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Chapter 02

1. What differentiates an organic compound from an inorganic compound?
   a. An organic compound lacks isotopes.
   b. An organic compound contains carbon.
   c. An organic compound lacks valence electrons.
   d. An organic compound is basic rather than acidic.
   e. An organic compound contains two or more atoms.

ANSWER:	b
POINTS:	1
REFERENCES:	2.1 Elements and Atoms
QUESTION TYPE:	Multiple Choice
HAS VARIABLES:	False
LEARNING OBJECTIVES:	BIO.SBM.02.01 - Name the principal chemical elements in living things and provide an important function of each.
KEYWORDS:	Bloom's: Understand
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2. Which statement best describes an atom?
   a. A substance that cannot burn.
   b. A substance that is soluble in both acid and base
   c. A substance that is held together by covalent bonds
   d. A substance that is composed of more than one kind of atom
   e. A substance that cannot be broken into a simpler substance

ANSWER:	e
POINTS:	1
REFERENCES:	2.1 Elements and Atoms
QUESTION TYPE:	Multiple Choice
HAS VARIABLES:	False
LEARNING OBJECTIVES:	BIO.SBM.02.01 - Name the principal chemical elements in living things and provide an important function of each.
KEYWORDS:	Bloom's: Remember
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3. How can we identify a particular element?
   a. by its number of protons
   b. by its number of electrons
   c. by its number of neutrons
   d. by its shape of valence shells

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e. by its amount of energy levels

ANSWER: a
POINTS: 1
REFERENCES: 2.1 Elements and Atoms
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.01 - Name the principal chemical elements in living things and provide an important function of each.
KEYWORDS: Bloom's: Remember
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4. Which element activates many enzymes and is needed in blood and other tissues of animals?

a. magnesium
b. iron
c. sulfur
d. chlorine
e. sodium

ANSWER: a
POINTS: 3
REFERENCES: 2.1 Elements and Atoms
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.01 - Name the principal chemical elements in living things and provide an important function of each.
KEYWORDS: Bloom's: Remember
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5. A chlorine atom has 17 protons and 18 neutrons. What is its atomic mass?

a. 1 amu
b. 17 amu
c. 18 amu
d. 35 amu
e. 306 amu

ANSWER: d
POINTS: 1
REFERENCES: 2.1 Elements and Atoms
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False

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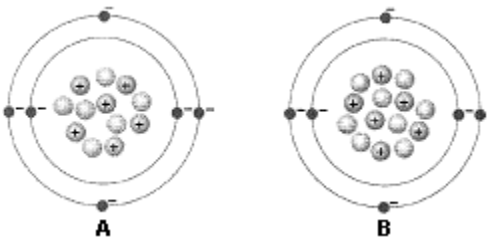
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LEARNING OBJECTIVES: BIO.SBM.02.02 - Compare the physical properties (mass and charge) and locations of electrons, protons, and neutrons. Distinguish between the atomic number and the mass number of an atom.
KEYWORDS: Bloom's: Understand
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6. What is the difference between a stable isotope and a radioisotope?
   a. A stable isotope emits light.
   b. A radioisotope emits radiation.
   c. A stable isotope emits radiation.
   d. A stable isotope absorbs radiation.
   e. A radioisotope has an unequal number of protons and electrons.

ANSWER: b
POINTS: 1
REFERENCES: 2.1 Elements and Atoms
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.03 - Define the terms orbital and electron shell. Relate electron shells to principal energy levels.
KEYWORDS: Bloom's: Understand
NOTES: Modified
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Figure 2-1



7. What is the atomic mass of the atom identified as A in the accompanying figure?
   a. 2 amu
   b. 6 amu
   c. 8 amu
   d. 12 amu
   e. 18 amu

ANSWER: d
POINTS: 1

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REFERENCES: 2.1 Elements and Atoms
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
PREFACE NAME: Figure 2-1
LEARNING OBJECTIVES: BIO.SBM.02.02 - Compare the physical properties (mass and charge) and locations of electrons, protons, and neutrons. Distinguish between the atomic number and the mass number of an atom.
KEYWORDS: Bloom's: Apply
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8. What does the accompanying figure represent?
   a. an acid and a base
   b. two different ions
   c. a cation and an anion
   d. two different elements
   e. two isotopes of the same element

ANSWER: e
POINTS: 1
REFERENCES: 2.1 Elements and Atoms
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
PREFACE NAME: Figure 2-1
LEARNING OBJECTIVES: BIO.SBM.02.02 - Compare the physical properties (mass and charge) and locations of electrons, protons, and neutrons. Distinguish between the atomic number and the mass number of an atom.
KEYWORDS: Bloom's: Apply
NOTES: Modified
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9. What is the difference between the two atoms in the accompanying figure?
   a. their electrical charge
   b. the number of electrons
   c. the number of protons
   d. the number of neutrons
   e. the number of valence shells

ANSWER: d
POINTS: 1
REFERENCES: 2.1 Elements and Atoms

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Chapter 02

QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
PREFACE NAME: Figure 2-1
LEARNING OBJECTIVES: BIO.SBM.02.02 - Compare the physical properties (mass and charge) and locations of electrons, protons, and neutrons. Distinguish between the atomic number and the mass number of an atom.
KEYWORDS: Bloom's: Apply
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10. Isotopes differ from each other with respect to the number of:
    a. protons only
    b. electrons only
    c. neutrons only
    d. both protons and electrons
    e. both neutrons and protons

ANSWER: c
POINTS: 1
REFERENCES: 2.1 Elements and Atoms
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.03 - Define the terms orbital and electron shell. Relate electron shells to principal energy levels.
KEYWORDS: Bloom's: Remember
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11. What is the atomic mass of the most common isotope of carbon?
    a. 12.01 amu
    b. 20.18 amu
    c. 16.01 amu
    d. 1.01 amu
    e. 14.01 amu

ANSWER: a
POINTS: 3
REFERENCES: 2.1 Elements and Atoms
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.01 - Name the principal chemical elements in living things and provide an important function of each.

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KEYWORDS: Bloom's: Remember
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12. The chemical behavior of an atom is determined most directly by the:
    a. atomic number
    b. atomic weight
    c. number of neutrons
    d. number protons
    e. number of valence electrons

ANSWER: e
POINTS: 1
REFERENCES: 2.2 Chemical Reactions
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.04 - Explain how the number of valence electrons of an atom is related to its chemical properties.
KEYWORDS: Bloom's: Understand
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13. Nitrogen has five electrons in its valence shell. How many electrons does it need to gain to complete its valence shell?
    a. one
    b. two
    c. three
    d. seven
    e. eight

ANSWER: c
POINTS: 1
REFERENCES: 2.2 Chemical Reactions
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.04 - Explain how the number of valence electrons of an atom is related to its chemical properties.
KEYWORDS: Bloom's: Apply
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14. Which of the following atoms can form five covalent bonds?

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a. oxygen
b. phosphorus
c. hydrogen
d. carbon
e. nitrogen

ANSWER: b
POINTS: 3
REFERENCES: 2.3 Chemical Bonds
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.07 - Distinguish among covalent bonds, ionic bonds, hydrogen bonds, and van der Waals interactions. Compare them in terms of the mechanisms by which they form and their relative strengths.
KEYWORDS: Bloom's: Understand
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15. How many molecules are present in one mole of $C_6H_{12}O_6$?

a. 1.7×10^{10} molecules
b. 1.3×10^{10} molecules
c. 24 molecules
d. 1.7×10^{22} molecules
e. 6.02×10^{23} molecules

ANSWER: e
POINTS: 1
REFERENCES: 2.2 Chemical Reactions
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.06 - Explain why the mole concept is so useful to chemists.
KEYWORDS: Bloom's: Understand
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16. Which substance is a reactant in the following chemical equation?

$CO_2 + H_2O \leftrightarrow H_2CO_3$

a. water
b. carbon
c. oxygen
d. hydrogen
e. carbonic acid

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ANSWER: a
POINTS: 1
REFERENCES: 2.2 Chemical Reactions
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.05 - Distinguish among simplest, molecular, and structural chemical formulas.
KEYWORDS: Bloom's: Understand
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17. Which statement best describes the product of a chemical reaction?
    a. It is joined by an ionic bond only.
    b. It is always in equilibrium with the reactants.
    c. It is the substance that initiates the reaction.
    d. It is generally written on the left side of the equation.
    e. It is the substance generated by the reaction.

ANSWER: e
POINTS: 1
REFERENCES: 2.2 Chemical Reactions
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.05 - Distinguish among simplest, molecular, and structural chemical formulas.
KEYWORDS: Bloom's: Understand
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18. The representation H−O−H is known as a(n):
    a. structural formula
    b. simplest formula
    c. molecular formula
    d. Lewis structure
    e. orbital diagram

ANSWER: a
POINTS: 1
REFERENCES: 2.2 Chemical Reactions
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False

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LEARNING OBJECTIVES: BIO.SBM.02.05 - Distinguish among simplest, molecular, and structural chemical formulas.
KEYWORDS: Bloom's: Remember
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19. Sulfur has six valence electrons. How many covalent bonds does a sulfur atom typically form?
    a. 3
    b. 1
    c. 5
    d. 2
    e. 4

ANSWER: d
POINTS: 3
REFERENCES: 2.3 Chemical Bonds
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.07 - Distinguish among covalent bonds, ionic bonds, hydrogen bonds, and van der Waals interactions. Compare them in terms of the mechanisms by which they form and their relative strengths.
KEYWORDS: Bloom's: Understand
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20. Which of the following is a covalent compound?
    a. potassium chloride
    b. methane
    c. lithium bromide
    d. magnesium oxide
    e. sodium fluoride

ANSWER: b
POINTS: 3
REFERENCES: 2.3 Chemical Bonds
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.07 - Distinguish among covalent bonds, ionic bonds, hydrogen bonds, and van der Waals interactions. Compare them in terms of the mechanisms by which they form and their relative strengths.
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21. The covalent bond between a hydrogen atom and the oxygen atom in water is formed when:
    a. hydrogen gains an electron from oxygen
    b. hydrogen and oxygen share an electron pair
    c. hydrogen and oxygen both lose electrons from their outer shells
    d. hydrogen and oxygen both gain electrons in their outer shells
    e. hydrogen loses an electron from oxygen

ANSWER: b
POINTS: 1
REFERENCES: 2.3 Chemical Bonds
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.07 - Distinguish among covalent bonds, ionic bonds, hydrogen bonds, and van der Waals interactions. Compare them in terms of the mechanisms by which they form and their relative strengths.
KEYWORDS: Bloom's: Understand
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22. _____ in the muscle cell are required for muscle contraction.
    a. Sodium ions
    b. Potassium ions
    c. Calcium ions
    d. Chloride ions
    e. Magnesium ions

ANSWER: c
POINTS: 3
REFERENCES: 2.3 Chemical Bonds
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.07 - Distinguish among covalent bonds, ionic bonds, hydrogen bonds, and van der Waals interactions. Compare them in terms of the mechanisms by which they form and their relative strengths.
KEYWORDS: Bloom's: Understand
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23. Which of the following is a common oxidizing agent?
    a. carbon monoxide
    b. lithium
    c. oxygen
    d. zinc

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e. iron

ANSWER: c
POINTS: 3
REFERENCES: 2.4 Redox Reactions
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.08 - Distinguish between the terms oxidation and reduction, and relate these processes to the transfer of energy.
KEYWORDS: Bloom's: Understand
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24. Water molecules have a strong tendency to stick to one another, a property known as _____.
a. adhesion
b. capillary action
c. cohesion
d. surface tension
e. osmosis

ANSWER: c
POINTS: 3
REFERENCES: 2.5 Water
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.09 - Explain how hydrogen bonds between adjacent water molecules govern many of the properties of water.
KEYWORDS: Bloom's: Understand
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25. Which atom would most likely be involved in an ionic bond?
a. hydrogen
b. oxygen
c. sodium
d. nitrogen
e. helium

ANSWER: c
POINTS: 1
REFERENCES: 2.3 Chemical Bonds
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.07 - Distinguish among covalent bonds, ionic bonds, hydrogen

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	bonds, and van der Waals interactions. Compare them in terms of the mechanisms by which they form and their relative strengths.
KEYWORDS:	Bloom's: Understand
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26. What is the difference between an electrically neutral atom and an ion?
    a. An ion has an unequal number of protons and electrons, while a neutral atom has an equal number.
    b. An ion has an equal number of protons and electrons, while an atom has an unequal number.
    c. An atom has an unequal number of neutrons and protons, while an ion has an equal number.
    d. An atom has its electrons in orbitals, while an ion has its electrons in its nucleus.
    e. An atom must have an equal number of neutrons and electrons, while an ion does not.

ANSWER:	a
POINTS:	1
REFERENCES:	2.3 Chemical Bonds
QUESTION TYPE:	Multiple Choice
HAS VARIABLES:	False
LEARNING OBJECTIVES:	BIO.SBM.02.07 - Distinguish among covalent bonds, ionic bonds, hydrogen bonds, and van der Waals interactions. Compare them in terms of the mechanisms by which they form and their relative strengths.
KEYWORDS:	Bloom's: Understand
NOTES:	Modified
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27. Which statement about van der Waal interactions is *false*?
    a. They are very strong.
    b. They are attractive forces.
    c. They operate over very short distances.
    d. They form between nonpolar molecules.
    e. They involve transient regions of positive and negative charges.

ANSWER:	a
POINTS:	1
REFERENCES:	2.3 Chemical Bonds
QUESTION TYPE:	Multiple Choice
HAS VARIABLES:	False
LEARNING OBJECTIVES:	BIO.SBM.02.07 - Distinguish among covalent bonds, ionic bonds, hydrogen bonds, and van der Waals interactions. Compare them in terms of the mechanisms by which they form and their relative strengths.
KEYWORDS:	Bloom's: Remember

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28. Which component is the *oxidizing agent* in the following chemical reaction?
$4\ Fe + 3\ O_2 \rightarrow 2\ Fe_2O_3$

a. rust
b. iron
c. water
d. oxygen
e. hydrogen

ANSWER: d
POINTS: 1
REFERENCES: 2.4 Redox Reactions
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.08 - Distinguish between the terms oxidation and reduction, and relate these processes to the transfer of energy.
KEYWORDS: Bloom's: Apply
NOTES: Modified
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29. Which component becomes oxidized in the following chemical reaction?
$4\ Fe + 3\ O_2 \rightarrow 2\ Fe_2O_3$

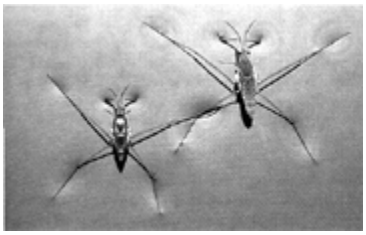
a. rust
b. iron
c. water
d. oxygen
e. hydrogen

ANSWER: b
POINTS: 1
REFERENCES: 2.4 Redox Reactions
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.08 - Distinguish between the terms oxidation and reduction, and relate these processes to the transfer of energy.
KEYWORDS: Bloom's: Apply
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30. Consider the aquatic insects pictured in the accompanying figure. Which characteristic of water molecules directly contributes to their remarkable “water walking” success?



a. ionic bonds
b. capillary action
c. hydrogen bonds
d. adhesive forces
e. nonpolar covalent bonds

ANSWER: c
POINTS: 1
REFERENCES: 2.5 Water
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.09 - Explain how hydrogen bonds between adjacent water molecules govern many of the properties of water.
KEYWORDS: Bloom's: Understand
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31. It takes one calorie of heat to raise the temperature of one gram of water by one degree Celsius at sea level. This is referred to as the ____ of water.

a. specific heat
b. heat of fusion
c. homeostasis
d. vaporization
e. heat of transformation

ANSWER: a
POINTS: 1
REFERENCES: 2.5 Water
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.09 - Explain how hydrogen bonds between adjacent water molecules govern many of the properties of water.
KEYWORDS: Bloom's: Remember

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32. Sugar dissolves readily in water because it is a(n) ____ substance.
    a. adhesive
    b. cohesive
    c. hydrophilic
    d. hydrophobic
    e. evaporative

ANSWER: c
POINTS: 1
REFERENCES: 2.5 Water
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.09 - Explain how hydrogen bonds between adjacent water molecules govern many of the properties of water.
KEYWORDS: Bloom's: Understand
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33. What is the specific heat of water?
    a. 0.5 cal/g of water per degree Celsius
    b. 0.75 cal/g of water per degree Celsius
    c. 3 cal/g of water per degree Celsius
    d. 1 cal/g of water per degree Celsius
    e. 2 cal/g of water per degree Celsius

ANSWER: d
POINTS: 3
REFERENCES: 2.5 Water
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.09 - Explain how hydrogen bonds between adjacent water molecules govern many of the properties of water.
KEYWORDS: Bloom's: Understand
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34. As water boils and turns to steam, what happens to the hydrogen bonds?
    a. The hydrogen bonds break.

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b. The hydrogen bonds strengthen.
c. The hydrogen bonds generate additional bonds.
d. The hydrogen bonds form a crystalline lattice structure.
e. The hydrogen bonds continually break and rejoin.

ANSWER: a
POINTS: 1
REFERENCES: 2.5 Water
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.09 - Explain how hydrogen bonds between adjacent water molecules govern many of the properties of water.
KEYWORDS: Bloom's: Understand
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35. Which event illustrates evaporative cooling?
a. a tea kettle whistling
b. sweat evaporating from the skin
c. ice cubes floating in a glass of water
d. a fish not freezing in an ice-covered pond
e. salt dissolving in a pot of water with potatoes

ANSWER: b
POINTS: 1
REFERENCES: 2.5 Water
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.09 - Explain how hydrogen bonds between adjacent water molecules govern many of the properties of water.
KEYWORDS: Bloom's: Understand
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36. The cohesiveness between water molecules is due largely to _____.
a. ionic bonds
b. hydrogen bonds
c. polar covalent bonds
d. nonpolar covalent bonds
e. hydrophobic interactions

ANSWER: b

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POINTS: 1
REFERENCES: 2.5 Water
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.09 - Explain how hydrogen bonds between adjacent water molecules govern many of the properties of water.
KEYWORDS: Bloom's: Remember
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37. Which of the following solutions has a pH value of 9.0?
    a. Beer
    b. Blood
    c. Bleach
    d. Seawater
    e. Rainwater

ANSWER: c
POINTS: 3
REFERENCES: 2.5 Water
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.09 - Explain how hydrogen bonds between adjacent water molecules govern many of the properties of water.
KEYWORDS: Bloom's: Understand
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38. A base is defined as a(n) _____ acceptor.
    a. neutron
    b. electron
    c. proton
    d. anion
    e. cation

ANSWER: c
POINTS: 1
REFERENCES: 2.6 Acids, Bases, and Salts
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.10 - Contrast acids and bases, and discuss their properties.
KEYWORDS: Bloom's: Remember

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Chapter 02

NOTES: New
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39. Which of the following would most likely form electrolytes in water?
    a. glucose
    b. ethanol
    c. an organic compound
    d. an inorganic compound
    e. a nonionic compound

ANSWER: d
POINTS: 1
REFERENCES: 2.6 Acids, Bases, and Salts
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.10 - Contrast acids and bases, and discuss their properties.
KEYWORDS: Bloom's: Remember
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40. What is the OH^- concentration of a solution having a pH of 2?
    a. 1×10^{-12}
    b. 1×10^{-10}
    c. 1×10^{-7}
    d. 1×10^{-2}
    e. 1×10^{-1}

ANSWER: a
POINTS: 1
REFERENCES: 2.6 Acids, Bases, and Salts
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.11 - Convert the hydrogen ion concentration (moles per liter) of a solution to a pH value and describe how buffers help minimize changes in pH.
KEYWORDS: Bloom's: Apply
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41. When a small amount of hydrochloric acid (HCl) is added to a solution of Na_2HPO_4, the pH of the solution does not change markedly. The pH also does not change drastically when a small amount of sodium hydroxide (NaOH) is added to this same solution. Based on these observations, the compound Na_2HPO_4 is:
    a. acting as a buffer

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b. acting as a solvent
c. able to donate hydrogen atoms to HCl
d. able to remove hydrogen ions from the OH^- of NaOH
e. an enzyme facilitating the reaction between HCl and NaOH

ANSWER: a
POINTS: 1
REFERENCES: 2.6 Acids, Bases, and Salts
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.11 - Convert the hydrogen ion concentration (moles per liter) of a solution to a pH value and describe how buffers help minimize changes in pH.
KEYWORDS: Bloom's: Apply
NOTES: Modified
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42. A liquid with a pH of 7 is considered a(n) ____ solution.
a. basic
b. acidic
c. neutral
d. hydrophilic
e. hydrochloric

ANSWER: c
POINTS: 1
REFERENCES: 2.6 Acids, Bases, and Salts
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.10 - Contrast acids and bases, and discuss their properties.
KEYWORDS: Bloom's: Understand
NOTES: New
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43. A salt is a compound in which the hydrogen ion of ____ is replaced by some other cation.
a. water
b. a base
c. an acid
d. an anion
e. a hydroxide ion

ANSWER: c
POINTS: 1

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REFERENCES: 2.6 Acids, Bases, and Salts
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.12 - Describe the composition of a salt and explain the ways in which salts are important in organisms.
KEYWORDS: Bloom's: Remember
NOTES: Modified
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44. Which substance is an example of a very strong acid?
    a. milk
    b. coffee
    c. bleach
    d. seawater
    e. lemon juice

ANSWER: e
POINTS: 1
REFERENCES: 2.6 Acids, Bases, and Salts
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.10 - Contrast acids and bases, and discuss their properties.
KEYWORDS: Bloom's: Understand
NOTES: New
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45. What is the purpose of a buffer?
    a. To convert an acid to a base
    b. To minimize the change in pH
    c. To measure the acidity of a solution
    d. To form a stable bond between atoms
    e. To maintain a constant internal temperature

ANSWER: b
POINTS: 1
REFERENCES: 2.6 Acids, Bases, and Salts
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.11 - Convert the hydrogen ion concentration (moles per liter) of a solution to a pH value and describe how buffers help minimize changes in pH.
KEYWORDS: Bloom's: Remember

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46. Which element forms the backbone of organic molecules?
    a. magnesium
    b. iron
    c. chlorine
    d. sodium
    e. carbon

ANSWER: e
POINTS: 3
REFERENCES: 2.1 Elements and Atoms
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.01 - Name the principal chemical elements in living things and provide an important function of each.
KEYWORDS: Bloom's: Remember
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47. What is the approximate pH of ammonia?
    a. 2
    b. 4
    c. 7
    d. 8
    e. 11

ANSWER: e
POINTS: 1
REFERENCES: 2.6 Acids, Bases, and Salts
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.10 - Contrast acids and bases, and discuss their properties.
KEYWORDS: Bloom's: Remember
NOTES: New
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48. List four of the principal chemical elements found in living organisms and identify an important biological function of each element.
ANSWER: Some examples from Table 2-1: Oxygen is required for cellular respiration, carbon forms the backbone of organic molecules, hydrogen is involved in some energy transfers, and

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nitrogen is a component of proteins and nucleic acids.

POINTS: 1
REFERENCES: 2.1 Elements and Atoms
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.01 - Name the principal chemical elements in living things and provide an important function of each.
KEYWORDS: Bloom's: Remember
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49. Explain how the number and arrangement of valence electrons is related to the chemical properties of an atom. Use two specific examples in your explanation.

ANSWER: Valence electrons are those in the outermost orbital of the atom, and they dictate the number of bonds that can be formed by that atom. Atoms that have filled valence shells (e.g., helium and neon) are stable and unreactive; atoms that have unfilled valence shells (e.g., chlorine and sodium) are unstable and reactive.
POINTS: 1
REFERENCES: 2.2 Chemical Reactions
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.04 - Explain how the number of valence electrons of an atom is related to its chemical properties.
KEYWORDS: Bloom's: Apply
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50. Identify and compare the properties of the bond between sodium and chloride (NaCl) with the bond between carbon and hydrogen in methane (CH_4).

ANSWER: NaCl represents an ionic bond and methane (CH_4) represents a nonpolar covalent bond. Both covalent and ionic bonds result in each atom having a filled valence shell. Covalent bonds are formed via the sharing of electrons between neutral atoms. The resulting molecule is electrically neutral but can be polar or nonpolar. In contrast, ionic bonds are formed via the transfer of electrons, which creates two oppositely charged ions. The resulting molecule is held together by the electrical attraction between the positive and negative ions. Unlike atoms joined by a covalent bond, atoms joined by an ionic bond tend to dissociate into their respective ions when placed in water.
POINTS: 1
REFERENCES: 2.3 Chemical Bonds
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.07 - Distinguish among covalent bonds, ionic bonds, hydrogen bonds, and van der Waals interactions. Compare them in terms of the mechanisms by which they form and their relative strengths.

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KEYWORDS: Bloom's: Analyze
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51. Diagram and carefully label two water molecules using an appropriately sized ball for each atom. Then, use a dashed line on this diagram to show how hydrogen bonds form between the two water molecules.
ANSWER: The diagram should resemble Fig. 2-12 except only two water molecules are shown. Hydrogen bonds form as a result of the attraction between the partial positive charge of a hydrogen atom with the partial negative charge of the oxygen atom
POINTS: 1
REFERENCES: 2.3 Chemical Bonds
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.02 - Compare the physical properties (mass and charge) and locations of electrons, protons, and neutrons. Distinguish between the atomic number and the mass number of an atom.
BIO.SBM.02.07 - Distinguish among covalent bonds, ionic bonds, hydrogen bonds, and van der Waals interactions. Compare them in terms of the mechanisms by which they form and their relative strengths.
KEYWORDS: Bloom's: Apply
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52. An inorganic compound is one that contains carbon.
a. True
b. False
ANSWER: False
POINTS: 1
REFERENCES: 2.1 Elements and Atoms
QUESTION TYPE: True / False
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.01 - Name the principal chemical elements in living things and provide an important function of each.
KEYWORDS: Bloom's: Remember
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53. The atomic mass determines the identity of an element.
a. True
b. False
ANSWER: False
POINTS: 1
REFERENCES: 2.1 Elements and Atoms

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QUESTION TYPE: True / False
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.02 - Compare the physical properties (mass and charge) and locations of electrons, protons, and neutrons. Distinguish between the atomic number and the mass number of an atom.
KEYWORDS: Bloom's: Remember
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54. An atom that has a filled valence shell is stable and unreactive.
    a. True
    b. False
ANSWER: True
POINTS: 1
REFERENCES: 2.1 Elements and Atoms
QUESTION TYPE: True / False
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.03 - Define the terms orbital and electron shell. Relate electron shells to principal energy levels.
KEYWORDS: Bloom's: Remember
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55. The valence shell of hydrogen or helium is unstable when it contains two electrons.
    a. True
    b. False
ANSWER: False
POINTS: 1
REFERENCES: 2.2 Chemical Reactions
QUESTION TYPE: True / False
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.04 - Explain how the number of valence electrons of an atom is related to its chemical properties.
KEYWORDS: Bloom's: Remember
NOTES: New
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56. A chemical formula shows the types and numbers of atoms in a molecule and their arrangement.
    a. True
    b. False
ANSWER: False

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POINTS: 1
REFERENCES: 2.2 Chemical Reactions
QUESTION TYPE: True / False
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.05 - Distinguish among simplest, molecular, and structural chemical formulas.
KEYWORDS: Bloom's: Remember
NOTES: New
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57. When atoms react to form an ionic bond, electrons are shared between those atoms.
    a. True
    b. False
ANSWER: False
POINTS: 1
REFERENCES: 2.3 Chemical Bonds
QUESTION TYPE: True / False
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.07 - Distinguish among covalent bonds, ionic bonds, hydrogen bonds, and van der Waals interactions. Compare them in terms of the mechanisms by which they form and their relative strengths.
KEYWORDS: Bloom's: Remember
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58. The tetrahedron shape of a methane molecule is the result of orbital hybridization.
    a. True
    b. False
ANSWER: True
POINTS: 1
REFERENCES: 2.3 Chemical Bonds
QUESTION TYPE: True / False
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.07 - Distinguish among covalent bonds, ionic bonds, hydrogen bonds, and van der Waals interactions. Compare them in terms of the mechanisms by which they form and their relative strengths.
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59. An example of an anion is K^+.

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a. True
b. False

ANSWER: False
POINTS: 1
REFERENCES: 2.3 Chemical Bonds
QUESTION TYPE: True / False
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.07 - Distinguish among covalent bonds, ionic bonds, hydrogen bonds, and van der Waals interactions. Compare them in terms of the mechanisms by which they form and their relative strengths.
KEYWORDS: Bloom's: Remember
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60. Oxidation occurs when an atom gains one or more electrons.

a. True
b. False

ANSWER: False
POINTS: 1
REFERENCES: 2.4 Redox Reactions
QUESTION TYPE: True / False
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.08 - Distinguish between the terms oxidation and reduction, and relate these processes to the transfer of energy.
KEYWORDS: Bloom's: Remember
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61. *Specific heat* refers to the amount of energy required to change 1 gram of a substance from the liquid phase to the vapor phase.

a. True
b. False

ANSWER: False
POINTS: 1
REFERENCES: 2.5 Water
QUESTION TYPE: True / False
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.09 - Explain how hydrogen bonds between adjacent water molecules govern many of the properties of water.
KEYWORDS: Bloom's: Remember
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62. A combination of adhesive and cohesive forces accounts for surface tension.
    a. True
    b. False

ANSWER: False
POINTS: 3
REFERENCES: 2.5 Water
QUESTION TYPE: True / False
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.09 - Explain how hydrogen bonds between adjacent water molecules govern many of the properties of water.
KEYWORDS: Bloom's: Understand
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63. A solution having a pH of 8 is slightly acidic.
    a. True
    b. False

ANSWER: False
POINTS: 1
REFERENCES: 2.6 Acids, Bases, and Salts
QUESTION TYPE: True / False
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.10 - Contrast acids and bases, and discuss their properties.
KEYWORDS: Bloom's: Remember
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64. A calorie is the amount of heat energy required to raise the temperature of 1 g of water 1 degree Celsius (C).
    a. True
    b. False

ANSWER: True
POINTS: 3
REFERENCES: 2.5 Water
QUESTION TYPE: True / False
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.09 - Explain how hydrogen bonds between adjacent water molecules govern many of the properties of water.
KEYWORDS: Bloom's: Understand
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65. As a researcher, you are charged with determining the effects of a new drug. From previous observations, you suspect that this drug reduces the rate of DNA production (replication) in the skin cells of patients using the drug. With the following materials, design an experiment that would determine the effect of the drug on DNA replication. You know that DNA contains phosphate groups. You have radioactive isotopes of phosphate (^{32}P), skin cell cultures from different patients, the drug in question, and a device that measures radioactivity.

ANSWER: **Concepts to Consider:** Construction of an appropriate experiment with appropriate controls; use of the radioisotope to label DNA; isolation of the DNA using an unspecified technique; measuring radioactivity of the isolated DNA; comparing the treatment and control groups; making a conclusion.

POINTS: 1

REFERENCES: 2.1 Elements and Atoms

QUESTION TYPE: Essay

HAS VARIABLES: False

LEARNING OBJECTIVES: BIO.SBM.02.02 - Compare the physical properties (mass and charge) and locations of electrons, protons, and neutrons. Distinguish between the atomic number and the mass number of an atom.

TOPICS: Discussion or Thought Questions

KEYWORDS: Bloom's: Create

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66. The hydrogen bonds of water play an important role in the ability of plants to transport water (via capillary action). Explain how this occurs.

ANSWER: **Concepts to Consider:** Transfer of energy to the hydrogen bonds; adhesive versus cohesive forces; the effects of surface area of a tube and the amount of water to be transported

POINTS: 1

REFERENCES: 2.5 Water

QUESTION TYPE: Essay

HAS VARIABLES: False

LEARNING OBJECTIVES: BIO.SBM.02.09 - Explain how hydrogen bonds between adjacent water molecules govern many of the properties of water.

TOPICS: Discussion or Thought Questions

KEYWORDS: Bloom's: Analyze

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67. Explain and identify the mechanism of how carbon dioxide maintains blood pH levels.

ANSWER: **Concepts to Consider:** Buffering capacity; reversible reactions; maintenance of equilibrium.

POINTS: 1

REFERENCES: 2.6 Acids, Bases, and Salts

QUESTION TYPE: Essay

HAS VARIABLES: False

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LEARNING OBJECTIVES: BIO.SBM.02.11 - Convert the hydrogen ion concentration (moles per liter) of a solution to a pH value and describe how buffers help minimize changes in pH.
TOPICS: Discussion or Thought Questions
KEYWORDS: Bloom's: Analyze
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Match the type of bond or interaction with its description.
a. hydrogen bond
b. van der Waals interaction
c. ionic bond
d. covalent bond
REFERENCES: 2.3 Chemical Bonds
QUESTION TYPE: Matching
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.07 - Distinguish among covalent bonds, ionic bonds, hydrogen bonds, and van der Waals interactions. Compare them in terms of the mechanisms by which they form and their relative strengths.
KEYWORDS: Bloom's: Remember
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68. Strong attractive force resulting from the transfer of electrons between atoms
ANSWER: c
POINTS: 1

69. Strong attractive force resulting from the sharing of electrons between atoms
ANSWER: d
POINTS: 1

70. Very weak attractive force joining nonpolar molecules
ANSWER: b
POINTS: 1

71. Holds adjacent water molecules together
ANSWER: a
POINTS: 1

Match the term with its description.
a. adhesion
b. cohesion
c. surface tension
d. capillary action

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Chapter 02

REFERENCES: 2.5 Water
QUESTION TYPE: Matching
HAS VARIABLES: False
LEARNING OBJECTIVES: BIO.SBM.02.09 - Explain how hydrogen bonds between adjacent water molecules govern many of the properties of water.
KEYWORDS: Bloom's: Remember
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72. Sticking together of like molecules
ANSWER: b
POINTS: 1

73. Enables certain insects to walk on water
ANSWER: c
POINTS: 1

74. Tendency of water to move in narrow tubes
ANSWER: d
POINTS: 1

75. Sticking together of unlike molecules
ANSWER: a
POINTS: 1

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