• \( \text{Ca}_5(\text{PO}_4)_3\text{OH}(s) \rightarrow 5\text{Ca}^{2+}(\text{aq}) + 3\text{PO}_4^{3-}(\text{aq}) + \text{OH}^-\text{(aq)} \)

• They provide binding sites for substrates that readily accommodate changes in geometry. Depending on the metal, they can also allow for redox reactions, eg \( \text{Fe}^{2+}/\text{Fe}^{3+} \).

• \( 2.44 \times 10^3 \text{ kJ} \)

• Long chain fatty acids consist of a polar head and a non-polar tail. When dispersed in water they 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.

• \[
\begin{array}{c}
\uparrow\text{Cl}\downarrow \\
\uparrow\text{Cl}
\end{array}
\]

2004-J-3

• +0.62 V

• \( 9.4 \times 10^{20} \)

• 6.4 atm

2004-J-4

• \( 2.10 \times 10^{-7} \text{ M}^2 \)

• 4.19

Yes, because the concentrations of weak acid and conjugate base are equal - good buffers require this ratio to be between 0.1 and 10. Note that the concentrations are only 0.01 M, so that the buffer does not have a very great capacity. It will buffer effectively for small amounts of added \( \text{H}^+ \) or \( \text{OH}^- \), but large amounts will quickly cause the weak acid/conjugate base ratio to move outside the 0.1-10 range.

• Shift to the left (reactant)

Shift to the right (product)
2004-J-5

- alkene, ester

achiral

\[ \text{stereoisomer} \]

\[ \text{constitutional isomer} \]

(Note: Many other examples possible)

\[ \text{ racemic mixture} \]

achiral

2004-J-6

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<td>[\text{O} + \text{CH}_3\text{OH} ]</td>
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At pH = 5.7, tyrosine exists as an overall net uncharged zwitterion. At pH > 5.7, tyrosine has a net negative charge and at pH < 5.7, tyrosine has a net positive charge.