

# Review Sheet Water

## Lester BIOL 150

**General things to do to prepare for the exam:**

- study the PowerPoints
- write out the answers to the learning objectives found with each PowerPoint
- listen to my lecture recordings

### Chapter 3

Explain how water is a polar molecule.

What are the four properties of water that facilitate an environment for life?

Describe how each of these four properties facilitate an environment for life.

Compare and contrast cohesion with adhesion.

Explain surface tension.

Differentiate kinetic energy from heat from temperature.

Define calorie, kilocalorie, and specific heat.

Define evaporation, evaporative cooling, and heat of vaporization. What the benefit of evaporative cooling to life?

Explain why ice floats and what would happen to the earth and life on the earth if ice sank.

Define solution, solute, solvent, aqueous solution, and hydration shell.

Differentiate hydrophilic from hydrophobic.

Define a colloid.

Define molecular mass and mole.

What is Avogadro's number and what does it mean?

Although you will not calculate any molarity on this exam, you need to be able to explain what it is: moles/L.

When a molecule of water dissociates, what does it really form? But how do we write it for simplicity?

Define: pH, acid, and base (alkali).

Describe the pH scale.

Define buffer. What are the two most common biological buffers in the body?

### Sample Exam Questions Chapter 3

In a single molecule of water, two hydrogen atoms are bonded to a single oxygen atom by \_\_\_\_\_.

- A) hydrogen bonds
- B) nonpolar covalent bonds
- C) polar covalent bonds
- D) ionic bonds

Sulfur is in the same column of the periodic table as oxygen, but has electronegativity similar to carbon. Compared to water molecules, molecules of H<sub>2</sub>S will \_\_\_\_\_.

- A) have greater cohesion to other molecules of H<sub>2</sub>S
- B) have a greater tendency to form hydrogen bonds with each other
- C) have a higher capacity to absorb heat for the same change in temperature
- D) not form hydrogen bonds with each other

Cohesion, surface tension, and adhesion are the properties of water molecules that \_\_\_\_\_.

- A) increase when temperature increases
- B) increase when pH increases
- C) are a result of hydrogen bonding
- D) are a result of polar covalent bonding

Which of the following can be attributed to water's high specific heat?

- A) Oil and water do not mix well.
- B) A lake heats up more slowly than the air around it.
- C) Ice floats on water.
- D) Sugar dissolves in hot tea faster than in iced tea.

Which of the following effects can occur because of the high surface tension of water?

- A) Lakes cannot freeze solid in winter, despite low temperatures.
- B) A raft spider can walk across the surface of a small pond.
- C) Organisms can resist temperature changes, although they give off heat due to chemical reactions.
- D) Sweat can evaporate from the skin, helping to keep people from overheating.

A dietary Calorie equals 1 kilocalorie. One kilocalorie equals \_\_\_\_\_.

- A) 1000 calories, or the amount of heat required to raise the temperature of 1 g of water by 1°C
- B) 10,000 calories, or the amount of heat required to raise the temperature of 1 kg of water by 1°F
- C) 1000 calories, or the amount of heat required to raise the temperature of 1 kg of water by 1°C
- D) 1000 calories, or the amount of heat required to raise the temperature of 100 g of water by 100°C

Hydrophobic substances such as vegetable oil are \_\_\_\_\_.

- A) nonpolar substances that repel water molecules
- B) nonpolar substances that have an attraction for water molecules
- C) polar substances that repel water molecules
- D) polar substances that have an affinity for water

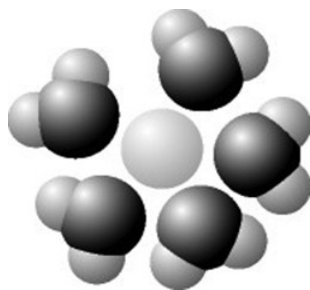
One mole (mol) of glucose (molecular mass = 180 daltons) is \_\_\_\_\_.

- A)  $180 \times 10^{23}$  molecules of glucose
- B) 1 kilogram of glucose dissolved in 1 liter of solution
- C) 180 mL of dissolved glucose
- D) 180 grams of glucose

When an ionic compound such as sodium chloride (NaCl) is placed in water, the component atoms of the NaCl crystal dissociate into individual sodium ions (Na<sup>+</sup>) and chloride ions (Cl<sup>-</sup>). In contrast, the atoms of covalently bonded molecules (e.g., glucose, sucrose, glycerol) do not generally dissociate when placed in aqueous solution. Which of the following solutions would be expected to contain the greatest number of solute particles (molecules or ions)?

- A) 1 liter of 0.5 M NaCl
- B) 1 liter of 1.0 M NaCl
- C) 1 liter of 1.0 M glucose
- D) 1 liter of 1.0 M NaCl and 1 liter of 1.0 M glucose will contain equal numbers of solute particles.

Use the following figure to answer the question.



Based on your knowledge of the polarity of water molecules, the solute molecule depicted is most likely:

- A) positively charged
- B) negatively charged
- C) without charge
- D) nonpolar

Arrange, from low to high, the pH of blood, stomach acid, and urine.

- A) blood, urine, and stomach acid
- B) stomach acid, blood, and urine
- C) urine, blood, stomach acid
- D) stomach acid, urine, blood

A solution with a pH of 2 has how many more protons in it than a solution with a pH of 4?

- A) 5 times more
- B) 10 times more
- C) 100 times more
- D) 1000 times more

Which of the following is considered to be a strong base (alkali)?

- A)  $\text{HCl} \rightarrow \text{H}^+ + \text{Cl}^-$
- B)  $\text{NH}_3 + \text{H}^+ \rightleftharpoons \text{NH}_4^+$
- C)  $\text{H}_2\text{CO}_3 \rightleftharpoons \text{HCO}_3^- + \text{H}^+$
- D)  $\text{NaOH} \rightarrow \text{Na}^+ + \text{OH}^-$

Which of the following statements is true about buffer solutions?

- A) They maintain a constant pH of 7.
- B) They maintain a constant pH when acids are added to them but not when bases are added to them.
- C) They fluctuate in pH when either acids or bases are added to them.
- D) They maintain a relatively constant pH when either acids or bases are added to them.

Carbon dioxide in the atmosphere dissolves with the raindrops. The pH of raindrops is \_\_\_\_\_.

- A) slightly acidic
- B) slightly basic
- C) same as pure water
- D) depends on the altitude where rain drops are formed