

General Biochemistry

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مصادر عامة

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Water

Molecule in which opposite ends have opposite electric charges

a. polar molecule

b. solution

c. cohesion

d. hydrogen bond

calculate the pH of buffer solution prepared by mixing 75 ml of 1M lactic acid and 25 ml of 1M sodium lactate, $K_a = 1.38 \times 10^{-4}$

a. 3.38

b. 3.83

c. 3.33

d. 8.33

..... water can dissolve many things so it is called the

a. wonderful water

b. cohesion

c. liquid

d. universal solvent

calculate the ratio $[(CH_3COOH)/(NaCH_3COO)]$ that give a solution with pH= 5.00

a. 0.28

b. 0.36

c. 0.44

d. 0.56

e. 0.63

Answer

First find out the acid dissociation constant from the data book

$K_a = 1.7 \times 10^{-5}$ for acetic acid

$pK_a = -\log K_a$

$pK_a = 4.77$

From Henderson–Hasselbalch equation

$pH = pK_a + \log[CH_3COONa] / [CH_3COOH]$

$5.00 = 4.77 + \log[CH_3COONa] / [CH_3COOH]$

$0.23 = \log[CH_3COONa] / [CH_3COOH]$

$[CH_3COONa] / [CH_3COOH] = 1.69$

$\{CH_3COOH\} / \{NaCH_3COO\} = 1 / 1.69$

$\{CH_3COOH\} / \{NaCH_3COO\} = 0.56$

polar molecules can readily dissolve in water. This is because:

a. polar molecules can form hydrogen bonds with water

b. polar molecules can replace water-water interaction with more energetically favorable water-solute interactions

c. polar charged water can interact with the charge of polar molecules

d. all polar molecules are amphipathic in nature

what do you understand by polyprotic acid:

a. it consists of one proton and one electron

b. process of dissociation these acids are able to donate three proton per molecule

c. it is also known as cation

d. they undergo two dissociation depends upon pH

What aspect of triglyceride structure accounts for their insolubility in water

A. The COOH group of fatty acid

B. The nonpolar C-H bonds in fatty acid

- C. The OH groups in glycerol
- D. The C=C bonds found in unsaturated fatty acid

In the water molecule, the oxygen atom has a _____ charge

- A. Positive
- B. Negative
- C. Neutral
- D. Both

What word describes when a molecule is attracted to water

- A. Hydrophilic
- B. Hydrophobic
- C. Lipophilic
- D. Lipophobic

Mathematical what is $[\text{CH}_3\text{COO}^-]/[\text{CH}_3\text{COOH}]$ ratio in an acetate buffer at pH=5.0 $K_a=1.76 \times 10^{-3}$

- A. 1.73/1
- B. 2.71/1
- C. 1.73
- D. 1.37/1

Which of the following is false statement about water

- A. Water is a polar molecule
- B. More than 70% of our bodies are composed of water
- C. Water is a non-polar molecule
- D. Water is a solvent

A strong acid has a large K_a value

- A. True
- B. False

Calculate the relative amounts and pH of acetic acid and acetate ion presents at the following points when 1 mole of acetic acid is titrated with 0.5 mole of NaOH

- A. 4.5
- B. 4.76

What is the concentration of OH⁻ ions in a solution with an H⁺ ion concentration of 1.3×10^{-4} M

a. 7.7×10^{-11} M

b. 7.7×10^{-10} M

c. 1.4×10^{-11} M

d. 1.4×10^{-10} M

What do you understand by monoprotic acid

A. It consists of one proton and one electron

B. During the process of dissociation these acids are able to donate one proton per molecule

C. It is also known as cation

D. They undergoes two dissociation depends upon pH

Hydrogen bond is best represented as the electrostatic attraction between

A. Hydrogen covalently bounded to an electronegative atom and another hydrogen atom

B. Hydrogen covalently bounded to an electronegative atom and another electronegative atom

C. Two electronegative atoms and a hydrogen atom

D. Two hydrogen atoms

If you shake a bottle of oil and vinegar than let it sit, it will separate into two phases because

A. The non-polar oil is soluble in water

B. Water can form hydrogen bonds with the oil

C. Polar oil is not soluble in water

D. Nonpolar oil is not soluble in water

The most important peculiarity of water when compared to other solvents is that water has

A. High Boiling point, high melting point, high heat of vaporization

B. High Boiling point, low melting point, low heat of vaporization

C. Low Boiling point, high melting point, low heat of vaporization

D. Low Boiling point, low melting point, low heat of vaporization

Most important reason for the unusual properties of water is

A. The covalent bonding pattern in water molecule

B. The bond angle between the two hydrogen atoms in water

C. Hydrogen bonding between water molecules

D. Water can be immediately ionized at room temperature

The bond dissociation energy of O-H bond in water is

A. 460 kJ/mol

B. 348 kJ/mol

C. 23 kJ/mol

D. 10 kJ/mol

Bond created by the weak attraction of a slightly positive hydrogen atom to a slightly negative portion of another molecule

A. Polar molecule

B. Solution

C. Adhesion

D. Hydrogen bond

Which one of the following relationships is true in water at 25°C

A. $[H^+] = [H_2O]$

B. $[OH^-] = [H_2O]$

C. $K_w > 1 \times 10^{-14}$

D. $[H^+] = [OH^-]$

Suppose an equilibrated, dilute solution containing an acid HA with $K_a = 10^{-4}$, is measured to have pH=6 and $[HA] = 10^{-8}$ M. Which of the following gives the best estimate of $[A^-]$

A. 10^{-4} M

B. 10^{-6} M

C. 10^{-14} M

D. 10^{-12} M

What is $[CH_3COO^-]/[CH_3COOH]$ ratio in an acetate buffer at pH=5.0, $K_a = 1.76 \times 10^{-5}$

A. 1.7

B. $1.7 \times 10^{-7}/1$

C. 1.7/1

D. $1.6 \times 10^{-6}/1$

The polarity of water molecule is due to

A. Difference in electronegativity of oxygen and hydrogen atoms in water

B. The readily ionizing behavior of water

C. The positive charge of water molecule

D. The negative charge of water molecule

Which statement is correct regarding acids

A. Acid is a molecule which donate proton or accept electron pair in reactions

B. Acid increase the concentration of hydrogen atoms or hydronium atoms in water

C. Acids have pH value less than 7

D. Acid in the stomach helps in the digestion of food

E. All of the above

Suppose an acid HA, A has a dissociation constant $K_a=1 \times 10^{-1}$. It is mixed into a buffered solution, and it is equilibrium concentration is $[HA]=0.1$ M. If the concentration of the conjugate base is 10M, what is the pH of the solution

A. 4

B. 3

C. 8

D. 1

Water molecules form hydrogen bonds by

A. The attraction between the positive poles of one water molecule with the negative poles of another

B. The sharing of electrons between one water molecule and another

C. The transfer of electrons between one water molecule and another

D. Water molecules never form hydrogen bonds

Which of the following statements is true regarding the electronegativity of atoms in water molecule

A. Hydrogen is more electronegative than oxygen

B. Hydrogen is less electronegative than oxygen

C. Electronegativity of hydrogen and oxygen is same

D. Oxygen and hydrogen do not have significant electronegativity in water

Water is liquid at room temperature, the most important reason for this is the

A. High boiling point if water

- B. High melting point of water
- C. High heat of vaporization of water

D. Cohesive forces due to hydrogen bonds in water

Hydrogen bonds are formed

- A. Between any molecules that contain hydrogen
- B. Only between water molecules

C. When hydrogen is part of a polar bond

- D. When two atoms of hydrogen share an electron

The pH of pure water is neutral, the best explanation of this is

- A. The pH of pure water is 7

B. In pure water the concentration of H^+ and OH^- are the same

- C. Water does not contain free H^+ or OH^- ions
- D. Water will never ionize

What is the pH of a solution with a hydronium ion concentration $[H_3O^+] = 10^{-4} M$

- A. -8

B. -4

- C. 10
- D. 4

Calculate the relative amounts and pH of acetic acid and acetate ion presents at the following points, when 1 mole of acetic acid is titrated with 0.1 mole of NaOH

- A. 4.0

B. 3.81

- C. 2.0

Which of the following represent the current melting point and boiling point of water

A. $0^\circ C$, $100^\circ C$

- B. $100^\circ C$, $0^\circ C$

C. $-0^\circ C$, $-100^\circ C$

- D. $-100^\circ C$, $-0^\circ C$

A single water molecule can form how many hydrogen bond at a time? (Theoretically possible value)

A. 1

B. 2

C. 3

D. 4

Substance in a solution that dissolves the other substance and is present in the greater amount

A. Solute

B. Solution

C. Solvent

D. Acid

Why does ice float

A. As water freezes, it expands and its density decreases

B. As water freezes, it takes up more hydrogen from the atmosphere, causing it to have a greater buoyancy

C. As water freezes, hydrogen bonds reform between water molecules

D. As water freezes, air becomes trapped between the hydrogen bonds of water molecules

When you mix oil and water the immediately separate because

A. Oil is hydrophilic

B. Oil is hydrophobic

C. Hydrogen bonds reform between water molecules

D. It depends on what kind of oil you are using

Water is polar because

A. The unequal sharing of electrons gives the water molecule a slight negative charge near its oxygen atom and a slight positive charge near its hydrogen atoms

B. The unequal sharing of electrons gives the water molecule a slight negative charge near its hydrogen atom and a slight positive charge near its oxygen atoms

C. The molecule has two poles, at which the it is colder than other regions of the molecule

D. The water molecule is neutral

Property due to which water acts as a universal solvent is its

A. Polarity only

B. Ability to make hydrogen bond only

C. Strong dipole-dipole interaction

D. Polarity and ability to make hydrogen bond

A molecule with polar covalent bonds would

A. Be soluble in water

B. Not be soluble in water

C. Contain atoms with very similar electronegativity

D. Both B and C are correct

Ionic bonds arise from

A. Shared valence electrons

B. Attractions between valence electrons

C. Charge attractions between valence electrons

D. Attractions between ions of opposite charge

Mathematical calculate the hydrogen ion conc, [H+], for blood plasma, pH= 7.4

A. 3.98×10^{-8} M

B. 3.98×10^{-7} M

C. 4.25×10^{-8} M

D. 3.98×10^{-11} M

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