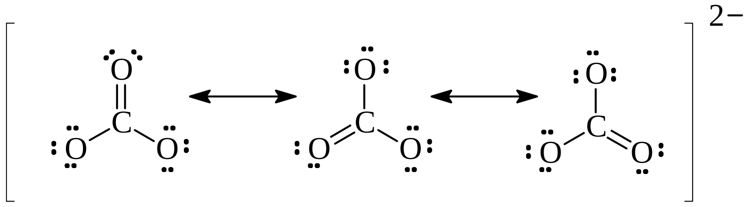
CHEM1909 (1LS Advanced Course) - November 2005

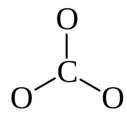
2005-N-2

- 2.40×10^3 m s^{-1}
- 1.3×10^{-9} m

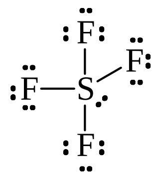
2005-N-3



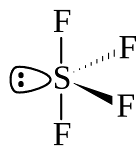
sp^2



trigonal planar



$sp^3\,d$



"see-saw"

2005-N-4

- $\Delta H°_f$ = 51 kJ mol^{-1}

  $\Delta H°_f$ = 12 kJ mol^{-1}

2005-N-5

- 0.0102 mol

  1.00×10^4

2005-N-6

1.00×10^4

–23.6 kJ mol^{-1}

1.35 kJ mol^{-1}

The amount of NO_2 will increase. As $\Delta G°$ is positive, the reaction is non-spontaneous in forward direction and spontaneous in backward direction.

2005-N-7

- –79.9 kJ mol^{-1}

  3.16 kPa

  –0.287 °C

  NaCl. It gives $2(\frac{3.42}{58.44}) = 0.117$ mol of ions; $CaCl_2$ gives $3(\frac{3.42}{131.0}) = 0.0783$.

2005-N-8

- More sensible to detect Fe^{3+}. $Fe(OH)_3$ is much less soluble at pH 8 than $Fe(OH)_2$, so it's easier to precipitate.
- hexaaquachromium(III) nitrate

  dibromobis(ethylenediamine)cobalt(III) chloride

2005-N-9

- 6.0×10^{30} M

2005-N-10

- anode: $Sn(s) \rightarrow Sn^{2+}(aq) + 2e^-$

  cathode: $Ag^+(aq) + e^- \rightarrow Ag(s)$

  Overall: $2Ag^+(aq) + Sn(s) \rightarrow Ag(s) + Sn^{2+}(aq)$

  $Sn(s) \mid Sn^{2+}(aq) \parallel Ag^+(aq) \mid Ag(s)$

  positive

  +0.94 V
- During winter, ice crystals form in the stratosphere to produce an aerosol colloid (solid dispersed in gas). The ice crystals provide a catalytic surface for the reaction: $ClO + NO_2 \rightarrow ClNO_3$
  $ClNO_3$ thus accumulates during winter. When spring/summer arrives UV radiation from the sun causes decomposition of $ClNO_3$ and releases Cl radicals which can destroy ozone.

2005-N-11

- 11.19

  3.60
- 8.08

  0.21

2005-N-12

- 5.98 hours

  94%
- neutron:proton ratio = 8:5 = 1.6. It would therefore decay via β^- decay as this would give neutron:proton ratio = 7:6 = 1.2, which is closer to 1.

  $^{13}_{5}B \rightarrow {}^{13}_{6}C + {}^{0}_{-1}e$

2005-N-13

- Rate = $k[ClO_2]^2[OH^-]$

  $k = 2.3 \times 10^2$ M^{-2} s^{-1}

  rate of decrease of $[ClO_2]$ is twice the rate of increase of $[ClO_3^-]$

2005-N-14

Rate = $k[Cl_2]^{½}[CHCl_3]$