CHEM1909 (Life Sciences Course) - November 2006

2006-N-2

- $C_6H_5COOH(s) + {}^{15}/_2O_2(g) \rightarrow 7CO_2(g) + 3H_2O(l)$

  1308 J K^{-1}

  8.05 atm

2006-N-3

- copper
- As the halogen gets bigger, the length of the H-X bond increases and hence gets weaker. The weaker the bond, the more easily the H^+ dissociates.

  As the electronegativity of the halide increases, the more electron density it pulls from the O-H bond towards itself. This results in the O-H bond becoming more polar and increasing the ease with which the H^+ will be lost.

2006-N-4

- 8.10

  4.12

2006-N-5

- –262 kJ mol^{-1}

2006-N-6

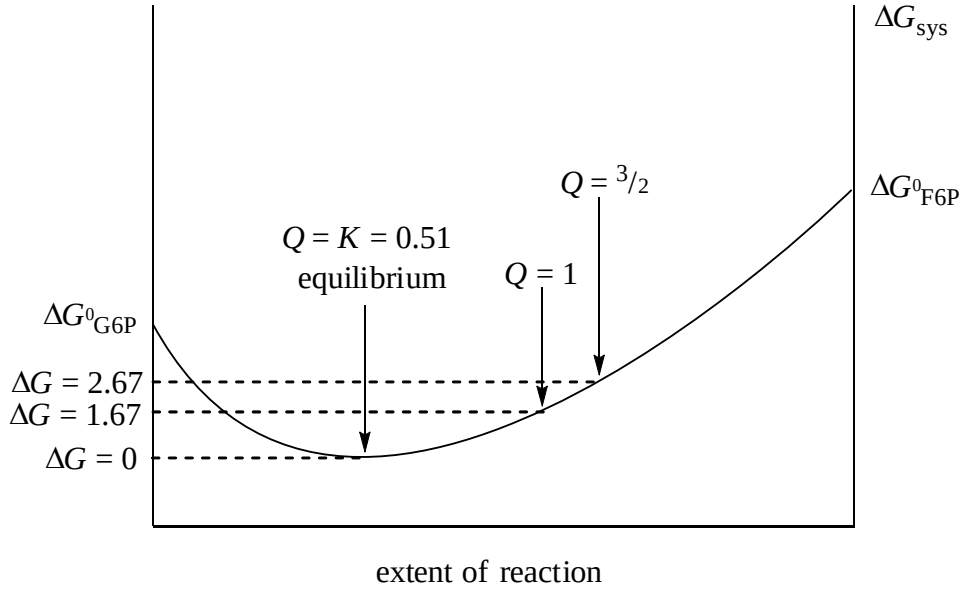
0.12 M

$[CO_2(g)]$ decreases

2006-N-7

- 0.510

  2.67 kJ mol^{-1}



2006-N-8

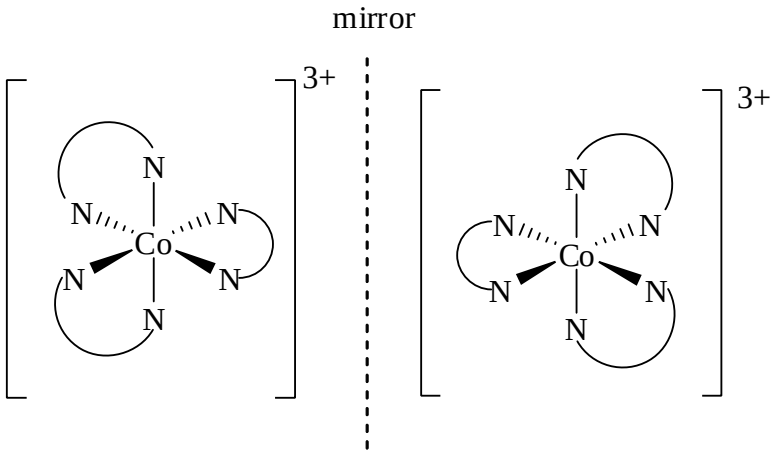
- –2.11 °C

  23.28 mmHg

  2.80×10^{6} M

2006-N-9

- 7.0×10^{-8} M^{3}



- tetraaaquadibromocobalt(III) chloride

  potassium dicyanoaurate(I)

2006-N-10

- $Cd^{2+} + 4NH_3 \rightleftharpoons [Cd(NH_3)_4]^{2+}$

  $K_{stab} = \dfrac{[Cd(NH_3)_4^{2+}]}{[Cd^{2+}][NH_3]^4}$

- 0.40 V

2006-N-11

- –100 kJ mol^{-1}

  3.9×10^{17}

  $Zn(s) | Zn^{2+}(aq) || Ni^{2+}(aq) | Ni(s)$

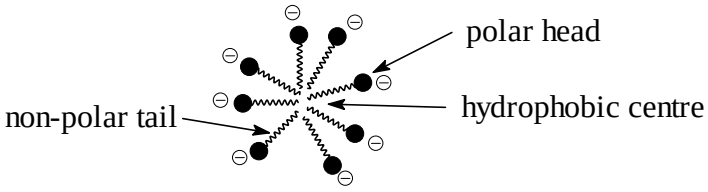
- 2.29 minutes

2006-N-12

- 41 mg
- They can be stabilised via electrostatic and steric stabilisation.

  Hydrophilic colloids may have a charge on their surface that attracts oppositely charged ions (H^+ or OH^- present in water) to form a tightly bound layer known as the Stern Layer. The Stern layer is surrounded by a diffuse layer which contains an excess of counter-ions (opposite in charge to the Stern layer) and a deficit of co-ions. The Stern layer and diffuse layer are collectively known as a double layer. Coagulation of a hydrophilic colloid is prevented by mutual repulsion of the double layers.

  Hydrophobic colloids may be stabilised by the use of a surfactant, *e.g.* a long chain fatty acid with a polar head and a non-polar tail. When dispersed in water these molecules arrange themselves spherically so that the polar (hydrophilic) heads are interacting with the polar water molecules and the non-polar (hydrophobic) tails are interacting with each other. This arrangement is called a micelle. The hydrophobic colloid can be stabilized by dissolving in the non-polar interior of the micelle.



- 2.23×10^3 kJ mol^{-1}

2006-N-13

- Rate = $k[NO_2]^2$

  $k = 2.08 \times 10^{-4}$ L mol^{-1} s^{-1}

  5.21×10^{-5} M s^{-1}

  $2NO_2(g) \rightarrow NO(g) + NO_3(g)$ slow

  $NO_3(g) + CO(g) \rightarrow NO_2(g)\ CO_2(g)$ fast

  The slow first step is consistent with rate law of Rate = $k[NO_2]^2$. The fast second step is consistent with the rate being independent of [CO].