

These review questions are for the Water lecture topic. The questions were adapted from several sources, including 1700+ Review Questions for Anatomy and Physiology II (3rd edition) by R. Michael Anson, Ph.D.

Multiple choice review questions:

- 1) The molecular formula for a water molecule is
 - A) W
 - B) H²O
 - C) 2HO
 - D) H₂O

- 2) Which is **not** a property of water that helps our bodies function properly?
 - A) Water is a natural antibiotic (anti-bacterial) substance
 - B) Water dissolves many substances
 - C) Water cools when it evaporates

- 3) If you dissolve red paint powder into water, the paint powder is the _____.
 - A) Ion
 - B) Solute
 - C) Solution
 - D) Concentration

- 4) If you made red paint by dissolving dry red paint powder into water, the liquid red paint you make is a _____.
 - A) Ion
 - B) Solute
 - C) Solution
 - D) Concentration

- 5) If you put a sugar cube into a glass of water, at first the sugar molecules will be concentrated in the cube, but after some time, they will spread out throughout the water. This is an example of...
 - A) Osmosis
 - B) Cell membranes
 - C) Buffering
 - D) Diffusion

- 6) Most solutes inside cells stay inside the cell because the _____ stops them from diffusing outward.
 - A) Cell membrane
 - B) Water molecules
 - C) Solutes
 - D) Osmosis

- 7) If you place a cell in a glass of very salty water, by osmosis the cell will...
- A) Gain water
 - B) Lose water
 - C) Gain salt
 - D) Lose salt
- 8) Any solution that has a higher solute concentration than a cell is called a(n) _____ solution.
- A) Hypotonic
 - B) Isotonic
 - C) Hypertonic
 - D) Hypodermic
- 9) The term used to describe molecules that do not mix well with water is
- A) hydrophilic.
 - B) lipophobic.
 - C) hydrophobic.
 - D) ionic.
- 10) Any molecule that adds H^+ ions to a solution is a...
- A) Cell
 - B) Cell membrane
 - C) Acid
 - D) Buffer
- 11) Any molecule that absorbs H^+ ions is a...
- A) Amino acid
 - B) Base
 - C) Organic molecule
 - D) Buffer
- 12) 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
- 13) Which is **not** true of a solution that is pH 1?
- A) It is acidic
 - B) It has more hydrogen ions than a solution that is pH 2
 - C) It has more hydrogen ions than pure water
 - D) It is a basic solution

14) 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

15) 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

Answers to multiple-choice questions:

- 1) D
- 2) A
- 3) B
- 4) C
- 5) D
- 6) A
- 7) B
- 8) C
- 9) C
- 10) C
- 11) B
- 12) C
- 13) D
- 14) D
- 15) B

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) The most abundant molecule in our bodies is _____. Its molecular formula is _____.
- 2) The term _____ means molecules that don't dissolve well in water.

3) Circle the most hydrophobic molecule below (the molecule below that is least able to dissolve in water).



4) The term _____ means when the atoms, molecules, or ions of a substance become spread out in a liquid.

5) If you dissolve salt in pure water, the salt is the _____ and the salt water that you make is called a salt _____.

6) The amount of solute in a solution is called the _____ of the solute in the solution.

7) Name two common units of concentration.

8) 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? _____.

9) A swimmer urinates while swimming in a lake. At first the urine molecules are concentrated close by the swimmer, but after a short time the molecules will spread out throughout the lake. The spreading out movement of molecules in a liquid is called _____.

10) The term _____ means the movement of water molecules across a cell membrane toward the side of the membrane that has the higher solute concentration.

11) All cells have a certain internal solute concentration. If a cell is placed in a glass of pure water (no solutes), water molecules will move in/out (circle one) of the cell by osmosis.

12) A solution that has a higher solute concentration than a cell is called a(n) _____ solution. All cells will gain/lose/neither gain nor lose (circle one of the three) water if placed in such a solution.

13) A solution that has a lower solute concentration than a cell is called a(n) _____ solution. All cells will gain/lose/neither gain nor lose (circle one of the three) water if placed in such a solution.

14) A solution that has an equal solute concentration compared to a cell is called a(n) _____ solution. All cells will gain/lose/neither gain nor lose (circle one of the three) water if placed in such a solution.

15) List two common isotonic solutions used in hospitals.

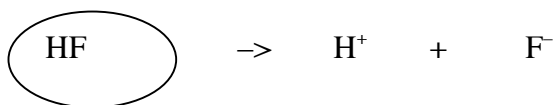
16) Any molecule that releases H^+ is a(n) _____.

17) Any molecule that absorbs H^+ is a(n) _____.

18) List a common acid found in the body: _____

19) List a common base found in the body: _____

20) Is the circled molecule below an acid or a base?



21) The pH scale indicates how acidic (or basic) a solution is. The pH scale goes from ____ (a number) to ____ (a number). Pure water has a pH of ____ (a number), which is called the “neutral” pH because it is not acidic or basic.

22) Pure water does/does not (circle one) have H^+ ions.

23) Any solution that has more H^+ than water is called a(n) _____ solution. A solution of this type will always have a pH that is greater/equal to/less (circle one of the three) than pH 7.

24) Any solution that has fewer H^+ than water is called a(n) _____ solution. A solution of this type will always have a pH that is greater/equal to/less (circle one of the three) than pH 7.

25) A solution with a pH of 2.7 is an example of a strongly _____ solution

26) A solution of pH 3 has _____ more/less (choose one) H^+ than pure water.

27) A solution of pH 2 has _____ more/less (choose one) H^+ as one of pH 3

28) The more hydrogen ions there are in solution, the more acidic/basic (choose one) the solution is.

29) A solution of pH 8 is more/less (circle one) basic than one of pH 7.

30) A solution of pH 1 is more/less (circle one) acidic than one of pH 3.

31) Any substance that acts to prevent changes in H^+ concentration and to stabilize a solution’s pH is called a _____.

32) 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.

33) 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.

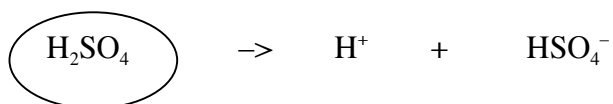
Answers to fill-in-the-blank review questions:

- | | |
|---|---|
| 1) Water
H ₂ O | 18) Carbonic acid (H ₂ CO ₃)
[Other acids are also possible answers] |
| 2) Hydrophobic | 19) Bicarbonate ion (HCO ₃ ⁻)
[Other bases are also possible answers] |
| 3) C ₉ H ₂₀ | 20) Acid |
| 4) Dissolve | 21) 0 |
| 5) Solute
Solution | 14 |
| 6) Concentration | 7 |
| 7) Grams per liter
Percent concentration | 22) Does |
| 8) The second glass | 23) Acidic
Less |
| 9) Diffusion | 24) Basic
Greater |
| 10) Osmosis | 25) Acidic |
| 11) In | 26) More |
| 12) Hypertonic
Lose | 27) More |
| 13) Hypotonic
Gain | 28) Acidic |
| 14) Isotonic
Neither gain nor lose | 29) More |
| 15) 0.9% saline (also called normal saline)
5% Dextrose (also called 5% glucose)
Ringer's lactate | 30) More |
| 16) Acid | 31) Buffer |
| 17) Base | 32) buffer |
| | 33) 7.4
Above
Stabilizes the pH of a liquid
Bicarbonate ion
Carbonic acid |

Short answer review questions:

- 1) Describe two properties of water that make it essential to the functioning of our bodies. After each property, give a specific tissue or organ in the body that relies on that property for its normal function.
- 2) What is the definition of a hydrophobic substance? Give an example of a household substance that is hydrophobic.
- 3) What is the definition of diffusion?
- 4) Explain why nutrients inside cells don't diffuse out of the cell.

5) Inspect the chemical reaction below. Is the circled molecule an acid or a base? Justify your answer.



6) 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. The blood relies on this property of water to carry many molecules throughout the body. Water cools when it evaporates. The sweat glands in the skin rely on this property of water to cool the body.

2) A hydrophobic substance is one that does not dissolve in water. Common examples are fats, oils, greases, and waxes.

3) Diffusion is the movement of a solute molecule from an area of high concentration to an area of low concentration.

4) The cell membrane acts as a barrier that stops most solutes (including nutrients) from diffusing out of the cell.

5) The circled molecule is an acid. It is an acid because the chemical reaction shows that it releases a H^+ . This is the definition of an acid.

6) (a) Sicko-Soda has a higher H^+ concentration.

(b) Sicko-Soda is acidic.

(c) Powersludge Energy Goop is acidic.

(d) The blood is buffered by carbonic acid (H_2CO_3) and bicarbonate ion (HCO_3^-). 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.