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CORRECT ANSWERS ARE LOCATED IN THE 2ND HALF OF THIS DOC.

MULTIPLE CHOICE - Choose the one alternative that best completes the statement or answers the question.

1) Matter is composed of_____.
   A) atoms
   B) energy
   C) mass
   D) molecules

2) All atoms possess the ability to do work. The term that is defined as the ability to do work is_____.
   A) matter
   B) energy
   C) molecules
   D) space

3) The number of protons in a given atom is equal to its_____.
   A) atomic number
   B) mass
   C) neutron number
   D) molecular number

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4) Isotopes that are unstable and decay when their nucleus breaks up into elements with lower atomic numbers, emitting significant amounts of energy in the process, are called_____.
   A) energetic
   B) ionic
   C) radioactive
   D) isometric

5) Atoms containing a specific number of protons are called_____.
   A) minerals
   B) elements
   C) metals
   D) molecules

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6) Which chemical group forms hydrogen bonds with water and is most likely to explain why sugars dissolve well in water?
   A) -O-H
   B) -N-H
   C) -C-H
   D) -C-C

7) The negative logarithm of the hydrogen ion concentration in the solution is referred to as_____.
   A) pH
   B) atomic mass
   C) OH^- concentration
   D) electronegativity
   E) specific heat

8) Bicarbonate ions in the blood can absorb hydrogen ions, keeping the pH balanced. Therefore bicarbonate is acting as a_____ in the blood.
   A) buffer
   B) acid
   C) base
   D) alkaline

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9) Atomic nuclei contain protons and_____.
   A) isomers
   B) ions
   C) moles
   D) neutrons

10) Carbon-12, carbon-13 and carbon-14 are examples of_____.
   A) ions
   B) isotopes
   C) isomers
   D) molecules

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11) Organisms are composed of molecules, which are collections of smaller units, termed_____.
A) monomers
B) atoms
C) electrons
D) polymers
E) ions

12) Negatively charged subatomic particles that have almost no mass are called_____.
A) electrons
B) protons
C) neutrons
D) ions
E) polymers

13) Atoms of a single element that possess different numbers of neutrons are called_____.
A) polymers
B) ions
C) monomers
D) isomers
E) isotopes

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14) $Cl + e^- \rightarrow Cl^-$ is an example of a_____ reaction.
A) oxidation
B) reduction
C) polymerization
D) ionization

15) When atoms gain or lose electrons, they can become negatively or positively charged. These negatively or positively charged atoms are known as_____.
A) isotopes
B) ions
C) isomers
D) unstable atoms

16) When two atoms share a pair of electrons, the bonding is referred to as_____.
A) ionic
B) covalent
C) unstable
D) hydrogen

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17) Water molecules are polar with ends that exhibit partial positive and negative charges. These opposite charges allow water molecules to attract each other through_____.
A) ionic bonds
B) covalent bonds
C) hydrogen bonds
D) peptide bonds

18) An atom has 20 electrons and 20 neutrons. What is the mass of this atom?
A) 10
B) 20
C) 40
D) 80

19) Sue was monitoring the oil spill into the Gulf of Mexico from an oil tanker. From her observations, she noted that the oil was moving as large patches on the water. It did not appear as though the oil was dissolving into the water. Why did the oil not dissolve into the water?
A) Hydrophobic interactions
B) Surface tension
C) Sea water acts as a solvent
D) Water forms hydration shellsTBEXAM.COM
E) Water has a high heat of vaporization

20) The atomic number of an element is equal to the number of_____.
A) protons only
B) neutrons only
C) protons plus electrons
D) protons plus neutrons
E) neutrons plus electrons

21) Oxygen has an atomic mass of 16 and an atomic number of 8. How many neutrons are present?
A) 24
B) 8
C) 16
D) 4

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22) The pH of your small intestines is around 7.5 and the pH of your large intestine can be 5.5. As substances travel from the small intestines to the large intestine, what would happen to the H^+ ion concentration?
A) It decreases 100-fold.
B) It increases by 100-fold.
C) It increases 10-fold.
D) It increases 2-fold.
E) It decreases 10-fold.

23) Oxygen-16 is abundant and has 8 protons and 8 neutrons. Oxygen-18 is a/an_____ of oxygen-16.
A) ion
B) isotope
C) isomer
D) dimer

24) Which element's isotope is commonly used to determine when biological samples, such as fossils, were formed?
A) Oxygen
B) Hydrogen
C) Carbon
D) Nitrogen
E) Sulfur

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25) Atoms in which the number of electrons does not equal the number of protons are known as_____.
A) valences
B) ions
C) isotopes
D) isomers

26) The area around a nucleus where an electron is most likely to be found is the_____.
A) electrical space
B) energy level
C) polar space
D) orbital

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27) Regardless of its shape, a given orbital may contain no more than_____.
A) one electron
B) four electrons
C) eight electrons
D) two electrons

28) All atoms tend to fill their outer energy levels with the maximum number of electrons, usually eight. Depending on whether atoms satisfy the octet rule will predict_____.
A) the chemical behavior of the atoms
B) whether they will be found in nature
C) whether they will dissolve in water
D) their radioactive energy

29) Mendeleev found that when he arranged the known elements according to their atomic mass, the entries in the table exhibited a pattern of chemical properties that repeated itself in groups of eight elements. This led to the generalization now known as_____.
A) an atomic model
B) valance electrons
C) the periodic table
D) the octet rule

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30) Sodium has 11 electrons arranged in three energy levels. In order to become stable, sodium forms an ion with _____.
A) no charge
B) −1 charge
C) −8 charge
D) +1 charge
E) +8 charge

31) In the crystal matrix of ordinary salt, the sodium and chlorine are held together by_____.
A) peptide bonds
B) covalent bonds
C) ionic bonds
D) hydrogen bonds
E) nonpolar bonds

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32) Two carbon atoms joined to each other by the sharing of two pairs of electrons form a/an_____.
A) single bond
B) ionic bond
C) hydrogen bond
D) double covalent bond

33) In a chemical analysis of an animal tissue sample, which element would be in the least quantity?
A) Carbon
B) Hydrogen
C) Nitrogen
D) Oxygen
E) Iodine

34) Life is thought to have evolved from complex molecules formed by the interaction of smaller molecules in oceans and the atmosphere. The substance which brought these molecules together to interact is_____.
A) hydrogen
B) acids
C) water
D) buffers
E) salts

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35) Because oxygen is more electronegative than hydrogen, the water molecule is_____.
A) hydrophobic
B) hydrophilic
C) nonpolar
D) ionic
E) polar

36) Water molecules are attracted to each other due to the opposite charges created by partial charge separations within the molecules. These attractions are called_____.
A) peptide bonds
B) covalent bonds
C) ionic bonds
D) hydrogen bonds
E) double bonds

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37) An oxygen atom in water has two covalent bonds with hydrogen atoms and two unpaired electrons. How many hydrogen bonds can a water molecule form?
A) One
B) Two
C) Three
D) Four
E) Five

38) Nitrogen has a higher electronegativity than hydrogen. As a result you would expect that ammonia (NH_3) molecules can form_____ with each other.
A) hydrogen bonds
B) hydrophilic bonds
C) ionic bonds
D) covalent bonds
E) cohesive bonds

39) When water ionizes, it produces equal amounts of hydrogen and hydroxide ions that can reassociate with each other. The pH of water is_____.
A) three
B) four
C) five
D) six
E) seven

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40) A scientist conducts a procedure that causes nitrogen atoms to gain neutrons. The resulting atoms will be_____.
A) ions of nitrogen
B) positively charged
C) negatively charged
D) isotopes of nitrogen
E) new elements with higher atomic numbers

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41) The half-life of carbon-14 is approximately 5,700 years. Using this information scientists have been able to determine the age of some artifacts left by humans. A scientist wants to know approximately how old a piece of wood was that she collected on the floor in an old cave that had recently been discovered. Her wood sample contained 2 grams of carbon-14. If the age of the wood was determined to be 22,800 years old, how much carbon-14 originally existed in this piece of wood?

A) 32 grams
B) 16 grams
C) 12 grams
D) 8 grams
E) 4 grams

42) Plants transport water to their leaves through the xylem when water evaporates from the leaves. The evaporating water pulls other water molecules up the xylem through_____.

A) hydrogen bonds
B) ionic bonds
C) covalent bonds
D) hydrophobic interactions

43) Water is most dense and thus heaviest at 4°C. At 0°C, ice forms and can float on liquid water. Suppose ice were most dense at 0°C. What would happen in a lake at this temperature?

A) The ice would cover the surface of the aquatic system and would never melt.
B) The ice would cover the bottom of the aquatic system and would build up in layers over time.
C) Ice would not form because solids are always less dense than liquids.
D) The cold temperatures and the subsequent ice formation would prevent hydrogen bonds from forming between the water molecules, thus causing the existing ice crystals to become disassociated from each other.

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44) Your dog becomes ill and you rush him to the veterinarian's office. A technician draws blood your dog. After a few minutes the lab results are given to the vet, who immediately begins to fill a syringe with an unknown fluid. You inquire about the fluid, and the vet informs you the fluid is necessary to manage your dog's metabolic acidosis. Based on the information provided, what is acidosis, and what is the likely effect of the injection?

A) Acidosis means that your dog's blood pH has dropped from its normal level, and an injection of saline is required to reverse the condition.
B) Acidosis means that your dog's blood pH has increased from its normal level, and an injection of saline is required to reverse the condition.
C) Acidosis means that your dog's blood pH has decreased from its normal level, and an injection of buffering solution is required to reverse the condition.
D) Acidosis means that your dog's blood pH has increased from its normal level, and an injection of buffering solution is required to reverse the condition.

45) As you and a friend are entering a chemistry laboratory at your university, you see a sign that states: DANGER—RADIOACTIVE ISOTOPES IN USE. Your friend is an accounting major and has not had any science courses yet. She asks you what a radioactive isotope is and you respond correctly with_____.

A) radioactive isotopes are atoms that are unstable and as a result emit energy in a process called radioactive decay
B) radioactive isotopes are atoms that are stable and as a result emit energy in a process called radioactive decay
C) radioactive isotopes are atoms that are stable and as a result only emit energy if they are exposed to higher temperatures
D) radioactive isotopes are atoms that are unstable but unless actively disturbed by some chemical process will remain intact and pose no problems

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46) An effective way to increase the rate of the reaction $A + B \rightarrow C$ would be to_____.

A) add more C
B) decrease the temperature
C) add more A or B
D) remove the catalyst

47) The two nitrogen atoms in nitrogen gas (N_2) share six electrons forming a_____.

A) triple covalent bond
B) double covalent bond
C) single covalent bond
D) hydrogen bond
E) double bond

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48) Capillary action is one of the forces that aids water's upward movement in plants. The narrower the diameter of the tube, the farther the water column will rise. Capillary action is a result of water molecules_____.
A) storing heat and thus moving faster because of heat of vaporization
B) producing sufficient surface tension to overcome the pull of gravity
C) having a strong cohesive force and attaching to the surrounding vessel walls
D) having an adhesive force, which allows them to attach to the vessel walls
E) being associated with hydrophobic molecules, which can result in upward movement

49) Which atomic particle has no charge and is located in the nucleus?
A) Electron
B) Ion
C) Neutron
D) Proton
E) Isotope

50) The subatomic particle with a positive charge is_____.
A) an electron
B) an ion
C) a neutron
D) a proton
E) an isotope

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51) The smallest subatomic particle of those listed below is the_____.
A) electron
B) ion
C) isotope
D) neutron
E) proton

52) An atom that is negatively charged because it has accepted an electron is a/an_____.
A) isomer
B) ion
C) isotope
D) monomer

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53) One mole of a substance contains 6.02×10^{23} molecules. The atomic number of lithium (Li) is 3 and the atomic mass is approximately 7. If you have three moles of Li, how many grams does it weigh?

A) 9
B) 21
C) $7 \times 6.02 \times 10^{23}$
D) $3 \times 6.02 \times 10^{23}$

54) After taking your biology exam, you return to your car only to find that you had left the lights on and now the car battery is dead. Your friend offers to jump-start your car, but when you go to hook up the jumper cables you find that the battery terminals are covered with corrosion due to battery acid condensation. Based on your knowledge, what substance could be used to clean the corrosion?

A) Coffee (pH of 5)
B) Water (pH of 7)
C) Vinegar (pH of 3)
D) Baking soda (pH of 9)

55) The amino acid glycine ($C_3NO_2H_6$) is a/an_____.

A) organic molecule
B) inorganic molecule
C) element
D) vitamin

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56) Consider the following electronegativity values:
Boron (B) = 1.8
Carbon (C) = 2.5
Chlorine (Cl) = 3.2
Selenium (Se) = 2.6
Which of the following bonds is the most polar?

A) B-Cl
B) C-Cl
C) Se-Cl
D) It cannot be determined from the information provided.

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57) <p>The reaction ($H_2 + F_2 \rightarrow 2HF$) is an example of a redox reaction. In reality, two half reactions are occurring. The half reaction ($H_2 \rightarrow 2H^+ + 2e^-$) is a/an _____.

A) reduction reaction
B) oxidation reaction
C) redox reaction
D) potential energy reaction

58) The electronic configuration of the noble gas neon, which has an atomic number of 10, can be written as follows: $1s^2 2s^2 2p^6$. What is the electronic configuration of the noble gas argon, which has an atomic number of 18?

A) $1s^2 2s^2 3p^6 4s^2 5p^6$
B) $1s^2 2s^6 2p^2 3s^6 3p^2$
C) $1s^2 2s^2 2p^6 3s^2 3p^6$
D) $1s^2 2s^8 3p^8$

59) You identify an enzyme involved in a cellular reaction. How does the enzyme affect the reaction equilibrium between reactants and products and the time needed to reach equilibrium?

A) It alters the reaction equilibrium and shortens the time needed to reach equilibrium.
B) The reaction equilibrium is unaffected, but it shortens the time needed to reach equilibrium.
C) It alters the reaction equilibrium and lengthens the time needed to reach equilibrium.
D) The reaction equilibrium is unaffected, but it lengthens the time needed to reach equilibrium.

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60) You walk down into your basement to find that the carpeting on the floor is damp. Concerned, you look around for large puddles of water or broken pipes, but find none. In fact, only the basement floor and carpeting is damp. You realize that water must have wicked into the carpet from the floor by_____.

A) adhesion and cohesion
B) adhesion and solubility
C) adhesion, cohesion, and solubility
D) cohesion and solubility

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61) You recently discovered a new element and find that this particular element has multiple energy levels and one electron in its outer energy level. What would you expect will happen to an atom of this element if placed in water?
A) It will lose an electron forming a positive ion.
B) It will lose an electron forming a negative ion.
C) It will gain an electron forming a positive ion.
D) It will gain an electron forming a negative ion.

62) Sulfur is found directly below oxygen on the periodic table. What type of bond would you predict S-H would form?
A) Polar covalent
B) Ionic
C) Hydrogen bond
D) Nonpolar covalent bond

63) Why is it necessary to take special safety precautions when using radioactivity?
A) Radioactive substances will ionize cells.
B) Radioactive substances have the potential to cause damage to living cells.
C) Radioactive substances decay.
D) Radioactive substances will perforate plasma membranes.

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64) The high heat of vaporization of water helps you to feel cooler when you sweat because the transition of water from a liquid to a gas requires a_____ of energy to break hydrogen bonds. The energy is_____ from heat produced by your body, thus helping to lower the surface temperature of your body.
A) release; released
B) release; obtained
C) input; obtained
D) input; released

65) A chemist adds a chemical to pure water and there is a 100-fold increase in the concentration of hydrogen ions. What is the best approximation of the new pH value?
A) 0
B) 5
C) 7
D) 9
E) 14

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66) The electronegativity of nitrogen (N) is 3.0, while the electronegativity of hydrogen (H) is 2.1. Knowing this, consider how the electrons will be shared in ammonia (NH_3). What do you predict about the polarity of ammonia?

A) Each H atom has a partial positive charge
B) The N atom has a partial positive charge
C) Each H atom has a partial negative charge
D) The N atom has a strong positive charge

67) Magnesium chloride ($MgCl_2$)is a salt formed with ionic bonds between one magnesium ion and two chloride ions. Magnesium has two electrons in its outer shell and chlorine has seven electrons in its outer shell. How are the electrons transferred between these atoms?

A) Both magnesium and chlorine are reduced
B) Both magnesium and chlorine are oxidized
C) Chlorine is oxidized and magnesium is reduced
D) Magnesium is oxidized and chlorine is reduced

68) The carbonic acid and bicarbonate buffer in blood is extremely important to help maintain homeostasis. What would happen to the pH of the blood if bicarbonate were removed?

A) Removing bicarbonate from the blood would increase the pH.
B) Removing bicarbonate from the blood would decrease the pH.
C) Removing bicarbonate from the blood would not affect the pH.

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69) The common basilisk lizard will run across water on its hind legs in an erect position when startled by predators. This lizard has large feet and flaps of skin along its toes. What properties of water allow this lizard to walk on water?

A) Hydrogen bonds absorb heat when they break and release heat when they form. This helps to minimize temperature changes.
B) The surface tension created by hydrogen bonds is greater than the weight of the lizard initially.
C) Polar molecules are attracted to ions and polar compounds, making these compounds soluble.
D) Hydrogen bonds hold water molecules together; many hydrogen bonds must be broken for water to evaporate.

70) Chlorine (Cl) has 7 electrons in its outer shell and potassium (K) has 1 electron in its outer shell. How is the bond in Cl_2 different from the bond in KCl?

A) Cl_2 is covalent and KCl is ionic.
B) Cl_2 and KCl are both ionic.
C) Cl_2 is ionic and KCl is covalent.

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71) Carbon has four valence electrons and oxygen has six. Carbon dioxide would contain _____.
A) one single covalent bond
B) four hydrogen bonds
C) two double covalent bonds
D) two single covalent bonds

72) If water were nonpolar it would not form hydrogen bonds. At normal room temperatures this nonpolar water would be_____.
A) a gas
B) a liquid
C) a solid

73) Proteins are three dimensional molecules made of strands of amino acids (imagine a ball of string). There are 20 different amino acids used in proteins found in living organisms. Some of these amino acids are polar and others are nonpolar. Where would a series of nonpolar amino acids most likely be located in a protein that is found in the cytosol of an animal cell?
A) On the surface of the protein
B) In the interior of the protein
C) At the very top of the protein
D) At the very bottom of the protein

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74) According to most car mechanics, plain water is the best coolant to use in an engine provided the engine is not being exposed to freezing temperatures. If the car is subject to freezing temperatures, then a mixture of water and ethylene glycol (antifreeze) is recommended, but it does not cool as efficiently as plain water. Why would ethylene glycol reduce the cooling efficiency of water?
A) Ethylene glycol has a lower heat capacity than water.
B) Ethylene glycol has a higher heat capacity than water.
C) Hydrogen bonds in water allow high levels of heat absorption and a large increase in temperature.
D) Ethylene glycol raises the freezing point of water.

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75) Dennis had a history of heart disease in his family and was reducing his intake of saturated fats. Saturated means each carbon atom is bonded to as many hydrogen atoms as it can accept. If a carbon were bonded to two carbons, how many hydrogens could it accept?

A) Zero
B) One
C) Two
D) Three
E) Four

76) _____ are an important component of antibody recognition, where a substantial amount of atoms are in close proximity between the antibody and the antigen.

A) Hydrogen bonds
B) Covalent bonds
C) Hydrophobic interactions
D) Ionic bonds
E) Van der Waals attractions

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Answer Key

Test name: Chapter 02

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

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Clarify Question

- What is the key concept addressed by the question? The question asks about calculating the mass of an atom.
- The question asks about calculating the mass of an atom.
- The question asks about calculating the mass of an atom.
- You are being asked to apply the definition of atomic mass to calculate an atomic mass.
- Atomic mass—sum of the masses of protons and neutrons in an atom (electron mass is negligable)
- What do you know about atomic mass? What other information is related to the question? The mass of a proton and a neutron are both (approximately) 1.
- The mass of a proton and a neutron are both (approximately) 1.
- The mass of a proton and a neutron are both (approximately) 1.
- Given what you now know, what information is most likely to produce the correct answer? 20 protons + 20 neutrons = an atomic mass of 40.
- 20 protons + 20 neutrons = an atomic mass of 40.
- 20 protons + 20 neutrons = an atomic mass of 40.
- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you confuse atomic number (the number of protons alone) with the atomic mass (the sum of protons and neutrons)?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you confuse atomic number (the number of protons alone) with the atomic mass (the sum of protons and neutrons)?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you confuse atomic number (the number of protons alone) with the atomic mass (the sum of protons and neutrons)?

19) A

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Clarify Question

- What is the key concept addressed by the question? The question asks why oil and water don't mix.
- The question asks why oil and water don't mix.
- The question asks why oil and water don't mix.
- You are being asked to apply your knowledge of the properties of water and oil to explain why the oil does not dissolve in water.
- Dissolve—one compound mixes completely with a solvent like water
- What do you know about water as a solvent? What other information is related to the question? Water is a polar molecule, this means that other polar molecules or ions will dissolve in it. These water loving molecules are called hydrophilic. Oil is a non-polar molecule and will dissolve better in a non-polar solvent. These molecules are called hydrophobic, or water fearing. Water is a solvent with a high heat of vaporization and surface tension. Water also forms surface tension. However, none of these properties explain why oil does not dissolve in water.
- Water is a polar molecule, this means that other polar molecules or ions will dissolve in it. These water loving molecules are called hydrophilic.
- Oil is a non-polar molecule and will dissolve better in a non-polar solvent. These molecules are called hydrophobic, or water fearing.
- Water is a solvent with a high heat of vaporization and surface tension. Water also forms surface tension. However, none of these properties explain why oil does not dissolve in water.
- Water is a polar molecule, this means that other polar molecules or ions will dissolve in it. These water loving molecules are called hydrophilic.
- Oil is a non-polar molecule and will dissolve better in a non-polar solvent. These molecules are called hydrophobic, or water fearing.
- Water is a solvent with a high heat of vaporization and surface tension. Water also forms surface tension. However, none of these properties explain why oil does not dissolve in water.
- Given what you now know, what information is most likely to produce the correct answer? The best answer is that oil is hydrophobic, meaning it does not interact well with water. This is because water is a polar molecule and oil is non-polar. Water has O-H bonds which do not share electrons equally giving the O a partial negative charge and the H a partial positive charge. In contrast oil is made up of C-H bonds and the electrons are shared more equally leading to no partial charges. Because oil does not have these charges it is not attracted to the charges in water and does not dissolve well in water.

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- The best answer is that oil is hydrophobic, meaning it does not interact well with water. This is because water is a polar molecule and oil is non-polar. Water has O-H bonds which do not share electrons equally giving the O a partial negative charge and the H a partial positive charge. In contrast oil is made up of C-H bonds and the electrons are shared more equally leading to no partial charges. Because oil does not have these charges it is not attracted to the charges in water and does not dissolve well in water.
- The best answer is that oil is hydrophobic, meaning it does not interact well with water. This is because water is a polar molecule and oil is non-polar. Water has O-H bonds which do not share electrons equally giving the O a partial negative charge and the H a partial positive charge. In contrast oil is made up of C-H bonds and the electrons are shared more equally leading to no partial charges. Because oil does not have these charges it is not attracted to the charges in water and does not dissolve well in water.
- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you know what the word hydrophobic meant? Did you have difficulty remembering which properties of water make it a good solvent for other polar molecules?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you know what the word hydrophobic meant? Did you have difficulty remembering which properties of water make it a good solvent for other polar molecules?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you know what the word hydrophobic meant? Did you have difficulty remembering which properties of water make it a good solvent for other polar molecules?

20) A

21) B

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Clarify Question

- What is the key concept addressed by the question? The question asks you to calculate the number of neutrons from the atomic mass and number of an atom.
- The question asks you to calculate the number of neutrons from the atomic mass and number of an atom.
- The question asks you to calculate the number of neutrons from the atomic mass and number of an atom.
- You are being asked to apply your knowledge of how atomic mass and atomic number are calculated.
- Atomic mass—number of neutrons plus protons in an atom
- Atomic number—number of protons in an atom
- What do you know about the number of neutrons in an atom? What other information is related to the question? Atomic mass contains both the neutrons and protons in an atom.
- Atomic mass contains both the neutrons and protons in an atom.
- Atomic mass contains both the neutrons and protons in an atom.
- Given what you now know, what information is most likely to produce the correct answer? To calculate the number of neutrons, simply take Atomic mass (P + N) minus Atomic number (P). For this question about oxygen: 16 – 8 = 8 neutrons
- To calculate the number of neutrons, simply take Atomic mass (P + N) minus Atomic number (P).
- For this question about oxygen: 16 – 8 = 8 neutrons
- To calculate the number of neutrons, simply take Atomic mass (P + N) minus Atomic number (P).
- For this question about oxygen: 16 – 8 = 8 neutrons
- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you know the definitions of how atomic mass and atomic numbers? Did you have difficulty figuring out how to calculate the number of neutrons by subtracting atomic mass from atomic number?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you know the definitions of how atomic mass and atomic numbers? Did you have difficulty figuring out how to calculate the number of neutrons by subtracting atomic mass from atomic number?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you know the definitions of how atomic mass and atomic numbers? Did you have difficulty figuring out how to calculate the number of neutrons by subtracting atomic mass from atomic number?

22) B

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Clarify Question

- What is the key concept addressed by the question? The question asks about relating pH to %media:1formula2.mml% concentration.
- The question asks about relating pH to %media:1formula2.mml% concentration.
- The question asks about relating pH to %media:1formula2.mml% concentration.
- You are being asked to apply the definition of pH to a specific example.
- pH—this is the –log[%media:1formula2.mml%]
- What do you know about the link between %media:1formula2.mml% concentration and pH? What other information is related to the question? Because the relationship between %media:1formula2.mml% concentration and pH is a log scale, a change in pH of 1 is a change in %media:1formula2.mml% concentration of 10-fold, and because the relationship is inverse, an increase in pH of 1 is a decrease in %media:1formula2.mml% concentration by 10-fold. In moving from the small intestines to the large intestines the pH goes from 7.5 to 5.5, which means the substance is moving to a more acidic environment. This means that the %media:1formula2.mml% concentration will increase.
- Because the relationship between %media:1formula2.mml% concentration and pH is a log scale, a change in pH of 1 is a change in %media:1formula2.mml% concentration of 10-fold, and because the relationship is inverse, an increase in pH of 1 is a decrease in %media:1formula2.mml% concentration by 10-fold.
- In moving from the small intestines to the large intestines the pH goes from 7.5 to 5.5, which means the substance is moving to a more acidic environment. This means that the %media:1formula2.mml% concentration will increase.
- Because the relationship between %media:1formula2.mml% concentration and pH is a log scale, a change in pH of 1 is a change in %media:1formula2.mml% concentration of 10-fold, and because the relationship is inverse, an increase in pH of 1 is a decrease in %media:1formula2.mml% concentration by 10-fold.
- In moving from the small intestines to the large intestines the pH goes from 7.5 to 5.5, which means the substance is moving to a more acidic environment. This means that the %media:1formula2.mml% concentration will increase.
- Given what you now know, what information is most likely to produce the correct answer? Because the pH drops by 2 pH units, the %media:1formula2.mml% concentration increases by %media:1formula3.mml% or %media:1formula4.mml% or 100-fold.
- Because the pH drops by 2 pH units, the %media:1formula2.mml% concentration increases by %media:1formula3.mml% or %media:1formula4.mml% or 100-fold.
- Because the pH drops by 2 pH units, the %media:1formula2.mml% concentration increases by %media:1formula3.mml% or %media:1formula4.mml% or 100-fold.

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- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall that pH is a log scale? Did you recall that pH has a negative relationship to %media:1formula2.mml% concentration, so an increase in pH leads to a decrease in %media:1formula2.mml% concentration?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall that pH is a log scale? Did you recall that pH has a negative relationship to %media:1formula2.mml% concentration, so an increase in pH leads to a decrease in %media:1formula2.mml% concentration?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall that pH is a log scale? Did you recall that pH has a negative relationship to %media:1formula2.mml% concentration, so an increase in pH leads to a decrease in %media:1formula2.mml% concentration?

23) B
24) C
25) B
26) D
27) D
28) A
29) D
30) D
31) C
32) D
33) E
34) C
35) E
36) D
37) D

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Clarify Question

- What is the key concept addressed by the question? The question asks about the formation of hydrogen bonds in water.
- The question asks about the formation of hydrogen bonds in water.
- The question asks about the formation of hydrogen bonds in water.
- You are being asked to apply your knowledge of the structure of water to predict the formation of hydrogen bonds.
- Hydrogen bonds—weak ionic interactions between a partial positive charge on one atom and partial negative charge on another atom
- Water has the structure H-O-H
- What do you know about hydrogen bonds? What other information is related to the question? Oxygen has a stronger attraction for electrons than hydrogen and ends up with two partial negative charges. Hydrogen has a weaker attraction for electrons than oxygen and ends up with a partial positive charge. Hydrogen bonds will form between the H atom on one water molecule and the O atom on a second water molecule.
- Oxygen has a stronger attraction for electrons than hydrogen and ends up with two partial negative charges.
- Hydrogen has a weaker attraction for electrons than oxygen and ends up with a partial positive charge.
- Hydrogen bonds will form between the H atom on one water molecule and the O atom on a second water molecule.
- Oxygen has a stronger attraction for electrons than hydrogen and ends up with two partial negative charges.
- Hydrogen has a weaker attraction for electrons than oxygen and ends up with a partial positive charge.
- Hydrogen bonds will form between the H atom on one water molecule and the O atom on a second water molecule.
- Given what you now know, what information is most likely to produce the correct answer? Each H atom can form one hydrogen bond with an O atom on another water molecule. Each O atom can form hydrogen bonds with two H atoms on other water molecules. Water can form hydrogen bonds with 4 water molecules. Two bonds will be through the H atoms and two through the O atom.
- Each H atom can form one hydrogen bond with an O atom on another water molecule.
- Each O atom can form hydrogen bonds with two H atoms on other water molecules.
- Water can form hydrogen bonds with 4 water molecules. Two bonds will be through the H atoms and two through the O atom.
- Each H atom can form one hydrogen bond with an O atom on another water molecule.
- Each O atom can form hydrogen bonds with two H atoms on other water molecules.
- Water can form hydrogen bonds with 4 water molecules. Two bonds will be through the H atoms and two through the O atom.

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- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Could you draw the structure of a water molecule? Could you identify which atoms would be involved in forming a hydrogen bond?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Could you draw the structure of a water molecule? Could you identify which atoms would be involved in forming a hydrogen bond?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Could you draw the structure of a water molecule? Could you identify which atoms would be involved in forming a hydrogen bond?

38) A

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Clarify Question

- What is the key concept addressed by the question? The question asks about electronegativity.
- The question asks about electronegativity.
- The question asks about electronegativity.
- You are being asked to apply your knowledge of electronegativity to predict what types of bonds a molecule could form.
- Electronegativity—pull of an atom on an electron
- What do you know about electronegativity? What other information is related to the question? Nitrogen has a higher electronegativity than hydrogen. This means that the nitrogen atoms will have a partial negative charge and the hydrogen atoms will have a partial positive charge. The partial charges on N and H atoms on adjacent %media:1formula5.mml% molecules will be attracted to each other. These are not covalent bonds which share electrons. These are partial charges, so they are not ionic bonds. Because these are charged they are hydrophilic and not hydrophobic.
- Nitrogen has a higher electronegativity than hydrogen. This means that the nitrogen atoms will have a partial negative charge and the hydrogen atoms will have a partial positive charge.
- The partial charges on N and H atoms on adjacent %media:1formula5.mml% molecules will be attracted to each other.
- These are not covalent bonds which share electrons. These are partial charges, so they are not ionic bonds. Because these are charged they are hydrophilic and not hydrophobic.
- Nitrogen has a higher electronegativity than hydrogen. This means that the nitrogen atoms will have a partial negative charge and the hydrogen atoms will have a partial positive charge.
- The partial charges on N and H atoms on adjacent %media:1formula5.mml% molecules will be attracted to each other.
- These are not covalent bonds which share electrons. These are partial charges, so they are not ionic bonds. Because these are charged they are hydrophilic and not hydrophobic.
- Given what you now know, what information is most likely to produce the correct answer? The best answer is that the attraction through partial charges is a hydrogen bond between the N on one NH3 and the H on another.
- The best answer is that the attraction through partial charges is a hydrogen bond between the N on one NH3 and the H on another.
- The best answer is that the attraction through partial charges is a hydrogen bond between the N on one NH3 and the H on another.

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- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Could you draw the structure of an NH3 molecule? Did you realize how hydrogen bonds form?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Could you draw the structure of an NH3 molecule? Did you realize how hydrogen bonds form?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Could you draw the structure of an NH3 molecule? Did you realize how hydrogen bonds form?

39) E
40) D
41) A

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Clarify Question

- What is the key concept addressed by the question? The question asks about radioactive decay.
- The question asks about radioactive decay.
- The question asks about radioactive decay.
- You are being asked to analyze data on radioactive decay.
- Half-life—amount of time in which half of a dose of radioactivity in a sample will be lost to decay
- What do you know about half life? What other information is related to the question? The first step is to figure out how many half-lives have occurred. %media:1formula6.mml%. In 4 half-lives the amount of radiation will have been cut in half 4 times. In 4 half-lives the amount of radiation will have been cut in half 4 times. %media:1formula7.mml%, which means that the total amount of radiation will be decreased 16-fold.
- The first step is to figure out how many half-lives have occurred. %media:1formula6.mml%. In 4 half-lives the amount of radiation will have been cut in half 4 times.
- In 4 half-lives the amount of radiation will have been cut in half 4 times.
- %media:1formula7.mml%, which means that the total amount of radiation will be decreased 16-fold.
- The first step is to figure out how many half-lives have occurred. %media:1formula6.mml%. In 4 half-lives the amount of radiation will have been cut in half 4 times.
- In 4 half-lives the amount of radiation will have been cut in half 4 times.
- %media:1formula7.mml%, which means that the total amount of radiation will be decreased 16-fold.
- Given what you now know, what information is most likely to produce the correct answer? If 2 grams of carbon-14 remain now and this represents the amount left after a 16-fold decrease, the original amount would be 2 grams x 16 = 32 grams.
- If 2 grams of carbon-14 remain now and this represents the amount left after a 16-fold decrease, the original amount would be 2 grams x 16 = 32 grams.
- If 2 grams of carbon-14 remain now and this represents the amount left after a 16-fold decrease, the original amount would be 2 grams x 16 = 32 grams.
- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall that the amount of sample could be cut in half with each decay? One common misconception is to think that 4 rounds of decay would decrease the radioactivity 4-fold. Each round cuts the amount of radioactivity in half, so this leads to a 16-fold decrease.

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- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall that the amount of sample could be cut in half with each decay? One common misconception is to think that 4 rounds of decay would decrease the radioactivity 4-fold. Each round cuts the amount of radioactivity in half, so this leads to a 16-fold decrease.
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall that the amount of sample could be cut in half with each decay? One common misconception is to think that 4 rounds of decay would decrease the radioactivity 4-fold. Each round cuts the amount of radioactivity in half, so this leads to a 16-fold decrease.

42) A

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Clarify Question

- What is the key concept addressed by the question? The question asks about attractive interactions between water molecules.
- The question asks about attractive interactions between water molecules.
- The question asks about attractive interactions between water molecules.
- You are being asked to apply your knowledge about the properties of water.
- Ionic bonds—a full positive charge on one molecule attracted to a full negative charge on another
- Hydrophobic interactions—hydrophobic groups repel water and clump together
- Hydrogen bonds—a partial negative charge on one atom is attracted to a partial positive charge on a hydrogen atom
- Covalent bonds—sharing a pair of electrons between two atoms
- What do you know about the properties of water? What other information is related to the question? Water is a polar molecule with partial negative charges on oxygen atoms and partial positive charges on hydrogen atoms. Covalent bonds form between atoms within a molecule, the question refers to interactions between water molecules, so these cannot be covalent. Ionic bonds involve full charges, water has partial charges. Hydrophobic interactions are found in non-polar molecules, water is polar.
- Water is a polar molecule with partial negative charges on oxygen atoms and partial positive charges on hydrogen atoms.
- Covalent bonds form between atoms within a molecule, the question refers to interactions between water molecules, so these cannot be covalent.
- Ionic bonds involve full charges, water has partial charges.
- Hydrophobic interactions are found in non-polar molecules, water is polar.
- Water is a polar molecule with partial negative charges on oxygen atoms and partial positive charges on hydrogen atoms.
- Covalent bonds form between atoms within a molecule, the question refers to interactions between water molecules, so these cannot be covalent.
- Ionic bonds involve full charges, water has partial charges.
- Hydrophobic interactions are found in non-polar molecules, water is polar.
- Given what you now know, what information is most likely to produce the correct answer? The best answer is that hydrogen bonds form between water molecules. As one water molecule evaporates it pulls the next water molecule up, moving water through the xylem.
- The best answer is that hydrogen bonds form between water molecules. As one water molecule evaporates it pulls the next water molecule up, moving water through the xylem.
- The best answer is that hydrogen bonds form between water molecules. As one water molecule evaporates it pulls the next water molecule up, moving water through the xylem.

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- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall the structure of water and types of bonds it forms?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall the structure of water and types of bonds it forms?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall the structure of water and types of bonds it forms?

43) B

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Clarify Question

- What is the key concept addressed by the question? The question asks about the properties of liquid water and ice.
- The question asks about the properties of liquid water and ice.
- The question asks about the properties of liquid water and ice.
- You are being asked to apply your knowledge of the relative densities of liquid water and ice to what happens in a lake in the winter.
- Density—measure of mass/volume
- What do you know about ice? What other information is related to the question? Because ice has more rigid structure than liquid water it occupies more volume. Thus the same mass of liquid water and ice vary in their density. Because liquid water occupies less volume it has a larger density than ice. This is why ice floats on top of liquid water. With many molecules solids are denser than liquids. The question asks you to predict what would happen if ice was denser than liquid water.
- Because ice has more rigid structure than liquid water it occupies more volume. Thus the same mass of liquid water and ice vary in their density. Because liquid water occupies less volume it has a larger density than ice. This is why ice floats on top of liquid water.
- With many molecules solids are denser than liquids. The question asks you to predict what would happen if ice was denser than liquid water.
- Because ice has more rigid structure than liquid water it occupies more volume. Thus the same mass of liquid water and ice vary in their density. Because liquid water occupies less volume it has a larger density than ice. This is why ice floats on top of liquid water.
- With many molecules solids are denser than liquids. The question asks you to predict what would happen if ice was denser than liquid water.
- Given what you now know, what information is most likely to produce the correct answer? If ice were denser than water it would sink to the bottom of a lake during the winter. Over time the ice would fill in the lake from the bottom up, freezing everything in the lake.
- If ice were denser than water it would sink to the bottom of a lake during the winter. Over time the ice would fill in the lake from the bottom up, freezing everything in the lake.
- If ice were denser than water it would sink to the bottom of a lake during the winter. Over time the ice would fill in the lake from the bottom up, freezing everything in the lake.
- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you realize that if ice was denser than liquid water it would sink? The density would not affect the ability to form or break hydrogen bonds.

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- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you realize that if ice was denser than liquid water it would sink? The density would not affect the ability to form or break hydrogen bonds.
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you realize that if ice was denser than liquid water it would sink? The density would not affect the ability to form or break hydrogen bonds.

44) C

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Clarify Question

- What is the key concept addressed by the question? The question asks about the treatment of acidosis.
- The question asks about the treatment of acidosis.
- The question asks about the treatment of acidosis.
- You are being asked to apply your knowledge of acids to explain how acidosis is treated.
- Acidosis—this means that the blood is more acidic
- Buffers—these are used to adjust the pH of a solution
- Saline—a salt solution with the same osmolarity as blood
- What do you know about acids and buffers? What other information is related to the question? Acids will lower the pH of a solution. Buffers can be used to neutralize acids. Saline is a salt solution and will not affect pH.
- Acids will lower the pH of a solution.
- Buffers can be used to neutralize acids.
- Saline is a salt solution and will not affect pH.
- Acids will lower the pH of a solution.
- Buffers can be used to neutralize acids.
- Saline is a salt solution and will not affect pH.
- Given what you now know, what information is most likely to produce the correct answer? If your dog has acidosis then the pH of his blood is too low. A buffer will be used to neutralize the acid and raise the pH back to a healthy level.
- If your dog has acidosis then the pH of his blood is too low. A buffer will be used to neutralize the acid and raise the pH back to a healthy level.
- If your dog has acidosis then the pH of his blood is too low. A buffer will be used to neutralize the acid and raise the pH back to a healthy level.
- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall that acids will lower pH? Did you recall that buffers will neutralize a pH?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall that acids will lower pH? Did you recall that buffers will neutralize a pH?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall that acids will lower pH? Did you recall that buffers will neutralize a pH?

45) A
46) C

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Clarify Question

- What is the key concept addressed by the question? The question asks about factors that affect the rate of a reaction.
- The question asks about factors that affect the rate of a reaction.
- The question asks about factors that affect the rate of a reaction.
- You are being asked to apply your knowledge of factors that affect the rate of a reaction.
- Rate of reaction—the speed at which chemical bonds are breaking or forming in the reaction
- What do you know about factors that affect the rate of a reaction? What other information is related to the question? If you want to increase the rate of a reaction, more of the reactants are added to increase the probability that they will interact and form a product. Enzymes catalyze reactions, making them go faster. Temperature can also increase the rate of a reaction.
- If you want to increase the rate of a reaction, more of the reactants are added to increase the probability that they will interact and form a product. Enzymes catalyze reactions, making them go faster. Temperature can also increase the rate of a reaction.
- If you want to increase the rate of a reaction, more of the reactants are added to increase the probability that they will interact and form a product. Enzymes catalyze reactions, making them go faster. Temperature can also increase the rate of a reaction.
- Given what you now know, what information is most likely to produce the correct answer? C is a product of the reaction, so increasing its concentration would slow down the reaction. Similarly removing an enzyme catalyst or decreasing the temperature would decrease the rate of the reaction. Increasing the concentration of the reactants, A and B, would drive the reaction forward and increase the rate.
- C is a product of the reaction, so increasing its concentration would slow down the reaction. Similarly removing an enzyme catalyst or decreasing the temperature would decrease the rate of the reaction.
- Increasing the concentration of the reactants, A and B, would drive the reaction forward and increase the rate.
- C is a product of the reaction, so increasing its concentration would slow down the reaction. Similarly removing an enzyme catalyst or decreasing the temperature would decrease the rate of the reaction.
- Increasing the concentration of the reactants, A and B, would drive the reaction forward and increase the rate.
- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you think that adding more of the product would increase the rate of the reaction? Did you realize that removing an enzyme catalyst or decreasing the temperature would slow down a reaction?

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- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you think that adding more of the product would increase the rate of the reaction? Did you realize that removing an enzyme catalyst or decreasing the temperature would slow down a reaction?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you think that adding more of the product would increase the rate of the reaction? Did you realize that removing an enzyme catalyst or decreasing the temperature would slow down a reaction?

47) A
48) D
49) C
50) D
51) A
52) B
53) B

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Clarify Question

- What is the key concept addressed by the question? The question asks about calculating the mass of 3 moles of lithium.
- The question asks about calculating the mass of 3 moles of lithium.
- The question asks about calculating the mass of 3 moles of lithium.
- You are being asked to apply the atomic mass of a compound to calculate the mass of 3 moles.
- Atomic mass—mass (grams) in one mole of an element
- Atomic number—number of protons in an atom
- %media:1formula13.mml% atoms/mole—Avagadro's number, and is universal for each atom
- What do you know about converting from moles to mass? What other information is related to the question? If you have 3 moles of Li you want to multiply that by a factor with the units grams/mole so the moles cancel and you are left with grams. Atomic number has the units protons/atom and won't be useful in calculating grams. Avagadro's number has the units atoms/mole and won't be useful in calculating grams.
- If you have 3 moles of Li you want to multiply that by a factor with the units grams/mole so the moles cancel and you are left with grams.
- Atomic number has the units protons/atom and won't be useful in calculating grams.
- Avagadro's number has the units atoms/mole and won't be useful in calculating grams.
- If you have 3 moles of Li you want to multiply that by a factor with the units grams/mole so the moles cancel and you are left with grams.
- Atomic number has the units protons/atom and won't be useful in calculating grams.
- Avagadro's number has the units atoms/mole and won't be useful in calculating grams.
- Given what you now know, what information is most likely to produce the correct answer? Atomic mass has the units grams/mole. 3 moles of Li x 7 grams/mole = 21 grams of Li
- Atomic mass has the units grams/mole.
- 3 moles of Li x 7 grams/mole = 21 grams of Li
- Atomic mass has the units grams/mole.
- 3 moles of Li x 7 grams/mole = 21 grams of Li
- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall the units for atomic mass, atomic number, and Avagadro's number? Were you able to set up the calculation properly?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall the units for atomic mass, atomic number, and Avagadro's number? Were you able to set up the calculation properly?

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- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall the units for atomic mass, atomic number, and Avagadro's number? Were you able to set up the calculation properly?

54) D

Clarify Question

- What is the key concept addressed by the question? The question asks about pH.
- The question asks about pH.
- The question asks about pH.
- You are being asked to apply your knowledge of pH to neutralize an acid.
- Acids have a pH less than 7
- Bases have a pH greater than 7
- What do you know about acids? What other information is related to the question? Acids have a pH less than 7, to neutralize the acid you want to use a base with a pH greater than 7. Water is neutral (pH 7) and will not neutralize an acid.
- Acids have a pH less than 7, to neutralize the acid you want to use a base with a pH greater than 7.
- Water is neutral (pH 7) and will not neutralize an acid.
- Acids have a pH less than 7, to neutralize the acid you want to use a base with a pH greater than 7.
- Water is neutral (pH 7) and will not neutralize an acid.
- Given what you now know, what information is most likely to produce the correct answer? The only base on the list of answers is baking soda (pH 9). Adding a base with a high pH will neutralize an acid with a low pH.
- The only base on the list of answers is baking soda (pH 9). Adding a base with a high pH will neutralize an acid with a low pH.
- The only base on the list of answers is baking soda (pH 9). Adding a base with a high pH will neutralize an acid with a low pH.
- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall that acids have a low pH? Did you realize that a base with a high pH would neutralize an acid?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall that acids have a low pH? Did you realize that a base with a high pH would neutralize an acid?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall that acids have a low pH? Did you realize that a base with a high pH would neutralize an acid?

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55) A
56) A

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Clarify Question

- What is the key concept addressed by the question? The question asks about the link between electronegativity and polar bonds.
- The question asks about the link between electronegativity and polar bonds.
- The question asks about the link between electronegativity and polar bonds.
- You are being asked to analyze the relative electronegativities of two atoms in a bond to predict which would be the most polar.
- Electronegativity—attraction of an atom for an electron
- Polar bond—covalent bond in which the electrons are not shared equally
- What do you know about polar bonds? What other information is related to the question? The greater the difference in electronegativity between two atoms in a covalent bond the more polar the bond will be. To calculate the relative polarity of the bonds, simply subtract the electronegativities of each atom in the bond.
- The greater the difference in electronegativity between two atoms in a covalent bond the more polar the bond will be.
- To calculate the relative polarity of the bonds, simply subtract the electronegativities of each atom in the bond.
- The greater the difference in electronegativity between two atoms in a covalent bond the more polar the bond will be.
- To calculate the relative polarity of the bonds, simply subtract the electronegativities of each atom in the bond.
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- Given what you now know, what information is most likely to produce the correct answer? Se-Cl; 3.2-2.6 = 0.6 C-Cl; 3.2-2.5 = 0.7 B-Cl; 3.2-1.8 = 1.4 The largest difference is between B and Cl, so the B-Cl bond will be the most polar with Cl pulling the electrons away from B.
- Se-Cl; 3.2-2.6 = 0.6
- C-Cl; 3.2-2.5 = 0.7
- B-Cl; 3.2-1.8 = 1.4
- The largest difference is between B and Cl, so the B-Cl bond will be the most polar with Cl pulling the electrons away from B.
- Se-Cl; 3.2-2.6 = 0.6
- C-Cl; 3.2-2.5 = 0.7
- B-Cl; 3.2-1.8 = 1.4
- The largest difference is between B and Cl, so the B-Cl bond will be the most polar with Cl pulling the electrons away from B.

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- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you know what electronegativity and polar bonds were? Did you know to compare the difference in electronegativity between the two atoms to determine the polarity of the bond?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you know what electronegativity and polar bonds were? Did you know to compare the difference in electronegativity between the two atoms to determine the polarity of the bond?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you know what electronegativity and polar bonds were? Did you know to compare the difference in electronegativity between the two atoms to determine the polarity of the bond?

57) B

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Clarify Question

- What is the key concept addressed by the question? The question asks about redox reactions.
- The question asks about redox reactions.
- The question asks about redox reactions.
- You are being asked to apply the definition of reactions that lose an electron.
- Redox reaction—contains an oxidation and a reduction reaction
- Oxidation—loss of an electron
- Reduction—gain of an electron (the charge of the atom or molecule gaining the electron is reduced)
- What do you know about redox reactions? What other information is related to the question? In a redox reaction electron(s) are transferred from one atom or molecule to another. This is made up of an oxidation half reaction where the electrons are lost by one reactant, and a reduction half reaction where the electrons are gained by the second reactant. In the half reaction %media:1formula16.mml%, %media:1formula17.mml% is losing 2 electrons.
- In a redox reaction electron(s) are transferred from one atom or molecule to another. This is made up of an oxidation half reaction where the electrons are lost by one reactant, and a reduction half reaction where the electrons are gained by the second reactant.
- In the half reaction %media:1formula16.mml%, %media:1formula17.mml% is losing 2 electrons.
- In a redox reaction electron(s) are transferred from one atom or molecule to another. This is made up of an oxidation half reaction where the electrons are lost by one reactant, and a reduction half reaction where the electrons are gained by the second reactant.
- In the half reaction %media:1formula16.mml%, %media:1formula17.mml% is losing 2 electrons.
- Given what you now know, what information is most likely to produce the correct answer? Because %media:1formula17.mml% is losing 2 electrons this is an oxidation reaction. This would be balanced by the reduction half reaction, %media:1formula18.mml%. Finally the %media:1formula19.mml%. Putting this all together you get the reaction: %media:1formula20.mml%
- Because %media:1formula17.mml% is losing 2 electrons this is an oxidation reaction.
- This would be balanced by the reduction half reaction, %media:1formula18.mml%.
- Finally the %media:1formula19.mml%.
- Putting this all together you get the reaction: %media:1formula20.mml%
- Because %media:1formula17.mml% is losing 2 electrons this is an oxidation reaction.
- This would be balanced by the reduction half reaction, %media:1formula18.mml%.
- Finally the %media:1formula19.mml%.
- Putting this all together you get the reaction: %media:1formula20.mml%

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- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you have trouble recognizing that an oxidation half reaction was being shown? Did the mention of a redox reaction confuse the problem for you?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you have trouble recognizing that an oxidation half reaction was being shown? Did the mention of a redox reaction confuse the problem for you?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you have trouble recognizing that an oxidation half reaction was being shown? Did the mention of a redox reaction confuse the problem for you?

58) C

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Clarify Question

- What is the key concept addressed by the question? The question asks about the configuration of electrons in an atom.
- The question asks about the configuration of electrons in an atom.
- The question asks about the configuration of electrons in an atom.
- You are being asked to apply your knowledge of electron configuration to create one for Argon.
- Electron configuration—occupancy of electrons in different shells
- Atomic number—number of protons in an atom (and the number of electrons in a neutral atom)
- What do you know about electron configuration? What other information is related to the question? The first shell contains 2 electrons in an "s" orbital. A full first shell is represented %media:1formula26.mml%. The next shells each contain 8 electrons, 2 electrons in an "s" orbital and 6 electrons in a "p" orbital. A full second shell is represented %media:1formula27.mml%. Argon has an atomic number 18 and Neon is 10. Thus Argon has 8 more electrons than Neon, which adds one more shell.
- The first shell contains 2 electrons in an "s" orbital. A full first shell is represented %media:1formula26.mml%.
- The next shells each contain 8 electrons, 2 electrons in an "s" orbital and 6 electrons in a "p" orbital. A full second shell is represented %media:1formula27.mml%.
- Argon has an atomic number 18 and Neon is 10. Thus Argon has 8 more electrons than Neon, which adds one more shell.
- The first shell contains 2 electrons in an "s" orbital. A full first shell is represented %media:1formula26.mml%.
- The next shells each contain 8 electrons, 2 electrons in an "s" orbital and 6 electrons in a "p" orbital. A full second shell is represented %media:1formula27.mml%.
- Argon has an atomic number 18 and Neon is 10. Thus Argon has 8 more electrons than Neon, which adds one more shell.
- Given what you now know, what information is most likely to produce the correct answer? Adding a third shell to Neon will add 8 more electrons, 2 electrons in an "s" orbital and 6 electrons in a "p" orbital. Following the same numbering as with Neon this would add %media:1formula27.mml%. The complete electron configuration for Argon will be %media:1formula28.mml%.
- Adding a third shell to Neon will add 8 more electrons, 2 electrons in an "s" orbital and 6 electrons in a "p" orbital.
- Following the same numbering as with Neon this would add %media:1formula27.mml%.
- The complete electron configuration for Argon will be %media:1formula28.mml%.
- Adding a third shell to Neon will add 8 more electrons, 2 electrons in an "s" orbital and 6 electrons in a "p" orbital.
- Following the same numbering as with Neon this would add %media:1formula27.mml%.

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- The complete electron configuration for Argon will be %media:1formula28.mml%.
- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you have trouble understanding what was being represented in the numbering system of an electron configuration? Did you realize that the 8 electrons in shells 2 and 3 were split between "s" and "p" orbitals.
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you have trouble understanding what was being represented in the numbering system of an electron configuration? Did you realize that the 8 electrons in shells 2 and 3 were split between "s" and "p" orbitals.
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you have trouble understanding what was being represented in the numbering system of an electron configuration? Did you realize that the 8 electrons in shells 2 and 3 were split between "s" and "p" orbitals.

59) B
60) A

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Clarify Question

- What is the key concept addressed by the question? The question asks about properties of water.
- The question asks about properties of water.
- The question asks about properties of water.
- You are being asked to apply your understanding of properties of water to explain an observation.
- Wicked—this means the water moved upwards, in this case from the floor to the carpet
- What do you know about properties of water? What other information is related to the question? Water is a polar molecule that forms hydrogen bonds with other water molecules and polar compounds. This allows water to move upwards by wicking. Adhesion—water sticking to other molecules through hydrogen bonds. Cohesion—water molecules sticking to each other. Solubility—substances dissolving in water.
- Water is a polar molecule that forms hydrogen bonds with other water molecules and polar compounds. This allows water to move upwards by wicking.
- Adhesion—water sticking to other molecules through hydrogen bonds.
- Cohesion—water molecules sticking to each other.
- Solubility—substances dissolving in water.
- Water is a polar molecule that forms hydrogen bonds with other water molecules and polar compounds. This allows water to move upwards by wicking.
- Adhesion—water sticking to other molecules through hydrogen bonds.
- Cohesion—water molecules sticking to each other.
- Solubility—substances dissolving in water.
- Given what you now know, what information is most likely to produce the correct answer? Both adhesion and cohesion will allow water molecules to bind to polar molecules in the carpet and wick upwards from the floor.
- Both adhesion and cohesion will allow water molecules to bind to polar molecules in the carpet and wick upwards from the floor.
- Both adhesion and cohesion will allow water molecules to bind to polar molecules in the carpet and wick upwards from the floor.
- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall the definitions of adhesion, cohesion, and solubility?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall the definitions of adhesion, cohesion, and solubility?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall the definitions of adhesion, cohesion, and solubility?

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61) A

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Clarify Question

- What is the key concept addressed by the question? The question asks about the formation of ions.
- The question asks about the formation of ions.
- The question asks about the formation of ions.
- You are being asked to apply your knowledge of electron energy levels to the formation of ions.
- Outer energy level—the outermost level of electrons based on the total number of electrons present in an atom
- What do you know about ions? What other information is related to the question? To be most stable, an atom may gain or lose electrons to end up with a full outer shell of electrons as an atom is most stable when it's outer energy level is full. This new atom has one extra electron in its outer shell. If it gains an electron it will still have a partially full shell (2 electrons), if it loses an electron it will have a full outer shell (8 electrons).
- To be most stable, an atom may gain or lose electrons to end up with a full outer shell of electrons as an atom is most stable when it's outer energy level is full.
- This new atom has one extra electron in its outer shell. If it gains an electron it will still have a partially full shell (2 electrons), if it loses an electron it will have a full outer shell (8 electrons).
- To be most stable, an atom may gain or lose electrons to end up with a full outer shell of electrons as an atom is most stable when it's outer energy level is full.
- This new atom has one extra electron in its outer shell. If it gains an electron it will still have a partially full shell (2 electrons), if it loses an electron it will have a full outer shell (8 electrons).
- Given what you now know, what information is most likely to produce the correct answer? Because an electron has a -1 charge, losing the electron to achieve a full outer shell will give the atom a +1 charge, forming a positive ion.
- Because an electron has a -1 charge, losing the electron to achieve a full outer shell will give the atom a +1 charge, forming a positive ion.
- Because an electron has a -1 charge, losing the electron to achieve a full outer shell will give the atom a +1 charge, forming a positive ion.
- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you realize that the atom would be most stable if it lost an electron? Did you recognize that losing an electron would lead to the formation of a positively charged ion?

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- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you realize that the atom would be most stable if it lost an electron? Did you recognize that losing an electron would lead to the formation of a positively charged ion?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you realize that the atom would be most stable if it lost an electron? Did you recognize that losing an electron would lead to the formation of a positively charged ion?

62) A

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Clarify Question

- What is the key concept addressed by the question? The question asks about the properties of atoms based on their location in the periodic table.
- The question asks about the properties of atoms based on their location in the periodic table.
- The question asks about the properties of atoms based on their location in the periodic table.
- You are being asked to apply your knowledge of the properties of atoms based on their location in the periodic table.
- Periodic table—organizational chart of the elements that is arraigned based on their chemical properties
- What do you know about the properties of atoms based on their location in the periodic table? What other information is related to the question? When one atom like oxygen has a higher attraction for electrons (electronegativity) than another atom like hydrogen sharing the electrons in a covalent bond, the electrons spend more time closer to the atom with the higher electronegativity. This causes a partial positive charge on the atom with a lower electronegativity and a partial negative charge on the atom with a higher electronegativity. This causes the covalent bond to have polarity. In an O-H bond, oxygen has a partial negative charge and hydrogen a partial positive charge. S is right below O on the periodic table, so it will have a similar electronegativity.
- When one atom like oxygen has a higher attraction for electrons (electronegativity) than another atom like hydrogen sharing the electrons in a covalent bond, the electrons spend more time closer to the atom with the higher electronegativity. This causes a partial positive charge on the atom with a lower electronegativity and a partial negative charge on the atom with a higher electronegativity. This causes the covalent bond to have polarity.
- In an O-H bond, oxygen has a partial negative charge and hydrogen a partial positive charge. S is right below O on the periodic table, so it will have a similar electronegativity.
- When one atom like oxygen has a higher attraction for electrons (electronegativity) than another atom like hydrogen sharing the electrons in a covalent bond, the electrons spend more time closer to the atom with the higher electronegativity. This causes a partial positive charge on the atom with a lower electronegativity and a partial negative charge on the atom with a higher electronegativity. This causes the covalent bond to have polarity.
- In an O-H bond, oxygen has a partial negative charge and hydrogen a partial positive charge. S is right below O on the periodic table, so it will have a similar electronegativity.

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- Given what you now know, what information is most likely to produce the correct answer? A hydrogen bond is not a covalent bond between two ions, but relies on the attraction between two polar covalent bonds. Ionic interactions occur when two ions are attracted to each other. A covalent bond in which the electrons are shared equally is a non-polar covalent bond. An S-H bond will be similar to an O-H bond and will be a polar covalent bond.
- A hydrogen bond is not a covalent bond between two ions, but relies on the attraction between two polar covalent bonds. Ionic interactions occur when two ions are attracted to each other. A covalent bond in which the electrons are shared equally is a non-polar covalent bond.
- An S-H bond will be similar to an O-H bond and will be a polar covalent bond.
- A hydrogen bond is not a covalent bond between two ions, but relies on the attraction between two polar covalent bonds. Ionic interactions occur when two ions are attracted to each other. A covalent bond in which the electrons are shared equally is a non-polar covalent bond.
- An S-H bond will be similar to an O-H bond and will be a polar covalent bond.
- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall that S would have similar properties to O because of its location on the periodic table? Did you understand that and O-H bond would be a polar covalent bond?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall that S would have similar properties to O because of its location on the periodic table? Did you understand that and O-H bond would be a polar covalent bond?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall that S would have similar properties to O because of its location on the periodic table? Did you understand that and O-H bond would be a polar covalent bond?

63) B
64) C

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Clarify Question

- What is the key concept addressed by the question? The question asks about evaporation of water.
- The question asks about evaporation of water.
- The question asks about evaporation of water.
- You are being asked to apply your knowledge of evaporation of water.
- Heat of vaporization—amount of energy required to change 1 g of a substance from a liquid to a gas
- What do you know about evaporation of water? What other information is related to the question? Water molecules are attracted to each other by hydrogen bonds, with the partial negative charge on one water molecule being attracted to the partial positive charge on the hydrogen in a neighboring water molecule. To overcome this attraction heat is needed to break these hydrogen bonds and allow a water molecule to move from being a liquid to being a gas.
- Water molecules are attracted to each other by hydrogen bonds, with the partial negative charge on one water molecule being attracted to the partial positive charge on the hydrogen in a neighboring water molecule. To overcome this attraction heat is needed to break these hydrogen bonds and allow a water molecule to move from being a liquid to being a gas.
- Water molecules are attracted to each other by hydrogen bonds, with the partial negative charge on one water molecule being attracted to the partial positive charge on the hydrogen in a neighboring water molecule. To overcome this attraction heat is needed to break these hydrogen bonds and allow a water molecule to move from being a liquid to being a gas.
- Given what you now know, what information is most likely to produce the correct answer? Because of hydrogen bonding between water molecules, more heat is required to convert the water into a gas. This means that more heat is released from your body as you sweat. Based on this logic, more heat is input into water and is obtained from your body leading to cooling.
- Because of hydrogen bonding between water molecules, more heat is required to convert the water into a gas. This means that more heat is released from your body as you sweat.
- Based on this logic, more heat is input into water and is obtained from your body leading to cooling.
- Because of hydrogen bonding between water molecules, more heat is required to convert the water into a gas. This means that more heat is released from your body as you sweat.
- Based on this logic, more heat is input into water and is obtained from your body leading to cooling.

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- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you think that when water goes from a liquid to a gas it would release heat? Did you think that heat would be delivered to your body as your sweat evaporated from your skin?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you think that when water goes from a liquid to a gas it would release heat? Did you think that heat would be delivered to your body as your sweat evaporated from your skin?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you think that when water goes from a liquid to a gas it would release heat? Did you think that heat would be delivered to your body as your sweat evaporated from your skin?

65) B

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Clarify Question

- What is the key concept addressed by the question? The question asks about the relationship between pH and hydrogen ion concentration.
- The question asks about the relationship between pH and hydrogen ion concentration.
- The question asks about the relationship between pH and hydrogen ion concentration.
- You are being asked to apply your knowledge of pH to predict what would happen to water when the hydrogen ion concentration is increased.
- pH—the –log[%media:1formula29.mml%]
- What do you know about pH? What other information is related to the question? Because pH is the –log[%media:1formula29.mml%] as the %media:1formula29.mml% concentration goes up the pH goes down. Because it is a log scale, each 10-fold change in %media:1formula29.mml% concentration is a change in pH of 1. In this case a 100-fold increase in %media:1formula29.mml% concentration would lead to a decrease in pH of 2.
- Because pH is the –log[%media:1formula29.mml%] as the %media:1formula29.mml% concentration goes up the pH goes down.
- Because it is a log scale, each 10-fold change in %media:1formula29.mml% concentration is a change in pH of 1.
- In this case a 100-fold increase in %media:1formula29.mml% concentration would lead to a decrease in pH of 2.
- Because pH is the –log[%media:1formula29.mml%] as the %media:1formula29.mml% concentration goes up the pH goes down.
- Because it is a log scale, each 10-fold change in %media:1formula29.mml% concentration is a change in pH of 1.
- In this case a 100-fold increase in %media:1formula29.mml% concentration would lead to a decrease in pH of 2.
- Given what you now know, what information is most likely to produce the correct answer? Pure water has a pH of 7 and the chemical dropped the pH by 2, so the new pH will be about 5.
- Pure water has a pH of 7 and the chemical dropped the pH by 2, so the new pH will be about 5.
- Pure water has a pH of 7 and the chemical dropped the pH by 2, so the new pH will be about 5.
- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you have trouble using the equation of pH? Did you recall that this was a negative log relationship between pH and %media:1formula29.mml% concentration, so the pH decreased? Did you recall that the pH of water is 7?

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- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you have trouble using the equation of pH? Did you recall that this was a negative log relationship between pH and %media:1formula29.mml% concentration, so the pH decreased? Did you recall that the pH of water is 7?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you have trouble using the equation of pH? Did you recall that this was a negative log relationship between pH and %media:1formula29.mml% concentration, so the pH decreased? Did you recall that the pH of water is 7?

66) A

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Clarify Question

- What is the key concept addressed by the question? The question asks about electronegativity.
- The question asks about electronegativity.
- The question asks about electronegativity.
- You are being asked to apply your knowledge of electronegativity to predict the effect on the partial charge of an atom.
- Electronegativity—attraction of an atom for an electron
- Partial charges—charge of an atom that is the result of unequal sharing of electrons
- Electronegativity—attraction of an atom for an electron
- What do you know about electronegativity? What other information is related to the question? In a polar covalent bond, the atom with the stronger attraction will have a partial negative charge and the atom with the weaker attraction will have a partial positive charge. The electronegativity of N is 3.0 and that of H is 2.1. N has a stronger attraction for the electrons in its covalent bond with H.
- In a polar covalent bond, the atom with the stronger attraction will have a partial negative charge and the atom with the weaker attraction will have a partial positive charge.
- The electronegativity of N is 3.0 and that of H is 2.1.
- N has a stronger attraction for the electrons in its covalent bond with H.
- In a polar covalent bond, the atom with the stronger attraction will have a partial negative charge and the atom with the weaker attraction will have a partial positive charge.
- The electronegativity of N is 3.0 and that of H is 2.1.
- N has a stronger attraction for the electrons in its covalent bond with H.
- Given what you now know, what information is most likely to produce the correct answer? Based on the same logic, each H atom will have a partial positive charge as the electrons are pulled towards N.
- Based on the same logic, each H atom will have a partial positive charge as the electrons are pulled towards N.
- Based on the same logic, each H atom will have a partial positive charge as the electrons are pulled towards N.
- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recognize that the higher electronegativity on N meant it had more attraction for electrons than H? Did you realize that a stronger pull for electrons gave N a partial negative charge, while this led to a partial positive charge on each H?

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- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recognize that the higher electronegativity on N meant it had more attraction for electrons than H? Did you realize that a stronger pull for electrons gave N a partial negative charge, while this led to a partial positive charge on each H?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recognize that the higher electronegativity on N meant it had more attraction for electrons than H? Did you realize that a stronger pull for electrons gave N a partial negative charge, while this led to a partial positive charge on each H?

67) D

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Clarify Question

- What is the key concept addressed by the question? The question asks about reduction and oxidations.
- The question asks about reduction and oxidations.
- The question asks about reduction and oxidations.
- You are being asked to apply your knowledge to the formation of ions through reduction and oxidation.
- Outer shell of electrons—the outermost level of electrons based on the total number of electrons present in an atom, atoms are most stable with a full outer shell of electrons
- What do you know about oxidations and reductions? What other information is related to the question? If an atom loses an electron it becomes oxidized and forms a positive charge. If an atom gains an electron it becomes reduced and forms a negative charge. Mg has 2 extra electrons in its outer shell, so it will be most stable losing two electrons. Cl has 7 electrons in its outer shell, so it will be most stable gaining one electron.
- If an atom loses an electron it becomes oxidized and forms a positive charge. If an atom gains an electron it becomes reduced and forms a negative charge.
- Mg has 2 extra electrons in its outer shell, so it will be most stable losing two electrons.
- Cl has 7 electrons in its outer shell, so it will be most stable gaining one electron.
- If an atom loses an electron it becomes oxidized and forms a positive charge. If an atom gains an electron it becomes reduced and forms a negative charge.
- Mg has 2 extra electrons in its outer shell, so it will be most stable losing two electrons.
- Cl has 7 electrons in its outer shell, so it will be most stable gaining one electron.
- Given what you now know, what information is most likely to produce the correct answer? Mg will lose two electrons, forming %media:1formula32.mml% and be oxidized in the process. Cl will gain one electron, forming %media:1formula33.mml% and be reduced in the process.
- Mg will lose two electrons, forming %media:1formula32.mml% and be oxidized in the process.
- Cl will gain one electron, forming %media:1formula33.mml% and be reduced in the process.
- Mg will lose two electrons, forming %media:1formula32.mml% and be oxidized in the process.
- Cl will gain one electron, forming %media:1formula33.mml% and be reduced in the process.
- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you realize that Mg would lose electrons and Cl would gain them? Did you remember that oxidations lose electrons and reductions gain electrons?

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- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you realize that Mg would lose electrons and Cl would gain them? Did you remember that oxidations lose electrons and reductions gain electrons?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you realize that Mg would lose electrons and Cl would gain them? Did you remember that oxidations lose electrons and reductions gain electrons?

68) B

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Clarify Question

- What is the key concept addressed by the question? The question asks about buffers.
- The question asks about buffers.
- The question asks about buffers.
- You are being asked to apply your knowledge of buffers to predict what would happen if a base was removed.
- Carbonic acid—acid of the buffer
- Bicarbonate—base of the buffer
- What do you know about buffers? What other information is related to the question? Buffers contain an acid and its complementary base. Acids lower the pH of a solution and bases raise the pH. If the bicarbonate was removed from the solution all that would be left is the carbonic acid.
- Buffers contain an acid and its complementary base. Acids lower the pH of a solution and bases raise the pH.
- If the bicarbonate was removed from the solution all that would be left is the carbonic acid.
- Buffers contain an acid and its complementary base. Acids lower the pH of a solution and bases raise the pH.
- If the bicarbonate was removed from the solution all that would be left is the carbonic acid.
- Given what you now know, what information is most likely to produce the correct answer? Acids lower the pH of a solution, so the pH of blood would drop.
- Acids lower the pH of a solution, so the pH of blood would drop.
- Acids lower the pH of a solution, so the pH of blood would drop.
- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you realize that bicarbonate was the base in the problem? One clue was that carbonic acid had to be the acid, based on its name. Did you recall that acids lower the pH and bases raise the pH?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you realize that bicarbonate was the base in the problem? One clue was that carbonic acid had to be the acid, based on its name. Did you recall that acids lower the pH and bases raise the pH?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you realize that bicarbonate was the base in the problem? One clue was that carbonic acid had to be the acid, based on its name. Did you recall that acids lower the pH and bases raise the pH?

69) B

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70) A

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Clarify Question

- What is the key concept addressed by the question? The question asks about differences between covalent and ionic bonds.
- The question asks about differences between covalent and ionic bonds.
- The question asks about differences between covalent and ionic bonds.
- You are being asked to apply your knowledge of differences between covalent and ionic bonds.
- %media:1formula34.mml%—molecule of 2 chlorine atoms
- KCl—molecule of 1 potassium atom and 1 chlorine atom
- What do you know about differences between covalent and ionic bonds? What other information is related to the question? In an ionic bond, atoms gain or lose electrons to form a stable outer shell forming either negative or positive ions respectively. In a covalent bond, two atoms share a pair of electrons filling their outer shells.
- In an ionic bond, atoms gain or lose electrons to form a stable outer shell forming either negative or positive ions respectively. In a covalent bond, two atoms share a pair of electrons filling their outer shells.
- In an ionic bond, atoms gain or lose electrons to form a stable outer shell forming either negative or positive ions respectively. In a covalent bond, two atoms share a pair of electrons filling their outer shells.
- Given what you now know, what information is most likely to produce the correct answer? Cl has 7 electrons in its outer shell. If it gains one electron it will form a %media:1formula36.mml% ion. K has 1 electron in its outer shell, so if it loses one electron it will form a %media:1formula35.mml% ion. The %media:1formula36.mml% and %media:1formula35.mml% ions will be attracted to each other through an ionic bond. In Cl, 6 of the electrons in the outer shell form pairs, leaving one unpaired electron. If two Cl atoms share their unpaired electrons, that gives each atom a total of 8 electrons in their outer shell and forms a covalent bond.
- Cl has 7 electrons in its outer shell. If it gains one electron it will form a %media:1formula36.mml% ion. K has 1 electron in its outer shell, so if it loses one electron it will form a %media:1formula35.mml% ion. The %media:1formula36.mml% and %media:1formula35.mml% ions will be attracted to each other through an ionic bond.
- In Cl, 6 of the electrons in the outer shell form pairs, leaving one unpaired electron. If two Cl atoms share their unpaired electrons, that gives each atom a total of 8 electrons in their outer shell and forms a covalent bond.
- Cl has 7 electrons in its outer shell. If it gains one electron it will form a %media:1formula36.mml% ion. K has 1 electron in its outer shell, so if it loses one electron it will form a %media:1formula35.mml% ion. The %media:1formula36.mml% and %media:1formula35.mml% ions will be attracted to each other through an ionic bond.

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- In Cl, 6 of the electrons in the outer shell form pairs, leaving one unpaired electron. If two Cl atoms share their unpaired electrons, that gives each atom a total of 8 electrons in their outer shell and forms a covalent bond.
- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you confuse covalent and ionic bonds? Did you understand that covalent bonds were formed by sharing electrons while ionic bonds were formed when atoms gained or lost electrons?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you confuse covalent and ionic bonds? Did you understand that covalent bonds were formed by sharing electrons while ionic bonds were formed when atoms gained or lost electrons?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you confuse covalent and ionic bonds? Did you understand that covalent bonds were formed by sharing electrons while ionic bonds were formed when atoms gained or lost electrons?

71) C

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Clarify Question

- What is the key concept addressed by the question? The question asks about the formation of covalent bonds.
- The question asks about the formation of covalent bonds.
- The question asks about the formation of covalent bonds.
- You are being asked to apply your knowledge of the structure of atoms to predict how many covalent bonds carbon dioxide could form.
- Valence electrons—electrons in the outer shell of an atom
- What do you know about covalent bonds? What other information is related to the question? Typically an atom is most stable if it has a full outer shell. This can be accomplished by gaining, losing, or sharing electrons. When two electrons are shared between two atoms this forms a covalent bond. The name carbon dioxide indicates that there are one carbon atom and two oxygen atoms in this molecule. Carbon has 4 valence electrons, so it needs to share 4 more electrons to get a full outer shell. This means it can form 4 covalent bonds. Oxygen has 6 valence electrons, so it needs to share 2 more electrons to get a full outer shell. This means each oxygen atom can form 2 covalent bonds.
- Typically an atom is most stable if it has a full outer shell. This can be accomplished by gaining, losing, or sharing electrons. When two electrons are shared between two atoms this forms a covalent bond.
- The name carbon dioxide indicates that there are one carbon atom and two oxygen atoms in this molecule.
- Carbon has 4 valence electrons, so it needs to share 4 more electrons to get a full outer shell. This means it can form 4 covalent bonds.
- Oxygen has 6 valence electrons, so it needs to share 2 more electrons to get a full outer shell. This means each oxygen atom can form 2 covalent bonds.
- Typically an atom is most stable if it has a full outer shell. This can be accomplished by gaining, losing, or sharing electrons. When two electrons are shared between two atoms this forms a covalent bond.
- The name carbon dioxide indicates that there are one carbon atom and two oxygen atoms in this molecule.
- Carbon has 4 valence electrons, so it needs to share 4 more electrons to get a full outer shell. This means it can form 4 covalent bonds.
- Oxygen has 6 valence electrons, so it needs to share 2 more electrons to get a full outer shell. This means each oxygen atom can form 2 covalent bonds.
- Given what you now know, what information is most likely to produce the correct answer? The carbon atom can form a double bond with each of the oxygen atoms. That will give the carbon atom 4 bonds and each oxygen atom 2 bonds needed to fill their outer shells. The structure O = C = O would thus contain two double covalent bonds.

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- The carbon atom can form a double bond with each of the oxygen atoms. That will give the carbon atom 4 bonds and each oxygen atom 2 bonds needed to fill their outer shells. The structure O = C = O would thus contain two double covalent bonds.
- The carbon atom can form a double bond with each of the oxygen atoms. That will give the carbon atom 4 bonds and each oxygen atom 2 bonds needed to fill their outer shells. The structure O = C = O would thus contain two double covalent bonds.
- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you have trouble figuring out how many bonds carbon and oxygen each needed to form to be stable? Were you confused on whether all of the bonds were between C and O or did you try to make some O-O bonds?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you have trouble figuring out how many bonds carbon and oxygen each needed to form to be stable? Were you confused on whether all of the bonds were between C and O or did you try to make some O-O bonds?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you have trouble figuring out how many bonds carbon and oxygen each needed to form to be stable? Were you confused on whether all of the bonds were between C and O or did you try to make some O-O bonds?

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72) A

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Clarify Question

- What is the key concept addressed by the question? The question asks about the properties of liquid water and ice.
- The question asks about the properties of liquid water and ice.
- The question asks about the properties of liquid water and ice.
- You are being asked to apply your knowledge of the vaporization of water.
- Nonpolar—matching affinity for shared electrons within a molecule
- What do you know about the vaporization of water? What other information is related to the question? Hydrogen bonds between polar water molecules cause attractions that make it harder for a single water molecule to move from liquid to a gas. Other molecules like carbon dioxide (%media:1formula37.mml%) and oxygen (%media:1formula38.mml%) are about the same size as water, but cannot form hydrogen bonds and these molecules are gases at room temperature.
- Hydrogen bonds between polar water molecules cause attractions that make it harder for a single water molecule to move from liquid to a gas. Other molecules like carbon dioxide (%media:1formula37.mml%) and oxygen (%media:1formula38.mml%) are about the same size as water, but cannot form hydrogen bonds and these molecules are gases at room temperature.
- Hydrogen bonds between polar water molecules cause attractions that make it harder for a single water molecule to move from liquid to a gas. Other molecules like carbon dioxide (%media:1formula37.mml%) and oxygen (%media:1formula38.mml%) are about the same size as water, but cannot form hydrogen bonds and these molecules are gases at room temperature.
- Given what you now know, what information is most likely to produce the correct answer? If water was nonpolar, the molecules would not be attracted to each other and water would be a gas instead of a liquid at room temperature.
- If water was nonpolar, the molecules would not be attracted to each other and water would be a gas instead of a liquid at room temperature.
- If water was nonpolar, the molecules would not be attracted to each other and water would be a gas instead of a liquid at room temperature.
- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall that hydrogen bonds cause water molecules to be attracted to each other and form a liquid? Did you think that a lack of hydrogen bonds would make water become a solid instead of a gas?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall that hydrogen bonds cause water molecules to be attracted to each other and form a liquid? Did you think that a lack of hydrogen bonds would make water become a solid instead of a gas?

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- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you recall that hydrogen bonds cause water molecules to be attracted to each other and form a liquid? Did you think that a lack of hydrogen bonds would make water become a solid instead of a gas?

73) B

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Clarify Question

- What is the key concept addressed by the question? The question asks about nonpolar amino acids.
- The question asks about nonpolar amino acids.
- The question asks about nonpolar amino acids.
- You are being asked to apply your knowledge of polarity to predict how this would affect the structure of a protein.
- Polar—molecules in which electrons are not shared equally between atoms, leading to partial charges on the atoms
- Nonpolar—molecules in which electrons are shared equally between atoms, leading to no partial charges
- What do you know about nonpolar molecules? What other information is related to the question? Nonpolar molecules do not interact well with water, which is a polar molecule. These nonpolar molecules actually interfere with the formation of hydrogen bonds between water molecules. The inside of an animal cell contains cytoplasm which is made up of a lot of water. Thus the inside of the cell is a polar environment. Nonpolar amino acids in the inside of a cell are repelled by the polar water molecules.
- Nonpolar molecules do not interact well with water, which is a polar molecule. These nonpolar molecules actually interfere with the formation of hydrogen bonds between water molecules.
- The inside of an animal cell contains cytoplasm which is made up of a lot of water. Thus the inside of the cell is a polar environment.
- Nonpolar amino acids in the inside of a cell are repelled by the polar water molecules.
- Nonpolar molecules do not interact well with water, which is a polar molecule. These nonpolar molecules actually interfere with the formation of hydrogen bonds between water molecules.
- The inside of an animal cell contains cytoplasm which is made up of a lot of water. Thus the inside of the cell is a polar environment.
- Nonpolar amino acids in the inside of a cell are repelled by the polar water molecules.
- Given what you now know, what information is most likely to produce the correct answer? The repulsion of non-polar amino acids by water will cause them to cluster in the center of the protein where they are shielded from water. This is why most proteins are ball shaped, with the non-polar or hydrophobic amino acids in the center of the ball.
- The repulsion of non-polar amino acids by water will cause them to cluster in the center of the protein where they are shielded from water. This is why most proteins are ball shaped, with the non-polar or hydrophobic amino acids in the center of the ball.
- The repulsion of non-polar amino acids by water will cause them to cluster in the center of the protein where they are shielded from water. This is why most proteins are ball shaped, with the non-polar or hydrophobic amino acids in the center of the ball.

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- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you understand the difference between polar and non-polar amino acids? Did you realize that the inside of the cell would be a polar environment? Did you know that non-polar groups will cluster near each other to be shielded from water?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you understand the difference between polar and non-polar amino acids? Did you realize that the inside of the cell would be a polar environment? Did you know that non-polar groups will cluster near each other to be shielded from water?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you understand the difference between polar and non-polar amino acids? Did you realize that the inside of the cell would be a polar environment? Did you know that non-polar groups will cluster near each other to be shielded from water?

74) A

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Clarify Question

- What is the key concept addressed by the question? The question asks about the ability of water to absorb heat.
- The question asks about the ability of water to absorb heat.
- The question asks about the ability of water to absorb heat.
- You are being asked to apply your understanding of the properties of water to explain the effect of adding antifreeze.
- Cooling efficiency—measure of how well a solution can absorb heat
- What do you know about the properties of water? What other information is related to the question? Water has a very high heat capacity. This means that it can absorb a lot of heat. Adding ethylene glycol decreases the cooling efficiency of the water in the radiator. This is done to lower the freezing point of water, which keeps the radiator from freezing solid in the winter.
- Water has a very high heat capacity. This means that it can absorb a lot of heat.
- Adding ethylene glycol decreases the cooling efficiency of the water in the radiator. This is done to lower the freezing point of water, which keeps the radiator from freezing solid in the winter.
- Water has a very high heat capacity. This means that it can absorb a lot of heat.
- Adding ethylene glycol decreases the cooling efficiency of the water in the radiator. This is done to lower the freezing point of water, which keeps the radiator from freezing solid in the winter.

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- Given what you now know, what information is most likely to produce the correct answer? Adding ethylene glycol to the radiator decreases the amount of heat that the water can absorb because it has a lower heat capacity than water.
- Adding ethylene glycol to the radiator decreases the amount of heat that the water can absorb because it has a lower heat capacity than water.
- Adding ethylene glycol to the radiator decreases the amount of heat that the water can absorb because it has a lower heat capacity than water.
- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you realize that the property of water relevant to cooling efficiency was its heat capacity? Did you recognize that the question was not asking about changes in the freezing point?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you realize that the property of water relevant to cooling efficiency was its heat capacity? Did you recognize that the question was not asking about changes in the freezing point?

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- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you realize that the property of water relevant to cooling efficiency was its heat capacity? Did you recognize that the question was not asking about changes in the freezing point?

75) C

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Clarify Question

- What is the key concept addressed by the question? The question asks about forming covalent bonds.
- The question asks about forming covalent bonds.
- The question asks about forming covalent bonds.
- You are being asked to apply your knowledge of the structure of an atom to predict how many bonds it can form.
- Saturated fat—fats with a backbone of C-C bonds with as many C-H bonds as possible
- What do you know about covalent bonds? What other information is related to the question? Carbon has four valence electrons, and needs to share an additional four electrons to have a full outer shell. This means it needs to form four covalent bonds. In a saturated fat there is a backbone of C atoms attached by covalent bonds giving a structure like: -C-C-C- These covalent bonds provide two additional electrons, leaving a need for two more for carbon to have a full outer shell.
- Carbon has four valence electrons, and needs to share an additional four electrons to have a full outer shell. This means it needs to form four covalent bonds.
- In a saturated fat there is a backbone of C atoms attached by covalent bonds giving a structure like: -C-C-C-
- These covalent bonds provide two additional electrons, leaving a need for two more for carbon to have a full outer shell.
- Carbon has four valence electrons, and needs to share an additional four electrons to have a full outer shell. This means it needs to form four covalent bonds.
- In a saturated fat there is a backbone of C atoms attached by covalent bonds giving a structure like: -C-C-C-
- These covalent bonds provide two additional electrons, leaving a need for two more for carbon to have a full outer shell.
- Given what you now know, what information is most likely to produce the correct answer? To obtain the remaining two electrons, each C atom bonded to two other C atoms forms covalent bonds with two H atoms.
- To obtain the remaining two electrons, each C atom bonded to two other C atoms forms covalent bonds with two H atoms.
- To obtain the remaining two electrons, each C atom bonded to two other C atoms forms covalent bonds with two H atoms.
- Did your problem-solving process lead you to the correct answer? If not, where did the process break down or lead you astray? How can you revise your approach to produce a more desirable result? If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you understand what was meant by a saturated fat? Could you figure out how many total covalent bonds each C atom would form?

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- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you understand what was meant by a saturated fat? Could you figure out how many total covalent bonds each C atom would form?
- If you got the correct answer, great job! If you got an incorrect answer, where did the process break down? Did you understand what was meant by a saturated fat? Could you figure out how many total covalent bonds each C atom would form?

76) E

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