Package Title: Test Bank
Course Title: Test Bank Questions, Anderson 2e
Chapter Number: 2 An Introduction to the Chemical Basis of Life

Question type: Multiple-Choice

1) Which of the following elements is a bacterial micronutrient?

a) carbon
b) chlorine
c) hydrogen
d) nitrogen

Answer: b

Difficulty: Medium
Learning Objective: 2.1 Identify the components of an atom and explain how they influence element formation and assist in chemical bond formation.
Section Reference: 2.1 Atoms, Elements, and Molecules

Question type: Multiple-Selection

2) The chemical symbol for _____ is _____. (Select all that apply)

a) carbon; Ca
b) oxygen; O
c) potassium; K
d) magnesium; Mn

Answer 1: b
Answer 2: c

Difficulty: Easy
Learning Objective: 2.1 Identify the components of an atom and explain how they influence element formation and assist in chemical bond formation.
Section Reference: 2.1 Atoms, Elements, and Molecules

Question type: Multiple-Choice

3) Elements with similar chemical properties are organized in the same _____ of the periodic table.

a) row
b) quadrant
c) column
d) color block

Answer: c

Difficulty: Easy
Learning Objective: 2.1 Identify the components of an atom and explain how they influence element formation and assist in chemical bond formation.
Section Reference: 2.1 Atoms, Elements, and Molecules

Question type: Multiple-Choice

4) The atomic number of an element is the same as the number of _____ in each atom.

a) neutrons
b) protons
c) neutrons plus protons
d) protons plus electrons

Answer: b

Difficulty: Easy
Learning Objective: 2.1 Identify the components of an atom and explain how they influence element formation and assist in chemical bond formation.
Section Reference: 2.1 Atoms, Elements, and Molecules

Question type: Multiple-Choice

5) The atomic nucleus of an atom is composed of _____.

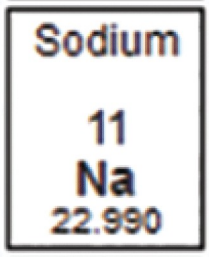
a) positively charged protons
b) positively protons and electrically neutral neutrons
c) electrically neutral neutrons and negatively charged electrons
d) electrically neutral protons

Answer: b

Difficulty: Medium
Learning Objective: 2.1 Identify the components of an atom and explain how they influence element formation and assist in chemical bond formation.
Section Reference: 2.1 Atoms, Elements, and Molecules

Question type: Multiple-Choice

6) Each proton and neutron have a mass of one atomic mass unit (amu). Using this information from the periodic table, determine the mass of sodium (Na).



a) 11 amu
b) 12 amu
c) 23 amu
d) 34 amu

Answer: c

Difficulty: Hard
Learning Objective: 2.1 Identify the components of an atom and explain how they influence element formation and assist in chemical bond formation.
Section Reference: 2.1 Atoms, Elements, and Molecules

Question type: Multiple-Choice

7) Isotopes of an element differ from each other by the _____.

a) number of neutrons they possess
b) number of valence shell electrons
c) arrangement of their electrons in orbitals
d) arrangement of their electrons in the atomic nucleus

Answer: a

Difficulty: Easy
Learning Objective: 2.1 Identify the components of an atom and explain how they influence element formation and assist in chemical bond formation.
Section Reference: 2.1 Atoms, Elements, and Molecules

Question type: Multiple-Choice

8) An atom with more electrons than protons is a(n) _____.

a) isotope
b) isomer
c) cation
d) anion

Answer: d

Difficulty: Easy
Learning Objective: 2.1 Identify the components of an atom and explain how they influence element formation and assist in chemical bond formation.
Section Reference: 2.1 Atoms, Elements, and Molecules

Question type: Multiple-Selection

9) Radioisotopes of an element _____. (Select all that apply)

a) are highly reactive and preferentially participate in chemical reactions
b) emit energy
c) can be used in diagnostic procedures such as indium scans
d) have additional electrons in their valence shell

Answer 1: b
Answer 2: c

Difficulty: Medium
Learning Objective: 2.1 Identify the components of an atom and explain how they influence element formation and assist in chemical bond formation.
Section Reference: 2.1 Atoms, Elements, and Molecules

Question type: Multiple-Selection

10) Orbitals _____. (Select all that apply)

a) represent the volume of space where an atom's electrons are most likely to be found
b) are associated with different energy shells
c) contain a maximum of 8 electrons
d) may be spherical or pear-shaped

Answer 1: a
Answer 2: b
Answer 3: d

Difficulty: Medium
Learning Objective: 2.1 Identify the components of an atom and explain how they influence element formation and assist in chemical bond formation.
Section Reference: 2.1 Atoms, Elements, and Molecules

Question type: Multiple-Selection

11) Valence shell electrons _____. (Select all that apply)

a) are located exclusively in the *s* orbitals

b) participate in chemical reactions
c) have the highest associated energy
d) can be shared with the valence shell of an adjacent atom

Answer 1: b
Answer 2: c
Answer 3: d

Difficulty: Hard
Learning Objective: 2.1 Identify the components of an atom and explain how they influence element formation and assist in chemical bond formation.
Section Reference: 2.1 Atoms, Elements, and Molecules

Question type: Multiple-Selection

12) When an atom loses a valence shell electron, it _____. (Select all that apply)

a) becomes a cation
b) participates in polar covalent bonds
c) can become part of a polar molecule
d) can form an ionic bond with an anion

Answer 1: a
Answer 2: c
Answer 3: d

Difficulty: Medium
Learning Objective: 2.1 Identify the components of an atom and explain how they influence element formation and assist in chemical bond formation.
Section Reference: 2.1 Atoms, Elements, and Molecules

Question type: Multiple-Selection

13) When two adjacent atoms of similar electronegativity share a pair of electrons, _____. (Select all that apply)

a) it promotes the formation of hydrogen bonds with surrounding atoms

b) a strong polar covalent bond is formed
c) a strong nonpolar covalent bond is formed
d) van der Waals forces are generated

Answer 1: c

Difficulty: Medium
Learning Objective: 2.1 Identify the components of an atom and explain how they influence element formation and assist in chemical bond formation.
Section Reference: 2.1 Atoms, Elements, and Molecules

Question type: Multiple-Selection

14) When two adjacent atoms unequally share a pair of electrons, _____. (Select all that apply)

a) the resulting bond is highly unstable
b) a strong polar covalent bond is formed
c) a strong nonpolar covalent bond is formed
d) a polar molecule is formed

Answer 1: b
Answer 2: d

Difficulty: Medium
Learning Objective: 2.1 Identify the components of an atom and explain how they influence element formation and assist in chemical bond formation.
Section Reference: 2.1 Atoms, Elements, and Molecules

Question type: Multiple-Choice

15) Two adjacent nitrogen atoms share 3 pairs of electrons resulting in the formation of _____.

a) a nonpolar covalent bond
b) a triple nonpolar covalent bond
c) a combination of polar and nonpolar covalent bonds

d) a triple polar covalent bond

Answer: b

Difficulty: Medium
Learning Objective: 2.1 Identify the components of an atom and explain how they influence element formation and assist in chemical bond formation.
Section Reference: 2.1 Atoms, Elements, and Molecules

Question type: Multiple-Choice

16) When a pair of valence shell electrons are shared by two atoms with significantly different electronegativity values, _____.

a) a polar covalent bond forms
b) the electron pair of the bond is positioned closer to the atom with the lower electronegativity
c) an ionic bond forms
d) the electronegativity values of the two atoms equalize

Answer: a

Difficulty: Medium
Learning Objective: 2.1 Identify the components of an atom and explain how they influence element formation and assist in chemical bond formation.
Section Reference: 2.1 Atoms, Elements, and Molecules

Question type: Multiple-Choice

17) Weak electrostatic attraction between a hydrogen atom participating in a polar covalent bond and a slightly negative region of a molecule results in the formation of a(n) _____.

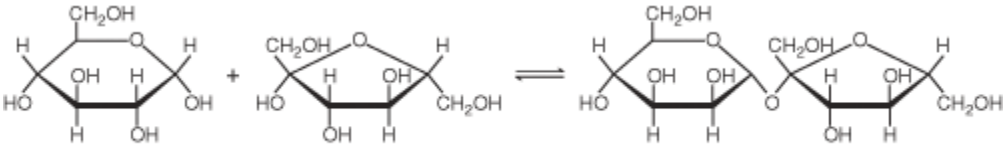
a) ionic bond
b) double covalent bond
c) van der Waals interaction
d) hydrogen bond

Answer: d

Difficulty: Easy
Learning Objective: 2.1 Identify the components of an atom and explain how they influence element formation and assist in chemical bond formation.
Section Reference: 2.1 Atoms, Elements, and Molecules

Question type: Multiple-Choice

18) In the chemical equation below, glucose is a(n) _____.



a) reactant
b) product
c) intermediate complex
d) equilabrator

Answer: a

Difficulty: Easy
Learning Objective: 2.1 Identify the components of an atom and explain how they influence element formation and assist in chemical bond formation.
Section Reference: 2.1 Atoms, Elements, and Molecules

Question type: Multiple-Choice

19) Chemical equilibrium describes _____.

a) a reaction that has run to completion
b) a reaction that has converted all reactant into product
c) a reaction that involves only one reactant and one product
d) a situation where the rate of the forward reaction is exactly equal to the rate of the reverse reaction

Answer: d

Difficulty: Easy
Learning Objective: 2.1 Identify the components of an atom and explain how they influence element formation and assist in chemical bond formation.
Section Reference: 2.1 Atoms, Elements, and Molecules

Question type: Multiple-Selection

20) Hydrogen bonds between water molecules in solid form _____. (Select all that apply)

a) make it less dense than its liquid form
b) allow it to serve as a layer of surface insulation to provide a thermally stable aquatic habitat in the winter
c) are very stable and space the molecules closer together
d) can convert to covalent bonds when ice melts

Answer 1: a
Answer 2: b

Difficulty: Medium
Learning Objective: 2.2 Relate the properties of water to the basis of cellular life and describe biochemical processes such as acid/base balance and molarity in aqueous solutions.
Section Reference: 2.2 Water: Life's Most Essential Molecule

Question type: Multiple-Selection

21) Because of its extreme hydrogen bonding, water has a high specific heat so it _____. (Select all that apply)

a) heats up slowly
b) cools down slowly
c) maintains a thermally stable aquatic environment
d) requires the addition of a lot energy to break all of these weak intermolecular bonds

Answer 1: a
Answer 2: b
Answer 3: c

Answer 4: d

Difficulty: Medium
Learning Objective: 2.2 Relate the properties of water to the basis of cellular life and describe biochemical processes such as acid/base balance and molarity in aqueous solutions.
Section Reference: 2.2 Water: Life's Most Essential Molecule

Question type: Multiple-Selection

22) Evaporation of sweat _____. (Select all that apply)

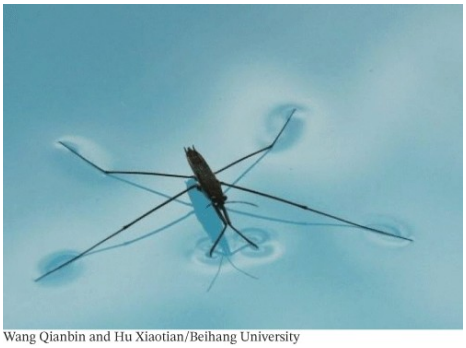
a) leads to cooling that is essential for maintaining a constant body temperature
b) is due to water's high specific heat
c) elevates the pH level of the skin
d) leaves elevated salt levels on the skin which serve to inhibit pathogen growth

Answer 1: a
Answer 2: d

Difficulty: Medium
Learning Objective: 2.2 Relate the properties of water to the basis of cellular life and describe biochemical processes such as acid/base balance and molarity in aqueous solutions.
Section Reference: 2.2 Water: Life's Most Essential Molecule

Question type: Multiple-Choice

23) What unique feature of water is highlighted in this photo?



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a) Water's ability to serve as an excellent solvent
b) Water's high specific heat
c) Water's high heat of vaporization
d) Water's cohesive nature

Answer: d

Difficulty: Medium
Learning Objective: 2.2 Relate the properties of water to the basis of cellular life and describe biochemical processes such as acid/base balance and molarity in aqueous solutions.
Section Reference: 2.2 Water: Life's Most Essential Molecule

Question type: Multiple-Choice

24) Which of the following is **FALSE**?

a) Water is a polar molecule
b) Water exists in nature in all three physical states
c) Hydrogen bonds tend to form between water molecules
d) Solid water is (ice) is denser than liquid water

Answer: d

Difficulty: Easy
Learning Objective: 2.2 Relate the properties of water to the basis of cellular life and describe biochemical processes such as acid/base balance and molarity in aqueous solutions.
Section Reference: 2.2 Water: Life's Most Essential Molecule

Question type: Multiple-Choice

25) A _____ is the substance used to dissolve materials.

a) solute
b) solvent
c) solution
d) hydration shell

Answer: b

Difficulty: Easy
Learning Objective: 2.2 Relate the properties of water to the basis of cellular life and describe biochemical processes such as acid/base balance and molarity in aqueous solutions.
Section Reference: 2.2 Water: Life's Most Essential Molecule

Question type: Multiple-Selection

26) An aqueous solution _____. (Select all that apply)

a) uses water as a solvent
b) dissolves hydrophobic solutes
c) forms hydration shells around the solutes
d) is always characterized by a neutral pH

Answer 1: a
Answer 1: c

Difficulty: Medium
Learning Objective: 2.2 Relate the properties of water to the basis of cellular life and describe biochemical processes such as acid/base balance and molarity in aqueous solutions.
Section Reference: 2.2 Water: Life's Most Essential Molecule

Question type: Multiple-Choice

27) The molecular weight of glucose is 181.18 g/mol. To make 250 ml of a 0.25 M glucose solution, you would dissolve _____ g of glucose in 250 ml of water.

a) 11.32
b) 18.11
c) 45.26
d) 181.18

Answer: a

Difficulty: Hard

Learning Objective: 2.2 Relate the properties of water to the basis of cellular life and describe biochemical processes such as acid/base balance and molarity in aqueous solutions.
Section Reference: 2.2 Water: Life's Most Essential Molecule

Question type: Multiple-Selection

28) Acids _____. (Select all that apply)

a) accept hydrogen ions from a solution
b) increase the pH when a buffer is added
c) have a pH value below 7
d) turn phenol red fuchsia

Answer 1: c

Difficulty: Medium
Learning Objective: 2.2 Relate the properties of water to the basis of cellular life and describe biochemical processes such as acid/base balance and molarity in aqueous solutions.
Section Reference: 2.2 Water: Life's Most Essential Molecule

Question type: Multiple-Choice

29) The difference between an acid and a base is that an acid _____, whereas a base _____.

a) undergoes a reversible reaction; does not
b) releases H^+ ions in solution; accepts H^+ ions
c) releases H^+ ions in solution; accepts OH^- ions
d) releases OH^- ions in solution; releases H^+ ions

Answer: b

Difficulty: Medium
Learning Objective: 2.2 Relate the properties of water to the basis of cellular life and describe biochemical processes such as acid/base balance and molarity in aqueous solutions.
Section Reference: 2.2 Water: Life's Most Essential Molecule

Question type: Multiple-Choice

30) Acid rain is a serious environmental problem. A sample of rainwater collected in the Adirondack Mountains had an H^+ concentration of 10^{-4} mol/L. The pH of this sample was _____.

a) 0.0001
b) –4
c) 4
d) 10,000

Answer: c

Difficulty: Medium
Learning Objective: 2.2 Relate the properties of water to the basis of cellular life and describe biochemical processes such as acid/base balance and molarity in aqueous solutions.
Section Reference: 2.2 Water: Life's Most Essential Molecule

Question type: Multiple-Choice

31) If the pH of a solution is increased from pH 5 to pH 7, it means that the concentration of H^+ is _____ than it was at pH 5.

a) 2 times lower
b) 10 times greater
c) 100 times greater
d) 100 times lower

Answer: d

Difficulty: Hard
Learning Objective: 2.2 Relate the properties of water to the basis of cellular life and describe biochemical processes such as acid/base balance and molarity in aqueous solutions.
Section Reference: 2.2 Water: Life's Most Essential Molecule

Question type: Multiple-Choice

32) To minimize the pH change when an acid or base is added to a solution, a _____ is needed.

a) ketone
b) pH indicator
c) isotope
d) buffer

Answer: d

Difficulty: Easy
Learning Objective: 2.2 Relate the properties of water to the basis of cellular life and describe biochemical processes such as acid/base balance and molarity in aqueous solutions.
Section Reference: 2.2 Water: Life's Most Essential Molecule

Question type: Multiple-Choice

33) The pH of pure water is _____.

a) 0
b) 2
c) 7
d) 14

Answer: c

Difficulty: Easy
Learning Objective: 2.2 Relate the properties of water to the basis of cellular life and describe biochemical processes such as acid/base balance and molarity in aqueous solutions.
Section Reference: 2.2 Water: Life's Most Essential Molecule

Question type: Multiple-Selection

34) Which of the following represent ways to increase the molecular diversity of organic molecules? (Select all that apply)

a) varying the length of the carbon skeleton
b) the presence of multiple bonds in the carbon skeleton
c) branching of the carbon skeleton
d) substitution of functional groups for a hydrogen

Answer 1: a
Answer 2: b
Answer 3: c
Answer 4: d

Difficulty: Easy
Learning Objective: 2.3 Relate carbon's atomic structure to biomolecular diversity.
Section Reference: 2.3. Carbon's Key Role in Biochemistry

Question type: Multiple-Choice

35) Which functional group acts as an acid by donating a hydrogen ion to the solution?

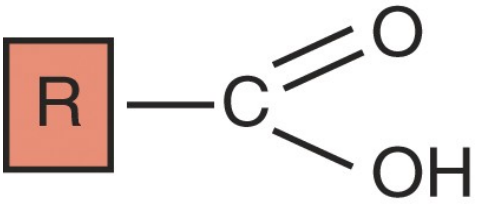
a) Ketone
b) Methyl
c) Carboxyl
d) Hydroxyl

Answer: c

Difficulty: Easy
Learning Objective: 2.3 Relate carbon's atomic structure to biomolecular diversity.
Section Reference: 2.3. Carbon's Key Role in Biochemistry

Question type: Multiple-Choice

36) Identify this functional group.



a) aldehyde
b) thiol
c) carboxyl
d) hydroxyl

Answer: a

Difficulty: Easy
Learning Objective: 2.3 Relate carbon's atomic structure to biomolecular diversity.
Section Reference: 2.3. Carbon's Key Role in Biochemistry

Question type: Multiple-Choice

37) How many covalent bonds can be formed by one carbon atom?

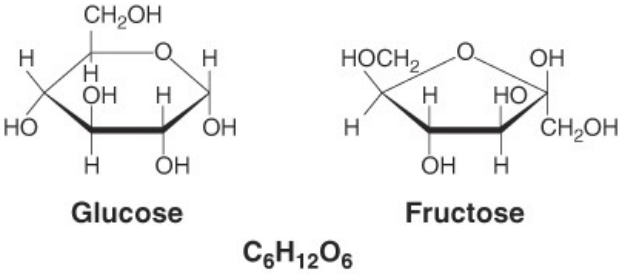
a) 1
b) 2
c) 4
d) 8

Answer: c

Difficulty: Easy
Learning Objective: 2.3 Relate carbon's atomic structure to biomolecular diversity.
Section Reference: 2.3. Carbon's Key Role in Biochemistry

Question type: Multiple-Selection

38) Glucose and fructose represent _____ isomers. (Select all that apply)



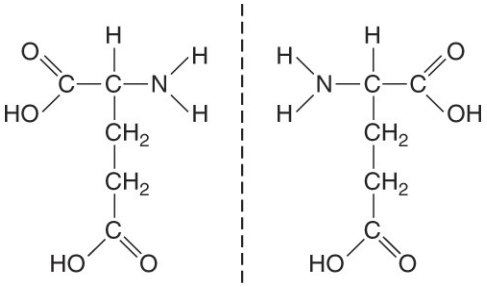
a) structural
b) optical
c) enantiomer
d) radioactive

Answer 1: a

Difficulty: Easy
Learning Objective: 2.3 Relate carbon's atomic structure to biomolecular diversity.
Section Reference: 2.3. Carbon's Key Role in Biochemistry

Question type: Multiple-Selection

39) The figure below illustrates _____ isomers. (Select all that apply)



a) structural
b) optical
c) enantiomer
d) radioactive

Answer 1: b
Answer 2: c

Difficulty: Medium

Learning Objective: 2.3 Relate carbon's atomic structure to biomolecular diversity.
Section Reference: 2.3. Carbon's Key Role in Biochemistry

Question type: Multiple-Choice

40) What is the chemical mechanism by which cells degrade polymers into monomers?

a) Ionic monomer bonding
b) Dehydration synthesis
c) Hydrolysis
d) Polymerization

Answer: c

Difficulty: Medium
Learning Objective: 2.3 Relate carbon's atomic structure to biomolecular diversity.
Section Reference: 2.3. Carbon's Key Role in Biochemistry

Question type: Multiple-Choice

41) What process does a cell use to recycle monomers?

a) Ionic monomer bonding
b) Dehydration synthesis
c) Hydrolysis
d) Polymerization

Answer: c

Difficulty: Medium
Learning Objective: 2.3 Relate carbon's atomic structure to biomolecular diversity.
Section Reference: 2.3. Carbon's Key Role in Biochemistry