Formula of aspirin molar mass

Learning objectives Distinguish between experimental formulas and molecular formulas Defining experimental formulas and molecular formulas using a percentage component Determining experimental formulas and molecular formulas using mass data Experimental measurements based on the number of measurements (experiments) such as mass. Knowing the mass of each element in a compound, we can determine its formula. There are two types of form formulas, experimental and molecular. Experimental formula: The lowest total ratio of elements in a molecular formula compound: The actual inso number ratio of elements in a compound. Experimental formulas are the lowest inso number ratio of elements in a compound. In (part 2.10), we found that benzene and acetylene have the same percentage of mass, and therefore it is reasonable that they have the same ratio of elements together, that is, they have the same experimental formula. Compound Acetylene benzene NaCl Structure Empirical Formula CH NaCl Molecular Formula C_2H_2 C_6H_6 not a molecule (use NaCl) Figure \(\PageIndex{1}\): Experimental and molecular formulas of some simple compounds. Experimental formulas are the lowest inso number ratio of elements in a compound. In (part 2.10), we found that benzene and acetylene have the same percentage of mass, and therefore it is reasonable that they have the same ratio of elements together, that is, they have the same experimental formula. For salts without copper diatomic ions (such as Hg_2 +2 or O2-2) the experimental formula is the recipe we write for describing salt. Mercury (I) chloride has an experimental formula of HgCl, but the real compound formula is Hg_2Cl_2 (2.7.3 rating) Many molecules may have the same experimental formula. For example, benzene (C_6H_6) and acetylene (C_2H_2) both experimental form formulas of CH (see Figure \(\PageIndex{1}\). Steps: Get the mass of each element (in grams) if the total volume you need is the volume of all but one element (the total volume is equal to the total volume). if for % the component assumes 100 g and converts to volume. if for % components you need data for all but one factor (the total percentage equals 100%). Calculates the # of moles of each element present (from the mass and weight of the atom). Now you have a formula that represents the mole proportions of the elements in the compound and you need to create these in in insles. Divide the mole number of each mole by the one with the smallest value (tie it to one and make all other values larger than one). By by the result of step 3 with the smallest ins ins ins insy will convert all of them to in in in in ins in ins. Note The secret is to convert the tithing to a percentimal number and then by the lowest common deed (see video \(\PageIndex{1}\)) 0.5=\(\frac{1}{2}\) 0.33=\(\\) frac{1}{3}\) 0.67=\(\frac{2}{3}\\ ) 0.25=\\(\frac{1}{4}\) 0.75=\\(\frac{3}{4}\) 0.167=\(\frac{1}{6}\) The following video shows how to calculate experimental formulas for ambition. Experimental formula calculation for aspirin: Aspirin is made of H, O&C and is analyzed to contain 60.0% carbon and 35.5% oxygen. Video \(\PageIndex{1}\): Experimental formula of aspirin For example \(\PageIndex{1}\) A certain compound has been found to contain 67.6% C, 22.5% O and 9.9% H. What is an experimental formula?. Solution \[22.5gO\left (\frac{1molO}{16.00g} \right)= 1.4\Rightarrow \frac{1.4}{1 1 1.4}= 1\] \[67.6gC\left (\frac{1molC}{12.011g} \right)= 5.63\Rightarrow \frac{5.63}{1.4}= 4\] \[9.9gH\left (\frac{1molH}{1,007g} \[right)= 9.9\Rightarrow \frac{9.9}{1.4}= 7\] This C_4H_7O Applet comes from ChemCollective at Carnegie Mellon University. This link will send you the video and instructions associated with this applet. Every time you load the page a new problem will load, and there are a variety of cascading suggestions to help you work through the issues. Exercise \(\PageIndex{1}\): Experimental formula Calculating experimental formula for sample A 3.3700 g of the following salt containing copper, nitrogen and oxygen, analyzed to contain 1.1418 g of copper and 1.7248 g of oxygen. A compound of nitrogen and oxygen contains 30.43% N by weight. The 2,402 g sample made of C, H, N and O contains 1,121 g N, 0.161 g H, 0.480 g C and an indidiid amount of oxygen. Answer CuN_2O_6 b NO_2 Answer c N_2H_4CO Exercise \(\PageIndex{2}\): Experimental formula For experimental formula of the compound in part (a) of the above: What could be the formula of the compound. What will be the name of the compound, using the formula in the answer from part (a) of this question. Answer a Cu $(NO_3)_2$ Answer b Copper (II) nitrate of cupric nitrate exercise \(\PageIndex{3}\): experimental formula In part 2.10.2 we find that benzene and acetylene both have the same volume percentage (92.3% C and 7.7% H), so let's calculate what is their experimental formula What is the experimental formula of acetylene (C_2H_2)? What is the experimental formula of benzene (C_6H_6)? (Knowing (a) experimental form formulas of acetylene and (b) benzene and acetylene have the same composition % mass, cam you answer this without doing any math?) Answer ch Answer b CH To calculate the molecular formula, we need more information in addition to the mass component or the percentage of mass, we need to know the molecular mass of the substance. There are many ways the test can be determined, and we will learn some as the semester progresses. The mass spectral machine that we use to determine the iso iso isothe composition in part 2.3 of this Chapter can be used to determine the molecular mass of many unknowns. But there are other techniques, and at this point in the semester, molecular mass will be considered certain. Experimental form formula represents the lowest inso number ratio of elements in a molecular Molecular formulas represent the actual formula of the molecules. Therefore, the molecular formula must be an indus multiple of the experimental formula, that is, it is greater than n times in which n = 1 or 2 or 3 or .... but it is a raw number. This gives the following relationship \[\text{[Molecular Formula=n([Empirical Formula)]}}\] then if we have a mole \[\text{[Molecular Weight=n([Experimental Weight)]}}\] or \[n=\frac{\text{[Molecular Weight]}}{[Experimental Weight]}}}] you calculate the experimental formula as above, then determine the weight of a mole, divide it into a functional mass, and that tell you how much larger it is, and then many emprical formulas according to that number. Compare Benzene to acetylene. In video 2.10.2 (part 2.10.2), we found that benzene and acetylene have the same mass composition % and in exercise 2.11.3 we say that they have the same experimental formula name: Benzene Acetylene Formula Weight 78.1 2g / mol 26.04g/mol Experimental formula CH Experimental formula weight 13.017 13.017 n=\(\frac{\text{[Molecular Weight]}}}{{text{[Experimental weight]}}}) \(\\\frac{\text{[Molecular Weight]}}}{{text{[Experimental Weight]}}}) \(\\\frac {78.12}{13.017}=6\) \(\frac{26.04}{13.017}=2\) Formula = n times experimental formula 6(CH) = C_6H_6 2(CH) = Table C_2H_2 \(\PageIndex{1}\): set up data to calculate molecular formulas for experimental formulas and molecular mass for benzene and acetylene For example \(\PageIndex{2}\) A certain compound was found to contain 67.6% C , 22.5% O, and 9.9% H. If the molecular weight of the compound is found to be about 142 g/mol, what is the correct molecular formula for the compound? Experimental C_4H_7O solution is (4)(12.01) + (7)(1,007) + (16.00) = 71.09g/mol \[\left) (\frac{142g/mol}{71.09g/mol} \right)= 2\] $C_8H_{14}O_2$ \(\PageIndex{4}\): Molecular Formula Molecular Formula calculation for the following compound A has an experimental formula of C_2HF with amol mass of 132.06 g/ mole. 200.0 g of acid sample with amol mass of 616.73g / mole contains 171.36 g of carbon, 18.18g of nitrogen and the rest is hydrogen. Strychine has amol mass of 334 g/mol and a percent composition of 75.42%C, 6.63%H and 8.38%N and the rest is oxygen. Answer $C_6H_3F_3$ b $C_{44}N_4H_{32}$ Answer c $C_{21}N_2H_{22}O_2$ Robert E. Belford (University of Arkansas Little Rock; Faculty of Chemistry). The breadth, depth and authenticity of this work is the responsibility of Robert E. Belford, rebelford@ualr.edu. You should contact him if you have any concerns. This document has both initial contributions and content built upon previous contributions from the LibreTexts Community and other resources, included but not limited to: November Palmer & Emily Choate (UALR) Ronia Kattoum (Learning Goals) At the end of this section, you will be able to: Calculate the formula volume for chemotherapy and ion-plus compounds Determine the number of mole units and the number of quan Avogadro Explanation between mass, moles, and the number of atoms or molecules, and make calculations derived from these numbers from each other We can argue that modern chemical science begins when scientists begin to explore the dosing as well as meastical aspects of chemistry. For example, Dalton's atomic theory was an attempt to explain the results of measurements that allowed him to calculate the relative mass of elements combined in various compounds. Understanding the relationship between the mass of atoms and the chemical formulas of compounds allows us to quantize the composition of substances. In an earlier chapter, we described the development of atomic mass units, the concept of average atomic mass, and the use of chemical form formulas to represent the element structure of substances. These ideas can be expanded to calculate the formula volume of a substance by synthesizing the average atomic mass of all the atoms represented in the substance's formula. The formula volume for chemotherapy plus substances for chemotherapy plus substances, the formula represents the quantities and types of atoms that form a single molecular of the substance; therefore, the formula volume can be referred to correctly as a molecular mass. Consider chloroform ($CHCl_3$), a chemotherapy compound that was once used as a surgical anesthetic and is now mainly used in the production of the anti-stick polymer, Teflon. The molecular formula of chloroform indicates that a single molecular contains a carbon atom, a hydrogen atom and three chlorine atoms. Therefore, the average molecular mass of a chloroform molecular is equal to the average total atomic mass of these atoms. Figure 1 outlines the calculations used to obtain the molecular mass of chloroform, which is 119.37 amulets. Chart 1. The average mass of a chloroform molecular, $CHCl_3$, is 119.37 amu, which is the total of the average atomic mass of each of its constituent atoms. This model shows the molecular structure of chloroform. Similarly, the molecular mass of an aspirin molecular, $C_9H_8O_4$, is the total atomic mass of nine carbon atoms, eight hydrogen atoms and four oxygen atoms, up to 180.15 amu (Figure 2). Chart 2. The average mass of an aspirin molecular is 180.15 amulets. This model shows the molecular structure of aspirin, $C_9H_8O_4$. Ibuprofen, $C_{13}H_{18}O_2$, is a chemotherapy compound and active ingredients in some common nonprescription analgesics, such as Advil and Motrin. What is the molecular mass (amulet) for this compound? The compound's solution molecules consist of 13 carbon atoms, 18 hydrogen atoms and 2 oxygen atoms. According to the approach described above, the average molecular mass for this compound is: Study Acetaminophen Test of $C_8H_9NO_2$, is a co-chemotherapy compound and active ingredients in some common nonprescription analgesics, such as Tylenol. What is a molecular (amulet) for this compound? Ion compounds consist of discrete ations and proportionally combined anions to deliver large quantities of neutral electricity. The formula volume for an ion compound is calculated in a similar way to the formula volume for chemotherapy compound: by synthesizing the average atomic mass of all atoms in the formula of the compound. However, keep in mind that the formula for an ion compound does not represent the composition of a discrete molecular, so it may not exactly be called molecular mass. For example, consider sodium chloride, NaCl, the chemical name for ordinary table salt. Sodium chloride is an ion compound consisting of sodium ations, na+, and anion chloride, cl–, combined in a ratio of 1:1. The formula volume for this compound is calculated as 58.44 amu (see Figure 3). Chart 3. Table salt, NaCl, contains a series of sodium and chloride ions combined in a ratio of 1:1. Its recipe volume is 58.44 amu. Note that the average mass of neutral sodium and chlorine atoms has been used in this calculation, rather than mass for sodium and chlorine anion concentrations. This approach is perfectly acceptable when calculating the formula volume of an ion compound. Although sodium cation has a slightly smaller mass than sodium atoms (as it lacks electrons), this difference will be offset by the fact that chloride anions are slightly larger than chloride atoms (due to the addition of electrons). Moreover, the mass of an electron is insignificantly small for the mass of a typical atom. Even when calculating the mass of an isolated ion, missing or additional electrons can generally be ignored, since their contribution to the overall mass is insignificant, which is reflected only in insignificant digits that will be lost when the calculated volume is rounded properly. A few exceptions to this guide are very mild ions derived from elements of precisely known atomic mass. Aluminum sulfate, Al2 (SO4) 3, is an ion compound used in paper production and in various water filtration processes. What is the formula volume (amu) of this compound? The Formula solution for this compound shows that it contains al3+ and SO42 ions combined in a ratio of 2:3. For the purpose of calculating a formula volume, it is useful to rewwwww formulas in a simpler format, $Al_2S_3O_{12}$. According to the above-mentioned approach, the formula volume for this compound is calculated as follows: Check your study calcium phosphate, Ca3 (PO4) 2, which is an ion compound and a common anti-typeing substance added to food products. What is the formula volume (amulet) of calcium phosphate? The identity of a substance is determined not only by the types of atoms or ions it contains, but also by the number of each type of atom or ion. For example, water, H_2O, and hydrogen peroxide, H_2O_2, are the same at their respective molecules include hydrogen and oxygen However, because a hydrogen peroxide cell contains two oxygen atoms, as opposed to water molecules, only one or two substances express very different properties. Today, we have sophisticated tools that allow direct measurement of these micro-defining characteristics; however, the same characteristics were originally derived from the measurement of macro-properties (mass and mass of large quantities of matter) using relatively simple tools (balancing and volume glass). This experimental approach requires the introduction of a new unit for the number of substances, moles, which remain indispensable in modern chemical science. Mole is a unit of the same amount as familiar units such as pairs, dozen, totals, etc. It provides a specific measure of the number of atoms or molecules in a sample of mass matter. A mole is defined as the amount of substance containing the same number of discrete bodies (atoms, molecules, ions, etc.) such as the number of atoms in the pure 12C sample weighing exactly 12 g. A Latin meaning for the word mole is large volume or large quantity, suitable for its use as a name for this unit. Moles provide a link between an easily measured macro asset, large volume, and an extremely important fundamental asset, the number of atoms, molecules, and so forth. The number of bodies that make a mole has been experimentally identified as [latex]6.02214179\times {10}^{23}[/latex], a basic constant named Avogadro number (NA) or Avogadro constant in honor of Italian scientist Amedeo Avogadro. This constant is properly reported with a clear unit of each mole, a conveniently rounded version of [latex]6022\times {10}^{23}\text{/mol.} [/latex] In accordance with its definition as a unit of amount, 1 mole of any element contains the same number of atoms as 1 mole of any other factor. However, the mass of 1 mole of different elements is different, since the mass of individual atoms differs significantly. Themol mass of an element (or compound) is the mass in grams of 1 mole of that substance, an asset expressed in grams per mole (g / mole) (see Figure 4). Chart 4. Each sample contains 6,022 × 1023 atoms—1.00 atomic molts. From left to right (top row): 65.4g zinc, 12.0g carbon, 24.3g magnesium and 63.5g copper. From left to right (bottom row): 32.1g sulfur, 28.1g silicon, 207g lead and 118.7g tin. (credit: editing by Mark Ott) Because the definitions of both the mole and the unit of atomic mass are based on the same reference substance, 12C, the molecular mass of any substance is equivalent to the number of atoms or the weight of its formula in the amulet. By the enchanting definition, a single 12C atom weighs 12 amndets (its atomic mass is 12 amndets). By the definition of a mole, 12 g 12C contains 1 mole of 12C atoms (its jaws 12 g/mol). This relationship keeps all elements, since their atomic mass is measured against the amuth reference, 12C. Expanding this principle, the molecular mass of a compound in grams is digitally equivalent to the volume of its formula in amulet (Figure 5). Chart 5. Each sample contains 6.02 × or 1.00 molt form units of compounds or elements. Clock wise from top left: 130.2g $C_8H_{17}OH$ (1-octanol, formula volume 130.2 amu), 454.9g HgI_2 (mercury(II) iodine, Formula mass 459.9 amu), 32.0g CH_3OH (methanol, formula volume 32.0 amu) and 256.5g S_8 (sulfur, formula volume 256.6 amu). (credit: Sahar Atwa) Average atomic mass element (amu) Mass of mole (g / mol) Atom / Mole C 12.01 12.01 [latex] 6,022 \ {10} ^ {23} [/ latex H 1008 1008 [latex]6022\times {10}^{23}[/latex] O 16.00 16.00 [latex]6.6 022\times {10}^{23}[/latex] Na 22.99 22.99 [latex]6022\times {10}^{23}[/latex] Cl 33 .4 5 33.45 [latex]6,022\times {10}^{23}[/latex] While atomic mass and mass are extremely equivalent in number, remember that they vary greatly in size, as represented by large differences in the length of their respective units (amuk vs. g). To appreciate the size of the mole, consider a small drop of water weighing about 0.03 g (see Figure 6). Although this represents only a small part of 1 mole of water (~18 g), it contains more water molecules than can clearly imagine. If molecules were equally distributed among about seven billion people on earth, each would receive more than 100 billion molecules. Chart 6. The number of molecules in a drop of water is about 100 billion times larger than the number of people on earth. (credit: tanakawho/Wikimedia commons) Moles are used in chemistry to represent [latex]6022\times {10}^{23}[/latex] of something, but it can be difficult to conceptualize such a large number. Watch this video to learn more. The relationship between the mass of form formulas, moles and Avogadro numbers can be applied to calculate the different quantities describing the composition of substances and compounds. For example, if we know the mass and chemical composition of a substance, we can determine the number of moles and calculate the number of atoms or molecules in the sample. Similarly, if we know the number of moles of a substance, we can obtain the number of atoms or molecules and calculate the mass of the substance. According to nutritional guidelines from the U.S. Department of Agriculture, the estimated average demand for dietary potassium is 4.7 g. What is the estimated average requirement of potassium in moles? Solution The volume of K is provided, and the corresponding amount of K in moles is required. Referring to the circulatory table, the atomic mass of K is 39.10 amu, and therefore itsmol mass is 39.10 g / mol. Certain volumes of (4.7 g) is bits more than a tenth of the mass of moles (39.10 g), so a reasonable ballpark estimate of the number of moles will be slightly larger than 0.1 molts. The amount of mole of a substance can be calculated by dividing its mass (g) by itsmol mass (g/mol): The number label method supports this mathematical method because unit g cancels and the answer hasmol units: [latex]4.7\cancel{\text{g}}\text{K}\left(\fra {\text{mol K}}{39.10\cancel{\text{g}}}}\right)=0.12\text{mol K}[/latex] The calculated scale (0.12 mol K) is in line with our expectations, as it is slightly larger than 0.1 molts. Check your academic Beryllium is a light metal used to make transparent X-ray windows for medical image instruments. How many moles of Be in a thin leaf window weigh 3.24 g? Derived from Grams from Moles for an element A liter of air containing [latex]9.2\times {10}^{-4}[/latex] mol argon. What is the volume of ar in a liter of air? Ar solution is provided and must be used to obtain the corresponding volume in grams. Since the ar amount is less than 1 mole, the mass will be less than the mass of 1 mole of Ar, about 40 g. The amount of pole in question is approximately one thousandth (~10-3) of the mole, and therefore the corresponding mass should be approximately one thousandth of the molecular mass (~0.04 g): In this case, dictation logic (and support factor labeling method) by the amount provided (mol) by the volume of moles (g/mol): [latex]9.2\times {10}^{-4}\cancel{\text{mol}}\text{Ar}\left(\frac{39.95\text{g}}}{{{cancel{\text{mol}}\text{Ar}}\right)=0.037\text{g Ar}[/latex] Results in line with our expectations as stated above, About 0.04 g Ar. What is your academic test volume of 2,561 gold molts? Copper is often used to make wires (Figure 7). How many copper atoms are in 5.00 g of copper wire? Chart 7. Copper wire consists of many, many atoms of Cu. (credit: Emilian Robert Vicol) Solution The number of Stale atoms in the wire can be conveniently derived from its mass by calculating two steps: first calculate the pole amount of the Stale, and then use the number Avogadro (NA) to convert this molecular number into the number of Stale atoms: Consider that the sample mass provided (5.00 g) is less than one-tenth the mass of 1 stale mole (~64 g), a reasonable estimate of the number of atoms in the sample will be in the order of one-tenth of NA, or about 1022 Cu atoms. : [latex]5.00\cancel{\text{g}}\text{Cu}\left(\frac{\cancel{text{mol}}\text{Cu}}{63.55\cancel{\text{g}}}}}right)\left(\frac{6,022 \times {10}^{23} \text{atoms}}{{{cancel{\text{mol}}}}}}}right)=4.74\times {10}^{22}\text{atoms of copper}[/latex] The measure label method provides the ability to cancel the desired unit and calculation results in the 1022 order as expected. Study Yours A panning probe for gold in a river collects 15.00 g of pure gold. How many Au atoms are in this amount of gold? Answer: [latex]4586\times {10}^{22}\text{Au atoms}[/latex] Our body synthesizes proteins from amino acids. One of these amino acids is glycine, which has the molecular formula C2H5O2N. How many moles of glycine molecules are contained in 28.35 glycines? Solution We can obtain the mole population of a compound from its mass according to the same process that we used for an element in Example 3: The molecular mass of glycine is necessary to allow this calculation, and it is calculated in a way similar to its molecular mass. A mole of glycine, C2H5O2N, which contains 2 carbon moles, 5 hydrogen moles, 2 oxygen moles and 1 nitrogen mole: The volume of glycine supplied (~28 g) is greater than a third of themol mass (~75 g/mol), so we expect the calculation results to be greater than a third of moles (~0.33 molts). Divide the mass of the compound by its molt mass output: [latex]28.35\cancel{\text{g}}\text{glycine}\left(\frac{\text{mol glycine}}{75.0 7\cancel{\text{g}}}}right)=0.378\text{mol glycine}[/latex] This results Check your learning How many moles of sucrose, C12H22O11, is in a 25-g sample of sucrose? Derived from grams from moles for a vitamin C compound is a chemotherapy compound with molecular formula C6H8O6. The recommended daily dietary subsidy of vitamin C for children aged 4-8 years is [latex]1.42\times {10}^{-4}\text{mol.}[/latex] What is the volume of this subsidy in grams? Solution For elements, the mass of a compound can be derived from its amount of mole as shown: The volume of moles for this compound is calculated as 176,124 g / mol. The number of certain moles is a very small part of the mole (~10-4 or one-tenth of a thousandths); therefore, we expect the corresponding mass to be about one-tenth of a thousandth of the molecular mass (~0.02 g). Performing the calculation, we receive: [latex]1.42\times {10}^{-4}\cancel{\text{mol}}\text{vitamin C}\left(\frac{176.1 2\text{g}}{\cancel{\text{mol}}\text{vitamin C}}\right)=0.0250\text{g vitamin C}[/latex] This is consistent with the expected results. Check your learning mass of 0.443 mol of hydrazine, N2H4? A package of artificial sweeteners containing 40.0 mg of saccharin (C7H5NO3S), has a structural formula: Given that saccharin has amol volume of 183.18 g / mol, how many saccharin molecules in the sample saccharin 40.0 mg (0.0400-g) ? How many carbon atoms are in the same sample? Solution The number of molecules in a certain volume of compounds is calculated by first derived from the number of moles, as demonstrated in Figure 5, and then by the amount of Avogadro: Use the mass and volume of molecules provided for the output {10}^{23}{\text{C}}_{7}{\text{H}}_{5}{\text{NO}_{3}\text{S molecules}}{1\cancel{\text{mol}}{{\text{C}}_{7}{\text{H}}_{5}{\text{NO}}}__{3}\text{S}}\right)=1.31\times {10}^{20}{\text{C}_{7}{\text{H}}_{5}{\text{NO}}_{3}\text{S molecules}[/latex] The compound's formula shows that each molecular contains seven carbon atoms, and therefore, the number of C atoms in the sample provided is: [latex]1.31\times {10}^{20}{\text{C}}_{7}{\text{H}}_{5}{\text{NO}}_{3}\text{S molecules}\left(\frac{7\text{C atoms}}{1{\text{C}}_{7}{\text{H}}_{5}{\text{NO}}_{3}\text{S molecule}}}-right)=9.20\times {10}^{21}\text{C atoms}[/latex] How many C4H10 molecules are contained in 9,213 g of this compound? How many hydrogen atoms are there? Answer: [latex]9545\times {10}^{22}\text{molecules}{{\text{C}_{4}{\text{H}}_{10}\text{;} 9.545\times {10}^{23}\text{atoms H}[/latex] The brain is the control center of the central nervous system (Figure 8). It sends and receives signals to and from muscles and other internal organs to monitor and control their function; it handles stimuli detected by sensory bodies to guide interactions with the outside world; and it contains complex 2000s that give birth to our intellect and emotions. The vast field of neurosc science covers all aspects of the structure and function of the central nervous system, including research on the anatomy and erology of the brain. Great progress has been made in brain research over the past few decades, and the BRAIN Initiative, a federal initiative announced in 2013, aims to accelerate and leverage these advances through coordinated efforts by various industry, academic, and government agencies (more details are available at the White House website). Chart 8. (a) A typical human brain weighs about 1.5 kg and accounts for a volume of about 1.1 L. (b) Information transmitted in brain tissue and throughout the central nervous system by specialized cells called neurons (micrographs show cells at a magnion of 1600×). Specialized cells are called neurons that transmit information between different parts of the central nervous system by electrical and chemical signals. Chemical signals occur at the interface between different neurons when one of the cells releases molecules (known as neuro-transmission) that diffuse over a small distance between cells (known as synapses) and connect to the surface of other cells. Neurostructic molecules are stored in small intocyte structures called fuse sic pockets into cellular formations and then break open to release their contents when neurons are appropriately stimulated. This process is called exocytosis (see Figure 9). One that has been extensively studied is dopamine, C8H11NO2. Dopamine is involved in various neurological processes that affect a wide range of human behaviors. Tangled function in the dopamine systems of the brain serious neurological diseases such as Parkinson's and systical systzophrenia. Chart 9. (a) Chemical signals are transmitted from neurons to other cells by release neuroses into small gaps (synapses) between cells. (b) Dopamine, C8H11NO2, is a neuropathy involved in a number of neurological processes. An important aspect of the complex processes involved in dopamine signaling is the number of kinh molecules released in exocytosis. Since this number is a central factor in determining neural reactions (and human thoughts and actions), it is important to know how this number changes with certain controlled stimuli, such as taking the drug. It is also important to understand the mechanism responsible for any changes in the number of neurosophrenic molecules released – for example, some dysfunction in exocytosis, a change in the number of vesicles in neurons, or a change in the number of neurosophrenic molecules in each bag. Significant progress has been made recently in directly measuring the number of dopamine molecules stored in individual pockets and the true amount released when the bag undergoes exocytosis. Using miniature probes that can selectively detect dopamine molecules in very small quantities, scientists have determined that the vesicers of a certain type of mouse brain neuron contain an average of 30,000 dopamine molecules per bag (about [latex]5\times {10}^{-20}[/latex] of mol or 50 zmol). Analysis of neurons from mice subjected to various drug theotherapy showed significant changes in the average number of dopamine molecules contained in individual vesicies, increasing or decreasing by up to three times, depending on the specific drug used. These studies also show that not all dopamine in a given bag is released in exocytosis, suggests that it may be possible to regulate the release part using pharmaceutical treatments. The main concept and summary of the formula volume of a substance is the sum of the average atomic mass of each atom represented in the chemical formula and is expressed in atomic mass units. The formula mass of a chemotherapy compound is also known as molecular mass. A convenient amount unit to express a very large number of atoms or molecules is moles. Experimental measurements have determined the number of bodies that form a mole of the substance as [latex]6,022\times {10}^{23}[/latex], a number known as the Avogadro number. The mass in grams of 1 mole of the substance is its extreme mass. Due to the use of the same reference substance in determining units of atomic mass and moles, the formula mass (amulet) and the mass of moles (g / mol) for any substance equivalent in quantity (for example, an H2O molest weighs about 18 amndets and 1 mole of H2O molecules weighing about 18 g). Chemical End of What is the total volume (amu) exercise of carbon in each of the following molecules? CH4 CHCl3 C12H10O6 CH3CH2CH2CH2CH3 How long is the total volume of hydrogen in each cell? CH4 CHCl3 C12H10O6 CH3CH2CH2CH2CH3 Calculates the molecular mass or formula of each of the following types: P4 H2O Ca (NO3)2 CH3CO2H (acetic acid) C12H22O11 (sucrose, sugar cane). Determining the molecular mass of the following compounds: Determining the molecular mass of the following compounds: Which molecules have a molecular mass of 28.05 amndets? Write a sentence describing how to determine the number of moles of a compound in a known mass of the compound if we know its molecular formula. Compare 1 mole of H2, 1 mole of O2 and 1 mole of F2. Which has the largest number of molecules? Explain why. Which one has the largest volume? Explain why. Which contains the largest volume of oxygen: 0.75 molt ethanol (C2H5OH), 0.60 formic acid moles (HCO2H), or 1.0 moles of water (H2O)? Explain why. Which contains the largest number of moles of oxygen atoms: 1 mole ethanol (C2H5OH), 1 formic acid mole (HCO2H), or 1 water mole (H2O)? Explain why. How are the molecular mass and molecular mass of a compound similar and how are they different? Calculate the molecular mass of each of the following compounds: hydrogen fluoride, HF ammonia, NH3 nitric acid, HNO3 silver sulfate, Ag2SO4 boric acid, B(OH)3 Calculate the polarized mass of each of the following types: S8 C5H12 Sc2(SO4)3 CH3COCH3 (acetone) C6H12O6 (glucose) Calculate the experimental or molecular formula volume and molecular mass of each of the following minerals: limestone, CaCO3 halite, NaCl Be3Al2Si6O18 malachite, Cu2(OH)2CO3 turquoise, CuAl6(PO4)4(OH)8(H2O)4 Calculate the molecular mass of each person following: halothane anesthesia, C2HBrClF3 herbicide paraquat, C12H14N2Cl2 caffeine, urea C8H10N4O2, CO (NH2)2 a typical soap, C17H35CO2Na Determine the number of moles of the compound and the number of moles of each type of atom in each of the following : 25.0 g propylene, C3H6 [latex]3.06\times {10}^{-3}\text{g}[/latex] of amino acid glycine, C2H5NO2 25 lb herbicide Treflan, C13H16N2O4F (1 lb = 454 g) 0.125 kg pesticide Paris Green, Cu4(ASO3)2(CH3CO2)2 325 mg aspirin, C6H4(CO2H)(CO2CH3) Determining the mass of each of the following types: 0.0146 mol KOH 10.2 mol ethane, C2H6 [latex]1.6\times {10}^{{-3}\text{mol}{\text{Na}}_{2}{\text{SO}}_{4}[/latex] [latex]6854\times {10}^{3}\text{mol glucose},{\text{C}}_{6}{\text{H}}__{12} {6} <3> <2>{\text{O}}_{6}[/latex] 2.86 mol Co(NH3)6Cl3 Determines the number of moles of the compound and determines the number of moles of each type of atom in each of the following : 2.12 g potassium bromide, KBr 0.1488 g phosphorus acid, H3PO4 23 kg calcium carbonate, CaCO3 78,452 g calcium sulfate, Al2(SO4)3 0.1250 mg caffeine, C8H10N4O2 Determine the volume of each of the following types: 2,345 licl mol 0.0872 acetylene molt, C2H2 [latex]3.3\times {10}^{-2}\text{mol}{\text{Na}}_{2}{\text{CO}}_{3}[/latex] [latex]1.23\times {10}^{3}\text{mol fructose,}{\text{C}}_{6}{\text{H}}_{12}{\text{O}}_{6}[/latex] 0.5758 mol FeSO4(H2O)7 Appetise acid minimum daily dietary requirements, C6H13NO2, is 1.1 g. What is this requirement in moles? Determine the volume in grams of each of the following molecules: 0.600 atomic moles oxygen 0.600 molecular oxygen, O2 0.600 ozone molecular mole, O3 A woman weighing 55 kg has [latex]7.5\times {10}^{-3}\text{mol}[/latex] of hemoglobin (mass of moles = 64,456 g/mol) in the blood. How many molecules of this hemoglobin? When is this amount in grams? Determine the number of atoms and masses of zirconium, silicon and oxygen found in 0.3384 molts of zircon, ZrSiO4, a semi-precious rock. Determine which of the following contains the largest hydrogen mass: 1 CH4 mole, 0.6 C6H6 molt or 0.4 C3H8 molt. Determine which of the following contains the largest volume of aluminum: 122 g AlPO4, 266 g A12C16 or 225 g A12S3. Diamonds are an element form of carbon. An engagement ring contains a diamond weighing 1.25 carats (1 carat = 200 mg). How many atoms are present in the diamond? The Cullinan Diamond is the largest natural diamond ever found (January 25, 1905). It weighs 3104 carats (1 carat = 200 mg). How many carbon atoms were present in the rock A 55 gram serving of a specific grain supply of 270 mg of sodium, 11% of the recommended daily subsidy. How many moles and sodium atoms in the daily subsidy are recommended? A certain grain grain contains 11.0 grams of sugar (sucrose, C12H22O11) per serving size of 60.0 grams. How many portions of cereal must be eaten to consume 0.0278 sugar moles? What is a toothpaste tube containing 0.76 g of sodium monofluorophosphate (Na2PO3F) in 100 mL Of fluorine atomic mass in mg present? How many fluorine atoms are present? Which of the following molecules represent the least number of molecules? 20.0 g H2O (18.02 g/mol) 77.0 g CH4 (16.06 g/mol) 68.0 g CaH2 (4 2,09 g/mol) 100.0 g N2O (44.02 g/mol) 84.0 g HF (20.01 g/mol) 1. (a) [latex]1\times 12.01\text{amu}=12.01\text{amu;} [/latex] (b) [latex]1\times 12.01\text{amu}=12.01\text{amu;} [/latex] (c) [latex]12\times 12.01\text{amu}=144.12\text{amu;} [/latex] (d) [latex]5\times 12.01\text{amu}=60.05\text{amu}[/latex] 3. (a) [latex]4\times 30974\text{amu}=123.896\text{amu}[/latex] (b) [latex]2\times 1.008\text{amu}+15.999\text{amu}=18.015\text{amu}[/latex] (c) [latex]40\times 0.078\text{amu}+2\times 14,007\text{amu}+6\times 15,999\text{amu}=164.086\text{amu}[/latex] (d) [latex]2\times 12.011\text{amu}+4\times 1,008\text{amu}+2\times (e) [latex]12\times 12.011\text{amu}+22\times 1,008\text{amu}\times 11\times 15999\text{amu}=342.297\text{amu}[/latex] 5. (a) C4H8 [latex]\begin{array}{ll}4\text{C}\times 12.011\hfill & =48.044\text{amu}\hfill \\ 8\text{H}\times 1.0079\hfill & =\underline{8.06352\text{amu}}\hfill \\ \hfill & =56.107\text{amu}\hfill \end{array}[/latex] (b) C4H6 [latex]\begin{array}{ll}4\text{C}\times 12.011\hfill & =48.044\text{amu}\hfill \\ 6\text{H}\times 1.0079\hfill & =\underline{6.0474\text{amu}}\hfill \\ \hfill & =54.091\text{amu}\hfill \end{array}[/latex] (c) H2Si2Cl4 [latex]\begin{array}{ll}\hfill 2\text{H}\times 1.0079& =2.01558\text{amu}\hfill \\ 2\text{Si}\times 28.0855\hfill & =56.1710\text{amu}\hfill \\ 4\text{Cl}\times 35.4527\hfill & =\underline{141.8108\text{amu}}\hfill \\ \hfill & =199.9976\text{amu}\hfill \end{array}[/latex] (d) H3PO4 [latex]\begin{array}{ll}\hfill 3\text{H}\times 1.0079& =3.0237\text{amu}\hfill \\ 1\text{P}\times 30.973762\hfill & =30.973762\text{amu}\hfill \\ \hfill 4\text{O}\times 15.9994& =\underline{ 63.9976\text{amu}}\hfill \\ \hfill & =97.9950\text{amu}\hfill \end{array}\text{;} [/latex] 7. Using molecular formulas to find molecular mass; to get the number of moles, divide the volume of the compound by the molecular mass of the compound expressed in grams. 9. Formic acid. Its formula has twice as many oxygen atoms as the other two compounds (each). Therefore, 0.60 molts of formic acid would be equivalent to 1.20 molts of a compound containing a single oxygen atom. 11.Two blocks have the same number value, but the units are different: The molecular mass is the mass of 1 molecular while the molecular mass is the mass of [latex]6,022\times {10}^ {23}[/latex] molecules. 13. (a) S8 [latex]8\text{S}=8\times 32.066=256.528\text{g/mol;} [/latex] (b) C5H12 [latex]\start{array}{lll}\hfill 5\text{C}=5\times 12,011&; =&60.055\text{g}{\text{mol}}^^{{-1}\hfill \\ \hfill \text{12H}=12\times 1.00794&=& \underline{12.09528\text{g}{\text{mol}}}}}{-1}}\hfill \\ \hfill & =& 72,150\text{g}{\text{}}}}}}}}-1}\hfill \end{array}\text{;} [/latex] (c) Sc2(SO4)3 [latex]\begin{array}{lll}\hfill 2\text{Sc}=2\times 44.9559109& =&89.9118218\text{g}{\text{mol}}}^{-1}\hfill \\ \hfill \text{3S}=3\times 32,066&=&96.198\text{g}{\text {mol}}}}}}}{{-1}\hfill \\ \hfill 12\text{O}=12\times 15.99943& =& \underline{191.99316\text{g}{{\text{mol}}}^{{-1}}\hfill \\ \hfill & =& 378.103\text{g}{{\text{mol}}}}{{-1}\hfill \end{}\array\text{;} [/latex] (d) CH3COCH3 [latex]\start{array}{lll}\hfill 3\text{C}=3\times 12.011&; =&36.033\text{g}{\text{mol}}^{{-1}\hfill \\ \hfill \text{1O}=1\times 15.9994& =&15.9994\text{g}{\text{{\text{\mol}}}}}}{-1}\hfill \\ \hfill 6\text{H}=6\times 1.00794& =&\underline{6.04764\text{g}{\text{{mol}}}}}{-1}}\hfill \\ \hfill & =& \end{array}\text{;} [/mů] (e) C6H12O6 [latex]\begin{array}{lll}\hfill \text{6C}=6\times 12.011& =& \\ \\ \hfill \text{12H}=12\times 1.00794& =& 12.09528\text{g}{\text{mol}}^{-1}\hfill \\ \hfill 6\text{O}=6\times 15.9994& =& \gạch dưới{95.9964\text{g}{\text{mol}}^{-1}}\hfill \\ \hfill & =& 180.158\text{g}{\text{mol}}^{-1}\hfill \end{array}[/latex] 15. (a) C2HBrClF3 [latex]\begin{array}{lll}\hfill \text{2C}=2\times 12.011& =& 24.022\text{g}{\text{mol}}^{-1}\hfill \\ \hfill \text{1H}=1\lần 1.00794& =& 1.00794\text{g}{\text{mol}}}^{-1}\hfill \\ \hfill \text{1Br}=1\times 79.904& =& 79.904\text{g}{\text{mol}}^{-1}\hfill \\ \hfill \text{1Cl}=1\times 35.453& =& 35.453\text{g}{\text{mol}}}^{-1}\hfill \\ \hfill 3\text{F}=3\times 18.998403& =& \gạch dưới{56.995209\text{g}{\text{mol}}^{-1}}\hfill \\ \hfill & =& 197.682\text{g}{\text{mol}}^{-1}\hfill \end{array}\text{;} [/mů] (b) C12H14N2Cl2 [latex]\begin{array}{lll}\hfill \text{12C}=12\times 12.011& =& 144.132\text{g}{\text{mol}}^{-11}\hfill \\ \hfill \text{14H}=14\times 1.00794& =& 14.111\text{g}{\text{mol}}}}{-1}\hfill \\ \hfill \text{2N}=2\lần 14.0067& =& 28.0134\text{g}{\text{mol}}}^{-1}\hfill \\ \hfill \text{2Cl}=2\times 35.453& =& \underline{270.906\text{g}{\text{mol}}}^{-1}}\hfill \\ \hfill & =& 257.163\text{g}{\text{mol}}}^{-1}\hfill \end{array}\text{;} [/mů] (c) C8H10N4O2 [latex]\begin{array}{lll}\hfill \text{8C}=8\times 12.011& =& 96.088\text{g}{\text{mol}}^{-1}\hfill \\ \hfill \text{10H}=10\times 1.007& =& 10.079\text{g}{\text{mol}}^{-1}\hfill \\ \hfill \text{4N}=4\4\lần 14.0067& =& 56.027\text{g}{\text{mol}}^{-1}\hfill \\ \hfill \text{2O}=2\times 15.9994& =& \underline{31 .999\text{g}{\text{mol}}^{-1}}\hfill \\ \hfill & =& 194.193\text{g}{\text{mol}}}}}{-1}\hfill \end{array}\text{;} [/mů] (d) CO(NH2)2 [latex]\begin{array}{lll}\hfill \text{1C}=1\times 12.011& =& 12.011\text{g}{\text{mol}}}}{-1}\hfill \\ \\ \hfill \text{1O}=1\times 15.9994& =& 15.9994\text{g}{\text{mol}}}}{-1}\hfill \\ \hfill \text{2N}=2\times 14.0067& =& 28.0134\text{g}{\text{mol}}^{-1}\hfill \\ \hfill \text{4H}=4\times 1.00794& =& \underline{4.03176\text{g}{\text{mol}}}^{-1}}\hfill \\ \hfill & =& 60.056\text{g}{\text{mol}}}}}{-1}\hfill \end{array}\text{;} [/mů] (e) C17H35CO2Na [latex]\begin{array}{lll}\hfill \text{18C}=18\times 12.011& =& 216.198\text{g}{\text{mol}^{-1}\hfill \\ \hfill \text{35H}=35\times 1.00794& =& 35.2779\text{g}{\text{mol}}^{-1}\hfill \\ \hfill \text{2O}=2\times 15.9994& =& 31.9988\text{g}{\text{mol}}^{-1}\hfill \\ \hfill \text{1Na}=1\times 22.98977& =& \underline{22.2298977\text{g}{\text{mol}}}^{-1}}\hfill \\ \hfill & =& 306.464\text{g}{\text{mol}}}^{-1}\hfill \end{array}[/latex] 17. (a) KOH: [latex]\begin{array}{lll}\hfill 1\text{K}=1\times 39.0983& =& 39.0983\hfill \\ \\ 1\text{O}=1\times 15.9994& =& 15.9994\hfill \\ \hfill \text{1H}=1 1\lần 1.00794& =& \gạch dưới{1.00794}\hfill \\ \hfill \text{molar mass}& =& 56.1056\text{g}{\text{mol}}^{-1}\hfill \end{array}[/latex] [latex]\text{Mass}=0.0146\text{mol}\times [latex]\text{Mass}=0.0146\text{mol}\times (b) C2H6 [latex]\begin{array}{lll}\hfill 2\text{C}=2\times 12.011& =& 24.022\hfill \\ \hfill 6\text{H}=6\times 1.00794& =& [gạch dưới{6.04764}\hfill \ \hfill \text{molar mass}& =& 30.070\text{g}{\text{mol}}^{-1}\hfill \end{array}[/latex] [latex]\text{Mass}=10.2\text{mol}\times 30.070\text{g/mol}=307\text{g;} [/mů] (c) Na2SO4: [latex]\begin{array}{lll}\hfill 2\text{Na}=2\times 22.990& =& 45.98\hfill \\ \hfill 1\text {S}=1\times 32.066& =& 32.066\hfill \\ \hfill 4\text{O}=4\times 15.9994& =& \underline{63.9976}\hfill \\ \hfill \text{molar mass}& =& 142.044\text{g}{\text{mol}}}^{-1}\hfill \end{array}[/latex [latex]\text{Mass}=1.6\times {10}^{-3}\text{mol}\times 142.044\text{g/mol}=\text{0.23 g;} [/mů] (d) C6H12O6 [latex]\begin{array}{lll}\hfill 6\text{C}=6\times 12.011& =& 72.066\hfill \\ \hfill 12\text{H}=12\lần 1.00794& =& 12.0953\hfill \\ \hfill 6\text{O}=6\times 15.9994& =& \underline{95.9964}\hfill \\ \hfill \text{molar mass}& =& 180.158\text{g}{\text{mol}}^{-1}\hfill \end{array}[/latex] [latex]\text{Mass}=6.6854\times {10}^{3}\text{mol}\times 180.158\text{g/mol}=1.235\times {10}^{6}\text{g ()1235\text{kg};} [/mů] (e) Co(NH3)6Cl3 [latex]\begin{array}{lll}\hfill \text{Co}=1\times 58.99320& =& 58.99320\hfill \\ \hfill 6\text{N}=8 6\lần 14.0067& =& 84.0402\hfill \\ \hfill 18\text{H}=18\times 1.00794& =& 18.1429\hfill \\ \hfill 3 \text{Cl}=3\times 35.4527& =& \underline{106.358}\hfill \\ \hfill \text{molar mass}& =& 267.5344\text{g}{\text{mol}}^{-1}\hfill \end{array}[/latex] [latex]\text{Mass}=2.856\text{mol}\times 267.5344\text{g/mol}=765\text{g}[/latex] 19. (a) [latex]\begin{array}{lll}\hfill \text{molar mass}\left(\text{LiCl}\right)=1\times 6.941+1\times 35.4527& =& 42.394\text{g}{\text{mol}}^{-1}\hfill \\ \hfill \text{mass}=2.345\cancel{\text{mol}}\times 42.394\text{g}\cancel{{\text{mol}}^{-1}}& =& 99.41\text{g}\hfill \end{array}[/latex] (b) [latex]\begin{array}{lll}\hfill \text{molar mass}\left({\text{C}}_{2}{\text{H}}_{2}\right)=2\times 12.011+2\times 1.00794& =& 26.038\text{g}{\text{mol}}^{-1}\hfill \\ \hfill \text{mass}=0.0872\cancel{\text{mol}}\times 26.038\text{g}\cancel{{\text{mol}}^{-1}}& =& 2.27\text{g}\hfill \end{array}[/latex] (c) [latex]\begin{array}{lll}\hfill \text{molar mass}\left({\text{Na}}_{2}{\text{CO}}_{3}\right)=2\times 22.989768+1\times 12.011+3\times 15.9994& =& 105.989\text{g}{\text{mol}}^{-1}\hfill \\ \hfill \text{mass}=3.3\times {10}^{-2}\cancel{\text{mol}}\times 105.989\text{g}{\text{mol}}^{-1} & =& 3.5\text{g}\hfill \end{array}[/latex] (d) [latex]\begin{ mảng}{lll}\hfill \text{molar mass}\left({\text{C}_{6}{\text{H}_{12}{\text{O}}_{6}\right)=6\times 12.011+12\lần 1.00794+6\lần 15.9994& =& 180.158\text{g}{\text{mol}}^{-1}\hfill \\ \hfill {10}^{3}\cancel{\text{mol}}\times 180.158\text{g}{\text {mol}}}^{-1}=2.22\times {10}^{5}\text{g}& =& 222\text{kg}\hfill \end{array}[/latex] (e) (e) \text{molar mass}\left[{\text{FeSO}}_{4}{\left({\text{H}}_{2}\text{O}\right)}_{7}\right]& =&1\times 55,847+1\32,066+4\15,999\hfill \\ \hfill +7\left(2\times 1.00794+15.9994\right)&=& 278.018\text{g}{\text{mol}}}^{{-1}\hfill \\ \hfill \text{mass}=0.5758\cancel{\text{mol}}}}\times278.018\text{g}\cancel{{\text{mol}}^{{-1}}}& =\hfill & 160.1\text{g}\hfill \end{array}[/latex] 21. (a) [latex]0.600\cancel{\text{mol}}\times 15.9994\text{g/}\cancel{\text{mol}}=9.60\text{g}[/latex] (b) [latex]0.600\cancel{\text{mol}}\times 2\times 15.994 g/}\cancel{\text{mol}}=19.2\text{g}[/latex] (c) [latex]0.600\cancel{\text{mol}}\times 3\times 15,994\text{g/}\cancel{\text{mol}}=28.8\text{g}[/latex] 23. Determine the number of moles of each component. From moles, calculate the number of atoms and the volume of the related elements. Zirconi: [latex]0.3384\cancel{\text{mol}}\times 6,022\times {10}^{23}{\cancel{\text{mol}}}}}{{{cancel{-1}=2.038\times 1023\text{atoms;} 0.3384\cancel{\text{mol}}\times 91,224\text{g/}\cancel{\text{mol}}=30.87\text{g;} [/latex] Silicon: [latex]0.3384\cancel{\text{mol}}\times 6,022\times {10}^{23}{\cancel{\text{mol}}}}} {{{cancel{-1}}=2.038\times {10}^{23}\text{atoms;} 0.3384\cancel{\text{mol}}\times 28.0855\text{g/}\cancel{\text{mol}}=9.504\text{g;} [/latex] Oxygen: [latex]4\times 0.3384\cancel{\text{mol}}\times {10}^{23}{cancel{\text{mol}}}}}}}}{{{cancel{-1}}}}8,151\times {10}^{23} \text{atoms;} 4\times 0.3384\cancel{\text{mol}}\times 15.9994\text{g/}\cancel{\text{mol}}=21.66\text{g}[/latex] 25. Determine the volume of feces and, from the current gram, moles of each substance. The compound with the greatest number of moles of Al has the greatest mass of Al. Molar mass AlPO4: 26.981539 + 30.973762 + 4(15.9994) = 121.9529 g/mol Molar mass Al2Cl6: 2(26.981539) + 6(35.4527) = 266.6793 g/mol Molar mass Al2S3: 2(26.981539) + 3(32.066) = 150.161 g/mol AlPO4: [latex]\frac{122\cancel{\text{g}}}{121.9529\cancel{\text{g}}{\text{mol}}^{-1}}=1.000\text{mol.}[/latex] [latex]\text{mol Al}=1\times 1.000\text{mol}=1.000\text{mol}[/latex] Al2Cl6: [latex]\frac{266\text{g}}{266.6793\text{g}{\text{mol}}^{-1}}=0.997\text{mol}[/latex] [latex]\text{mol Al}=2\times 0.997\text{mol}=1.994\text{mol}[/latex] Al2S3: [latex]\frac{225\cancel{\text{g}}}{150.161\cancel{\text{g}}{\text{mol}}^{-1}}=1.50\text{mol}[/latex] [latex]\text{mol Al}=2\times 1.50\text{mol}=3.00\text{mol}[/latex] 27. Determine the number of grams that are in diamonds and from which the number of moles. Find the number of carbon atoms by doubling Avogadro's number by number of moles: [latex]\frac{3104\cancel{\text{carats}}}\times \frac{200\cancel{\text{mg}}}{1\cancel{\text{mg}}}}}}{12.011\cancel{\text{g}}}}cancel{{{\text{{-text{}}}}}}}left(6,022\times {10}^{23}\cancel{{\text{mol}}}}}}}3.113\times {10}^{25}\text 29. Determine the molecular mass of sugar. 12(12.011) + 22(1.00794) + 11(15.9994) = 342,300 g/mol; Then [latex]0.0278\text{mol}\times 342,300\text{g/mol}=9.52\text{g sugar.} [/latex] 9.52 g of sugar represents [latex]\frac{11.0}{60.0}[/latex] of a serving or [latex]\frac{60.' 0\text{g serving}}{11.0\cancel{\text{g sugar}}}\times 9.52\cancel{\text{g sugar}}=51.9\text{g cereal.} [/latex] This amount is [latex]\frac{51.9\text{g cereal}}{60.0\text{g serving}}}=0.865[/latex] serving, or about 1 serving. 31. Calculate the number of moles of each species, then remember that 1 mole of anything [latex]=6022\times {10}^{23}[/latex] species. (a) 20.0 g = 1.11 mol H2O; (b) 77.0 g CH4 = 4.79 ch4 molts; (c) 68.0 g CaH2 = 1.62 mol CaH2; (d) 100.0 g N2O = 2.27 N2O moles; (e) 84.0 g HF = 4.20 mol HF. Therefore, 20.0 g H2O represents the least number of molecules because it has the least number of moles. The number of avogadro (NA) that experimentally determines the value of the number of bodies including 1 mole of the substance, equal to [latex]6,022\times {10}^{23}{\text{mol}}^{{-1}[/latex] the formula volume of the average mass for all atoms represented in a chemical formula; for chemotherapy compound, this is also the molecular mass of molecular mass in grams 1 mole of a mole of a mole matter of the substance contains the same number of atoms, molecules, ions, or other objects as the number of atoms in exactly 12 grams 12C 12C