Praxis II General Science (5435) Practice Test (Sample)

Study Guide

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Questions

1. Which statement is true regarding the accuracy and precision of two classroom laboratory balances?

A. The digital balance is less accurate and less precise.

B. The mechanical balance is more accurate but less precise.

C. The digital balance is both more accurate and more precise.

D. Both balances have the same accuracy and precision.

2. What is the term for the temperature at which a liquid turns into a gas?

A. Melting point

B. Freezing point

C. Boiling point

D. Condensation point

3. Which form of radiation is most strongly absorbed by skin?

A. X-ray radiation

B. Infrared radiation

C. UV radiation

D. Gamma radiation

4. What is the common state of matter in which molecules are closely packed but can still flow?

A. Solid

B. Liquid

C. Gas

D. Plasma

5. Which of the following statements is NOT generally true regarding solubility?

A. Increasing temperature increases the solubility of a gas in a liquid.

B. Solubility can depend on pressure for gases.

C. Solubility generally increases with temperature for solids.

D. Polar solvents typically dissolve polar solutes.

6. Which statement regarding chemiosmosis in mitochondria is incorrect?

- **A. Protons are transported to the intermembrane space**
- **B. ATP is synthesized by ATP synthase during the process**
- **C. NADH is oxidized to produce ATP**
- **D. Energy from ATP is used to transport protons to the intermembrane space**

7. Which of the following is a scalar quantity?

- **A. Velocity**
- **B. Force**
- **C. Speed**
- **D. Acceleration**

8. What is the unit of measure for electrical resistance?

- **A. Volt**
- **B. Watt**
- **C. Ohm**
- **D. Ampere**

9. What is the main driver of tectonic plate movement?

- **A. Gravitational pull**
- **B. Convection currents in the mantle**
- **C. Subduction zones**
- **D. Magnetic fields**

10. Which planet is known as the "Red Planet"?

- **A. Venus**
- **B. Earth**
- **C. Mars**
- **D. Jupiter**

Answers

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

Explanations

1. Which statement is true regarding the accuracy and precision of two classroom laboratory balances?

A. The digital balance is less accurate and less precise.

B. The mechanical balance is more accurate but less precise.

C. The digital balance is both more accurate and more precise.

D. Both balances have the same accuracy and precision.

In a classroom laboratory setting, the choice that states the digital balance is both more accurate and more precise reflects the typical advantages associated with digital balances compared to mechanical ones. Accuracy refers to how close a measurement is to the true value, while precision pertains to the consistency of measurements under the same conditions. Digital balances are designed with advanced technology that often allows for better calibration and reduces the impact of human error, leading to more accurate readings. Additionally, digital balances measure weight with greater specificity (usually to the hundredth or thousandth of a gram), making them more precise than mechanical balances, which often rely on analog readings that can be subject to interpretation and may vary slightly from one reading to another. Mechanical balances can be quite effective but tend to rely on a system of beams and weights that may introduce variability in readings, plus they might not provide the same level of sensitivity and resolution as their digital counterparts. Therefore, the advantages of reduced error and improved measurement capability in digital balances support the assertion that they are both more accurate and more precise.

2. What is the term for the temperature at which a liquid turns into a gas?

A. Melting point

B. Freezing point

C. Boiling point

D. Condensation point

The term for the temperature at which a liquid turns into a gas is known as the boiling point. At this specific temperature, the vapor pressure of the liquid equals the external pressure surrounding the liquid, allowing bubbles of gas to form within the liquid. When a substance reaches its boiling point, it undergoes a phase change from liquid to gas, which occurs throughout the entire volume of the liquid. Understanding this concept is crucial in various scientific applications, including cooking, industrial processes, and understanding weather phenomena. The relationships between temperature, pressure, and phase changes are fundamental in thermodynamics and material science, illustrating how substances behave under different conditions. This knowledge also helps in practical everyday situations, such as knowing the boiling point of water for cooking or for processes in laboratories.

3. Which form of radiation is most strongly absorbed by skin?

A. X-ray radiation

B. Infrared radiation

C. UV radiation

D. Gamma radiation

Ultraviolet (UV) radiation is the form of radiation that is most strongly absorbed by the skin. This type of radiation falls within a specific spectrum of the electromagnetic spectrum and has shorter wavelengths than visible light, which allows it to penetrate the skin effectively. The skin contains various layers, including the epidermis, which absorbs UV radiation to a significant degree. The primary biological effect of UV radiation includes the stimulation of melanin production, which leads to tanning, and in some cases, can cause damage to cellular DNA. This damage can potentially result in skin cancer over prolonged exposure, emphasizing how specifically impactful UV radiation is on skin health. While other types of radiation, such as X-rays and gamma rays, have the ability to penetrate the skin and tissues, they are not absorbed by the skin's upper layers to the same extent as UV radiation. Infrared radiation primarily heats the skin but does not cause the same level of cellular change or damage as UV radiation does. Thus, the specific interaction of UV radiation with skin cells and its higher absorption compared to other radiation types make it the correct answer.

4. What is the common state of matter in which molecules are closely packed but can still flow?

A. Solid

B. Liquid

C. Gas

D. Plasma

The correct answer is liquid. In a liquid state, molecules are closely packed together, which allows for interactions that keep them relatively close. However, unlike in solids where molecules are held in fixed positions, the molecules in liquids can move past one another. This ability to flow makes liquids unique compared to the other states of matter. In solids, the molecules are tightly bound and vibrate in place, which prevents any flow, resulting in a definite shape. Gases, on the other hand, have molecules that are far apart and move freely, leading to no fixed shape or volume. Plasma is a state of matter similar to gas but consists of charged particles and is typically found in extreme conditions, such as in stars. Thus, liquids uniquely occupy a state in which they maintain a definite volume while having the ability to flow, distinguishing them from the other states mentioned.

5. Which of the following statements is NOT generally true regarding solubility?

A. Increasing temperature increases the solubility of a gas in a liquid.

B. Solubility can depend on pressure for gases.

C. Solubility generally increases with temperature for solids.

D. Polar solvents typically dissolve polar solutes.

Increasing temperature generally decreases the solubility of a gas in a liquid, which makes this statement not true in the context of solubility principles. The solubility of gases in liquids is inversely related to temperature due to increased kinetic energy at higher temperatures, which causes gas molecules to escape from the liquid phase more readily. On the other hand, the other statements correctly reflect solubility principles. Pressure does influence gas solubility due to the gas laws, particularly Henry's law, which states that the solubility of a gas is directly proportional to the pressure of that gas above the solution. For solids, increased temperature typically leads to greater solubility as more solute can be dissolved in a solvent. Lastly, the interaction between polar solvents and polar solutes follows the principle of "like dissolves like," meaning that polar substances tend to dissolve well in polar solvents due to similar intermolecular forces.

6. Which statement regarding chemiosmosis in mitochondria is incorrect?

A. Protons are transported to the intermembrane space

B. ATP is synthesized by ATP synthase during the process

C. NADH is oxidized to produce ATP

D. Energy from ATP is used to transport protons to the intermembrane space

The process of chemiosmosis in mitochondria involves the movement of protons across the inner mitochondrial membrane, which creates a proton gradient that drives ATP synthesis. In this context, the statement about energy from ATP being used to transport protons to the intermembrane space is inaccurate. During cellular respiration, particularly in the electron transport chain, energy from the oxidation of NADH and $FADH_2$ is used to pump protons from the mitochondrial matrix into the intermembrane space, not the energy derived from ATP. This proton gradient generated is what ultimately drives ATP synthase to produce ATP as protons flow back into the matrix, a process known as chemiosmosis. Protons are indeed transported to the intermembrane space, ATP is synthesized by ATP synthase during this process, and NADH is oxidized to facilitate ATP production, which are all correct components of how chemiosmosis functions in mitochondria.

7. Which of the following is a scalar quantity?

A. Velocity

B. Force

C. Speed

D. Acceleration

Speed is classified as a scalar quantity because it is defined solely by its magnitude and does not involve direction. Scalar quantities can be described by a single numerical value with units, such as miles per hour or meters per second, indicating how fast an object is moving without specifying the direction of that movement. In contrast, velocity is a vector quantity, which means it has both magnitude and direction—indicating not just how fast an object is traveling, but also in which direction it is traveling. Similarly, force is also a vector quantity, as it describes an influence that causes an object to accelerate, requiring both magnitude (how strong the force is) and direction (where the force is applied). Acceleration, like force and velocity, is another vector quantity that specifies how quickly the velocity of an object changes, encompassing both the rate of change and the direction of that change. Therefore, among the given options, speed stands out as the only scalar quantity, focusing solely on the rate of motion rather than the direction in which it occurs.

8. What is the unit of measure for electrical resistance?

A. Volt

B. Watt

C. Ohm

D. Ampere

The unit of measure for electrical resistance is the ohm. One ohm is defined as the amount of resistance that allows one ampere of current to flow when one volt of electrical potential is applied across it. This relationship is described by Ohm's Law, which states that voltage (V) equals current (I) multiplied by resistance (R), or V = IR. Understanding resistance is fundamental in electrical engineering and physics, as it influences how electrical circuits operate. The volt measures electrical potential, the watt measures electrical power, and the ampere measures electrical current. Each of these units pertains to different aspects of electricity but does not quantify resistance itself. The ohm is the specific unit designed to measure how much a component resists the flow of electric current within a circuit.

9. What is the main driver of tectonic plate movement?

A. Gravitational pull

B. Convection currents in the mantle

C. Subduction zones

D. Magnetic fields

The primary driver of tectonic plate movement is the convection currents in the mantle. These currents are caused by the heat from the Earth's core, which creates varying temperatures within the mantle. As the hot mantle material rises toward the Earth's crust, it cools and then sinks back down when it cools sufficiently. This cycle of rising and sinking material generates large-scale movements within the mantle, which in turn exert force on the tectonic plates situated above it. The convection currents facilitate the sliding of these plates over the semi-fluid asthenosphere, leading to their movement. This process is fundamental to phenomena such as earthquakes, volcanic activity, and continental drift. Other factors, while they may contribute to the dynamics of plate movement at certain boundaries, primarily arise from or influence this fundamental process of mantle convection.

10. Which planet is known as the "Red Planet"?

A. Venus

B. Earth

C. Mars

D. Jupiter

Mars is known as the "Red Planet" due to its reddish appearance, which is a result of iron oxide, commonly known as rust, on its surface. This distinctive color makes Mars stand out in the night sky and has led to its nickname. The reddish hue has fascinated observers for centuries, prompting various cultures to associate it with war and aggression in mythology. Unlike Venus, which appears bright white due to its thick cloud cover, or Earth, known for its blue oceans and green landmasses, Mars' surface features, such as its dust and rocks, contribute to its unmistakable red color. Jupiter, being a gas giant, does not have a solid surface and is characterized by its bands of color, but it does not reflect the same distinct red hue that Mars does. Thus, Mars' composition and atmospheric conditions are key factors in its identification as the "Red Planet."