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Sikirica stehiometrija rješenja zadataka

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****Understanding Units and Measurement**** In science and measurement, physical quantities are represented by a numerical value multiplied by a unit. The unit itself consists of two parts: a prefix (e.g., kilo, milli) and a base unit (e.g., meter, gram). Changing the unit will change the numerical value, but the actual quantity remains unchanged.

****International System of Units (SI)**** The SI system is based on seven base units: meter (m), gram (g), second (s), Kelvin (K), ampere (A), mole (mol), and candela (cd). Derived units are created by combining these base units. For example, a unit of pressure can be expressed as pascal (Pa) or bar. ****Prefixes**** SI prefixes are used to express units in different multiples, such as: * deca- (da): 10 * hecto- (h): 100 * kilo- (k): 1,000 * mega- (M): 1,000,000 * giga- (G): 1,000,000,000 * tera- (T): 1,000,000,000,000 ****Unit Conversions**** When converting between units, the numerical value is adjusted according to the base unit's multiplier. For example: * 1 meter = 100 centimeters = 1,000 millimeters * 1 kilogram = 1,000 grams = 1,000,000 milligrams ****Atmospheric Pressure**** The standard atmospheric pressure (atm) is defined as the pressure exerted by a column of mercury with a height of 760 mm and a density of 13,595.1 kg/m³ at normal gravity (g_N). The conversion factor between atm and pascal (Pa) is: * 1 atm = 101,325 Pa ****Other Conversions**** Various unit conversions are also discussed in the text, including: * Pressure: mmHg to Pa, atm to Pa * Length: meter to decimeter, centimeter, millimeter, micrometer * Mass: kilogram to gram, milligram, microgram The pressure of a liquid column can be calculated using the formula $p = h \times \rho \times g$. In SI units, this becomes $p = 0.1 \text{ m} \times 1000 \text{ kg/m}^3 \times 9.80665 \text{ m/s}^2 = 980665 \text{ Pa}$, which is equivalent to 7.356 mmHg. For a different liquid column with a height of 200 mm, the calculation would be: $p = h \times \rho \times g = 0.2 \text{ m} \times 1000 \text{ kg/m}^3 \times 9.80665 \text{ m/s}^2 = 1961333 \text{ Pa}$, which is equivalent to 14.71 mmHg or 0.019357 atm. Next, we can calculate the density of a material using the formula $\rho = m / V$. For example, if we have a sample with a mass of 81 g and a volume of 30 cm³, the density would be: $\rho = 81 \text{ g} / 30 \text{ cm}^3 = 2.7 \text{ g/cm}^3$ The Archimed's principle states that the weight of an object submerged in a fluid is equal to the weight of the fluid displaced. Using this principle, we can calculate the mass and volume of an object immersed in a liquid. Finally, we can use the formula $\rho = m / V$ to calculate the density of different materials, such as steel ($\rho(\text{Fe}) = 7.87 \text{ g/cm}^3$) or air ($\rho(\text{zrak}, 20^\circ\text{C}) = ?$). Poznavati njezinu masu i volumen. Masu vode u piknometru, m4, dobivamo iz razlike mase piknometra s vodom i mase praznog piknometra. Masa vode u piknometru m4 = 18,704 g – 15,482 g = 3,222 g. Koristenjem istih uvjeta, dobivamo masu tekućine u piknometru, m5, kao razliku mase otopine s tekućinom i mase praznog piknometra. Masa tekućine u piknometru m5 = 33,656 g – 15,482 g = 18,174 g. Za gustoću nepoznate tekućine konačno dobivamo razlikom mase otopine s tekućinom i mase istisnutog tekućina. Gustoća tekućine = 1,596 g cm⁻³. U daljem nastavku koristenje istih uvjeta, dobivamo masu metelen-jodida u piknometru s uzorkom, m4, kao razliku mase piknometra s metelen-jodidom i krutim uzorkom. Masa metelen-jodida u piknometru s uzorkom m4 = 10,038 g. Masa istisnutog metelen jodida, m5, jednaka je razliku mase piknometra napunjena s metelen jodoom i mase metelen jodida u piknometru s uzorkom. Masa istisnutog metelen jodida m5 = 2,410 g. Volumen istisnutog metelen jodida jednak je volumenu krutog uzorka. Podijelimo li masu istisnutog metelen jodida, m5, njegovom gustoćom dobivamo volumen uzorka. Vuzorak = 0,7466 cm3. Za gustoću uzorka konačno dobivamo razlikom mase istisnutog metelen jodida i njegove gustoće. Gustoća uzorka = 7,561 g cm⁻³. U daljem nastavku koristenje istih uvjeta, izračunamo masu čiste HNO3, m(HNO3), kao razlikom mase otopine HNO3 i masenim udjelom HNO3 u otopini. Otopine gustoće m(otop.) × ρ(otop.) = V(otop.). Primjerice, za otopinu HNO3: m(HNO3) = V(otop. HNO3) × ρ(otop. HNO3) × w(HNO3). Proizlazi da je w(HNO3) = 0,67 i V(otop. HNO3) = 1 mL, pa slijedi: m(HNO3) = 0,94 g. Maseni udio fosforne kiseline u otopini definiran je omjerom: m(H3PO4) w(H3PO4) = ----- m(otop. H3PO4). Proizlazi da je m(H3PO4) = 1436 g i V(otop. H3PO4) = 1000 cm3, pa slijedi: m(H3PO4) w(H3PO4) = 0,85. Gustoća otopine amonijaka definirana je omjerom: m(otop. NH3) ρ(otop. NH3) = ----- V(otop. NH3). Proizlazi da je m(otop. NH3) = 255 g i V(otop. NH3) = 1000 cm3, pa slijedi: m(otop. NH3) ρ(otop. NH3) = 0,900. Maseni udio klorovodika u otopini definiran je omjerom: m(CHCl3) w(CHCl3) = ----- m(otop. CHCl3). Proizlazi da je m(CHCl3) = 1194 g i V(otop. CHCl3) = 1000 cm3, pa slijedi: m(CHCl3) w(CHCl3) = 0,31. Debljina sloja nikla, δ, jednaka je omjeru volumena nikla, V(Ni), i površine pločice, A. Proizlazi da je δ = 2,8 × 10⁻⁵ cm. Izračunajmo najprije volumen žive sadržane u kapilari. Vidi STEHIOMETRIJA: m(Hg) 2,958 g - 2,460 g V(Hg) = ----- ρ(Hg) 13,5462 g cm⁻³ = 0,03676 cm⁻³ = 36,76 mm⁻³. The mass of sulfuric acid (H2SO4) in a concentrated solution is given by the equation: m(H2SO4) = w(H2SO4) × ρ(H2SO4) × V(H2SO4) To solve for the volume of concentrated sulfuric acid (V(H2SO4)), we can substitute the given values and simplify the equation: w(H2SO4) × ρ(H2SO4) × V(H2SO4) = V(H2SO4) Substituting the given values, we get: 0.323 × 1.24 g cm⁻³ × 1000 cm³ = V(H2SO4) Simplifying the equation, we get: V(H2SO4) = 0.960 × 1.84 g cm⁻³ Solving for V(H2SO4), we get: V(H2SO4) = 227 cm³ The problem also discusses the concept of molar mass and relative atomic mass. The molar mass (M) of a substance is defined as the ratio of its mass to one mole (mol⁻¹). For example, the molar mass of carbon (C) is 12 g/mol, while the molar mass of sulfuric acid (H2SO4) is approximately 98 g/mol. The problem also discusses the concept of relative atomic mass and relativistic atomic mass. The relativistic atomic mass (Mr) of an element is equal to its real atomic mass divided by Avogadro's number (6.022 × 10²³ mol⁻¹). For example, the relativistic atomic mass of silver (Ag) is approximately 107.9 g/mol. The problem also discusses the concept of relative molecular mass, which is obtained by adding the relative atomic masses of all atoms in a molecule. In the case of sulfuric acid (H2SO4), the relative molecular mass (Mr(AgCl)) is approximately 143.35 g/mol. Overall, the problem provides an introduction to the concepts of molar mass, relative atomic mass, and relativistic atomic mass, as well as their applications in chemistry. ****Section 2.5**** The molecular mass of AgCl (silver chloride) is calculated by multiplying the number of moles (n) by its molar mass (M). The result is 57.34 g. ****Section 2.6**** The relative molecular mass of K2SO4 (potassium sulfate) is determined by summing up the atomic masses of all atoms in its formula. This gives a value of 174.22 g/mol. The number of moles (n) and molar mass (M) are then used to calculate the mass (m) of K2SO4. ****Section 2.7**** The molecular mass of CaCl2·6H2O (calcium chloride hexahydrate) is calculated using its molar mass and number of moles. The result is 219.1 g/mol. The mass of this compound is then calculated to be 6.85 × 10⁻³ mol. ****Section 2.8**** The molecular mass of NiSO4·7H2O (nickel(II) sulfate heptahydrate) is calculated using its molar mass and number of moles. The result is 280.9 g/mol. The mass of this compound is then calculated to be 1 mol × 280.9 g/mol = 280.9 g. ****Section 2.12**** The relative atomic mass of lead (Pb) is given as 207.2. The relative molecular mass of PbO (lead(II) oxide) is calculated using the atomic masses of its constituent atoms. The molar mass of PbO is then used to calculate the mass of 328 kg. ****Section 2.13**** The molecular mass of Cr2O3 (chromium(III) oxide) is calculated using the atomic masses of its constituent atoms. The result is 152.0 g/mol. The mass of this compound is then calculated to be 3421 kg. ****Section 2.14**** The relative atomic masses of Ni, Pb, and O are given as 58.7, 207.2, and 16.0, respectively. ****Section 2.15**** The mass of oxygen (O) in a compound is calculated by subtracting the mass of lead (Pb) from the total mass of the compound. The result is 8.00 g. Given text here Looking forward to seeing everyone at the meeting tomorrow to discuss stoichiometry calculations. The text appears to be a collection of exercises or problems related to stoichiometry, which is the study of the quantitative relationships between reactants and products in chemical reactions. The problems involve converting mass to moles, calculating numbers of particles, and determining masses of substances based on given data. Some examples include: * Converting mass of phosphorus (P) from grams to moles * Calculating number of atoms of Mo in 1 meter * Determining surface area of a single gold atom * Calculating mass of water based on volume and density These exercises are likely used for educational purposes, such as teaching students about stoichiometry concepts or preparing them for exams. ****Calculations**** 1. Calculate the number of moles and molecular mass of water (H2O). The result is 0.1389 × 10⁻²³. 2. Calculate the mole fraction of sugar (C12H22O11) in a solution with a volume of 1012 mL. The result is 1.759 × 109 molecules per milliliter. 3. Calculate the molecular mass of a polymer, given atomic masses of C, H, and O. The result is 32,000 g/mol. 4. Calculate the molar mass of copper sulfate (CuSO4 · 5H2O). The result is 249.68 g/mol. 5. Calculate the mass of one molecule of a virus, given its molecular mass. The result is 437 × 10⁻⁷ g/mol. 6. Calculate the mass of one elementary cell of copper (Cu) and divide by the atomic mass of Cu. The result is approximately 3.98. 7. Repeat calculation 6 for alpha-iron (α-Fe), gamma-iron (γ-Fe), and delta-iron (δ-Fe). The results are approximately 2.4, and 2 atoms per cell, respectively. 8. Calculate the mass of one elementary cell of carbon (C) and divide by the atomic mass of C. The result is approximately 3.56. ****Calculating Molecular Masses and Densities**** The following calculations are performed to find the molecular masses and densities of various compounds. * For diamond, one elementary cell contains 8 carbon atoms. The density is calculated as: (molecular mass) / (number of atoms in an elementary cell) = 12.00 × 10⁻³ kg/mol = 7.99 * Similarly, for NaCl, one elementary cell contains 4 ion pairs. The density is calculated as: (molecular mass) / (number of ion pairs in an elementary cell) = 58.44 × 10⁻³ kg/mol = 4. * For Fe3C, one elementary cell contains 4 formula units. The density is calculated as: (molecular mass) / (number of formula units in an elementary cell) = 179.55 × 10⁻³ kg/mol = 3.99 * For Cr23C6, one elementary cell contains 4 formula units. The density is calculated as: (molecular mass) / (number of formula units in an elementary cell) = 1268 × 10⁻³ kg/mol * Similarly, the densities of Al, Cr, and other compounds are calculated using their molecular masses and the number of atoms in an elementary cell. ****Empirical Formula Calculations**** The empirical formulas of various compounds can be calculated by dividing the mass fractions of each element by their atomic masses. For example: * SO2: (mass fraction of S) / (atomic mass of S) = 0.50 / 32 = 1 : 64, but since this is not a whole number, it is rounded to 1 : 64 = 1 : 3 * SO3: (mass fraction of S) / (atomic mass of S) = 0.40 / 32 = 1 : 80, which rounds to 1 : 3 * MnO: (mass fraction of Mn) / (atomic mass of Mn) = 77.5 / 54.94 = 1.41 : 1 * Mn2O3: (mass fraction of Mn) / (atomic mass of Mn) = 69.6 / 54.94 = 1.27 : 1, which rounds to 2 : 3 * And so on. Note that these calculations are simplified and may not reflect the exact results in a real-world scenario. The following are examples of stoichiometric calculations and problems: 1. Calculate the mass ratio of nitrogen (N) to oxygen (O) in arsenic pentoxide (As2O5, Ar(V) Ar(O)). 2. Calculate the mass ratios of antimony (Sb) to oxygen (O) for several compounds: antimony trioxide, antimony trisulfide, and antimony trichloride. 3. Calculate the mass ratio of carbon (C) to hydrogen (H) in methane (CH4). 4. Calculate the mass ratio of hydrogen (H) to carbon (C) in methanol (CH4O). 5. Determine the empirical formula for a compound that contains sulfur (S), carbon (C), and oxygen (O). The compound has a molar mass of 44 g/mol, contains 1.28 g of sulfur, and 0.24 g of carbon. 6. Calculate the mass ratio of uranium (U) to oxygen (O) in uranyl oxide (UO3). 7. Determine the percentage composition of arsenic (As), hydrogen (H), carbon (C), and oxygen (O) in a compound that contains magnesium (Mg), ammonia (NH4), arsenic (As), and oxygen (O). The compound has a molar mass of 181.23 g/mol, contains 0.802 g of arsenic, and 7.2% oxygen. 8. Calculate the mass ratio of cadmium (Cd) to sulfur (S) in cadmium sulfate (CdSO4). These calculations involve determining the empirical formulas for various compounds, calculating mass ratios, and determining percentage compositions. ****Section 2.51**** The formula for cadmium sulfate (CdSO4) and water is written as M(CdSO4)M(H2O)3, where M represents the molecular mass. ****Section 2.52-2.58**** Various formulas are given for compounds such as magnesium-nickel-zinc, oxygen-water mixtures, and aluminum-magnesium oxide. The formulas involve ratios of atomic weights (Ar) to molecular weights (w), with percentages calculated based on these ratios. ****Section 2.59**** The formula for zinc-aluminum oxide is written as M(ZnAl2O4), where M represents the molecular mass. Similar formulas are given for other compounds, including iron-magnesium aluminum oxides and chromium-iron magnesium aluminum oxides. ****Section 2.60**** The molecular weight of hemoglobin (Mr(hemoglobin)) is calculated based on the atomic weight of iron (Ar(Fe)) and the molecular weight of iron (Mr(Fe)). The result is approximately 67,000. ****Section 2.61**** The formula for a polymer is written as Mr(polymer) = 3 × Mr(Br) + w(Br), where Mr(Br) is the molecular weight of bromine and w(Br) is the weight percentage of bromine in the polymer. The molecular weight of the polymer is calculated to be approximately 2291.6. Overall, these sections appear to involve calculations of molecular weights and percentages based on atomic weights and formulas for various compounds. ****Calculations and Formulas**** 1. For the compound W(P), the formula weight (Mr) is calculated as: W(P) = Mr(protein) / 30.97, where Mr(protein) = 36,000 2. The weights of K, Cu, C, N, and O in various compounds are calculated using their atomic masses: w(K) = Ar(K) × weight / Mr(K[Cu(CN)2]), etc. 3. For the compound Cr(CO)6, the weights of Cr, C, and O are calculated as: w(Cr) = 52.00 / 220.06 (x 100% = 23.6%), etc. ****Oxidation Numbers**** 1. Oxidation numbers are a way to keep track of electron transfers in chemical reactions. 2. The oxidation number of an element is zero (0) when it's in its elemental form. 3. Hydrogen has an oxidation number of +1, except in metal hydrides where it's -1. 4. Oxygen has an oxidation number of -2, except in peroxides where it's -1. ****Examples**** 1. The compound MnO has an oxidation number of +2 for manganese and -2 for oxygen. 2. The compound KMnO4 has an oxidation number of +7 for potassium, +6 for manganese, and -2 for oxygen. ****Other Topics**** 1. **Stechiometry:** the study of the proportions in which elements combine to form compounds. 2. **Oxidation reactions:** chemical reactions where one element gains electrons (reduction) while another loses electrons (oxidation). 3. **Redox reactions:** a type of reaction that involves both oxidation and reduction. Note that I've kept the formatting and structure of the original text, but paraphrased the content to make it easier to read and understand. Izoliranje slobodne kiseline H2SO3, H2S2O4, H2S2O5, H2S2O3 se odnosi na njihove soli koje se u kiselim otopinama disproporcioniraju. Najpoznate soli su soli NH3, NH4Cl, NH4NO2, HNO3. Nizanju su uključene i manje pojašnjenja za različite nukleotide kao što su NH2OH, N2H4, H2N2O2, NCl3, HNO2, CaCN2, Hg(OCN)2. U sastavu su soli kao P4, P4O6, P4O10, POCl3, i druge. Najpoznate soli su soli kao Na2HPO4, H4P2O7, Na6P6O18, Na2HPO3, Ba(H2PO2)2. Nakon što proučavaš ove soli, molarna formula za njih je odgovorna za njihovu strukturu i osobine.