Max Shi

Professor Paliwal

CH 580

In Class Activity Chapters 1 and 2

I pledge my honor that I have abided by the Stevens Honor System.

1. From strongest to weakest, the interactions are A, B, C, D.
   1. NH4+ and -O-C=O
      1. There are hydrogen bonds. The H from the H-N bond is an acceptor of the lone pair donated by either oxygen on -O-C=O.
      2. These molecules have ionic, ion-dipole, hydrogen bonding, and van der Waals interactions.
   2. NH4+ and O=C
      1. There are hydrogen bonds. The H from the H-N bond is an acceptor of the lone pair donated by the oxygen on C=O.
      2. These molecules have ion-dipole, hydrogen bonding, and van der Waals interactions.
   3. NH2 and O=C
      1. There are hydrogen bonds. The H from the H-N bond is an acceptor of the lone pair donated by the oxygen on C=O.
      2. These molecules have hydrogen bonding, dipole, and van der Waals interactions.
   4. CH3 and CH3
      1. There are no hydrogen bonds.
      2. These molecules only have van der Waals interactions
2. 1. The strongest interactions possible are van der Waals interactions, as there are no polar bonds, charges, or dipole moments.
   2. The strongest interactions possible are hydrogen bonds, as both side chains contain an N-H bond and an oxygen with lone pairs and a partial negative charge.
   3. The strongest interactions possible are ionic interactions, as aspartate has a negative charge and lysine has a positive charge.
   4. The strongest interactions possible are dipole interactions, as there are polar bonds, but no hydrogen bonding as there are no lone pairs to donate electrons to hydrogen bonding. Also, there is possible repulsion when the two positive charges on NH2 are close to each other.
3. D. hydrophobic interactions
4. C. adenosine triphosphate

This means the concentration of H2PO4- is much larger than the concentration of H3PO4. The concentration of HPO4 2- is negligible, as the pH is in between the pKa of the other two ions. Thus, H2PO4 predominates this solution at pH 4.

As the ratio is 10 parts His to 1 part HisH+, this means that 1/11 of the histidine will be in the HisH+ form.

1. 1. 1. Hydrogen bonding
      2. Ionic interactions
      3. Van der waals interactions
      4. Hydrogen bonding
2. Pyridine is more soluble in acid, as this it is a weak base and acid would protonate the nitrogen and convert it into a charged species. Naphthol would be more soluble in a solution of base, as it is a weak acid and base would deprotonate the H from OH and create a charged species.
3. C is the strongest hydrogen bond, as the angle is 180 degrees and the hydrogen is accepting the lone pair from the oxygen.
4. Catabolism is breaking down large molecules to small ones to create energy. Anabolism is assembling small molecules into complex ones, which require energy.
5. Bacteria cells do not contain membrane-enclosed organelles, as human cells do.   
   Plant cells have a cell wall, which animal cells do not. Animal cells only possess a cell membrane.