Biological Science, 3rd Canadian Edition **(Freeman et al.)**
Chapter 2 Water and Carbon: The Chemical Basis of Life

1) How many electrons are involved in a single covalent bond?
A) one
B) two
C) three
D) four
Answer: B
Type: MC
Reference: Section 2.1
Bloom's Taxonomy: Remembering
LO: 2-1. Describe how and why atoms interact to form molecules. Sketch examples of how electron pairs are shared in nonpolar covalent bonds, polar covalent bonds, and ionic bonds.

2) How many electrons are involved in a double covalent bond?
A) one
B) two
C) three
D) four
Answer: D
Type: MC
Reference: Section 2.1
Bloom's Taxonomy: Remembering
LO: 2-1. Describe how and why atoms interact to form molecules. Sketch examples of how electron pairs are shared in nonpolar covalent bonds, polar covalent bonds, and ionic bonds.

3) How many electrons are involved in a triple covalent bond?
A) two
B) three
C) six
D) nine
Answer: C
Type: MC
Reference: Section 2.1
Bloom's Taxonomy: Remembering
LO: 2-1. Describe how and why atoms interact to form molecules. Sketch examples of how electron pairs are shared in nonpolar covalent bonds, polar covalent bonds, and ionic bonds.

4) If an atom has a charge of +1, which of the following must be true?
A) It has two more protons than neutrons.
B) It has the same number of protons as electrons.
C) It has one more electron than it has protons.
D) It has one more proton than it has electrons.
Answer: D
Type: MC
Reference: Section 2.1
Bloom's Taxonomy: Comprehension
LO: 2-1. Describe how and why atoms interact to form molecules. Sketch examples of how electron pairs are shared in nonpolar covalent bonds, polar covalent bonds, and ionic bonds.

5) If an atom has a charge of -2, which of the following must be true?
A) It has two more electrons than protons.
B) It has two more protons than electrons.
C) It has two more protons than neutrons.
D) It has two more neutrons than electrons.
Answer: A
Type: MC
Reference: Section 2.1
Bloom's Taxonomy: Comprehension
LO: 2-1. Describe how and why atoms interact to form molecules. Sketch examples of how electron pairs are shared in nonpolar covalent bonds, polar covalent bonds, and ionic bonds.

6) If an atom is electrically neutral, which of the following must be true?
A) It has the same number of protons as neutrons.
B) It has the same number of protons as electrons.
C) It has the same number of neutrons as electrons.
D) It has at least one more electron than it has protons.
Answer: B
Type: MC
Reference: Section 2.1
Bloom's Taxonomy: Comprehension
LO: 2-1. Describe how and why atoms interact to form molecules. Sketch examples of how electron pairs are shared in nonpolar covalent bonds, polar covalent bonds, and ionic bonds.

7) An atom has six electrons in its valence shell. How many single covalent bonds would you expect it to form in most circumstances?
A) one
B) two
C) three
D) six
Answer: B
Type: MC
Reference: Section 2.1
Bloom's Taxonomy: Comprehension
LO: 2-1. Describe how and why atoms interact to form molecules. Sketch examples of how electron pairs are shared in nonpolar covalent bonds, polar covalent bonds, and ionic bonds.

8) An atom has four electrons in its valence shell. What types of covalent bonds is it capable of forming?
A) single, double, or triple
B) single and double only
C) four single bonds only
D) two double bonds only
Answer: A
Type: MC
Reference: Section 2.1
Bloom's Taxonomy: Comprehension
LO: 2-1. Describe how and why atoms interact to form molecules. Sketch examples of how electron pairs are shared in nonpolar covalent bonds, polar covalent bonds, and ionic bonds.

9) When are atoms most stable?
A) when they have the fewest possible valence electrons
B) when they have the maximum number of unpaired electrons
C) when all of the electron orbitals in the valence shell are filled
D) when all electrons are paired
Answer: C
Type: MC
Reference: Section 2.1
Bloom's Taxonomy: Remembering
LO: 2-1. Describe how and why atoms interact to form molecules. Sketch examples of how electron pairs are shared in nonpolar covalent bonds, polar covalent bonds, and ionic bonds.

10) What holds electrons in a covalent bond?
A) It is the fact that two electrons are paired in the same orbital.
B) The electron sharing that occurs makes the atoms involved smaller and more compact.
C) An increase in potential energy, caused by electrical repulsion of the electrons in the bond, holds the electrons.
D) The negative charges on the electrons are attracted by the positive charges on both nuclei.
Answer: D
Type: MC
Reference: Section 2.1
Bloom's Taxonomy: Remembering
LO: 2-1. Describe how and why atoms interact to form molecules. Sketch examples of how electron pairs are shared in nonpolar covalent bonds, polar covalent bonds, and ionic bonds.

11) How can you determine the approximate mass of an atom in atomic mass units?
A) Add up the number of protons, electrons, and neutrons.
B) Add up the number of protons and neutrons.
C) Add up the number of protons and electrons.
D) Take the number of protons minus the number of electrons.
Answer: B
Type: MC
Reference: Section 2.1
Bloom's Taxonomy: Remembering
LO: 2-1. Describe how and why atoms interact to form molecules. Sketch examples of how electron pairs are shared in nonpolar covalent bonds, polar covalent bonds, and ionic bonds.

12) When one of the atoms involved in a covalent bond has a much higher electronegativity than the other atom, what type of bond results?
A) a double bond
B) a hydrogen bond
C) a nonpolar covalent bond
D) a polar covalent bond
Answer: D
Type: MC
Reference: Section 2.1
Bloom's Taxonomy: Remembering
LO: 2-1. Describe how and why atoms interact to form molecules. Sketch examples of how electron pairs are shared in nonpolar covalent bonds, polar covalent bonds, and ionic bonds.

13) When the atoms involved in a covalent bond have the same electronegativity, what type of bond results?
A) an ionic bond
B) a hydrogen bond
C) a nonpolar covalent bond
D) a polar covalent bond
Answer: C
Type: MC
Reference: Section 2.1
Bloom's Taxonomy: Remembering
LO: 2-1. Describe how and why atoms interact to form molecules. Sketch examples of how electron pairs are shared in nonpolar covalent bonds, polar covalent bonds, and ionic bonds.

14) The difference between a polar covalent bond and an ionic bond is that electrons are shared unequally in a polar covalent bond, but are completely transferred (i.e., not shared) in an ionic bond.
A) true
B) false
Answer: A
Explanation: This would be a good classroom discussion question to drive home this important but subtle point.
Type: MC
Reference: Section 2.1
Bloom's Taxonomy: Remembering
LO: 2-1. Describe how and why atoms interact to form molecules. Sketch examples of how electron pairs are shared in nonpolar covalent bonds, polar covalent bonds, and ionic bonds.

15) Nitrogen (N) normally forms only three covalent bonds because it has a valence of five. However, ammonium has four covalent bonds, each to a different hydrogen (H) atom (H has a valence of one). Make a sketch of this molecule. Count the number of electrons in your sketch. Compare this number to the number of valence electrons in one N and four H's. What is the charge on this molecule most likely to be?
A) +1
B) -1
C) +2
D) -2
Answer: A
Type: MC
Reference: Section 2.1
Bloom's Taxonomy: Applying
LO: 2-1. Describe how and why atoms interact to form molecules. Sketch examples of how electron pairs are shared in nonpolar covalent bonds, polar covalent bonds, and ionic bonds.

16) The structural formula for a certain molecule includes a group symbolized -O. The dash next to the oxygen atom means that a single bond exists to another atom, such as a carbon. Based on the valence of oxygen and the number of bonds it normally forms, what is the charge on the oxygen atom in this case?
A) +1
B) -1
C) +2
D) -2
Answer: B
Explanation: This question is rather difficult, and easy to misinterpret. Instructors should use it as an exam question only if they have emphasized this concept in class. Otherwise, it would make an excellent in-class question to promote discussion on why certain atoms in molecules have a charge and others do not.
Type: MC
Reference: Section 2.1
Bloom's Taxonomy: Applying
LO: 2-1. Describe how and why atoms interact to form molecules. Sketch examples of how electron pairs are shared in nonpolar covalent bonds, polar covalent bonds, and ionic bonds.

17) You need to write down information about a molecule, but need to indicate only which atoms it contains and how many of each. Which representation would work best?
A) molecular formula
B) structural formula
C) ball-and-stick model
D) space-filling model
Answer: A
Type: MC
Reference: Section 2.1
Bloom's Taxonomy: Remembering
LO: 2-1. Describe how and why atoms interact to form molecules. Sketch examples of how electron pairs are shared in nonpolar covalent bonds, polar covalent bonds, and ionic bonds.

18) You need to write down information about a molecule that gives the most accurate picture of the relative sizes of the atoms involved and their relationship in space. Which representation would work best?
A) molecular formula
B) structural formula
C) ball-and-stick model
D) space-filling model
Answer: D
Explanation: In-class discussion could be accompanied by pictures of ball-and-stick and space-filling models to stress the advantages of space-filling models.
Type: MC
Reference: Section 2.1
Bloom's Taxonomy: Remembering
LO: 2-1. Describe how and why atoms interact to form molecules. Sketch examples of how electron pairs are shared in nonpolar covalent bonds, polar covalent bonds, and ionic bonds.

19) There are four elements that make up 95% of all matter found in organisms. Which of the following is not one of these?
A) nitrogen
B) calcium
C) hydrogen
D) oxygen
Answer: B
Type: MC
Reference: Section 2.1
Bloom's Taxonomy: Remembering
LO: 2-1. Describe how and why atoms interact to form molecules. Sketch examples of how electron pairs are shared in nonpolar covalent bonds, polar covalent bonds, and ionic bonds.

20) Why is water capable of forming hydrogen bonds?
A) The hydrogen atoms carry partial positive charges.
B) The oxygen atom carries a partial negative charge.
C) It is highly polar.
D) All of the above apply.
Answer: D
Type: MC
Reference: Section 2.2
Bloom's Taxonomy: Remembering
LO: 2-2. List the unique properties of water. Explain how these properties relate to the structure of water molecules.

21) Why is water such a good solvent?
A) Most polar and charged substances dissolve in it.
B) It is highly polar.
C) It can participate in hydrogen bonds.
D) All of the above apply.
Answer: D
Type: MC
Reference: Section 2.2
Bloom's Taxonomy: Remembering
LO: 2-2. List the unique properties of water. Explain how these properties relate to the structure of water molecules.

22) Water molecules are able to form hydrogen bonds with which of the following?
A) compounds that are not soluble in water
B) compounds that have nonpolar covalent bonds
C) oxygen gas (O_2) molecules
D) methane gas (CH_4) molecules
E) compounds that have polar covalent bonds
Answer: E
Type: MC
Reference: Section 2.2
Bloom's Taxonomy: Applying
LO: 2-2. List the unique properties of water. Explain how these properties relate to the structure of water molecules.

23) Which of the following effects is produced by the high surface tension of water?
A) Lakes don't freeze solid in winter despite low temperatures.
B) A water strider can walk across the surface of a small pond.
C) Organisms resist temperature changes, although they give off heat due to chemical reactions.
D) Evaporation of sweat from the skin helps to keep people from overheating.
E) Water flows upward from the roots to the leaves in plants.
Answer: B
Type: MC
Reference: Section 2.2
Bloom's Taxonomy: Applying
LO: 2-3. Explain how the structure of water explains its biologically important properties.

24) Which of the following unique properties of water is responsible for explaining how water can move from the roots of plants to their leaves against gravity?
A) Water is an excellent solvent.
B) Water is cohesive.
C) Water is denser as a liquid than a solid.
D) Water spontaneously dissociates into hydrogen ions and hydroxide ions.
E) Water can dissociate into H^+ and OH^-.
Answer: B
Type: MC
Reference: Section 2.2
Bloom's Taxonomy: Applying
LO: 2-3. Explain how the structure of water explains its biologically important properties.

25) The cities of Portland, Oregon, and Minneapolis, Minnesota, are at about the same latitude, but Minneapolis has much hotter summers and much colder winters than Portland. Why? (Portland is near the Pacific Ocean; Minneapolis is near a number of large lakes.)
A) They are not at exactly the same latitude.
B) The ocean is so large that it has a highly moderating influence on temperature.
C) Freshwater is more likely to freeze than saltwater.
D) Minneapolis is much windier, due to its location in the middle of a continent.
Answer: B
Type: MC
Reference: Section 2.2
Bloom's Taxonomy: Comprehension
LO: 2-2. List the unique properties of water. Explain how these properties relate to the structure of water molecules.

26) The slight negative charge at one end of one water molecule is attracted to the slight positive charge of another water molecule. What is this attraction called?
A) a covalent bond
B) a hydrogen bond
C) an ionic bond
D) a hydrophilic bond
E) a van der Waals interaction
Answer: B
Type: MC
Reference: Section 2.2
Bloom's Taxonomy: Knowledge/Comprehension
LO: 2-2. List the unique properties of water. Explain how these properties relate to the structure of water molecules.

27) In a single molecule of water, two hydrogen atoms are bonded to a single oxygen atom by what type of bond or interaction?
A) hydrogen bonds
B) nonpolar covalent bonds
C) polar covalent bonds
D) ionic bonds
E) van der Waals interaction
Answer: C
Type: MC
Reference: Section 2.2
Bloom's Taxonomy: Knowledge/Comprehension
LO: 2-1. Describe how and why atoms interact to form molecules. Sketch examples of how electron pairs are shared in nonpolar covalent bonds, polar covalent bonds, and ionic bonds.

28) While water has many exceptional and useful properties, which is the rarest property among compounds?
A) Water is a solvent.
B) Solid water is less dense than liquid water.
C) Water has a high heat capacity.
D) Water has surface tension.
Answer: B
Explanation: This question appears simple, and is. But the biological importance of bodies of water freezing from the top down, and cells rupturing from inside out due to water freezing, are important and worth noting now.
Type: MC
Reference: Section 2.2
Bloom's Taxonomy: Remembering
LO: 2-2. List the unique properties of water. Explain how these properties relate to the structure of water molecules.

29) A pH of 7 is neutral due to the dissociation of water molecules in pure water. How many molecules of water have broken down into a hydroxide ion and a hydronium ion at pH 7?
A) 1 in 1 million
B) 1 in 10 million
C) 1 in 100 million
D) 1 in 1 billion
Answer: B
Explanation: No other questions on pH, this questions makes student recast the information in different units
Type: MC
Reference: Section 2.2
Bloom's Taxonomy: Comprehension
LO: 2-2. List the unique properties of water. Explain how these properties relate to the structure of water molecules.

30) A solution with a pH of 5 has how many more protons in it than a solution with a pH of 7?
A) 5 times
B) 10 times
C) 100 times
D) 1,000 times
Answer: C
Explanation: Introduces log nature of pH scale
Type: MC
Reference: Section 2.2
Bloom's Taxonomy: Comprehension
LO: 2-2. List the unique properties of water. Explain how these properties relate to the structure of water molecules.

31) Consider the following reaction at equilibrium: $CO_2 + H_2O \leftrightarrow H_2CO_3$. What would be the effect of adding additional H_2CO_3?
A) It would drive the equilibrium dynamics to the right.
B) It would drive the equilibrium dynamics to the left.
C) Nothing would happen, because the reactants and products are in equilibrium.
D) The amounts of CO_2 and H_2O would decrease.
Answer: B
Explanation: This would be a good question to stimulate discussion on equilibrium and starting dynamics, ratios, and absolute quantities.
Type: MC
Reference: Section 2.3
Bloom's Taxonomy: Comprehension
LO: 2-2. List the unique properties of water. Explain how these properties relate to the structure of water molecules.

32) Which of the following is a violation of the first law of thermodynamics?
A) The amount of energy stored in a plant's cell as sugars after undergoing photosynthesis is less than the amount of sunlight it absorbed.
B) A hydrogen bomb can destroy a large city with only a few pounds of explosive material.
C) All of the energy in the universe today was present when the Big Bang occurred.
D) The universe will eventually die, and it will have no energy left in it.
Answer: D
Explanation: This question could generate a lot of classroom discussion.
Type: MC
Reference: Section 2.3
Bloom's Taxonomy: Comprehension
LO: 2-4. Define energy, and describe the major forms it can take. Explain why chemical bonds can be considered a form of potential energy.

33) Which reaction is most spontaneous?
A) a reaction that is slightly exothermic and leads to a slight increase in entropy
B) a reaction that is slightly endothermic and leads to a huge decrease in entropy
C) a reaction that is highly exothermic and leads to a huge decrease in entropy
D) a reaction that is slightly exothermic and leads to a huge increase in entropy
Answer: D
Explanation: This would be a good Classroom Response System (CRS) question. Wrong answers on this question can be very instructive.
Type: MC
Reference: Section 2.3
Bloom's Taxonomy: Comprehension/Remembering
LO: 2-4. Define energy, and describe the major forms it can take. Explain why chemical bonds can be considered a form of potential energy.

34) Why are some reactions exothermic?
A) The products have lower potential energy than the reactants.
B) They are spontaneous.
C) They are nonspontaneous.
D) The products have higher entropy (are more disordered) than the reactants.
Answer: A
Type: MC
Reference: Section 2.3
Bloom's Taxonomy: Remembering
LO: 2-4. Define energy, and describe the major forms it can take. Explain why chemical bonds can be considered a form of potential energy.

35) Ice melts spontaneously at room temperature, even though the process is endothermic. How is this possible?
A) ΔH is small, so melting still obeys the second law of thermodynamics.
B) The Gibbs free-energy relationship does not apply to phase changes such as melting.
C) There is an increase in free energy when ice melts.
D) There is a large increase in entropy.
Answer: D
Type: MC
Reference: Section 2.3
Bloom's Taxonomy: Remembering
LO: 2-4. Define energy, and describe the major forms it can take. Explain why chemical bonds can be considered a form of potential energy.

36) What does it mean to say a system has a ΔG equal to zero?
A) The system does not release or absorb heat.
B) The system is perfectly ordered (no entropy).
C) The total amount of potential energy in the system is zero.
D) The system is at equilibrium.
Answer: D
Type: MC
Reference: Section 2.3
Bloom's Taxonomy: Remembering
LO: 2-4. Define energy, and describe the major forms it can take. Explain why chemical bonds can be considered a form of potential energy.

37) In the Gibbs free-energy relationship, why is the T term necessary?
A) The free-energy change caused by a change in entropy is a function of temperature.
B) The free-energy change caused by a change in potential energy is a function of temperature.
C) The free-energy change caused by a change in electrical charge is a function of temperature.
Answer: A
Type: MC
Reference: Section 2.3
Bloom's Taxonomy: Remembering
LO: 2-4. Define energy, and describe the major forms it can take. Explain why chemical bonds can be considered a form of potential energy.

38) Which statement best summarizes the essence of chemical evolution?
A) Energy in the form of sunlight or heat was transformed into chemical energy.
B) Instead of being radiated back to space, energy in the form of sunlight or heat was retained in the oceans and atmosphere.
C) Entropy increased.
D) An increasing number of exothermic reactions occurred.
Answer: A
Type: MC
Reference: Section 2.3
Bloom's Taxonomy: Remembering
LO: 2-5. Explain in simple terms how changes in entropy and potential energy determine whether or not a reaction is spontaneous.

39) Why do chemical reactions tend to speed up when the reactants are heated?
A) The reactants move faster.
B) The reactants collide more often.
C) The reactants have greater energy.
D) All of the above apply.
Answer: D
Type: MC
Reference: Section 2.3
Bloom's Taxonomy: Remembering
LO: 2-5. Explain in simple terms how changes in entropy and potential energy determine whether or not a reaction is spontaneous.

40) Why do chemical reactions tend to speed up when the concentration of the reactants is increased?
A) The reactants move faster.
B) The reactants collide more often.
C) The reactants have greater energy.
D) All of the above apply.
Answer: B
Type: MC
Reference: Section 2.3
Bloom's Taxonomy: Remembering
LO: 2-5. Explain in simple terms how changes in entropy and potential energy determine whether or not a reaction is spontaneous.

41) During chemical evolution, which of the following occurred in the molecules involved?
A) Entropy decreased while potential energy increased.
B) Entropy increased while potential energy increased.
C) Entropy stayed constant while potential energy increased.
Answer: A
Type: MC
Reference: Section 2.3
Bloom's Taxonomy: Remembering
LO: 2-5. Explain in simple terms how changes in entropy and potential energy determine whether or not a reaction is spontaneous.

42) Chemical evolution refers to which of the following?
A) Large molecules tended to break apart because of the intense sunlight and heat from volcanoes.
B) Water condensed to form the first oceans.
C) Small molecules reacted to form larger, more complex molecules.
D) Earth's crust solidified, even as massive bombardment from outer space continued.
Answer: C
Type: MC
Reference: Section 2.3
Bloom's Taxonomy: Remembering
LO: 2-5. Explain in simple terms how changes in entropy and potential energy determine whether or not a reaction is spontaneous.

43) You've been asked to analyze a reaction that took place at 300°K. ΔH was -150 and ΔS was +0.4. Is the reaction endothermic or exothermic?
A) endothermic
B) exothermic
C) You cannot tell unless you know the potential energy of the reactants and products.
D) You cannot tell unless you know the amount of disorder in the reactants and products.
Answer: B
Type: MC
Reference: Section 2.3
Bloom's Taxonomy: Comprehension
LO: 2-5. Explain in simple terms how changes in entropy and potential energy determine whether or not a reaction is spontaneous.

44) The Q10 rule states that, within their survivable range, the rates of biochemical processes of many ectothermic organisms approximately double with every 10-degree (C) rise in temperature. Why would this be true?
A) Warmer molecules interact faster.
B) There are more vibrational harmonics with greater temperature.
C) Organisms move faster when they are warmer.
D) Sunlight warms all organisms.
Answer: A
Type: MC
Reference: Section 2.3
Bloom's Taxonomy: Comprehension
LO: 2-5. Explain in simple terms how changes in entropy and potential energy determine whether or not a reaction is spontaneous.

45) Why would the spontaneous formation of formaldehyde and hydrogen cyanide not take place on Earth today as much as on the prebiotic Earth?
A) Microorganisms break these down immediately.
B) The sun has changed its output.
C) Atmospheric conditions on Earth, such as the presence of oxygen, have changed.
Answer: C
Type: MC
Reference: Section 2.3
Bloom's Taxonomy: Remembering
LO: 2-5. Explain in simple terms how changes in entropy and potential energy determine whether or not a reaction is spontaneous.

46) The first chemicals that provided potential energy on Earth may have been formaldehyde and hydrogen cyanide. While these were produced by sunlight-driven reactions, they also occur around deep-sea vents. If the first organisms on Earth evolved around these vents, the first life on Earth was
A) photosynthetic and obtained energy from the sun.
B) chemosynthetic and obtained energy from chemicals.
C) herbivorous and obtained energy from plants.
D) carnivorous and obtained energy from animals.
Answer: B
Type: MC
Reference: Section 2.3
Bloom's Taxonomy: Remembering
LO: 2-5. Explain in simple terms how changes in entropy and potential energy determine whether or not a reaction is spontaneous.

47) Experiments by Stanley Miller in the 1950s demonstrated that the first organic molecules on Earth
A) were nucleic acids such as RNA and DNA.
B) most likely formed in an extraterrestrial environment and were deposited on Earth via asteroids.
C) could have formed abiotically in a reducing atmosphere containing hydrogen, methane, ammonia, and water vapour.
D) were catalysts composed of simple amino acids and most likely formed in an extraterrestrial environment and were deposited on Earth via asteroids.
E) were simple carbohydrates like glucose.
Answer: C
Type: MC
Reference: Section 2.4
Bloom's Taxonomy: Knowledge/Comprehension
LO: 2-6. Describe the current models for chemical evolution on the early Earth.

48) Which of the following models is described by the idea that dissolved gases came in contact with minerals lining the walls of deep-sea vents and formed more complex organic molecules?
A) the surface metabolism model
B) the prebiotic soup model
C) the extraterrestrial model
D) the atmospheric model
Answer: A
Type: MC
Reference: Section 2.4
Bloom's Taxonomy: Knowledge/Comprehension
LO: 2-6. Describe the current models for chemical evolution on the early Earth.

49) Consider the experiment that Stanley Miller did to simulate chemical evolution. Recall that a glass flask held the reduced gases NH_3, CH_4, and H_2 and that the gases were exposed to electrical sparks. What is the null hypothesis in the experiment?
A) Chemical evolution does not occur.
B) Chemical evolution requires the presence of reduced molecules.
C) Chemical evolution requires continuous heating.
D) Chemical evolution requires a source of kinetic energy.
E) Chemical evolution occurs only on Earth.
Answer: A
Type: MC
Reference: Section 2.4
Bloom's Taxonomy: Knowledge/Comprehension
LO: 2-6. Describe the current models for chemical evolution on the early Earth.

50) Which of the following tends to make chemical reactions spontaneous?
A) The reactants have lower potential energy than the products.
B) The reactants are more ordered than the products.
C) The temperature is low.
D) The pressure is low.
Answer: B
Type: MC
Reference: Section 2.5
Bloom's Taxonomy: Remembering
LO: 2-5. Explain in simple terms how changes in entropy and potential energy determine whether or not a reaction is spontaneous.

51) Why is carbon so important in biology?
A) It is a common element on Earth.
B) It has very little electronegativity, making it a good electron donor.
C) It bonds to only a few other elements.
D) It forms up to four covalent bonds.
Answer: D
Type: MC
Reference: Section 2.5
Bloom's Taxonomy: Remembering
LO: 2-7. Know why carbon is a key element for life. List the six major functional groups, their structural formulas, and their basic characteristics.

52) Carbon is an important element for biology because
A) of the variety of carbon skeletons and functional groups that can be built on them.
B) it has very high electronegativity and forms highly stable bonds.
C) carbon is so rare, organisms conserve it highly.
D) it has the ability to form six covalent bonds.
Answer: A
Type: MC
Reference: Section 2.5
Bloom's Taxonomy: Remembering
LO: 2-7. Know why carbon is a key element for life. List the six major functional groups, their structural formulas, and their basic characteristics.

53) How many times can humans be sure the switch from nonlife to life has happened in the universe?
A) once
B) twice
C) four times
D) 42 times
Answer: A
Type: MC
Reference: Section 2.5
Bloom's Taxonomy: Remembering
LO: 2-7. Know why carbon is a key element for life. List the six major functional groups, their structural formulas, and their basic characteristics.

54) Many scientific probes sent to other parts of the solar system are looking for signs of something so far known to exist only on Earth, namely
A) carbon.
B) gold.
C) nitrogen.
D) life.
Answer: D
Type: MC
Reference: Section 2.5
Bloom's Taxonomy: Remembering
LO: 2-7. Know why carbon is a key element for life. List the six major functional groups, their structural formulas, and their basic characteristics.