Biology 12th edition Mader Test Bank

SKU: 9780078024269-TEST-BANK

Chapter 02
Basic Chemistry

Multiple Choice Questions

1. Which of the following elements would be the most reactive with other elements?
A. boron, #5
B. neon, #10
C. argon, #18
D. helium, #2

Bloom's Level: 3. Apply
Learning Outcome: 02.01.04 Determine how electrons are configured around a nucleus.
Section: 02.01
Topic: Chemistry

2. Which of the following would be a proposed mechanism by which stomach antacids work?

A. Antacids dilute the solution, therefore lowering the pH.
B. Antacids are bases and by definition can absorb H^+ out of a solution.
C. Antacids are bases and by definition can absorb OH^- out of a solution.
D. Antacids contain mostly water and so they neutralize the solution.

Antacids are bases and by definition can absorb H^+ out of a solution.

Bloom's Level: 2. Understand
Learning Outcome: 02.04.03 Analyze how buffers prevent large pH changes in solutions.
Section: 02.04
Topic: Chemistry

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3. If you place the corner of a paper towel into a droplet of water the water moves across the paper towel. Which of the following would explain the movement of the water?
A. surface tension
B. cohesion
C. adhesion
D. both cohesion and adhesion

Both cohesion and adhesion explain the movement of water through a paper towel.

Bloom's Level: 3. Apply
Learning Outcome: 02.03.02 Describe why the properties of water are important to life.
Section: 02.03
Topic: Chemistry

4. Which of the following elements is NOT one of the six most common elements in living organisms?
A. carbon
B. oxygen
C. iron
D. nitrogen
E. hydrogen

Bloom's Level: 1. Remember
Learning Outcome: 02.02.01 Describe how elements are combined into molecules and compounds.
Section: 02.02
Topic: Chemistry

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5. If the atomic number of an element is 6 and the atomic mass is 12.01, how many protons are there in the nucleus?

A. 12
B. 6
C. 24
D. 52

The number of protons in the nucleus is the atomic number; Variations: atomic number 12 - atomic mass 24; answer = A atomic number 24 - atomic mass 52; answer = C

Bloom's Level: 3. Apply
Learning Outcome: 02.01.02 Use the periodic table to evaluate relationships between atomic number and mass number.
Section: 02.01
Topic: Chemistry

6. Which of the following is/are an atom, an isotope and an ion?

A. H^+
B. ^2H or deuterium
C. ^3H or tritium
D. H_2 or hydrogen gas
E. All of the choices are atoms, isotopes and ions.

Bloom's Level: 2. Understand
Learning Outcome: 02.01.03 Describe how variations in an atomic nucleus account for its physical properties.
Section: 02.01
Topic: Chemistry

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7.

Radioactive Isotope	Half-life	Energy of Particles Emitted
^{131}I ("iodine-131")	8.1 days	0.8 MeV
^{32}P ("phosphorus-32")	14.3 days	1.7 MeV
^{33}P ("phosphorus-33")	25.5 days	0.25 MeV
^{35}S ("sulfur-35")	87.5 days	0.2 MeV
^{3}H ("tritium")	12.4 years	0.02 MeV
^{14}C ("carbon-14")	5730 years	0.2 MeV

From the above table of radioisotopes and their properties, it is obvious that
A. the longer the half-life, the more energy emitted by the particles.
B. the longer the half-life, the less energy emitted by the particles.
C. radioisotopes of the same element must emit the same amount of energy in their emissions and decay at the same rate.
D. adjusted for time, radioisotopes emit the same amount of energy in their emissions.
E. energy and half-life are not directly related.

Energy and half-life are not directly related.

Bloom's Level: 3. Apply
Learning Outcome: 02.01.03 Describe how variations in an atomic nucleus account for its physical properties.
Section: 02.01
Topic: Chemistry

8. Which statement is NOT true about subatomic particles?
A. Protons are found in the nucleus.
B. Neutrons have no electrical charge.
C. Electrons contain much less mass than neutrons.
D. Electrons are found in orbitals around the nucleus.
E. All electrons in an atom contain the same amount of energy.

Bloom's Level: 1. Remember
Learning Outcome: 02.01.01 Describe how protons, neutrons, and electrons relate to atomic structure.
Section: 02.01
Topic: Chemistry

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9. Which is NOT true about the electrical charges in chemistry?
A. Protons carry a positive charge.
B. In an atom, the number of protons and neutrons must be equal.
C. An atom is neutral when the positive and negative charges balance.
D. An ion contains one or more positive or negative charges.

Bloom's Level: 2. Understand
Learning Outcome: 02.01.01 Describe how protons, neutrons, and electrons relate to atomic structure.
Section: 02.01
Topic: Chemistry

10. In a water molecule,
A. the oxygen atom is more electronegative than the hydrogen atoms.
B. the oxygen atom has an overall negative charge with the hydrogen atoms having an overall positive charge.
C. unequal sharing of electrons results in a polar molecule.
D. All of the choices are correct.

All of the choices are correct.

Bloom's Level: 1. Remember
Learning Outcome: 02.02.03 Explain the difference between a polar and a nonpolar covalent bond.
Section: 02.02
Topic: Chemistry

11. An atom's atomic mass is best described as the mass of
A. the protons it contains.
B. the neutrons it contains.
C. electrons in the outermost shell.
D. protons and neutrons it contains.
E. protons and electrons it contains.

An atom's atomic mass is best described as the mass of protons and neutrons it contains.

Bloom's Level: 1. Remember
Learning Outcome: 02.01.02 Use the periodic table to evaluate relationships between atomic number and mass number.
Section: 02.01
Topic: Chemistry

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12. A research article indicates that researchers have used an isotope ^{3}H to trace a certain metabolic process. From the symbol that is given, we know this is a hydrogen isotope with
A. three protons.
B. three neutrons.
C. three electrons.
D. one proton and two neutrons.
E. two protons and one neutron.

From the symbol that is given, we know this is a hydrogen isotope with one proton and two neutrons.

Bloom's Level: 3. Apply
Learning Outcome: 02.01.03 Describe how variations in an atomic nucleus account for its physical properties.
Section: 02.01
Topic: Chemistry

13. Both ^{18}O and ^{16}O are found in nature. However, ^{16}O is the most common. Therefore,
A. these are different elements.
B. oxygen atoms can have eight or 10 neutrons.
C. ^{18}O has two additional electrons in its outer shell.
D. ^{18}O is the form of oxygen that provides living cells with life.
E. only the common form of ^{16}O can bond with hydrogen atoms to form H_2O.

Oxygen atoms can have eight or 10 neutrons. These are the same element.

Bloom's Level: 3. Apply
Learning Outcome: 02.01.01 Describe how protons, neutrons, and electrons relate to atomic structure.
Section: 02.01
Topic: Chemistry

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14. To determine the age of fairly recent fossils and organic artifacts, it is possible to analyze the amounts of the isotopes ^{14}C and ^{14}N, because over time the ^{14}C-which originated in the atmosphere-breaks down into ^{14}N. What net change occurred for this to happen?

A. The ^{14}C lost an electron.
B. The ^{14}C gained an electron.
C. The ^{14}C lost a proton.
D. The ^{14}C gained a proton.
E. The ^{14}C gained a neutron.

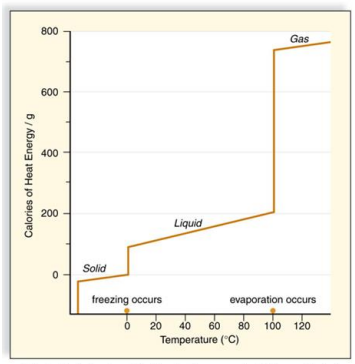
The change occurred because ^{14}C gained a proton.

Bloom's Level: 4. Analyze
Learning Outcome: 02.01.03 Describe how variations in an atomic nucleus account for its physical properties.
Section: 02.01
Topic: Chemistry

Essay Questions

15. What does this graph reveal about the heat of vaporization and the heat of fusion?

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a. Calories lost when 1 g of liquid water freezes and calories required when 1 g of liquid water evaporates.

Bloom's Level: 6. Create
Learning Outcome: 02.03.03 Analyze how water's solid, liquid, and vapor states allow life to exist on Earth.
Section: 02.03
Topic: Chemistry

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Multiple Choice Questions

16. Which of the following statements is NOT true about electron configurations?
A. If an atom has only one shell, it is complete with two electrons.
B. If an atom has two or more shells, the octet rule applies.
C. If an atom has two or more shells, the outer shell is complete with eight electrons.
D. Atoms with more than eight electrons in the outer shell react by gaining electrons.
E. Atoms with eight electrons in the outer shell are not reactive at all.

Bloom's Level: 2. Understand
Learning Outcome: 02.01.04 Determine how electrons are configured around a nucleus.
Section: 02.01
Topic: Chemistry

17. A valence shell is best described as
A. the electron shell closest to the nucleus.
B. the outermost electron shell of an atom.
C. the volume of space in which electrons are most often found.
D. the original energy level of electrons in photosynthesis.

A valence shell is best described as the volume of space in which electrons are most often found.

Bloom's Level: 1. Remember
Learning Outcome: 02.01.04 Determine how electrons are configured around a nucleus.
Section: 02.01
Topic: Chemistry

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18. Prior to prescription medications to control stomach acid and "heart burn" people consumed baking soda (sodium bicarbonate) to decrease their discomfort. This would indicate that sodium bicarbonate

A. effectively buffers stomach acid by releasing H^+.
B. should be sold as a prescription drug.
C. blocks acid production by combining with OH^-.
D. neutralizes stomach acid by combining with excess H^+.

Sodium bicarbonate neutralizes stomach acid by combining with excess H^+.

Bloom's Level: 3. Apply
Learning Outcome: 02.04.03 Analyze how buffers prevent large pH changes in solutions.
Section: 02.04
Topic: Chemistry

19. Which statement is NOT true about ionic bonds?

A. One atom acts as an electron donor and another atom acts as an electron acceptor.
B. Electrons are completely lost or gained in ion formation.
C. An ion has the same number of electrons as a nonionic atom of the same element.
D. An ionic bond occurs between positive ions and negative ions.
E. A salt such as NaCl is formed by an ionic reaction.

Bloom's Level: 2. Understand
Learning Outcome: 02.02.02 List the different types of bonds that occur between elements.
Section: 02.02
Topic: Chemistry

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20. Which statement is NOT true about covalent bonds?
A. Covalent bonds form when an electron is completely lost or gained from an atom.
B. A covalent molecule contains one or more covalent bonds.
C. A single covalent bond is drawn as a line between two atoms.
D. A pair of electrons is shared between two atoms for each covalent bond.
E. Shared electrons allow an atom to complete its outer electron shell in a covalent molecule.

Bloom's Level: 2. Understand
Learning Outcome: 02.02.02 List the different types of bonds that occur between elements.
Section: 02.02
Topic: Chemistry

21. Which statement is NOT true about polar covalent bonds?
A. Most covalent bonds are nonpolar, with electrons shared fairly equally between the atoms.
B. Polar covalent bonds are important in the characteristics of water.
C. Electrons are shared unequally in a polar covalent bond.
D. The larger atom in a polar bond attracts the electron more strongly than the smaller atom.
E. The oxygen of a water molecule is electropositive relative to the hydrogen.

Bloom's Level: 2. Understand
Learning Outcome: 02.02.03 Explain the difference between a polar and a nonpolar covalent bond.
Section: 02.02
Topic: Chemistry

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22. An abandoned Indiana coal mine spoil bank contains chunks of pyrite minerals. Under constant erosion and weathering, the pyrites leech large amounts of sulfuric acid (H_2SO_4). The spoil banks are also mixed with large quantities of basic limestone and clay carbonates. What should occur over time?
A. The pH level will drop until all acid has washed out.
B. The pH level will remain at 7.0 because of constant washing with rain.
C. The pH level will remain at 7.0 because all acid will be immediately neutralized by bases.
D. The pH levels will be spotty and vary over time, first more acidic but drifting back toward 7.0.
E. Bases always dominate over acids.

The pH levels will be spotty and vary over time, first more acidic but drifting back toward 7.0.

Bloom's Level: 5. Evaluate
Learning Outcome: 02.04.03 Analyze how buffers prevent large pH changes in solutions.
Section: 02.04
Topic: Chemistry

True / False Questions

Which of the following statements is/are true about the pH scale?

Bloom's Level: 2. Understand
Learning Outcome: 02.04.01 Distinguish between an acid and a base.
Section: 02.04
Topic: Chemistry

23. The scale indicates the relative concentrations of hydrogen and hydroxyl ions in a solution.
TRUE

It is true that the scale indicates the relative concentrations of hydrogen and hydroxyl ions in a solution.

Bloom's Level: 1. Remember
Learning Outcome: 02.04.02 Explain the relationship betwteen H or OH- concentration and pH.
Section: 02.04
Topic: Chemistry

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24. The scale ranges from 1 to 15.
FALSE

The scale ranges from 1 to 14.

Bloom's Level: 1. Remember
Learning Outcome: 02.04.01 Distinguish between an acid and a base.
Section: 02.04
Topic: Chemistry

25. pH 7 has a balanced level of H^+ and OH^-.
TRUE

It is true that pH 7 has a balanced level of H^+ and OH^-.

Bloom's Level: 1. Remember
Learning Outcome: 02.04.01 Distinguish between an acid and a base.
Section: 02.04
Topic: Chemistry

26. Anything below pH 7 is acidic and above pH 7 is basic.
TRUE

It is true that anything below pH 7 is acidic and above pH 7 is basic.

Bloom's Level: 1. Remember
Learning Outcome: 02.04.01 Distinguish between an acid and a base.
Section: 02.04
Topic: Chemistry

27. A change of one pH unit represents a ten-fold increase or decrease in hydroxyl ion concentration.
TRUE

Bloom's Level: 2. Understand
Learning Outcome: 02.04.02 Explain the relationship betwteen H or OH- concentration and pH.
Section: 02.04
Topic: Chemistry

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Multiple Choice Questions

28. The blood buffer reactions described by H_2CO_3  $H^+ + HCO_3^-$ indicates that

A. scientists are uncertain which direction the equation flows.
B. the reaction can flow either direction depending on whether there is an excess of hydrogen or hydroxide ions.
C. any reaction in one direction causes an immediate reverse reaction.
D. chemicals can swing wildly from acid to basic.
E. there is really no difference in chemistry whether a molecule is formed or dissociated.

The reaction can flow either direction depending on whether there is an excess of hydrogen or hydroxide ions.

Bloom's Level: 2. Understand
Learning Outcome: 02.04.03 Analyze how buffers prevent large pH changes in solutions.
Section: 02.04
Topic: Chemistry

Bond	Energy (kcal/mol)	Bond	Energy (kcal/mol)
H—H	104	P—O	100
H—O	110	N—O	53
C—H	99	S—H	81
C—O	84	C=C	146
C—C	83	C=N	147
C—N	70	P=O	120
C—S	62	C=O	170
S—S	51	C≡C	195

Bloom's Level: 1. Remember
Learning Outcome: 02.02.02 List the different types of bonds that occur between elements.
Section: 02.02
Topic: Chemistry

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29. From the above table, it is apparent that
A. triple bonds are stronger than double bonds; double bonds are stronger than single bonds.
B. triple bonds are weaker than double bonds; double bonds are weaker than single bonds.
C. carbon bonds are stronger than other bonds; hydrogen bonds are always weakest.
D. carbon forms only single bonds.

Triple bonds are stronger than double bonds; double bonds are stronger than single bonds.

Bloom's Level: 3. Apply
Learning Outcome: 02.02.02 List the different types of bonds that occur between elements.
Section: 02.02
Topic: Chemistry

30. The characteristic way in which atoms of an element react is most related to the
A. number of electrons in the outermost shell.
B. number of electrons in the innermost shell.
C. number of neutrons in the nucleus.
D. size of the nucleus.

The characteristic way in which atoms of an element react is most related to the number of electrons in the outermost shell.

Bloom's Level: 2. Understand
Learning Outcome: 02.01.04 Determine how electrons are configured around a nucleus.
Section: 02.01
Topic: Chemistry

31. As a solid, water floats. This means that
A. solid water is less dense than liquid water.
B. organisms in ponds, lakes, and reservoirs can survive under the ice cover.
C. this is due to hydrogen bonding changes.
D. All of the choices are correct.

All of the choices are correct.

Bloom's Level: 2. Understand
Learning Outcome: 02.03.03 Analyze how water's solid, liquid, and vapor states allow life to exist on Earth.
Section: 02.03
Topic: Chemistry

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32. A coastal climate is moderated primarily by which of the following properties of water?
Water
A. is the universal solvent.
B. is cohesive and adhesive.
C. has a high heat of evaporation.
D. has a high surface tension.

A coastal climate is moderated primarily because water resists changes of state.

Bloom's Level: 3. Apply
Learning Outcome: 02.03.02 Describe why the properties of water are important to life.
Section: 02.03
Topic: Chemistry

33. Human blood has a pH of about 7.4. This is
A. neutral.
B. very acidic.
C. slightly acidic.
D. slightly basic.

Human blood has a pH of about 7.4. This is slightly basic.

Bloom's Level: 1. Remember
Learning Outcome: 02.04.01 Distinguish between an acid and a base.
Section: 02.04
Topic: Chemistry

34. All of the following are examples of damage caused by acid deposition from rain EXCEPT
A. leaching of aluminum from the soil into lakes which results in the formation of toxic methyl mercury from mercury in the lake sediments.
B. weakens trees in the forests and kills seedlings.
C. increased agricultural yields.
D. damage to marble and limestone monuments.

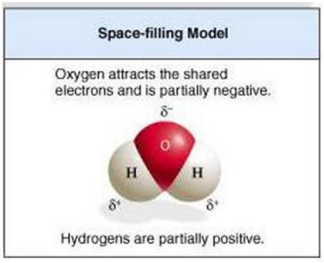
Bloom's Level: 2. Understand
Learning Outcome: 02.04.01 Distinguish between an acid and a base.
Section: 02.04
Topic: Chemistry

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Essay Questions

35. Draw the structural formula of a single water molecule. Note the location of partial positive and negative charges. Label the covalent bonds.



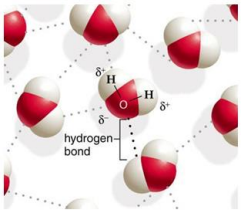
Note the diagrams above. The covalent bonds occur between the hydrogen and oxygen molecules. There are two covalent bonds in every water molecule.

Bloom's Level: 6. Create
Learning Outcome: 02.02.01 Describe how elements are combined into molecules and compounds.
Section: 02.02
Topic: Chemistry

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36. Draw three water molecules and the hydrogen bonding that may occur between the molecules. Define hydrogen bonding and explain how and why it occurs.



The hydrogen bonding is shown as dotted lines between the water molecules. Hydrogen bonding is the weak attraction between a covalently bonded hydrogen atom and an electronegative atom taking part in another covalent bond. It occurs between a partially positive hydrogen in one water molecule and a partially negative oxygen in another water molecule. The hydrogen has a partially positive charge and the oxygen has a partially negative charge because of the unequal sharing of electrons.

Bloom's Level: 6. Create
Learning Outcome: 02.03.01 Describe how water associates with other molecules in solution.
Section: 02.03
Topic: Chemistry

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37. Study the figures to determine which is liquid water and which is frozen water (ice). Explain your answer and predict if the water in Figure 2 would float or sink in the water in Figure 1.

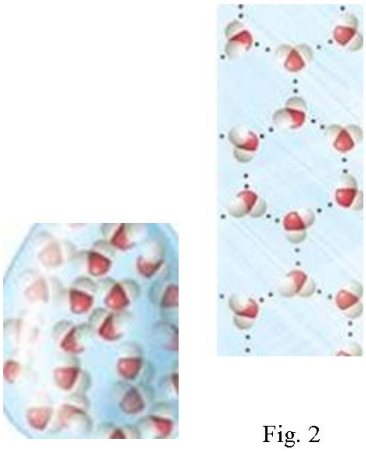


Fig. 2

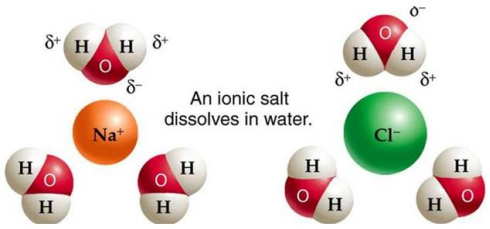
Figure 1 is liquid water, while Figure 2 is ice. Hydrogen bonding becomes more rigid and more open as water freezes, which is depicted in Figure 2. Frozen water is less dense than liquid water. The ice in Figure 2 will float in the liquid water of Figure 1.

Bloom's Level: 5. Evaluate
Learning Outcome: 02.03.03 Analyze how water's solid, liquid, and vapor states allow life to exist on Earth.
Section: 02.03
Topic: Chemistry

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38. Draw several (5 or 6) individual, unbonded water molecules. Simulate what happens when table salt (Na^+Cl^-) is added to water. Use the model you created to explain why salt is added to the roads in a 'snowy', cold climate.



There is an attraction of positively charged sodium ions to the partially negative oxygen in water. The negatively charged chloride ions are attracted to the partially positively charged hydrogen atoms in water molecules.

The presence of the sodium and chloride ions interferes with hydrogen bonding between water molecules and thus depresses the freezing point of water. This lowers the temperature at which ice will form on the roads.

Bloom's Level: 6. Create
Learning Outcome: 02.03.01 Describe how water associates with other molecules in solution.
Section: 02.03
Topic: Chemistry

39. Following nitrogen (78%) and oxygen (21%), argon is the next most common gas in the atmosphere (less than 1%). Checking the table of elements, you discover that argon is one of a family of atoms with outer shells already full of electrons. How is this related to the fact that these atoms have virtually no biological importance?

Argon has an outer shell with eight electrons. Atoms are stable, ordinarily not reacting with other atoms, when their outer shell holds eight electrons.

Bloom's Level: 3. Apply
Learning Outcome: 02.01.04 Determine how electrons are configured around a nucleus.
Section: 02.01
Topic: Chemistry

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Multiple Choice Questions

40. Which of the following substances is hydrophilic?
A. nonpolar substances
B. polar substances
C. ionic substances
D. both polar and ionic substances
E. All of the above are hydrophilic

Bloom's Level: 2. Understand
Learning Outcome: 02.03.01 Describe how water associates with other molecules in solution.
Section: 02.03
Topic: Chemistry

Essay Questions

41.

[H^+] (moles per liter)		pH
0.000001	$= 1 \times 10^{-6}$	6
0.0000001	$= 1 \times 10^{-7}$	7
0.00000001	$= 1 \times 10^{-8}$	8

Study the chart to determine the relationship between H^+ concentration and pH. If you were to create a herbal remedy to decrease excess stomach acid, would you create a solution with a relatively greater or lesser number of hydrogen ions.

Study of the chart confirms that as pH decreases, the concentration of H^+ increases. Acidity is associated with pHs below 7.0. Therefore, as the pH decreases and acidity increases, the concentration of H^+ increases. There is an inverse relationship between the pH and H^+ concentration. To neutralize excess stomach acid, one would create an herbal medication with lower concentrations of H^+. Solutions with lower concentrations of H^+ would have relatively higher pHs.

Bloom's Level: 3. Apply
Learning Outcome: 02.04.02 Explain the relationship betwteen H or OH- concentration and pH.
Section: 02.04
Topic: Chemistry

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Multiple Choice Questions

42. A solution with a pH of 7.0 has _____ times _____ H^+ than a solution of pH 10.
A. 30; more
B. 300; less
C. 10^3; more
D. 10^{-3}; less
E. none of these are correct.

A solution with a pH of 7.0 has 103 times more H^+ than a solution of pH 10.

Bloom's Level: 2. Understand
Learning Outcome: 02.04.02 Explain the relationship betwteen H or OH- concentration and pH.
Section: 02.04
Topic: Chemistry

43. A solution with a pH of 6 has _____ times _____ OH^- than a solution with a pH of 10.
A. 40; more
B. 4000; less
C. 10^4; less
D. 4; less
E. 10^4 more

A solution with a pH of 6.0 has 104 times less OH^+ than a solution of pH 10.

Bloom's Level: 2. Understand
Learning Outcome: 02.04.02 Explain the relationship betwteen H or OH- concentration and pH.
Section: 02.04
Topic: Chemistry

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44. This system of chemicals, $H_2CO_3 \rightleftharpoons H^+ + HCO_3^-$, act as a buffer in the blood. If hydrogen ions are added to blood which of the following reactions would occur?

A. $H^+ + HCO_3^- \longrightarrow H_2CO_3$

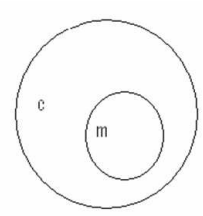
B. $OH^- + H_2CO_3 \longrightarrow HCO_3^- + H_2O$

If hydrogen ions are added to blood, the following reaction would occur: $H_2CO_3 \rightleftharpoons H^+ + HCO_3^-$

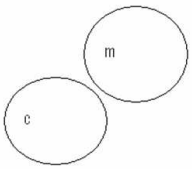
Bloom's Level: 4. Analyze
Learning Outcome: 02.04.03 Analyze how buffers prevent large pH changes in solutions.
Section: 02.04
Topic: Chemistry

45. Which of the following concept circles best depicts the relationship between molecules and compounds (c = compound and m = molecule)?

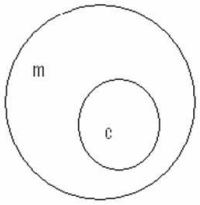
A.



B.



C.



A. Option A
B. Option B
C. Option C

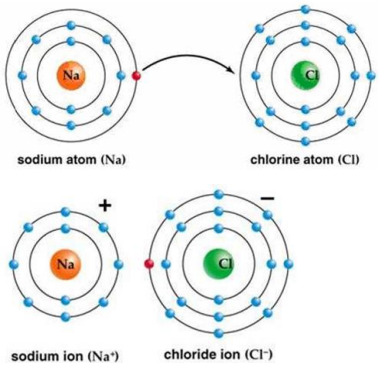
Bloom's Level: 4. Analyze
Learning Outcome: 02.02.01 Describe how elements are combined into molecules and compounds.
Section: 02.02
Topic: Chemistry

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Short Answer Questions

46. Use Bohr's model to draw a sodium (Na) atom and a chlorine (Cl) atom. Using your model, explain what happens when sodium reacts with chlorine to form table salt. Include in your explanation ion and ionic bond formation. Use your model to help you to decide whether NaCl is hydrophilic or hydrophobic.



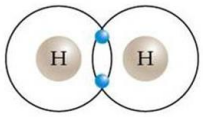
Sodium donates an electron to chlorine to form a sodium ion (Na^+) and a chloride ion (Cl^-). Ions are charged particles that have an unequal number of protons and electrons. These ions are oppositely charged and are, therefore, attracted to each other. The attraction between oppositely charged ions that were formed by a transfer of electrons is an ionic bond. These charged ions are attracted to the charged portions of water molecules. The Na^+ is attracted to the partially charged oxygen molecules in water and the Cl^- is attracted to the partially positive hydrogen atoms in water.

Bloom's Level: 6. Create
Learning Outcome: 02.02.01 Describe how elements are combined into molecules and compounds.
Section: 02.02
Topic: Chemistry

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47. Draw two hydrogen atoms using Bohr's model. Now bond them to form a molecule of hydrogen gas. Write the molecular formula. Explain what type of bond you've created and why this is a stable situation.



The molecular formula is H_2. A nonpolar covalent bond is created when two atoms of the same element equally share a pair of electrons. Through sharing, both atoms now have a completed outer shell with two electrons. This is a stable molecule.

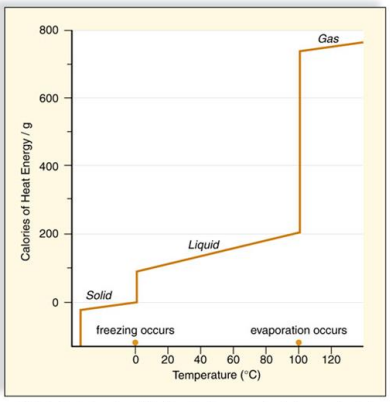
Bloom's Level: 6. Create
Learning Outcome: 02.02.03 Explain the difference between a polar and a nonpolar covalent bond.
Section: 02.02
Topic: Chemistry

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48. All living things are 70 - 90% water. Use this graph to explain what characteristics of water protect living organisms from rapid temperature changes.

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a. Calories lost when 1 g of liquid water freezes and calories required when 1 g of liquid water evaporates.

Converting 1 gm of the hottest liquid water to a gas requires an input of 540 calories of heat energy, therefore it has a high specific heat. This is because many hydrogen bonds must be broken before water boils and vaporizes. This is called the heat of vaporization and helps warm blooded animals cool down while panting or sweating. Water has a high heat of fusion, holding onto its heat, and its temperature falls more slowly than that of other liquids. Therefore, a high specific heat, a high heat of fusion, and a high heat of vaporization help organisms to better maintain their normal internal temperatures.

Bloom's Level: 5. Evaluate
Learning Outcome: 02.03.02 Describe why the properties of water are important to life.
Section: 02.03
Topic: Chemistry

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Multiple Choice Questions

49. The electrons are unequally shared in _____, and transferred in _____.
A. CH_4, Na^+Cl^-
B. O_2, CH_4
C. Na^+Cl^-, H_2O
D. H_2O, N_2

Bloom's Level: 3. Apply
Learning Outcome: 02.02.02 List the different types of bonds that occur between elements.
Section: 02.02
Topic: Chemistry

50. What is the maximum number of electrons that will be in the 1st valence shell?
A. 2
B. 1
C. 3
D. 6
E. 8

The 1st valence shell will hold a maximum of 2 electrons.

Bloom's Level: 1. Remember
Learning Outcome: 02.01.04 Determine how electrons are configured around a nucleus.
Section: 02.01
Topic: Chemistry

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51. If an element contains 8 electrons how many electrons will be placed in the 2nd valence shell?
A. 6
B. 2
C. 8
D. 5
E. 11

The 1st valence shell will have 2 electrons which will leave the remaining 6 to go in the 2nd valence ring.

Bloom's Level: 2. Understand
Learning Outcome: 02.01.04 Determine how electrons are configured around a nucleus.
Section: 02.01
Topic: Chemistry

52. How many atoms are required to form a molecule?
A. at least 2
B. at least 3
C. at least 4
D. at least 5
E. only 1

A molecule is formed with 2 or more atoms bond together.

Bloom's Level: 1. Remember
Learning Outcome: 02.02.01 Describe how elements are combined into molecules and compounds.
Section: 02.02
Topic: Chemistry

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53. Which type of covalent bond is the strongest?
A. single
B. double
C. triple
D. quadruple
E. all covalent bonds are equal in strength

Triple covalent bonds are the strongest covalent bond.

Bloom's Level: 2. Understand
Learning Outcome: 02.02.02 List the different types of bonds that occur between elements.
Section: 02.02
Topic: Chemistry

54. Which term refers to the attraction to water molecules?
A. hydrophilic
B. hydrophobic
C. hydrolysis
D. photolysis
E. nitrophylic

Hydrophilic is the attraction to water.

Bloom's Level: 1. Remember
Learning Outcome: 02.03.01 Describe how water associates with other molecules in solution.
Section: 02.03
Topic: Chemistry

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55. Which substances are on the basic side of the pH scale?
A. baking soda, oven cleaner and human blood
B. baking soda, oven cleaner and urine
C. tomatoes, oven cleaner and human blood
D. beer, vinegar and black coffee
E. Great Salt Lake, oven cleaner, tears

Baking soda, oven cleaner & human blood are all basic substances.

Bloom's Level: 1. Remember
Learning Outcome: 02.04.01 Distinguish between an acid and a base.
Section: 02.04
Topic: Chemistry

56. Which one is NOT one of the properties of water?
A. the frozen form is more dense than the liquid form
B. the frozen form is less dense than the liquid form
C. water is a solvent
D. water has a high heat capacity
E. water has a high heat of evaporation

The frozen form of water is NOT more dense than the liquid form

Bloom's Level: 1. Remember
Learning Outcome: 02.03.02 Describe why the properties of water are important to life.
Section: 02.03
Topic: Chemistry

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57. Which property of water allows it to act as a transport medium?
A. cohesion
B. high heat of evaporation
C. high heat capacity
D. water is solvent
E. the frozen form is less dense than the liquid form

Cohesion allows for water to act as a transport medium

Bloom's Level: 1. Remember
Learning Outcome: 02.03.02 Describe why the properties of water are important to life.
Section: 02.03
Topic: Chemistry

58. The mass number refers to the number of _____ and _____ within an element.
A. protons and neutrons
B. protons and electrons
C. electrons and neutrons
D. protons and molecules
E. electrons and atoms

The mass number is the sum of the number of protons and neutrons in an element.

Bloom's Level: 1. Remember
Learning Outcome: 02.01.02 Use the periodic table to evaluate relationships between atomic number and mass number.
Section: 02.01
Topic: Chemistry

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