

## Review questions for Water lecture

### Multiple choice review questions:

- 1) The best term used to describe molecules that do not mix well with water is
  - A) hydrophilic.
  - B) lipophobic.
  - C) hydrophobic.
  - D) ionic.
  
- 2) A solution that is acidic has a large amount of
  - A) buffers
  - B) monomers
  - C) bases
  - D) hydrogen ions
  
- 3) If the hydrogen ion concentration of a solution is the same as water, the solution has a pH of \_\_\_\_\_.
  - A) 0
  - B) 1
  - C) 7
  - D) 14
  
- 4) A base is defined as any molecule that can
  - A) stabilize the pH of a solution.
  - B) release  $B^+$  into the solution.
  - C) remove  $H^+$  from a solution.
  - D) burn the skin.
  
- 5) If solution A has less hydrogen ions than solution B, and solution B has a pH of 7.0, then solution A must always have a pH
  - A) outside the 0 – 14 range
  - B) equal to 7.0
  - C) less than 7.0
  - D) greater than 7.0
  
- 6) Any substance that resists changes in  $H^+$  concentration and therefore tends to maintain a stable pH is called a \_\_\_\_\_.
  - A) stabilizing
  - B) buffer
  - C) carbonic acid
  - D) pH

- 7) Movement of water through a cell membrane, rather than solute, is called  
A) solute diffusion.  
B) solvent diffusion.  
C) osmosis.
- 8) Red blood cells placed in a hypertonic solution will  
A) swell and eventually lyse.  
B) remain unchanged.  
C) shrivel.  
D) hemolyse.
- 9) Which of the following solutions is **not** isotonic relative to cells in the body?  
A) Ringer's lactate  
B) 0.9% NaCl  
C) 5% dextrose  
D) Pure water

**Answers to multiple-choice questions:**

- 1 = C  
2 = D  
3 = C  
4 = C  
5 = D  
6 = B  
7 = C  
8 = C  
9 = D

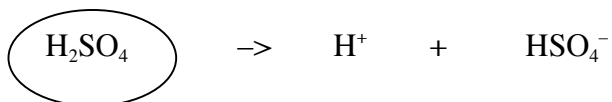
**Fill-in-the-blank review questions: Note: When specific pH numbers are used, understand the concept. A test question could use different pH numbers.**

- 1) When molecules dissolve well in water, they are said to be \_\_\_\_\_ molecules.
- 2) Water doesn't dissolve hydrophilic/hydrophobic (choose one) solutes.
- 3) Circle the molecule below that is least able to dissolve in water.



- 4) If you add a spoonful of sugar to a glass of water, and you add three spoonfuls of sugar to a second glass of water, which glass (the first or the second) has a higher concentration of sugar? \_\_\_\_\_.

- 5) Solutions have two components: the substance that is dissolved, called the \_\_\_\_\_, and the liquid in which it is dissolved, called the \_\_\_\_\_.
- 6) When a molecule moves from an area of high concentration to an area of low concentration, the process is called \_\_\_\_\_.
- 7) Any molecule that releases  $H^+$  is a(n) \_\_\_\_\_, while one which absorbs  $H^+$  is a(n) \_\_\_\_\_.
- 8) Is the circled molecule below an acid or a base?



- 9) A solution that has a lower  $H^+$  concentration than that of water is called a \_\_\_\_\_ solution.
- 10) A solution with a pH of 2.7 is an example of a strongly \_\_\_\_\_ solution
- 11) A solution of pH 3 has \_\_\_\_\_ more/less (choose one)  $H^+$  than pure water.
- 12) A solution of pH 2 has \_\_\_\_\_ more/less (choose one)  $H^+$  as one of pH 3
- 13) The more hydrogen ions there are in solution, the more acidic/basic (choose one) the solution is.
- 14) A solution of pH 8 is more/less (circle one) acidic than one of pH 7.
- 15) A solution of pH 1 is more/less (circle one) acidic than one of pH 3.
- 16) The pH scale goes from \_\_\_\_\_ to \_\_\_\_\_.
- 17) Any substance that acts to prevent changes in  $H^+$  concentration and to stabilize a solution's pH is called a \_\_\_\_\_.
- 18) The cells in our body constantly make carbon dioxide. The carbon dioxide reacts with water in our blood to form carbonic acid and bicarbonate ion. The carbonic acid and bicarbonate ions in the blood are important because they are the main \_\_\_\_\_ of the blood.
- 19) The pH scale is used to describe how acidic or basic a solution is. The blood is normally pH \_\_\_\_\_, which is above/below (circle one) the pH of pure water. The pH of our blood does not change when we eat foods that contain acids and bases because our blood contains a buffer, which is any substance that \_\_\_\_\_.

This is how the buffer in our blood works: If we take in too many hydrogen ions, the excess hydrogen ions in our blood are absorbed by the \_\_\_\_\_ ion of the buffer. If we lose hydrogen ions from our blood, they are replaced by hydrogen ions from \_\_\_\_\_ acid of the buffer.

20) The movement of a solute from an area of high concentration to an area of low concentration is called \_\_\_\_\_.

21) When water moves across a cell membrane from the side with low solute concentration to the side with high solute concentration, the process is called \_\_\_\_\_.

22) When a cell is surrounded by solution of equivalent solute concentration, the solution is said to be \_\_\_\_\_ to the cell. In this case, there is/isn't (circle one) net movement of water across the cell membrane.

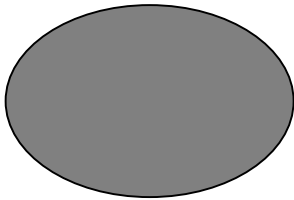
23) When a cell is surrounded by solution of higher solute concentration, the solution is said to be \_\_\_\_\_ to the cell, and the net movement of water is into/out of (circle one) the cell.

24) When a cell is surrounded by solution of lower solute concentration, the solution is said to be \_\_\_\_\_ to the cell, and the net movement of water is into/out of (circle one) the cell.

25) You dissolve some sugar in a glass of water. Then you add some blood cells to the sugar water. Answer the questions below:

- a) The sugar is the solute/solution (circle one).
- b) The sugar water is the solute/solvent/solution (circle one).

Blood cell before being put in the glass:



Blood cell after being put in put in the glass:



- c) The change in cell volume was caused by the process of \_\_\_\_\_.
- d) The cell volume changed because sugar/water (circle one) entered/exited (circle one) the cell.
- e) Judging from the change in cell volume, sugar water must have been hypertonic/hypotonic/isotonic tonic (circle one) compared to the cell.

26) Red blood cells placed in a hypotonic solution will burst, a process known as \_\_\_\_\_.

**Answers to fill-in-the-blank review questions:**

- 1) Hydrophilic
- 2) Hydrophobic
- 3)  $C_9H_{20}$
- 4) The second has higher concentration
- 5) Solute  
Solvent
- 6) Diffusion
- 7) Acid  
Base
- 8) Acid
- 9) Basic
- 10) Acidic
- 11) More
- 12) More
- 13) Acidic
- 14) Less
- 15) More
- 16) 0  
14
- 17) Buffer
- 18) Buffer
- 19) 7.4  
Above  
Stabilizes pH  
Bicarbonate  
Carbonic acid
- 20) Diffusion
- 21) Osmosis
- 22) Isotonic  
Isn't
- 23) Hypertonic  
Out of
- 24) Hypotonic  
Into
- 25) (a) Solute  
(b) Solution  
(c) Osmosis  
(d) Water, exited  
(e) Hypertonic
- 26) Lysis

**Short answer review questions:**

- 1) Describe two properties of water that make it essential to the functioning of our bodies.
- 2) What is the definition of a hydrophobic substance? Give an example of a household substance that is hydrophobic.
- 3) Explain why nutrients inside cells don't diffuse out of the cell.
- 4) Answer these questions about Sicko-Soda™ and Powersludge Energy Goop®. Sicko-Soda™ is pH 2 and Powersludge Energy Goop® is pH 4.
  - a) Which has the higher hydrogen ion concentration?
  - b) Is Sicko-Soda™ acidic, basic, or neutral?
  - c) Is Powersludge Energy Goop® acidic, basic, or neutral?
  - d) If you drank a gallon of these fine products, why wouldn't your blood pH change drastically?

**Answers to short answer review questions:**

- 1) Water dissolves most substances and water can cool by evaporation.
- 2) A hydrophobic substance is one that does not dissolve in water. Common examples are fats, oils, greases, and waxes.
- 3) The cell membrane acts as a barrier that stops most solutes (including nutrients) from diffusing out of the cell.
- 4)
  - (a) Sicko-Soda has a higher H<sup>+</sup> concentration.
  - (b) Sicko-Soda is acidic.
  - (c) Powersludge Energy Goop is acidic.
  - (d) The blood is buffered by carbonic acid (H<sub>2</sub>CO<sub>3</sub>) and bicarbonate ion (HCO<sub>3</sub><sup>-</sup>). These two molecules, working together, make the blood resistant to pH change, even when acidic foods (like Sicko-Soda and Powersludge Energy Goop) are eaten.