CHEM1612 (Pharmacy) - November 2012

2012-N-2

- All processes occur spontaneously in the direction that increases the total entropy of the universe.

  The partial pressure that builds up above the surface of a volatile liquid in a closed container due to evaporation.

  The pH at which a protein or amino acid has no net charge, *i.e.* it contains equal amounts of positive and negative charges.

- According to the First Law of Thermodynamics, energy can be transferred in the form of heat or work. The amount of energy the reaction releases is constant, so if the heat released in mitochondria is reduced it means more work must be done. ΔG is the maximum amount of non-PV work obtainable from a system. The energy released by the oxidation of NADH in mitochondria is used to do non-PV work, *viz.* the pumping of H^+ ions across the inner mitochondrial membrane. By storing this energy in the form of an H^+ gradient, the amount of energy wasted as heat is reduced.

2012-N-3

- -127.8 kJ mol^{-1}
- 227.0 kJ mol^{-1}

2012-N-4

- 2.08 L

  1.05×10^5 Pa

  7.99×10^4 Pa

2012-N-5

- 2.05 mol

2012-N-6

- 4.27
- 150 mM is used because this corresponds to the NaCl concentration in extracellular fluids and thus prevents any change in osmotic conditions in the blood. If water were used, water would flow into the red blood cells causing them to swell up and possibly burst. This may have fatal consequences for the patient.

2012-N-7

- $0.052\ J\ g^{-1}\ K^{-1}$
- $315\ g\ mol^{-1}$

2012-N-8

- 9.44 8.78

  Buffer 1 is better able to maintain a steady pH because its pH is closer to the pK_a of NH_4^+. It therefore has relatively high concentrations of **both** NH_4^+ and NH_3 which can react with any added OH^- or H^+ respectively.

2012-N-9

- $BaSO_4$ < Ag_2CrO_4 < $CuCl$ < $Cd(IO_3)_2$
  $(1.0 \times 10^{-5}\ M)$ $(8.7 \times 10^{-5}\ M)$ $(4.4 \times 10^{-4}\ M)$ $(1.8 \times 10^{-3}\ M)$
- $4.3 \times 10^{-31}\ M$

2012-N-10

- 650 mg
- Too few neutrons. Undergoes positron (β^+) emission or electron capture.

  Stable

  $Z > 83$, so unstable. Undergoes α decay to reduce mass.

2012-N-11

- $3.8 \times 10^{-3}\ M$

  5.5×10^{50}

  $-290\ kJ\ mol^{-1}$

  $Cr(s) \mid Cr^{3+}(aq) \parallel Ni^{2+}(aq) \mid Ni(s)$

2012-N-12

- $Zn(s) \rightarrow Zn^{2+}(aq) + 2e^-$ at anode

  $2H^+(aq) + 2e^- \rightarrow H_2(g)$ at cathode

  0.76 V

- $k = Ae^{-Ea/RT}$ Take natural logarithm to give $\ln k = \ln A - \frac{1}{T}(\frac{E_a}{R})$

  Plot ln$k$ (on y-axis) *versus* $\frac{1}{T}$ (on x-axis).

  It follows Arrhenius behaviour if the resulting graph is a straight line.

  The slope of the straight line is $-\frac{E_a}{R}$ and the y-intercept is ln$A$.

2012-N-13

- 0.0206 M
- Phospholipids contain a hydrophilic head and 2 hydrophobic tails. They self assemble in bilayers with the hydrophobic tails in the centre and the hydrophilic heads at the interface with the solution. Lipid bilayers (intercalated with proteins) make up over 50 % of cell membranes in biology, as the bilayer arrangement makes an effective barrier against the free passage of water and ions into and out of cells.

2012-N-14

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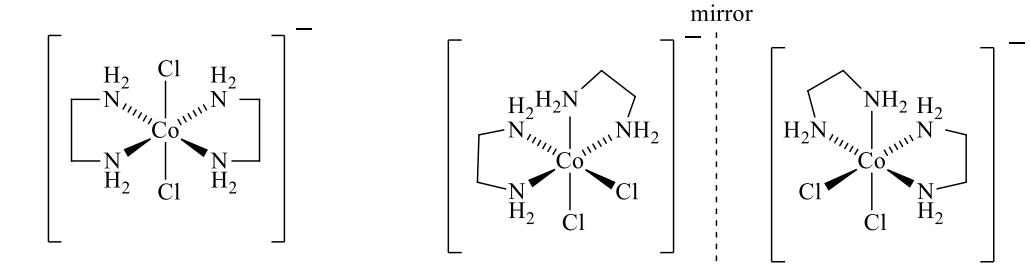
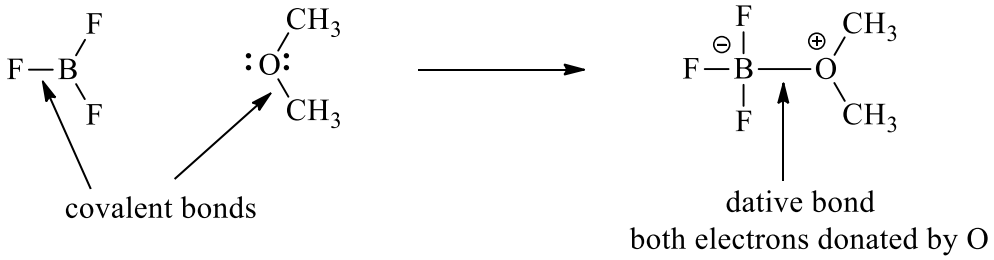


trans-dichloridobis(ethylenediamine)cobalt(III) ion

- Covalent bonds are formed when non-metals bond with each other by sharing electrons. Covalent bonds are relatively short, strong and highly directional.

  Dative bonds are similar to covalent bonds, but both electrons in the bond are donated by the one atom. They are typically found in coordination complexes where the lone pair on the ligand forms a bond with the metal ion. See the above Co(III) complexes for examples and the BF_3-ether adduct below for a different type of example. In general, dative bonds are weaker, longer and less directional than covalent bonds.



2012-N-15

- Rate = $k[NO_2]^2$

  Step 1: $NO_2 + NO_2 \rightarrow NO_3 + NO$ slow, rate determining step

  Step 2: $NO_3 + CO \rightarrow NO_2 + CO_2$ fast