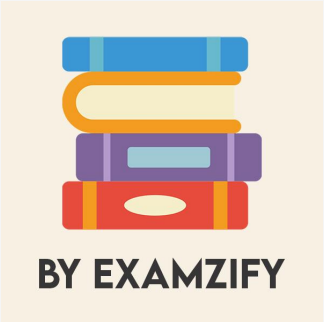
University of Central Florida (UCF) PSC1121 Physical Science Final Practice Exam (Sample)

Study Guide



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Questions

1. What is the measure of the acidity or basicity of a solution called?

   A. pH

   B. Conductivity

   C. Solubility

   D. Redox potential

2. The average molecular kinetic energy of a gas is related to which of the following properties?

   A. Density

   B. Pressure

   C. Viscosity

   D. Temperature

3. Which of the following statements about wave behavior is false?

   A. Waves can interfere with one another

   B. Waves can reflect off barriers

   C. Waves behave precisely like Newtonian particles

   D. Waves can diffract through openings

4. What happens during "destructive interference" of waves?

   A. Wave amplitudes double

   B. Waves merge perfectly

   C. Waves cancel each other out

   D. Waves travel faster

5. What is the tendency of a moving object to remain in unchanging motion called?

   A. Acceleration

   B. Force

   C. Friction

   D. Inertia

6. What is the result of a chemical reaction where energy is absorbed?

A. Exothermic reaction

B. Catalytic reaction

C. Endothermic reaction

D. Oxidation reaction

7. What is the angular speed of the second hand on a clock that measures seconds?

A. 3.0 degrees/s

B. 6.0 degrees/s

C. 12.0 degrees/s

D. 60.0 degrees/s

8. Which of the following defines acceleration in physics?

A. Change in force over time

B. Change in velocity over time

C. Change in position over time

D. Change in energy over time

9. Which of the following best describes an element?

A. A substance made of two or more types of atoms

B. A pure substance made from only one type of atom

C. A mixture of different compounds

D. A substance that can be broken down into simpler substances

10. Which particle in an atom has no charge?

A. Proton

B. Electron

C. Neutron

D. Ion

Answers

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

Explanations

1. What is the measure of the acidity or basicity of a solution called?

A. pH

B. Conductivity

C. Solubility

D. Redox potential

The measure of the acidity or basicity of a solution is called pH. The pH scale ranges from 0 to 14, with lower values indicating acidic solutions (pH < 7), a neutral point at pH 7, and higher values indicating basic or alkaline solutions (pH > 7). The pH scale is logarithmic, meaning that each whole number change on the scale represents a tenfold change in acidity or basicity. For example, a solution with a pH of 4 is ten times more acidic than one with a pH of 5. This measurement is crucial in various scientific fields, including chemistry, biology, and environmental science, as it affects chemical reactions, biological processes, and the behavior of substances in solutions. The other options do not specifically measure acidity or basicity: conductivity measures how well a solution can conduct electric current, solubility refers to the ability of a substance to dissolve in another, and redox potential relates to the tendency of a chemical species to acquire electrons and thereby be reduced, none of which directly indicate the pH level of a solution.

2. The average molecular kinetic energy of a gas is related to which of the following properties?

A. Density

B. Pressure

C. Viscosity

D. Temperature

The average molecular kinetic energy of a gas is directly related to its temperature. In kinetic molecular theory, temperature is defined as a measure of the average kinetic energy of the molecules in a substance. As the temperature increases, the molecules move more rapidly, resulting in higher kinetic energy. This relationship is fundamental in thermodynamics and is expressed by the equation $KE = \frac{3}{2} kT$, where KE is the average kinetic energy, k is the Boltzmann constant, and T is the absolute temperature in Kelvin. Thus, understanding this connection helps explain how changes in temperature affect the motion and energy of gas molecules, which in turn influences properties like pressure and volume but not directly density or viscosity.

3. Which of the following statements about wave behavior is false?

A. Waves can interfere with one another

B. Waves can reflect off barriers

C. Waves behave precisely like Newtonian particles

D. Waves can diffract through openings

Waves exhibit behaviors that demonstrate their unique properties, which differ significantly from those of particles described in Newtonian physics. When we say waves behave precisely like Newtonian particles, it is misleading because waves and particles follow different principles of motion and interaction. In wave behavior, we observe phenomena such as interference, where two or more waves combine to form a new wave pattern, and reflection, where waves bounce off barriers. Additionally, diffraction illustrates how waves spread out when passing through openings or around obstacles. These behaviors underscore the wave nature distinct from the particle nature governed by Newtonian physics. Therefore, stating that waves behave precisely like particles does not accurately reflect the nature of wave interactions and their fundamental characteristics.

4. What happens during "destructive interference" of waves?

A. Wave amplitudes double

B. Waves merge perfectly

C. Waves cancel each other out

D. Waves travel faster

During destructive interference of waves, two or more waves meet in such a way that their crests and troughs are aligned oppositely. When this occurs, the amplitude of the resultant wave is reduced or can even become zero if the waves are perfectly out of phase—meaning the crest of one wave aligns with the trough of another. This cancellation effect results in a lower overall intensity or amplitude of the combined wave, demonstrating how the superposition principle works in wave physics. In contrast, the other options describe different phenomena. For example, when wave amplitudes double, that describes constructive interference, where waves are in phase and combine to create a larger wave. Merging perfectly also relates to constructive interference, as it implies alignment that enhances amplitude. The speed of wave propagation typically does not change with interference; rather, it's determined by the medium through which the waves travel. Therefore, the correct answer highlights the fundamental nature of destructive interference in wave behavior.

5. What is the tendency of a moving object to remain in unchanging motion called?

A. Acceleration

B. Force

C. Friction

D. Inertia

The tendency of a moving object to remain in unchanging motion is known as inertia. This concept is rooted in Newton's first law of motion, which states that an object at rest will stay at rest, and an object in motion will remain in motion with the same speed and direction unless acted upon by a net external force. Inertia is essentially a property of matter related to its mass; objects with greater mass have a greater tendency to resist changes in their state of motion. In the context of this question, options like acceleration refer to the change in velocity of an object due to an external force, while force is an interaction that can cause a change in an object's motion. Friction is a force that opposes motion between surfaces in contact. None of these terms accurately captures the idea of an object's natural resistance to changes in its motion, which is the essence of inertia.

6. What is the result of a chemical reaction where energy is absorbed?

A. Exothermic reaction

B. Catalytic reaction

C. Endothermic reaction

D. Oxidation reaction

In a chemical reaction where energy is absorbed, the process is termed an endothermic reaction. This type of reaction requires energy input, often in the form of heat, from the surrounding environment to proceed. As a result, the temperature of the surroundings may decrease, reflecting the absorption of energy. Endothermic reactions typically involve the breaking of bonds, which requires energy, and they result in products that have higher energy than the starting materials. This contrasts with exothermic reactions, where energy is released, leading to an increase in temperature of the surroundings. In terms of energy flow, endothermic reactions are characterized by a net intake of energy, which is crucial for the reaction to occur. Other types of reactions, such as catalytic and oxidation reactions, do not specifically categorize energy absorption. While they may involve energy changes, they do not define the reaction as one that necessarily absorbs energy, making endothermic the most accurate descriptor in this context.

7. What is the angular speed of the second hand on a clock that measures seconds?

A. 3.0 degrees/s

B. 6.0 degrees/s

C. 12.0 degrees/s

D. 60.0 degrees/s

To determine the angular speed of the second hand on a clock, we first need to understand the motion of the second hand. The second hand of a clock completes one full revolution around the clock face in 60 seconds. Since one complete revolution corresponds to an angle of 360 degrees, we can calculate the angular speed by dividing the total degrees by the time taken for one cycle. The calculation is as follows: - Total degrees for one revolution: 360 degrees - Time for one revolution: 60 seconds The angular speed can be calculated by taking the total degrees (360) and dividing by the time in seconds (60): $$\text{Angular speed} = \frac{360 \text{ degrees}}{60 \text{ seconds}} = 6 \text{ degrees/second}$$ This shows that the angular speed of the second hand is 6 degrees per second, which corresponds to the correct choice. Understanding this concept helps illustrate how rotational movement is quantified and how it relates to time.

8. Which of the following defines acceleration in physics?

A. Change in force over time

B. Change in velocity over time

C. Change in position over time

D. Change in energy over time

Acceleration in physics is defined as the change in velocity over time. It describes how quickly an object's velocity is changing, which can include changes in speed or direction. Velocity is a vector quantity that encompasses both the speed and direction of an object, so acceleration can indicate whether an object is speeding up, slowing down, or changing direction. When an object has a uniform velocity, if it begins to speed up or slow down, it is experiencing acceleration. This concept is fundamental in kinematics, the branch of mechanics that deals with the motion of objects without considering the forces that cause this motion. The other choices refer to concepts that are different from acceleration. Change in force over time relates more to how forces interact but does not specifically capture how objects change their motion. Change in position over time refers to velocity itself, not acceleration, and change in energy over time pertains to work or power rather than how motion changes. Thus, option B precisely captures the essence of acceleration in the context of motion.

9. Which of the following best describes an element?

A. A substance made of two or more types of atoms

B. A pure substance made from only one type of atom

C. A mixture of different compounds

D. A substance that can be broken down into simpler substances

An element is defined as a pure substance that consists entirely of one type of atom. This means that all atoms in an element have the same number of protons, which determines the atomic number and the properties of that element. For example, all carbon atoms have six protons, making them distinctly carbon, regardless of the amount or form in which they occur. Elements cannot be broken down into simpler substances by chemical means, which underscores their fundamental nature in chemistry. In contrast to an element, a substance made of two or more types of atoms is classified as a compound or a mixture. Compounds involve chemical combinations of different elements, while mixtures can contain combinations of elements and/or compounds but do not have a chemical bonding. Similarly, substances that can be broken down into simpler substances often refer to compounds rather than elements. Therefore, the correct characterization of an element emphasizes its purity and homogeneity as consisting of only one type of atom.

10. Which particle in an atom has no charge?

A. Proton

B. Electron

C. Neutron

D. Ion

In an atom, the particle that has no charge is the neutron. Neutrons are found in the nucleus of the atom alongside protons. While protons carry a positive charge and electrons carry a negative charge, neutrons are neutral, meaning they do not have any electrical charge at all. This neutrality is significant because it allows neutrons to contribute to the mass of the atom without affecting its overall charge. The presence of neutrons helps to stabilize the nucleus of an atom by offsetting the repulsive forces between the positively charged protons. This balance of forces is crucial for the integrity of the atomic structure. In summary, neutrons are essential for the physical stability of atoms while remaining electrically neutral.