2004-J-2

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

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

- \( +0.62 \text{ V} \)
- \( 9.4 \times 10^{20} \)
- \( 6.4 \text{ atm} \)

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 H\(^+\) or 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

stereoisomer

constitutional isomer

(Note: Many other examples possible)

racemic mixture

achiral

2004-J-6

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<td><img src="image3.png" alt="Molecule" /> + CH&lt;sub&gt;3&lt;/sub&gt;OH</td>
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<td><img src="image4.png" alt="Molecule" /></td>
<td><img src="image5.png" alt="Molecule" /> + CH&lt;sub&gt;3&lt;/sub&gt;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.