I'm not a robot

DEA/ARCHIVIO B/De Agostini Picture Library / Getty Images Chemical names give a precise description of a substance, unlike common names which can be inaccurate.For example, 'baking soda' is known scientifically as sodium bicarbonate.Some substances have multiple scientific names, like ethyl alcohol also being called ethanol. Chemical or scientific names are used to give an accurate description of a substance's composition. Even so, you rarely ask someone to pass the sodium chloride at the dinner table. It's important to remember that common names are inaccurate and vary from one place and time to another. Therefore, don't assume that you know the chemical composition of a substance based on its common name. This is a list of archaic chemical names and common names for chemicals, with their modern or IUPAC equivalent name. You also may be interested in the list of common chemicals and where to find them. Common Name Chemical Name acetone dimethyl ketone; 2-propanone (usually known as acetone) acid potassium sulfate potassium bisulfate acid of sugar oxalic acid ackey nitric acid alcali volatil ammonium hydroxide alcohol, grain ethyl alcohol alcohol sulfuris carbon disulfide alcohol, wood methyl alcohol alum aluminum potassium sulfate alumina aluminum oxide antichlor sodium thiosulfate antifreeze ethylene glycol antimony black antimony trisulfide antimony bloom antimony trioxide antimony glance antimony trisulfide antimony red (vermillion) antimony oxysulfide aqua ammonia aqueous solution of ammonium hydroxide aqua fortis nitric acid aqua regia nitrohydrochloric acid aromatic spirit of ammonia ammonia in alcohol arsenic glass arsenic trioxide azurite mineral form of basic copper carbonate asbestos magnesium silicate aspirin acetylsalicylic acid baking soda sodium bicarbonate banana oil (artificial) isoamyl acetate barium white barium sulfate benzol benzene bicarbonate of soda sodium hydrogen carbonate or sodium bicarbonate bichloride of mercury mercuric chloride bichrome potassium dichromate bitter salt magnesium sulfate black ash crude form of sodium carbonate black copper oxide cupric oxide black lead graphite (carbon) blanc-fixe barium sulfate bleaching powder chlorinated lime; calcium hypochlorite blue copperas copper sulfate (crystals) blue lead lead sulfate blue salts nickel sulfate blue stone copper sulfate (crystals) blue vitriol copper sulfate bluestone copper sulfate bone ash crude calcium phosphate bone black crude animal charcoal boracic acid boric acid borax sodium borate; sodium tetraborate bremen blue basic copper carbonate brimstone sulfur burnt alum anhydrous potassium aluminum sulfate burnt lime calcium oxide burnt ochre ferric oxide burnt ore ferric oxide brine aqueous sodium chloride solution butter of antimony antimony trichloride butter of tin anhydrous stannic chloride butter of zinc zinc chloride calomel mercury chloride; mercurous chloride carbolic acid phenol carbonic acid gas carbon dioxide caustic lime calcium hydroxide caustic potash potassium hydroxide caustic soda sodium hydroxide chalk calcium carbonate Chile saltpeter sodium nitrate Chile nitre sodium nitrate Chinese red basic lead chromate Chinese white zinc oxide chloride of soda sodium hypochlorite chloride of lime calcium hypochlorite chrome alum chromic potassium sulfate chrome green chromium oxide chrome yellow lead (VI) chromate chromic acid chromium trioxide copperas ferrous sulfate corrosive sublimate mercury (II) chloride corundum (ruby, sapphire) chiefly aluminum oxide cream of tartar potassium bitartrate crocus powder ferric oxide crystal carbonate sodium carbonate dechlor sodium thiophosphate diamond carbon crystal emery powder impure aluminum oxide epsom salts magnesium sulfate ethanol ethyl alcohol farina starch ferro prussiate potassium ferricyanide ferrum iron flores martis anhydride iron (III) chloride fluorspar natural calcium fluoride fixed white barium sulfate flowers of sulfur sulfur 'flowers of' any metal oxide of the metal formalin aqueous formaldehyde solution French chalk natural magnesium silicate French vergidris basic copper acetate galena natural lead sulfide Glauber's salt sodium sulfate green verditer basic copper carbonate green vitriol ferrous sulfate crystals gypsum natural calcium sulfate hard oil boiled linseed oil heavy spar barium sulfate hydrocyanic acid hydrogen cynanide hypo (photography) sodium thiosulfate solution Indian red ferric oxide Isinglass agar-agar gelatin jeweler's rouge ferric oxide killed spirits zinc chloride lampblack crude form of carbon; charcoal laughing gas nitrous oxide lead peroxide lead dioxide lead protoxide lead oxide lime calcium oxide lime, slaked calcium hydroxide limewater aqueous solution of calcium hydroxide liquor ammonia ammonium hydroxide solution litharge lead monoxide lunar caustic silver nitrate liver of sulfur sufurated potash lye or soda lye sodium hydroxide magnesia magnesium oxide manganese black manganese dioxide marble mainly calcium carbonate mercury oxide, black mercurous oxide methanol methyl alcohol methylated spirits methyl alcohol milk of lime calcium hydroxide milk of magnesium magnesium hydroxide milk of sulfur precipitated sulfur "muriate" of a metal chloride of the metal muriatic acid hydrochloric acid natron sodium carbonate nitre potassium nitrate nordhausen acid fuming sulfuric acid oil of mars deliquescent anhydrous iron (III) chloride oil of vitriol sulfuric acid oil of wintergreen (artificial) methyl salicylate orthophosphoric acid phosphoric acid Paris blue ferric ferrocyanide Paris green copper acetoarsenite Paris white powdered calcium carbonate pear oil (artificial) isoamyl acetate pearl ash potassium carbonate permanent white barium sulfate plaster of Paris calcium sulfate plumbago graphite potash potassium carbonate potassa potassium hydroxide precipitated chalk calcium carbonate Prussic acid hydrogen cyanide pyro tetrasodium pyrophosphate quicklime calcium oxide quicksilver mercury red lead lead tetraoxide red liquor aluminum acetate solution red prussiate of potash potassium ferrocyanide red prussiate of soda sodium ferrocyanide Rochelle salt potassium sodium tartrate rock salt sodium chloride rouge, jeweler's ferric oxide rubbing alcohol isopropyl alcohol sal ammoniac ammonium chloride sal soda sodium carbonate salt, table sodium chloride salt of lemon potassium binoxalate salt of tartar potassium carbonate saltpeter potassium nitrate silica silicon dioxide slaked lime calcium hydroxide soda ash sodium carbonate soda nitre sodium nitrate soda lye sodium hydroxide soluble glass sodium silicate sour water dilute sulfuric acid spirit of hartshorn ammonium hydroxide solution spirit of salt hydrochloric acid spirit of wine ethyl alcohol spirits of nitrous ether ethyl nitrate sugar, table sucrose sugar of lead lead acetate sulfuric ether ethyl ether talc or talcum magnesium silicate tin crystals stannous chloride trona natural sodium carbonate unslaked lime calcium oxide Venetian red ferric oxide verdigris basic copper acetate Vienna lime calcium carbonate vinegar impure dilute acetic acid vitamin C ascorbic acid vitriol sulfuric acid washing soda sodium carbonate water glass sodium silicate white caustic sodium hydroxide white lead basic lead carbonate white vitriol zinc sulfate crystals yellow prussiate of potash potassium ferrocyanide yellow prussiate of soda sodium ferrocyanide zinc vitriol zinc sulfate zinc white zinc oxide Share — copy and redistribute the material in any medium or format for any purpose, even commercially. 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For example, other rights such as publicity, privacy, or moral rights may limit how you use the material. Principles of Chemical Nomenclature: A Guide to IUPAC Recommendations 2011 Edition, edited by Jeff Leigh, RSC Publishing, 2011 [ISBN 978-1-84973-007-5] Online PDF release Full text PDF – 1.5 MB (added 1 Dec 2021) The ultimate aim of IUPAC nomenclature is to provide unequivocal and comprehensible names for all kinds of chemical structures. This requires a rational basis from which comprehensible names can be developed. Written by leading world authorities this second edition of Principles of Chemical Nomenclature outlines IUPAC recommendations for application in the principle branches of chemistry: organic, inorganic, organometallic, and polymer. It also includes some basic biochemical nomenclature. The book clearly explains the fundamental principles of nomenclature methods and enables the reader to apply them accurately and with confidence. New developments are described and additional nomenclature systems used in specific industries are introduced. The book is replete with examples for guidance and there are extensive tables to direct the reader to information quickly. Aimed at chemistry teachers and students at all levels, it advises on the best presentation of formulae and chemical graphics. Although rather advanced for school pupils, their teachers will find it useful. Misc links Initiated in March 2012, a series of short notes and briefs about the Principles of Chemical Nomenclature have been published in CI – see www.iupac.org/publications/ci/indexes/nomenclature-notes.html Originating project 2006-029-1-800 > IUPAC Color Books Common names of chemicals are determined by cultural and historical factors, whereas trade names generally refer to the substance’s chemical name.The latter is typically based on the scientific standard nomenclature, the almost universally accepted standard of which is the IUPAC nomenclature, or the International Union of Pure and Applied Chemistry nomenclature.Trade names of chemicals may also refer to brand names, especially when it comes to medicines and other pharmaceutical products. However, for the purposes of this article, we only refer to the chemical names based on standard scientific nomenclature. Standard nomenclature is scientific because it takes account of the elemental composition of substances, along with the molecular structure and positions of the functional groups. In contrast, many of the common names have historical significance and cultural influence. For example, some of the earliest elements discovered have alchemical and magical equivalence based on the beliefs of ancient people.The difference between the chemical name and common nameThe main difference between chemical names and common names is the scientific standardised basis of naming. Common names are influenced by culture and history and can vary from one language to another, depending on the country or region. They may also have mythical and traditional origins.Cultural basis of namingThe element mercury is derived from the name of the Roman god Mercury (based on the Greek god Hermes), who was the god of translators and interpreters. He was also the messenger of the gods because of his super speed, as symbolised by his winged feet. In English, the element mercury is also called quicksilver due to its shiny, silver-white colour when in liquid form.Scientific basis of namingIt was only much later, in the 19th century, that chemical naming became more scientific. As the magical thinking of alchemy gave way to the empirically-based thinking of chemistry, the naming of chemicals also became more rational and organised.Elements were organised in a periodic table that reflected their shared and transitional properties. Undiscovered elements at that time were predicted based on the periodic table developed by Dmitri Mendeleev. The development of quantum mechanics and molecular orbital theory in the late 19th century also paved the way for understanding how chemical compounds and structures are formed. This knowledge was then integrated into the naming of chemicals.Popular searches for common chemical namesThese are seven of the most common chemical names that are frequently searched for online, along with their equivalent standard scientific chemical names.Water is considered a universal solvent because it can dissolve such a wide range of substances. It’s also the most abundant substance on the planet and plays a big role in sustaining life and regulating the weather and climate.The chemical name of water is sometimes playfully referred to online as “dihydrogen mono-oxide,” which is purportedly toxic and harmful. However, the IUPAC-compliant name of water is oxidane.Rust, particularly the rust on iron or steel surfaces, is an oxide of iron. Its formal IUPAC name is iron oxide and it has the chemical formula Fe2O3.Iron oxide is one of the most common minerals on the Earth’s crust. It serves as magnetic data storage for the earth itself and in electronic devices. The mineral’s unique colour also makes it useful for cosmetics and paints. Some iron oxides are used as catalysts for various types of chemical reactions, including the mass production of ammonia.Bicarbonate of soda, also known as sodium bicarbonate or simply baking soda, is a common chemical compound used in baking. It has various other applications too, including use in fire extinguishers. Its standard IUPAC name is sodium hydrogen carbonate, and its chemical is formula NaHCO3.Vitamin A is one of the fat-soluble vitamins and micronutrients we need to keep us healthy. It helps our body to function efficiently and is essential for good vision and healthy bones. There are two types of dietary vitamin A – the preformed vitamin A, such as retinol, and provitamin A carotenoids, such as beta-carotene.Vitamin C is a water-soluble vitamin. If water is considered a universal solvent, vitamin C is a master antioxidant. It can neutralise free radicals that might otherwise cause long-term cell damage. Vitamin C is also referred to by its chemical name of ascorbic acid. Commonly found in citrus fruits, it has the chemical formula C6H8O6.Petrol is a complex mixture of various hydrocarbons. It can refer to either crude oil or processed petroleum products, such as gasoline. That means the chemical name for petrol can be a long list of its various constituents, including benzene. However, petrol can also simply be called hydrocarbon.As blood is a complex mixture of living cells, antibodies, nutrients, minerals, and fluids, it doesn’t have a specific chemical name. However, if you’re referring to the oxygen-carrying protein in a red blood corpuscle, then this is called haemoglobin. Haemoglobin is a complex structure of amino acids that have an iron centre. Blood can also refer to other types of oxygen- and nutrient-carrying fluid in organisms, such as the blood of a horseshoe crab. The main functional protein of horseshoe crab blood is hemocyanin, which has a copper centre.If you want to learn more about the various chemical names and formulae of common chemical or trade names, here are more examples. Science, Tech, Math All Science, Tech, Math Humanities All Humanities Languages All Languages Resources All Resources Chemistry for Sustainable Future Join us in Kuala Lumpur, Malaysia, in July for the 53rd IUPAC General Assembly (53GA) and the 50th World Chemistry Congress (50WCC). See Congress details at iupac2025.org Follow the Congress and GA plan IUPAC is initiating a community roadmap and sustainability blueprint for digital standards in chemistry data reporting. With the rapid advancement of digital technologies, there’s an urgent need for consistent reporting and exchange of chemical data worldwide. 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It covers naming rules for compound ions, binary compounds, multiple valences using the Latin "ous/ic" m…SaveSave Nomenclature Worksheets For Later0%0% found this document useful, undefined Tutorials Binary Compound (Metal/Nonmetal) with Fixed Charge Cation Given Formula, Write the Name Given Name, Write the Formula Binary Compound (Metal/Nonmetal) with Variable Charge Cation: Stock System Given Formula, Write the Name Given Name, Write the Formula Binary Compound (Metal/Nonmetal) with Variable Charge Cation: Common Name System Given Formula, Write the Name Given Name, Write the Formula Covalent Binary Compound (Two Nonmetals): Greek Prefix System Given Formula, Write the Name Given Name, Write the Formula Polyatomics (Metal with fixed or variable charge/Polyatomic) Given Formula, Write the Name Given Name, Write the Formula Miscellaneous Problem Sets 0 ratings0% found this document useful (0 votes)733 viewsThis document is a worksheet for a 5th form introduction to organic chemistry class. It contains instructions for students to name condensed and fully displayed organic molecules using IUPAC…AI-enhanced title and descriptionSaveSave Organic chemistry nomenclature worksheet For Later0%0% found this document useful, undefined Know how ions form. Learn the characteristic charges that ions have. Construct a proper formula for an ionic compound. Generate a proper name for an ionic compound. So far, we have discussed elements and compounds that are electrically neutral. They have the same number of electrons as protons, so the negative charges of the electrons is balanced by the positive charges of the protons. However, this is not always the case. Electrons can move from one atom to another; when they do, species with overall electric charges are formed. Such species are called ions. Species with overall positive charges are termed cations , while species with overall negative charges are called anions. Remember that ions are formed only when electrons move from one atom to another; a proton never moves from one atom to another. Compounds formed from positive and negative ions are called ionic compounds. Individual atoms can gain or lose electrons. When they do, they become monatomic ions. When atoms gain or lose electrons, they usually gain or lose a characteristic number of electrons and so take on a characteristic overall charge. Table 4.6 "Monatomic Ions of Various Charges" lists some common ions in terms of how many electrons they lose (making cations) or gain (making anions). There are several things to notice about the ions in Table 4.6 "Monatomic Ions of Various Charges". First, each element that forms cations is a metal, except for one (hydrogen), while each element that forms anions is a nonmetal. This is actually one of the chemical properties of metals and nonmetals: metals tend to form cations, while nonmetals tend to form anions. Second, most atoms form ions of a single characteristic charge. When sodium atoms form ions, they always form a 1+ charge, never a 2+ or 3+ or even 1− charge. Thus, if you commit the information in Table 4.6 "Monatomic Ions of Various Charges" to memory, you will always know what charges most atoms form. (In Chapter 8 "Chemical Bonds", we will discuss why atoms form the charges they do.) Table 4.6 Monatomic Ions of Various Charges Ions formed by losing a single electron H+ Na+ K+ Rb+ Ag+ Au+ Ions formed by losing two electrons Mg2+ Ca2+ Sr2+ Fe2+ Co2+ Ni2+ Cu2+ Zn2+ Sn2+ Hg2+ Pb2+ Ions formed by losing three electrons Sc3+ Fe3+ Co3+ Ni3+ Au3+ Al3+ Cr3+ Ions formed by losing four electrons Ti4+ Sn4+ Pb4+ Ions formed by gaining a single electron F− Cl− Br− I− Ions formed by gaining two electrons O2− S2− Se2− Ions formed by gaining three electrons N3− P3− Third, there are some exceptions to the previous point. A few elements, all metals, can form more than one possible charge. For example, iron atoms can form 2+ cations or 3+ cations. Cobalt is another element that can form more than one possible charged ion (2+ and 3+), while lead can form 2+ or 4+ cations. Unfortunately, there is little understanding which two charges a metal atom may take, so it is best to just memorize the possible charges a particular element can have. Note the convention for indicating an ion. The magnitude of the charge is listed as a right superscript next to the symbol of the element. If the charge is a single positive or negative one, the number 1 is not written; if the magnitude of the charge is greater than 1, then the number is written before the + or − sign. An element symbol without a charge written next to it is assumed to be the uncharged atom. Naming an ion is straightforward. For a cation, simply use the name of the element and add the word ion (or if you want to be more specific, add cation) after the element’s name. So Na+ is the sodium ion; Ca2+ is the calcium ion. If the element has more than one possible charge, the value of the charge comes after the element name and before the word ion. Thus, Fe2+ is the iron two ion, while Fe3+ is the iron three ion. In print, we use roman numerals in parentheses to represent the charge on the ion, so these two iron ions would be represented as the iron(II) cation and the iron(III) cation, respectively. For a monatomic anion, use the stem of the element name and append the suffix -ide to it, and then add ion. This is similar to how we named molecular compounds. Thus, Cl− is the chloride ion, and N3− is the nitride ion. Name each species. Solution This species has a 2− charge on it, so it is an anion. Anions are named using the stem of the element name with the suffix -ide added. This is the oxide anion. Because this species has no charge, it is an atom in its elemental form. This is cobalt. In this case, there is a 2+ charge on the atom, so it is a cation. We note from Table 3.6 "Monatomic Ions of Various Charges" that cobalt cations can have two possible charges, so the name of the ion must specify which charge the ion has. This is the cobalt(II) cation. Test Yourself Name each species. Answers the phosphide anion the strontium cation Chemical formulas for ionic compounds are called ionic formulas. A proper ionic formula has a cation and an anion in it; an ionic compound is never formed between two cations only or two anions only. The key to writing proper ionic formulas is simple: the total positive charge must balance the total negative charge. Because the charges on the ions are characteristic, sometimes we have to have more than one of a cation or an anion to balance the overall positive and negative charges. It is conventional to use the lowest ratio of ions that are needed to balance the charges. For example, consider the ionic compound between Na+ and Cl−. Each ion has a single charge, one positive and one negative, so we need only one ion of each to balance the overall charge. When writing the ionic formula, we follow two additional conventions: (1) write the formula for the cation first and the formula for the anion next, but (2) do not write the charges on the ions. Thus, for the compound between Na+ and Cl−, we have the ionic formula NaCl (Figure 3.5 "NaCl = Table Salt"). The formula Na2Cl2 also has balanced charges, but the convention is to use the lowest ratio of ions, which would be one of each. (Remember from our conventions for writing formulas that we don’t write a 1 subscript if there is only one atom of a particular element present.) For the ionic compound between magnesium cations (Mg2+) and oxide anions (O2−), again we need only one of each ion to balance the charges. By convention, the formula is MgO. For the ionic compound between Mg2+ ions and Cl− ions, we now consider the fact that the charges have different magnitudes, 2+ on the magnesium ion and 1− on the chloride ion. To balance the charges with the lowest number of ions possible, we need to have two chloride ions to balance the charge on the one magnesium ion. Rather than write the formula MgClCl, we combine the two chloride ions and write it with a 2 subscript: MgCl2. What is the formula MgCl2 telling us? There are two chloride ions in the formula. Although chlorine as an element is a diatomic molecule, Cl2, elemental chlorine is not part of this ionic compound. The chlorine is in the form of a negatively charged ion, not the neutral element. The 2 subscript is in the ionic formula because we need two Cl− ions to balance the charge on one Mg2+ ion. Write the proper ionic formula for each of the two given ions. Ca2+ and Cl− Al3+ and F− Al3+ and O2− Solution We need two Cl− ions to balance the charge on one Ca2+ ion, so the proper ionic formula is CaCl2. We need three F− ions to balance the charge on the Al3+ ion, so the proper ionic formula is AlF3. With Al3+ and O2−, note that neither charge is a perfect multiple of the other. This means we have to go to a least common multiple, which in this case will be six. To get a total of 6+, we need two Al3+ ions; to get 6−, we need three O2− ions. Hence the proper ionic formula is Al2O3. Test Yourself Write the proper ionic formulas for each of the two given ions. Fe2+ and S2− Fe3+ and S2− Answers Naming ionic compounds is simple: combine the name of the cation and the name of the anion, in both cases omitting the word ion. Do not use numerical prefixes if there is more than one ion necessary to balance the charges. NaCl is sodium chloride, a combination of the name of the cation (sodium) and the anion (chloride). MgO is magnesium oxide. MgCl2 is magnesium chloride—not magnesium dichloride. In naming ionic compounds whose cations can have more than one possible charge, we must also include the charge, in parentheses and in roman numerals, as part of the name. Hence FeS is iron(II) sulfide, while Fe2S3 is iron(III) sulfide. Again, no numerical prefixes appear in the name. The number of ions in the formula is dictated by the need to balance the positive and negative charges. Name each ionic compound. Solution Using the names of the ions, this ionic compound is named calcium chloride. It is not calcium(II) chloride because calcium forms only one cation when it forms an ion, and it has a characteristic charge of 2+. The name of this ionic compound is aluminum fluoride. We know that cobalt can have more than one possible charge; we just need to determine what it is. Oxide always has a 2− charge, so with three oxide ions, we have a total negative charge of 6−. This means that the two cobalt ions have to contribute 6+, which for two cobalt ions means that each one is 3+. Therefore, the proper name for this ionic compound is cobalt(III) oxide. Test Yourself Name each ionic compound. Answers scandium oxide silver chloride How do you know whether a formula—and by extension, a name—is for a molecular compound or for an ionic compound? Molecular compounds form between nonmetals and nonmetals, while ionic compounds form between metals and nonmetals. The periodic table (Figure 4.2 "A Simple Periodic Table") can be used to determine which elements are metals and nonmetals. There also exists a group of ions that contain more than one atom. These are called polyatomic ions. Table 4.7 "Common Polyatomic Ions" lists the formulas, charges, and names of some common polyatomic ions. Only one of them, the ammonium ion, is a cation; the rest are anions. Most of them also contain oxygen atoms, so sometimes they are referred to as oxyanions. Some of them, such as nitrate and nitrite, and sulfate and sulfite, have very similar formulas and names, so care must be taken to get the formulas and names correct. Note that the -ite polyatomic ion has one less oxygen atom in its formula than the -ate ion but with the same ionic charge. Table 4.7 Common Polyatomic Ions Name Formula and Charge Name Formula and Charge ammonium NH4+ hydroxide OH− acetate C2H3O2−, or CH3COO− nitrate NO3− bicarbonate (hydrogen carbonate) HCO3− nitrite NO2− bisulfate (hydrogen sulfate) HSO4− peroxide O22− carbonate CO32− perchlorate ClO4− chlorate ClO3− phosphate PO43− chromate CrO42− sulfate SO42− cyanide CN− sulfite SO32− dichromate Cr2O72− triiodide I3− The naming of ionic compounds that contain polyatomic ions follows the same rules as the naming for other ionic compounds: simply combine the name of the cation and the name of the anion. Do not use numerical prefixes in the name if there is more than one polyatomic ion; the only exception to this is if the name of the ion itself contains a numerical prefix, such as dichromate or triiodide. Writing the formulas of ionic compounds has one important difference. If more than one polyatomic ion is needed to balance the overall charge in the formula, enclose the formula of the polyatomic ion in parentheses and write the proper numerical subscript to the right and outside the parentheses. Thus, the formula between calcium ions, Ca2+, and nitrate ions, NO3−, is properly written Ca(NO3)2, not CaNO32 or CaN2O6. Use parentheses where required. The name of this ionic compound is simply calcium nitrate. Write the proper formula and give the proper name for each ionic compound formed between the two listed ions. NH4+ and S2− Al3+ and PO43− Fe2+ and PO43− Solution Because the ammonium ion has a 1+ charge and the sulfide ion has a 2− charge, we need two ammonium ions to balance the charge on a single sulfide ion. Enclosing the formula for the ammonium ion in parentheses, we have (NH4)2S. The compound’s name is ammonium sulfide. Because the ions have the same magnitude of charge, we need only one of each to balance the charges. The formula is AlPO4, and the name of the compound is aluminum phosphate. Neither charge is an exact multiple of the other, so we have to go to the least common multiple of 6. To get 6+, we need three iron(II) ions, and to get 6−, we need two phosphate ions. The proper formula is Fe3(PO4)2, and the compound’s name is iron(II) phosphate. Test Yourself Write the proper formula and give the proper name for each ionic compound formed between the two listed ions. NH4+ and PO43− Co3+ and NO2− Answers (NH4)3PO4, ammonium phosphate Co(NO2)3, cobalt(III) nitrite The element sodium, at least in its ionic form as Na+, is a necessary nutrient for humans to live. In fact, the human body is approximately 0.15% sodium, with the average person having one-twentieth to one-tenth of a kilogram in their body at any given time, mostly in fluids outside cells and in other bodily fluids. Sodium is also present in our diet. The common table salt we use on our foods is an ionic sodium compound. Many processed foods also contain significant amounts of sodium added to them as a variety of ionic compounds. Why are sodium compounds used so much? Usually sodium compounds are inexpensive, but, more importantly, most ionic sodium compounds dissolve easily. This allows processed food manufacturers to add sodium-containing substances to food mixtures and know that the compound will dissolve and distribute evenly throughout the food. Simple ionic compounds such as sodium nitrite (NaNO2) are added to cured meats, such as bacon and deli-style meats, while a compound called sodium benzoate is added to many packaged foods as a preservative. Table 3.8 "Some Sodium Compounds Added to Food" is a partial list of some sodium additives used in food. Some of them you may recognize after reading this chapter. Others you may not recognize, but they are all ionic sodium compounds with some negatively charged ion also present. Table 4.8 Some Sodium Compounds Added to Food Sodium Compound Use in Food Sodium acetate preservative, acidity regulator Sodium adipate food acid Sodium alginate thickener, vegetable gum, stabilizer, gelling agent, emulsifier Sodium aluminum phosphate acidity regulator, emulsifier Sodium aluminosilicate anticaking agent Sodium ascorbate antioxidant Sodium benzoate preservative Sodium bicarbonate mineral salt Sodium bisulfite preservative, antioxidant Sodium carbonate mineral salt Sodium carboxymethylcellulose emulsifier Sodium citrates food acid Sodium dehydroacetate preservative Sodium erythorbate antioxidant Sodium erythorbin antioxidant Sodium ethyl para-hydroxybenzoate preservative Sodium ferrocyanide anticaking agent Sodium formate preservative Sodium fumarate food acid Sodium gluconate stabilizer Sodium hydrogen acetate preservative, acidity regulator Sodium hydroxide mineral salt Sodium lactate food acid Sodium malate food acid Sodium metabisulfite preservative, antioxidant, bleaching agent Sodium methyl para-hydroxybenzoate preservative Sodium nitrate preservative, color fixative Sodium nitrite preservative, color fixative Sodium orthophenyl phenol preservative Sodium propionate preservative Sodium propyl para-hydroxybenzoate preservative Sodium sorbate preservative Sodium stearoyl lactylate emulsifier Sodium succinates acidity regulator, flavor enhancer Sodium salts of fatty acids emulsifier, stabilizer, anticaking agent Sodium sulfite mineral salt, preservative, antioxidant Sodium sulfite preservative, antioxidant Sodium tartrate food acid Sodium tetraborate preservative The use of so many sodium compounds in prepared and processed foods has alarmed some physicians and nutritionists. They argue that the average person consumes too much sodium from his or her diet. The average person needs only about 500 mg of sodium every day; most people consume more than this—up to 10 times as much. Some studies have implicated increased sodium intake with high blood pressure; newer studies suggest that the link is questionable. However, there has been a push to reduce the amount of sodium most people ingest every day: avoid processed and manufactured foods, read labels on packaged foods (which include an indication of the sodium content), don’t oversalt foods, and use other herbs and spices besides salt in cooking. Ions form when atoms lose or gain electrons. Ionic compounds have positive ions and negative ions. Ionic formulas balance the total positive and negative charges. Ionic compounds have a simple system of naming. Groups of atoms can have an overall charge and make ionic compounds. Explain how cations form. Give the charge each atom takes when it forms an ion. If more than one charge is possible, list both. Give the charge each atom takes when it forms an ion. If more than one charge is possible, list both. Give the charge each atom takes when it forms an ion. If more than one charge is possible, list both. Name the ions from Exercise 3. Name the ions from Exercise 4. Name the ions from Exercise 5. Name the ions from Exercise 6. Give the formula and name for each ionic compound formed between the two listed ions. Mg2+ and Cl− Fe2+ and O2− Fe3+ and O2− Give the formula and name for each ionic compound formed between the two listed ions. K+ and S2− Ag+ and Br− Sr2+ and N3− Give the formula and name for each ionic compound formed between the two listed ions. Cu2+ and F− Ca2+ and O2− K+ and P3− Give the formula and name for each ionic compound formed between the two listed ions. Na+ and N3− Co2+ and I− Au3+ and S2− Give the formula and name for each ionic compound formed between the two listed ions. K+ and SO42− NH4+ and S2− NH4+ and PO43− Give the formula and name for each ionic compound formed between the two listed ions. Ca2+ and NO3− Ca2+ and NO2− Sc3+ and C2H3O2− Give the formula and name for each ionic compound formed between the two listed ions. Pb4+ and SO42− Na+ and I3− Li+ and Cr2O72− Give the formula and name for each ionic compound formed between the two listed ions. NH4+ and N3− Mg2+ and CO32− Al3+ and OH− Give the formula and name for each ionic compound formed between the two listed ions. Ag+ and SO32− Na+ and HCO3− Fe3+ and ClO3− Give the formula and name for each ionic compound formed between the two listed ions. Rb+ and O22− Au3+ and HSO4− Sr2+ and NO2− What is the difference between SO3 and SO32−? What is the difference between NO2 and NO2−? Click here for Solutions Systematic naming of chemical compounds Chemical nomenclature is a set of rules to generate systematic names for chemical compounds. The nomenclature used most frequently worldwide is the one created and developed by the International Union of Pure and Applied Chemistry (IUPAC). IUPAC Nomenclature ensures that each compound (and its various isomers) have only one formally accepted name known as the systematic IUPAC name. However, some compounds may have alternative names that are also accepted, known as the preferred IUPAC name which is generally taken from the common name of that compound. Preferably, the name should also represent the structure or chemistry of a compound. For example, the main constituent of white vinegar is CH3COOH, which is commonly called acetic acid and is also its recommended IUPAC name, but its formal, systematic IUPAC name is ethanoic acid. The IUPAC's rules for naming organic and inorganic compounds are contained in two publications, known as the Blue Book[1][2] and the Red Book,[3] respectively. A third publication, known as the Green Book,[4] recommends the use of symbols for physical quantities (in association with the IUPAP), while a fourth, the Gold Book,[5] defines many technical terms used in chemistry. Similar compendia exist for biochemistry[6] (the White Book, in association with the IUBMB), analytical chemistry[7] (the Orange Book), macromolecular chemistry[8] (the Purple Book), and clinical chemistry[9] (the Silver Book). These "color books" are supplemented by specific recommendations published periodically in the journal Pure and Applied Chemistry. The main purpose of chemical nomenclature is to disambiguate the spoken or written names of chemical compounds: each name should refer to one compound. Secondarily, each compound should have only one name, although in some cases some alternative names are accepted. Preferably, the name should also represent the structure or chemistry of a compound. This is achieved by the International Chemical Identifier (InChI) nomenclature. However, the American Chemical Society's CAS numbers nomenclature does not represent a compound's structure. The nomenclature used depends on the needs of the user, so no single correct nomenclature exists. Rather, different nomenclatures are appropriate for different circumstances. A common name will successfully identify a chemical compound, given context. Without context, the name should indicate at least the chemical composition. To be more specific, the name may need to represent the three-dimensional arrangement of the atoms. This requires adding more rules to the standard IUPAC system (the Chemical Abstracts Service system (CAS system) is the one used most commonly in this context), at the expense of having names which are longer and less familiar. The IUPAC system is often criticized for failing to distinguish relevant compounds (for example, for differing reactivity of sulfur allotropes, which IUPAC does not distinguish). While IUPAC has a human-readable advantage over CAS numbering, IUPAC names for some larger, relevant molecules (such as rapamycin) are barely human-readable, so common names are used instead. It is generally understood that the purposes of lexicography versus chemical nomenclature vary and are to an extent at odds. Dictionaries of words, whether in traditional print or on the internet, collect and report the meanings of words as their uses appear and change over time. For internet dictionaries with limited or no formal editorial process, definitions —in this case, definitions of chemical names and terms— can change rapidly without concern for the formal or historical meanings. Chemical nomenclature however (with IUPAC nomenclature as the best example) is necessarily more restrictive: Its purpose is to standardize communication and practice so that, when a chemical term is used it has a fixed meaning relating to chemical structure, thereby giving insights into chemical properties and derived molecular functions. These differing purposes can affect understanding, especially with regard to chemical classes that have achieved popular attention. Examples of the effect of these are as follows: resveratrol, a single compound defined clearly by this common name, but that can be confused, popularly, with its cis-isomer, omega-3 fatty acids, a reasonably well-defined class of chemical structures that is nevertheless broad as a result of its formal definition, and polyphenols, a fairly broad structural class with a formal definition, but where mistranslations and general misuse of the term relative to the formal definition has resulted in serious errors of usage, and so ambiguity in the relationship between structure and activity (SAR). The rapid pace at which meanings can change on the internet, in particular for chemical compounds with perceived health benefits, ascribed rightly or wrongly, complicate the monosemy of nomenclature (and so access to SAR understanding). Specific examples appear in the Polyphenol article, where varying internet and common-use definitions conflict with any accepted chemical nomenclature connecting polyphenol structure and bioactivity. The nomenclature of alchemy is descriptive, but does not effectively represent the functions mentioned above. Opinions differ about whether this was deliberate on the part of the early practitioners of alchemy or whether it was a consequence of the particular (and often esoteric) theories according to which they worked. While both explanations are probably valid to some extent, it is remarkable that the first "modern" system of chemical nomenclature appeared at the same time as the distinction (by French chemist Antoine Lavoisier) between elements and compounds, during the late eighteenth century. Title page of Méthode de nomenclature chimique. The French chemist Louis-Bernard Guyton de Morveau published his recommendations in 1782,[10] hoping that his "constant method of denomination" would "help the intelligence and relieve the memory". The system was refined in Méthode de nomenclature chimique [fr],[11] published in 1787 in collaboration with Lavoisier, Claude Louis Berthollet, and Antoine-François de Fourcroy, and translated into English as Method of Chymical Nomenclature by James St. John in 1788.[12] Méthode de nomenclature chimique contained handy dictionaries[13] in which older chemical names were listed with their new counterparts[14] and vice versa.[15] New names were provided in both French and Latin for the benefit of an international readership. For a modern reader these dictionaries are still useful, but now to discover and understand older names, rather than the new. In the English version,[16] the new names had been adapted to English, though they did not always align with current con