University of Central Florida (UCF) CHM2045C Chemistry Fundamentals I Practice Exam 1 (Sample)

Study Guide

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Questions

1. What term describes a mixture that is not uniform throughout?

   A. Solution

   B. Homogeneous

   C. Heterogeneous

   D. Substance

2. How many grams are in one pound?

   A. 423.59 g

   B. 453.59 g

   C. 400 g

   D. 500 g

3. What is the final rounded dose of Cisplatin for a patient with an area of 1.862 m^2?

   A. 0.0020 g

   B. 0.0037 g

   C. 0.0030 g

   D. 0.0040 g

4. What generally happens to the solubility of gas solutes as temperature increases?

   A. Solubility increases

   B. Solubility remains unchanged

   C. Solubility decreases

   D. Solubility becomes more complex

5. What role do catalysts play in chemical reactions?

   A. They are consumed in the reaction

   B. They slow down the reaction process

   C. They lower the activation energy barrier

   D. They change the equilibrium constant

6. What does the prefix 'deci' represent in scientific notation?

A. 10^1

B. 10^-1

C. 10^-2

D. 10^2

7. What is activation energy in a chemical reaction?

A. The energy released when products form

B. The minimum energy needed for the reaction to proceed

C. The energy change for the entire reaction

D. The energy stored in the products

8. Which of the following is a unit of length?

A. Milliliters

B. Candela

C. Centimeters

D. Kilograms

9. What type of change occurs when rubbing alcohol evaporates?

A. Chemical change

B. Physical change

C. Both physical and chemical change

D. Neither change

10. Which ion is represented by the formula ClO-?

A. Chlorate

B. Hypochlorite

C. Chlorite

D. Perchlorate

Answers

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

Explanations

1. What term describes a mixture that is not uniform throughout?

A. Solution

B. Homogeneous

C. Heterogeneous

D. Substance

A mixture that is not uniform throughout is described as heterogeneous. In such a mixture, individual components can be seen and identified, indicating that they do not blend uniformly at the microscopic level. This can often result in a composition that varies from one part of the mixture to another, making it possible to distinguish between different phases or substances within the mixture. In contrast, a solution refers to a homogeneous mixture where the components are fully dissolved and cannot be distinguished from one another. Homogeneous mixtures are characterized by uniformity in composition and properties throughout, while a substance typically refers to a form of matter that has a uniform and definite composition, which is distinct from the concept of a mixture.

2. How many grams are in one pound?

A. 423.59 g

B. 453.59 g

C. 400 g

D. 500 g

One pound is defined as exactly 453.59237 grams. When rounding to two decimal places, this value approximates to 453.59 grams, which is why this choice is recognized as correct. The unit of pound is widely used in the United States and is part of the imperial system of measurements, whereas grams are part of the metric system. Understanding the conversion between these two systems is fundamental in chemistry and many scientific applications, where precise measurements are crucial. Accurate conversions between units allow chemists to maintain consistent calculations when dealing with various substances and their reactions. In this case, recognizing that a pound is slightly more than 453 grams is essential for applications such as stoichiometry in chemical reactions, where mass and quantity conversions directly impact outcomes.

3. What is the final rounded dose of Cisplatin for a patient with an area of 1.862 m²?

A. 0.0020 g

B. 0.0037 g

C. 0.0030 g

D. 0.0040 g

To determine the correct final rounded dose of Cisplatin based on the patient's body surface area (BSA), a standard dosing formula is typically used. The usual dose of Cisplatin is approximately 50-75 mg/m² for treating cancer. For this patient with a BSA of 1.862 m², if we calculate the dose using the middle value of the dosing range, let's take 75 mg/m² as a reference. We would calculate the total dose as follows: - Total dose = BSA × Dose per m² - Total dose = 1.862 m² × 75 mg/m² This results in: - Total dose = 139.65 mg When converting this to grams for clarity: - 139.65 mg = 0.13965 g Rounding this to three significant figures gives us approximately 0.140 g. However, if instead, we were to calculate using a lower dose (for instance, 20 mg/m², which can also be common), the calculation would be: - Total dose = 1.862 m² × 20 mg/m² - Total dose = 37.24 mg = 0.03724 g

4. What generally happens to the solubility of gas solutes as temperature increases?

A. Solubility increases

B. Solubility remains unchanged

C. Solubility decreases

D. Solubility becomes more complex

As the temperature increases, the solubility of gas solutes typically decreases. This phenomenon is primarily due to the increased kinetic energy of the gas molecules, which allows them to escape from the solvent more easily. As the gas molecules gain energy, they move more rapidly and are less likely to be captured by the solvent molecules, leading to a reduction in the overall amount of gas that can remain dissolved in the liquid. Additionally, the principles governing gas solubility can be understood through Henry's Law, which states that at a constant temperature, the amount of gas that dissolves in a liquid is proportional to the partial pressure of the gas above the liquid. When the temperature rises, if the pressure remains constant, the solubility decreases because the gas molecules will tend to leave the solution, further supporting the observation that higher temperatures diminish the solubility of gases. In contrast, the solubility behavior of solids typically increases with temperature, but this does not apply to gases, reinforcing why the correct choice reflects a decrease in gas solubility with rising temperatures.

5. What role do catalysts play in chemical reactions?

A. They are consumed in the reaction

B. They slow down the reaction process

C. They lower the activation energy barrier

D. They change the equilibrium constant

Catalysts play a crucial role in chemical reactions by lowering the activation energy barrier, which is the energy required for a reaction to proceed. By providing an alternative pathway for the reaction, catalysts enable the reactants to convert to products more easily, thus increasing the rate at which the reaction occurs without being consumed in the process. This characteristic means that a catalyst can participate in the reaction mechanism, facilitating the transformation of reactants to products, and then be regenerated to its original state, ready to catalyze subsequent reactions. This efficiency in promoting reactions without undergoing permanent changes is what makes catalysts essential in various chemical processes, including industrial applications and biological systems. In contrast, catalysts do not affect the equilibrium constant of a reaction; they help achieve equilibrium faster but do not change the position of equilibrium. Similarly, they do not slow down reactions, rather they speed them up, and they are not consumed in the reaction, allowing them to be reused multiple times.

6. What does the prefix 'deci' represent in scientific notation?

A. 10^1

B. 10^-1

C. 10^-2

D. 10^2

The prefix 'deci' in scientific notation denotes a factor of 10 raised to the power of -1, which is equivalent to one-tenth or 0.1. This means that any measurement or quantity prefixed with 'deci' is one-tenth of the base unit. For example, a decimeter (dm) is one-tenth of a meter (0.1 meters). Understanding this prefix helps in converting between different units and facilitates a clearer comprehension of measurements in scientific contexts.

7. What is activation energy in a chemical reaction?

A. The energy released when products form

B. The minimum energy needed for the reaction to proceed

C. The energy change for the entire reaction

D. The energy stored in the products

Activation energy is defined as the minimum amount of energy required for reactants to undergo a chemical reaction and transition into products. This energy barrier must be overcome for the reaction to proceed, allowing the reactants to reach the transition state, where molecular bonds are breaking and forming. When this minimum energy level is met, the reaction can proceed, leading to the formation of products. Understanding this concept is crucial because it illustrates why some reactions occur rapidly under certain conditions while others may require catalysts or increased temperatures to provide the necessary energy for the reaction to take place. This is different from the energy released during the formation of products, which refers to the exothermic nature of a reaction, and does not represent the energy required to initiate the reaction itself. Similarly, the overall energy change and the energy stored in products pertain to the thermodynamics of the reaction but do not define the activation energy, which focuses specifically on the energy needed to get the reaction started.

8. Which of the following is a unit of length?

A. Milliliters

B. Candela

C. Centimeters

D. Kilograms

Centimeters is indeed a unit of length, and it is part of the metric system commonly used in scientific measurements. In the metric system, length can be measured in various units, including millimeters, centimeters, meters, and kilometers. Each of these units is related to one another by powers of ten, making conversions straightforward. While milliliters is a unit of volume, used to measure the capacity of liquids; candela is a unit of luminous intensity, measuring how much light is emitted in a particular direction; and kilograms is a unit of mass, used to measure weight, none of these are applicable for measuring length. This information highlights how specific units are designated for different types of measurements in science, making centimeters the correct choice in this context.

9. What type of change occurs when rubbing alcohol evaporates?

A. Chemical change

B. Physical change

C. Both physical and chemical change

D. Neither change

When rubbing alcohol evaporates, it undergoes a physical change. This is because evaporation involves a change from the liquid phase to the gas phase, which does not alter the chemical composition of the substance. The molecules of rubbing alcohol remain the same before and after evaporation; they simply transition from a liquid state to a gaseous state due to the increase in temperature or decrease in pressure. In a physical change, only the state of matter changes, while the substance's identity and composition remain intact. This contrasts with a chemical change, where a substance transforms into one or more different substances, with bonds being broken and formed, leading to a change in the chemical structure. Thus, understanding the distinction between physical and chemical changes is essential, as it clarifies how substances behave under different conditions without altering their chemical identity.

10. Which ion is represented by the formula ClO-?

A. Chlorate

B. Hypochlorite

C. Chlorite

D. Perchlorate

The ion represented by the formula ClO- is known as hypochlorite. This is determined by the fact that hypochlorite is a monoatomic anion with chlorine (Cl) bonded to one oxygen (O) atom and carries a single negative charge. In the context of chlorine oxoanions, the naming conventions follow specific rules based on the number of oxygen atoms bonded to the chlorine atom. Hypochlorite contains only one oxygen atom, making it distinct from other similar anions such as chlorate, chlorite, and perchlorate. Chlorate has three oxygen atoms (ClO3-), chlorite has two (ClO2-), and perchlorate has four (ClO4-). Each of these ions has different chemical properties and reactivities associated with the varying number of oxygen atoms. Understanding these differences is key to correctly identifying and naming these ions in chemical contexts.