

Biology Coffeehouse Review—Week 1

Review Questions for Chapters 1 and 2--Themes of Biology and Review of Chemistry

1. Which of the following is not a domain in the Tree of Life?
 - A) Archaea
 - B) Plantae
 - C) Eukarya
 - D) Bacteria
2. In an example experiment, researchers subjected frogs to various levels of UV-B radiation while keeping all other variables constant. This is an example of a _____ experiment.
 - A) controlled
 - B) repeated
 - C) laboratory
 - D) None of the above
3. Which of the following are necessary for speciation to occur?
 - A) Reproductive isolation of two groups of organisms
 - B) A large amount of mutation within a population
 - C) A reduction in the number of individuals in a population
 - D) None of the above
4. A group of cells that work together to carry out a similar function is known as
 - A) a tissue.
 - B) an organ system.
 - C) a unicellular organism.
 - D) protein.
5. Photosynthesis was a major evolutionary milestone because
 - A) photosynthetic organisms contributed oxygen to the environment, which led to the evolution of aerobic organisms.
 - B) photosynthesis led to conditions that allowed life to arise on land.
 - C) photosynthesis is the only metabolic process that can convert light energy to chemical energy.
 - D) All of the above
6. The strongest chemical bonds occur when
 - A) two atoms share electrons in a covalent bond.
 - B) two atoms share electrons in an ionic bond.
 - C) hydrogen bonds are formed.
 - D) van der Waals forces are in effect.
7. What occurs in a chemical reaction?
 - A) The bonding partners of atoms remain constant during the reaction.
 - B) All reactions release energy as they proceed.
 - C) The bonding partners of atoms changes during the reaction.
 - D) Matter is either created or destroyed.
8. If solution A has a pH of 2 and solution B has a pH of 8, which of the following statements is true?
 - A) A is basic and B is acidic.
 - B) A is acidic and B is basic.
 - C) A is a base and B is an acid.
 - D) A has a greater $[\text{OH}^-]$ than B.

9. The molecular weight of glucose is 180. If you added 180 grams of glucose to a 0.5 liter of water, what would be the molarity of the resulting solution? (use ^{12}C , ^1H , and ^{16}O)
- A) 18
 - B) 1
 - C) 9
 - D) 2
10. You have discovered that a molecule is hydrophilic. What else do you know about this molecule?
- A) It cannot form hydrogen bonds.
 - B) It is a polar molecule.
 - C) It has a partial positive region and a partial negative region.
 - D) Both b and c
11. Why does ice float in water?
- A) Ice is less dense than water.
 - B) There are no hydrogen bonds in ice.
 - C) Ice is denser than water.
 - D) Water has a higher heat capacity than ice.
12. The atomic number of an element refers to the number of _____ in an atom.
- A) protons and neutrons
 - B) protons
 - C) electrons
 - D) neutrons
13. The element with which of the following atomic numbers would be most stable?
- A) 1
 - B) 3
 - C) 12
 - D) 18
14. Which of the following statements about water is correct?
- A) Water has a low heat of vaporization.
 - B) Water has a high specific heat.
 - C) When water freezes, it gains energy from the environment.
 - D) None of the above
15. The role of a buffer is to
- A) allow the pH of a solution to vary widely.
 - B) make a solution basic.
 - C) maintain pH homeostasis.
 - D) disrupt pH homeostasis.
16. Which of the following statements concerning electrons is not correct?
- A) Electrons orbit the nucleus of an atom in defined orbitals.
 - B) The outer shell of all atoms must contain eight electrons.
 - C) An atom may have more than one valence shell.
 - D) Electrons are negatively charged particles.

17. How can you differentiate between an element and a molecule?
- A) Molecules may be composed of different types of atoms, whereas elements are always composed of only one type of atom.
 - B) Molecules are composed of only one type of atom, whereas elements are composed of different types of atoms.
 - C) Molecules are elements.
 - D) Molecules always have larger atomic weights than elements.
18. Cola has a pH of 3; blood plasma has a pH of 7. The hydrogen ion concentration of cola is _____ than the hydrogen ion concentration of blood plasma.
- A) 4 times greater
 - B) 4 times lesser
 - C) 400 times greater
 - D) 10,000 times greater

Making Molar Solutions

A molar solution is one way of expressing a solution in terms of the amount of solute, the thing that is getting dissolved in a given volume of solvent. A Molar (1M) solution is one containing 1 mole of solute per liter of solution. Remember, a mole is a mole is a mole is not a furry animal. A mole is 6.02×10^{23} number of something—just like a dozen of something is always 12 of something.

- To prepare a 1 M solution of something, first find the formula weight of your solute by adding the complete atomic masses of its components. You can find these atomic masses on the Periodic Table. (This does mean you might have to do some 'research' on your part to find the molecular formula for a compound as well as their formula weights.)
- A 1 M solution of NaCl would be made when 58.43 grams of NaCl is dissolved into 1 L (1000 mL) of water. The atomic masses of Na is 22.98 Da (Daltons) and Cl is 35.45 Da for a formula weight of NaCl coming in at 58.43 Da. For the record, a dalton is the same as an atomic mass unit (u). So 1 mole of NaCl is 58.43 grams.
- However, you may find that 1 liter of solution is often too much for our needs. You may want only a fraction of that. Here is an easy way to find out how much 'stuff' you need:

$$(\text{grams of solute}) = (\text{molarity}) \times (\text{formula weight}) \times (\text{volume, in liters})$$

1) Show background information and calculations for setting up 50 mL of 1 M NaCl solution.

2) Show background information and calculations for setting up 50 mL of 0.5 M glucose solution.

3) Show background information and calculations for setting up 300 ml of 2 M KCl solution

4) Show background information and calculations for setting up 200 mL of 0.6 M sucrose solution.

Answer Key

1. B
2. A
3. A
4. A
5. D
6. A
7. C
8. B
9. D
10. D
11. A
12. B
13. D
14. B
15. C
16. B
17. A
18. D

- 1.
- 2.
- 3.
- 4.