# Texas A&M University (TAMU) BIOL111 Introductory Biology I Exam 1 Practice Exam (Sample)

Study Guide


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# Questions

1. What occurs in a polar covalent bond?

   A. Electrons are evenly distributed

   B. Electrons are attracted to the more electronegative atom

   C. Electrons are completely transferred

   D. Electrons move freely between all atoms

2. What distinguishes a covalent bond from an ionic bond?

   A. A covalent bond involves the transfer of electrons, while an ionic bond involves sharing

   B. A covalent bond involves the sharing of electron pairs, while an ionic bond involves the transfer of electrons

   C. Both involve sharing electrons

   D. Both involve the transfer of protons

3. What is the primary function of the plasma membrane?

   A. To generate energy

   B. To regulate movement of substances

   C. To store genetic information

   D. To synthesize proteins

4. What type of bond is characterized by the equal sharing of electrons?

   A. Covalent bond

   B. Ionic bond

   C. Non-polar covalent bond

   D. Polar covalent bond

5. What are lipids primarily known for?

   A. Being diverse polymers

   B. Being energy-rich organic compounds

   C. Consisting mainly of amino acids

   D. Forms structural polysaccharides

6. What term describes substances that are water-fearing?

A. Hydrophilic

B. Hydrophobic

C. Amphipathic

D. Aqueous

7. What role do adhesive forces play in capillary action?

A. They decrease the height of the liquid column

B. They help liquid molecules stick to each other

C. They allow liquid molecules to cling to vessel walls

D. They prevent liquid from moving at all

8. How do you calculate the number of neutrons in an atom?

A. Atomic mass + atomic number

B. Atomic mass - atomic number

C. Atomic number + electrons

D. Electrons - atomic number

9. What time period did the naturalist Lamarck live in?

A. 1600-1700

B. 1700-1800

C. 1800-1900

D. 1900-2000

10. What is the primary function of a catalyst in a chemical reaction?

A. Increases the rate of reaction

B. Reduces the energy of activation

C. Produces more products

D. Changes the equilibrium constant

# Answers

1. B
2. B
3. B
4. C
5. B
6. B
7. C
8. B
9. B
10. A

# Explanations

1. What occurs in a polar covalent bond?

A. Electrons are evenly distributed

B. Electrons are attracted to the more electronegative atom

C. Electrons are completely transferred

D. Electrons move freely between all atoms

In a polar covalent bond, electrons are not shared equally between the atoms involved due to a difference in their electronegativities. Electronegativity is a measure of the tendency of an atom to attract electrons towards itself. In the case of a polar covalent bond, one atom is more electronegative than the other, which means it has a stronger attraction for the bonding electrons. As a result, these electrons spend more time closer to the more electronegative atom, leading to an unequal distribution of electron density. This unequal sharing creates a dipole, where one end of the bond becomes partially negative (the more electronegative atom) and the other end becomes partially positive (the less electronegative atom). This property is essential for understanding many biological processes, including hydrogen bonding and the behavior of water as a solvent, which plays a critical role in life. The other answer choices do not accurately describe polar covalent bonds, as they suggest either equal sharing or different forms of electron movement that don't apply to polar covalent interactions.

2. What distinguishes a covalent bond from an ionic bond?

A. A covalent bond involves the transfer of electrons, while an ionic bond involves sharing

B. A covalent bond involves the sharing of electron pairs, while an ionic bond involves the transfer of electrons

C. Both involve sharing electrons

D. Both involve the transfer of protons

A covalent bond is characterized by the sharing of electron pairs between atoms, allowing them to achieve more stable electron configurations. This typically occurs between nonmetals with similar electronegativities, where neither atom has sufficient strength to completely remove an electron from the other. Instead, they share electrons, forming a stable bond as they both benefit from the shared electrons. On the other hand, an ionic bond arises from the transfer of electrons from one atom to another, typically between a metal and a nonmetal. In this type of bond, one atom (usually a metal) donates one or more electrons, becoming positively charged, while the other atom (usually a nonmetal) accepts those electrons, becoming negatively charged. The resulting electrostatic attraction between these oppositely charged ions forms the ionic bond. This distinction between the sharing of electrons in covalent bonds and the transfer of electrons in ionic bonds is crucial in understanding how different types of compounds are formed and how they behave chemically.

3. What is the primary function of the plasma membrane?

A. To generate energy

B. To regulate movement of substances

C. To store genetic information

D. To synthesize proteins

The primary function of the plasma membrane is to regulate the movement of substances into and out of the cell. The plasma membrane is a selectively permeable barrier that allows certain molecules to pass while keeping others out, ensuring that essential nutrients are absorbed and waste products are expelled. This selective permeability is crucial for maintaining homeostasis within the cell. The composition of the plasma membrane, primarily consisting of a phospholipid bilayer with embedded proteins, facilitates various transport mechanisms, including passive transport (like diffusion) and active transport, which require energy. The proteins in the membrane serve as channels or carriers that help transport specific substances according to the cell's needs. Understanding the role of the plasma membrane in regulating substance movement highlights its importance in cellular functions and overall cellular health, aligning perfectly with the question's focus.

4. What type of bond is characterized by the equal sharing of electrons?

A. Covalent bond

B. Ionic bond

C. Non-polar covalent bond

D. Polar covalent bond

The correct answer pertains to the type of bond that involves the equal sharing of electrons, which is specifically the non-polar covalent bond. In a non-polar covalent bond, two atoms with similar electronegativities share electrons equally, leading to a balanced distribution of charge across the molecule. This equal sharing occurs because neither atom exerts a stronger pull on the shared electrons, resulting in no significant charge separation. To provide context, covalent bonds in general can involve unequal sharing of electrons, leading to different types such as polar and non-polar bonds. In a polar covalent bond, one atom has a higher electronegativity and attracts the shared electrons more strongly, resulting in a slight charge difference within the molecule. Conversely, an ionic bond involves the complete transfer of electrons from one atom to another, leading to the formation of charged ions rather than shared electron pairs. Understanding these distinctions helps clarify why non-polar covalent bonds are characterized by equal sharing, while polar bonds and ionic bonds are distinctly different in their electron interactions.

5. What are lipids primarily known for?

A. Being diverse polymers

B. Being energy-rich organic compounds

C. Consisting mainly of amino acids

D. Forms structural polysaccharides

Lipids are primarily known for being energy-rich organic compounds. This is due to their high energy content, which comes from their long hydrocarbon chains. When metabolized, lipids provide a significant amount of energy—more than carbohydrates or proteins—making them a vital component of cellular energy reserves. Additionally, many lipids, such as triglycerides, act as stored forms of energy in organisms. When the body requires energy, triglycerides can be broken down into glycerol and fatty acids, which can then be converted into energy through various metabolic pathways. The other options relate to different biological macromolecules. Polymers typically refer to macromolecules like proteins and nucleic acids, where repeated subunits form complex structures. Amino acids are the building blocks of proteins, not lipids. Structural polysaccharides, like cellulose and chitin, are carbohydrate-based compounds rather than lipids. Therefore, the unique characteristic of lipids being energy-rich organic compounds sets them apart in biological systems.

6. What term describes substances that are water-fearing?

A. Hydrophilic

B. Hydrophobic

C. Amphipathic

D. Aqueous

The term that describes substances that are water-fearing is "hydrophobic." Hydrophobic substances do not interact well with water and tend to be nonpolar or neutral in nature. This characteristic is due to the lack of polar functional groups that can form hydrogen bonds with water molecules. As a result, hydrophobic substances are often found to aggregate in aqueous environments rather than disperse throughout, which can influence various biological processes, such as the formation of cell membranes. For instance, lipids, which are primarily hydrophobic, form bilayers that create a barrier in cellular structures, keeping the interior of cells separate from their external environment. Understanding hydrophobicity is crucial when studying how molecules behave in biological contexts, particularly in the interactions between different types of molecules and the importance of water as a solvent in biological systems.

7. What role do adhesive forces play in capillary action?

A. They decrease the height of the liquid column

B. They help liquid molecules stick to each other

C. They allow liquid molecules to cling to vessel walls

D. They prevent liquid from moving at all

Adhesive forces are crucial in capillary action because they enable liquid molecules to adhere to the surfaces of the vessel walls. When a liquid, such as water, is placed in a narrow tube or porous material, adhesive forces between the liquid molecules and the molecules of the tube cause the liquid to climb up against gravity. This interaction is essential for processes like the movement of water and nutrients in plants, where water moves upwards from the roots to the leaves through tiny vascular channels. In contexts where adhesive forces are strong compared to cohesive forces (the attraction between liquid molecules), the liquid will rise in the tube until the gravitational force counteracts the adhesive forces. This phenomenon exemplifies the importance of adhesive forces in enabling liquid behavior in narrow spaces, which is fundamental in biological systems and various practical applications.

8. How do you calculate the number of neutrons in an atom?

A. Atomic mass + atomic number

B. Atomic mass - atomic number

C. Atomic number + electrons

D. Electrons - atomic number

To calculate the number of neutrons in an atom, you subtract the atomic number from the atomic mass. The atomic mass of an atom, typically represented as a whole number, reflects the total number of protons and neutrons in the nucleus. The atomic number, on the other hand, indicates the number of protons. Since neutrons are the particles in the nucleus that contribute to the atomic mass but are not counted in the atomic number, performing the subtraction allows you to isolate the number of neutrons. For example, if an atom has an atomic mass of 12 and an atomic number of 6, you would calculate the number of neutrons like this: 12 (atomic mass) - 6 (atomic number) = 6, indicating there are 6 neutrons in the nucleus. This method is fundamental in understanding atomic structure, as it helps to differentiate between protons, neutrons, and electrons, further aiding in predicting the behavior and characteristics of the element in chemical reactions.

9. What time period did the naturalist Lamarck live in?

A. 1600-1700

B. 1700-1800

C. 1800-1900

D. 1900-2000

Jean-Baptiste Lamarck was an important figure in the early development of evolutionary biology. He lived during the 18th and early 19th centuries, specifically from August 1, 1744, until December 18, 1829. This places his life predominantly in the 1700s, with his most influential work occurring in the late 1700s and early 1800s. Choosing the time period from 1700-1800 accurately encompasses Lamarck's life and contributions to science, including his ideas about inheritance and adaptation that preceded Darwin's theory of natural selection. This answer reflects the context of his work within the scientific exploration of biology and evolution during that time.

10. What is the primary function of a catalyst in a chemical reaction?

A. Increases the rate of reaction

B. Reduces the energy of activation

C. Produces more products

D. Changes the equilibrium constant

The primary function of a catalyst in a chemical reaction is to increase the rate of the reaction. Catalysts achieve this by providing an alternative reaction pathway with a lower activation energy, which allows the reaction to proceed more quickly. As a result, reactants can be converted to products more efficiently without changing the overall energy of the reaction or the equilibrium position. While reducing the energy of activation is an important characteristic of how catalysts function, it is this action that leads to the increase in the rate of reaction. Therefore, while it is true that catalysts lower activation energy, the more encompassing description of their role relates directly to speeding up the reaction. This distinction helps clarify why increasing the rate is considered the primary function of a catalyst, rather than just the activation energy reduction itself. The production of more products or changes to the equilibrium constant do not accurately reflect the behavior of a catalyst because they are independent of the presence of a catalyst in a reversible reaction scenario; the equilibrium remains unchanged.