2007-N-2

- –78.2 kJ mol^{-1}
- –350 kJ mol^{-1}

2007-N-3

- $\Delta G° = \Delta H° - T\Delta S°$
    $= -198.4 - (298 \times -187.9) \times 10^{-3}$
    $= -142.4$ kJ mol^{-1}

    As $\Delta G°$ is negative, the reaction is spontaneous

    To the left

    $K = 9.15 \times 10^{24}$

    $T > 1056$ K

2007-N-4

- $K = 6.52 \times 10^2$

    86.2%

    (i) add more glucose   (ii) decrease the temperature

        (removing either (or both) of the products isn't really simple)

2007-N-5

- 1.40×10^4 g mol^{-1}
- 334 g

2007-N-6

0.557 g

decrease

Increased pressure in lungs during deep sea diving causes an increased solubility of all gases in the blood. On ascending too quickly, these gases can bubble out of the blood. This is a serious problem with nitrogen as the bubbles can rupture blood vessels causing "the bends". The He atom is much smaller than the N_2 molecule, has a smaller electron cloud and is less polarisable. It therefore is less soluble in blood than nitrogen and is preferred as the above dangers are reduced.
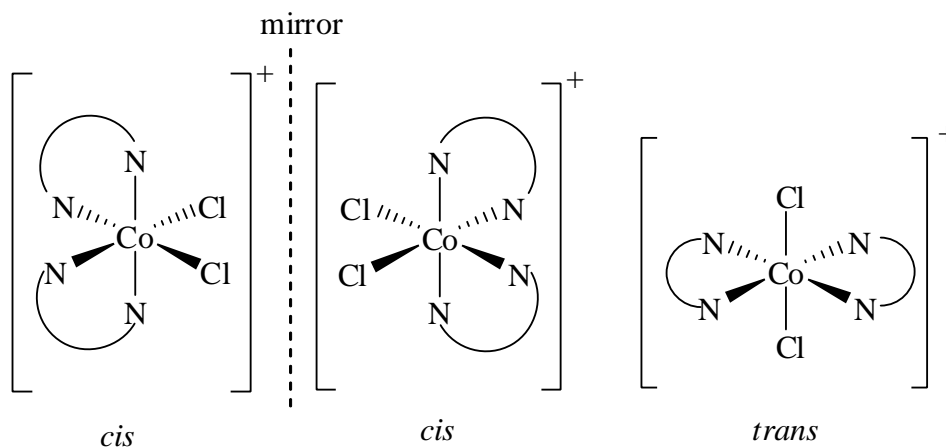
2007-N-7

- $+1.67$ kJ mol^{-1}

   $+7.37$ kJ mol^{-1}

   To the left. As written, the reaction is non-spontaneous (as $\Delta G° > 0$). It must therefore run spontaneously in the opposite direction.
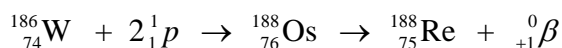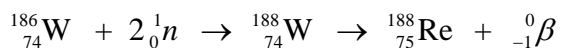

extent of reaction
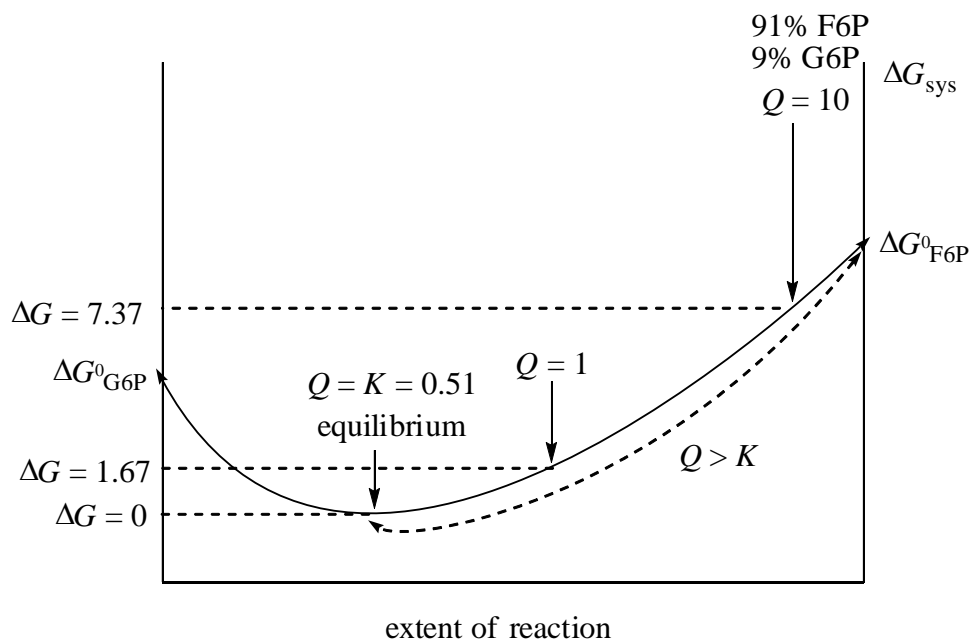
2007-N-8

- 1.0×10^{-7} M

-

dichlorobisethylenediaminecobalt(III) ion

- sodium hexafluoroaluminate(III)

   pentaamminebromocobalt(III) sulfate

2007-N-9

$$^{186}_{74}\text{W} + 2\,^{1}_{0}n \rightarrow \,^{188}_{74}\text{W} \rightarrow \,^{188}_{75}\text{Re} + \,^{0}_{-1}\beta$$

$$^{186}_{74}\text{W} + 2\,^{1}_{1}p \rightarrow \,^{188}_{76}\text{Os} \rightarrow \,^{188}_{75}\text{Re} + \,^{0}_{+1}\beta$$

$^{188}_{76}\text{Os}$ is a stable nuclide so proton bombardment doesn't work.

Neutron production is much cheaper than proton production.

Neutron bombardment is much easier reaction as the positively charged nucleus repels the positively charged protons.

1.36×10^{-6} g

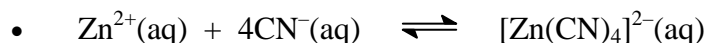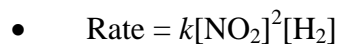**2007-N-10**

- 1.1×10^{3} minutes

- 0.86 mol

2007-N-11

- 0.51 V

  0.24 V

  (b) Ag^{+}(aq) ions are produced. They will react with the Cl^{-}(aq) ions in solution and a white precipitate of AgCl will be seen to form around the electrode.

2007-N-12

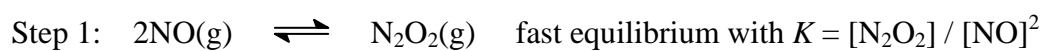- Zn^{2+}(aq) + $4CN^{-}$(aq) $\rightleftharpoons$ $[Zn(CN)_4]^{2-}$(aq)

  7.8×10^{-23} M

- Colloids can be stabilised electrostatically - like charges on the surface of the particles cause the particles to repel each other. The addition of electrolytes neutralises these surface charges and the particles can now come together.
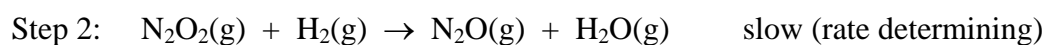

2007-N-13

- Rate = $k[NO_2]^2[H_2]$

  2.9×10^2 M^{-2} s^{-1}

  4.1×10^{-5} mol L^{-1} s^{-1}

  Step 1: $2NO$(g) $\rightleftharpoons$ N_2O_2(g)   fast equilibrium with $K = [N_2O_2] / [NO]^2$

  $\qquad\qquad K = [N_2O_2] / [NO]^2 \Rightarrow [N_2O_2] = K[NO]^2$

  Step 2: N_2O_2(g) + H_2(g) $\rightarrow$ N_2O(g) + H_2O(g)   slow (rate determining)

  Rate = $k[N_2O_2][H_2]$

  $\qquad = kK[NO]^2[H_2]$

  $\qquad\qquad$ which is consistent with rate law of   Rate = $k[NO]^2[H_2]$.