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Nomenclature for molecular compounds

Towards the end of this module, you will be able to: a systematic approach to derive the name for common types of inorganic compounds and simple molecular compounds using Nomenclature, a collection of rules for naming things, science and many other situations. This module describes the approach used to name simple ion and molecular compounds such as NaCl, CaCO3, and N2O4. The simplest binary compounds of these are compounds containing two elements, but we will also consider how to consider the name of the ion compound containing multiatomic ions, one specific, very important class of compounds known as acids – a subsequent chapter of this text will focus on these compounds in very detail. We limit our interest here in inorganic compounds, compounds that are composed mainly of elements other than carbon, and will follow the nomenclature guidelines proposed by IUPAC. The rules for organic compounds, where carbon is a principle factor, are processed in the latter part of organic chemistry. To name an inorganic compound, you need to consider the answers to some questions. First, is the compound ions or molecules? If the compound is an ion, is the metal-shaped ion one type (fixed charge) or one or more types (variable charge)? Are ions atoms or multi-atoms? If the compound is a molecule, does hydrogen be included? If so, does it also contain oxygen? In the answers we derive, we place the compound in the appropriate category and name it accordingly. The name of the binary compound containing the monatomic ion consists of the name of the cathode (the name of the metal) and the name of the anion (the name of the non-metallic element with its end replaced by the suffix-ide). Table 1 has several examples. NaCl, sodium chloride Na2O, sodium chloride KBr, potassium bromide CdS, potassium sulfide CaI2, calcium iodine Mg3N2, magnesium nitride CsF, cesium fluoride Ca3P2, calcium inspirder LiCl, chloride Al4C3, aluminum cabidde table 1. The name of some ion compoundcompounds containing multiatomic ions is named similar to compounds that contain only monatomic ions, except that the animation already exists under the name of anion – except that it does not need to be changed to ide endings. The example is shown in Table 2. For a general list of multiatomic ions, see Table 1 of the 4.2 ions and molecular compounds. KC2H3O2, potassium acetate (NH4) Cl, ammonium chloride or HCO3, sodium bicarbonate CaSO4, calcium sulfate al (CO3) 3, aluminum carbonate Mg3 (PO4) 2, magnesium phosphate table 2. Some pluralist ionic compound solutions a) the name identifies cations and anions. Because Na is a group 1 metal, it forms a cation na+ called sodium ion. Cl is a non-metallic and forms anion Cl- and chloride. Thus, NaCl = sodium chloride. b) AlBr3 consists of aluminum and bromine. We call it aluminum bromide. c) Bach2isbarium hydrate called Bahavis. Test yourself the following ion compound name: a) Al2S3 b) ZnS c) MgI2 answer a) Sulfide b) zinc sulfide c) iodine magnesium most metastasis metals can form two or more cations at different charges. The compounds of these metals with non-metals are named in the same way as compounds of the first category, except for the charge of metal ions, except those specified by the Roman numerals in parentheses after the name of the metal. The charge of the metal ion is determined from the charge of the formula and animation of the compound. For example, consider binary ion compounds in iron and chlorine. Iron typically represents the charge of 2+ or 3+ (see Figure 2 of the 4.2 ions and molecular compounds), and the two corresponding compound formulas are FeCl2 and FeCl3. The simplest name, chloride iron, is ambiguous because it does not distinguish between these two compounds. In such cases, the charge of the metal ion is included in the Roman numeral slot in the next bracket, just after the metal name. These two compounds are then obviously named iron (II) chloride and iron (III) chloride, respectively. Other examples are provided in Table 4. Transition metal ion compound name FeCl3 iron (III) chloride Hg2O mercury (I) oxide HgO mercury (II) oxide Cu3 (PO4)2 copper (II) phosphate table 4. The old naming rule of name of some transitional metal ion compounds uses a suffix –ic and -ous respectively and to specify metals: iron (III) chloride, FeCl3, iron (III) chloride can be called, iron (II) chloride, iron (II) chloride, FeCl2, also known as iron chloride. This old naming convention remains used by some segments of the industry. For example, a toothpaste tube might display the word Stannus fluoride. This represents the official SnF2, also known as annotation (II) fluoride, in accordance with more current conventions. The other fluoride in the tin is SnF4, now named tin (IV) fluoride, but is still often called stannic fluoride. Knowing both rules is still important. Element Common Ion Ion Oon Cu +/Cu2+ Cuprus/Cuprk Fe2+/Fe3+ Iron/Iron/Iron Co2+/Co3+ Cobaltus/Cobaltic Cr2+/Cr3+ chromous/Cromic Sn Sn2+/Sn4+ Stanus/Stannic Pb2+Pb4+ Plumbing/Hg22+Hg2+ Mercane/Mercure 5. The common name for some metal ions with variable charges is named for each species. a) O2-b) Co2+ solution a) Jong-eun Lee has a 2-−charge, so it's anian. Anions are named using a stem with the element name with the suffix-ide added. This is an oxide animation. b) It is an atom in the form of an element because there is no charge for Jong-eun Lee. This is cobalt. c) In this case, the atom has a 2+ charge, so it is catalysis. We need to specify the name of the ion with the ion charge, as cobalt cations can have two possible charges in Figure 2 of the 4.2 ions and molecular compounds. This is a cobalt (II) cation. Test each species of name: P3− and Sr2+ response to phosphate anion and strontium cation name then ion a) SnBr4 b) CoCl3 c) Fe2O3 solution a) first, identifies the charge for cation (Sn). Br is charged -1, so Sn knows that you have to charge +4. 0 = 1 (x) + 4 (-1) x = +4 thus SnBr4 = Tin (IV) Bromide b) Cl -1 0 = 1 (x) + 3 (-1) x = +3 (-1) x = +3 thus adopts the charge of CoCl3 = cobalt (III) chloride c) - 2 = x 2 (x x) x) adopts the filling of + 3 (-2) x = +3 and thus Fe2O3 = Iron (III) oxide test itself name the following ionic compounds: a) HgO b) PbCl4 c) PbS d) Sc2O3 e) AgCl answer a) mercury (II) oxide b) lead (IV) chloride c) lead (II) oxide e) silver chloride name next ion compound: a) Fe2S3 b) CuSe c) GaN d) CrCl3 e) Ti2 (SO4)3 f) Co2O3 g) CaCl2 h) AlF3 solution the cathode of these compounds is fixed negative charge (S2-, Se2−, N3-, Cl-, SO42-, O-2, F-) and compounds must be neutral. Question a) since the metal ions in f) have a variable charge, we need to understand the charge of the metal ions by ensuring that the total number of positive lysis of each compound must equal the total number of negative charges. Therefore, the positive ions must be Fe3+, Cu2+, Ga3+, Cr3+, Ti3+, and Co3+. These charges are used in the name of metal ions: a) iron (III) sulfide b) copper (II) selenium (III) chromium (III) chromium (III) chloride e) titanium (III) sulfate f) cobalt (III) cobalt (III) cobalt (III) cobalt (III) cobalt (III) cobalt (III) cobalt (III) cobalt (III) is used in the name of the metal ion, and therefore g) ionic is named for the name of the ion, and the compound is named eion chloride. Calcium is not calcium (II) chloride because it forms a single cation when forming ions and has a characteristic charge of 2+. h) The name of this ionic compound is aluminum fluoride. The test himself created the formula of the following ionic compounds: a) chromium (III) insped b) mercury (II) sulfide c) manganese d) copper (I) oxide e) chromium (VI) fluoride response a) CrP b) HgS c) Mn3 (PO4)d) early CF legal clerk Erin Brokovich (Figure 1) found a high percentage of hin's high rates of serious diseases in california. Her investigation eventually led to the fight aforsy at a nearby natural gas pipeline E) link the disease to groundwater contaminated by. In the dramatic film Erin Brockovich (Julia Roberts won an Oscar), Erin and his lawyer Edward Masri are accused of contaminating water near Hinckley in 1993. E sued. In 1996, the $333 million settlement was the largest in the United States at the time. Figure 1. (a) Erin Brockovich We found that the Cr (VI) used by E contaminated The Hinckley's water supply in California. (B) Cr (VI) ions are often present in the water with multi-atom ion chromate, CrO42 −(left), and icromate, Cr2O72 −(right). Chromium compounds are widely used in the industry to prevent corrosion of chromium plating, dye manufacturing, preservatives and cooling tower water that occurred near Hinckley. Environment, chromium is mainly present in the Cr (III) or Cr (VI) form. Cr (III), an ingredient in many vitamins and nutritional supplements, forms a compound that is not very soluble in water and is low in toxicity. However, Cr (VI) is much more toxic and forms a compound that is reasonably soluble in water. Exposure to a small amount of Cr (VI) can lead to damage to the respiratory tract, stomach and immune system, as well as kidney, liver, blood and skin. Despite cleanup efforts, Cr (VI) groundwater contamination remains a problem in Hinckley and elsewhere around the world. A 2010 study by the Environmental Working Group found that 31 out of 35 U.S. cities had higher levels of Cr (VIs) in tap water than the public health target of 0.02 percent of the billion parts set by the California Environmental Protection Agency. Create an appropriate formula and give the appropriate name for each ion compound formed between the two listed ions. a) NH4+ and S2−b) Al3+ and PO43−c) Fe2+ and PO43− Solution a) Ammonium ion has 1+ charges and sulfide ions have 2- charge, so we need two ammonium ions to balance the charge on one sulfide ion. Surroundthed the formula for ammonium ions in parentheses, we have (NH4)2S. The name of the compound is ammonium sulfide. b) Since the filling size of the ions is the same, we need only one single balance of the charge. The formula is AlPO4, the name of the compound is aluminum phosphate. c) Either charge is the exact multiple of anything else, so this should be the most common multiple of 6 East Sea. To get 6+, you need three iron (II) ions, and two phosphate ions to get 6-6. The proper formula is Fe3 (PO4) 2, and the compound's name is iron (II) phosphate. The test himself creates an appropriate formula and gives the appropriate name for each ionic compound formed between the two listed ions. a) NH4+ and PO43−b) Co3+ and NO2−Answer a) (NH4) 3PO4, Ammonium phosphate b) Co (NO2) 3, cobalt (III) nitrite daily you encounter and use a large number of ionic compounds. Some of these compounds, where they are found, and they are used for table 3. If you look at the label or ingredient list on the various products you use over the next few days, you can find references, or other ionic compounds that can now be written as names or formulas if you run into one of them in this table. Ion compounds use NaCl, sodium chloride plain table salt KI, potassium iodine yoodium saline thyroid health NaF, sodium fluoride component of toothpaste NaHCO3, sodium bicarbonate baking soda; Used in cooking (and antacids) Na2CO3, sodium carbonate washing soda; Antacids Mg (OH) 2, magnesium hydroxide component of antacids egg (OH) 3, antacids nao, sodium hydroxide sodium hydroxide from household bleach in the household bleach, sodium chloride active ingredient naOCl, low salt sodium by household bleach; Used as drainage purifier K3PO4, potassium phosphate food additives (multiple purposes) MgSO4, Purified water Na2HPO4, sulfate added to sodium phosphate anti-carking agent; Used in powdered products Na2SO3, sodium sulfate preservative table 3. The bonding properties of daily ion compoundinorganic molecular compounds are different from ionic compounds and are named using different systems. The filling of cations and anions dictates the ratio of ionic compounds, so naming ions provides enough information to determine the chemical formula. However, since shared bonds allow major variations in the combination rate of atoms in molecules, the name for molecular compounds must explicitly identify this ratio. When two non-metallic elements form molecular compounds, several combination ratios are often possible. For example, carbon and oxygen may form a CO and CO2 compounds. They are different substances with different properties, so neither can have the same name (neither can be called carbon oxides). To handle this situation, we used a naming method somewhat similar to the one used for ion compounds, but added a prefix to specify the number of atoms for each element. The names of more metal elements (farther to the left and/or bottom of the periodic table) are first followed by non-metallic elements (elements farther to the right and/or upwards) that have their ends changed to suffix-ide. The number of atoms for each element is specified by the Greek prefix shown in Table 6. Number prefix number prefix 1 (sometimes omitted) mono- 6 hexa - 2 d- 7 hectares - 3 tri - 8 octa - 4 tetra - 9 nonna - 5 penta - 10 deca - table 6. If there is only one atom in the name case prefix prefix first element, the prefix mono - is typically deleted from that part. Therefore, CO is called carbon monoxide, and CO2 is called carbon dioxide. When two collections are adjacent, the collections in the Grease prefix are typically deleted. Another example is shown in Table 7. Compound name SO2 sulfur dioxide BCl3 boron trichloride SO3 sulfur trichloride SO3 sulfur trichloride SF6 sulfate sulfate SF6 sulfate hydrochloride NO2 nitrogen dioxide PF5 in pentafluoride N2O4 di nitrogen tetraoxideside P4O10 tetraporus decadanan nitric oxide nitrogen dysinium if7 yonais two elements of some compounds chemical names are common names to continue when the chemical research of some compounds. For example, NO is often called nitric oxide, but its proper name is nitric oxide. Similarly, N2O is known as nitrous oxide even though our rules specify the name nitric oxide. (And H2O is commonly referred to as water, not hydrogen monoxide.) Commit to memory with the general name of the compound as you encounter them. Name name: a) SF6 b) N2O3 c) Cl2O7 d) P4O7 d) P4O6 e) PF3 f) CO g) Se2Br2 solution is a molecular compound because it consists of non-metallic only, so use it according to the rules. To specify the number of atoms of each element: a) sulfur hexafluride b) dinitrogen samoxide c) diclofriade hexanide hxanside d) tetraphosporus for the first time for oxidation first) carbon monoxide (not carbon monoxide) carbon monoxide (not carbon monoxide) a) in pentachloride b) dinitrogen carbon monoxide c) Iodine heptafluoride d) carbon tetrachloride e) disulhuang difluoride f) iodine pentabromide answer a) PCl5 b) N2O c) IF7 d) CCl4 e) S2F2 f) IBr5 next website naming practice chemical compounds and chemical formula sit. You can choose from binary, multiatomic and variable chargeion compounds as well as molecular compounds. Some compounds containing hydrogen are members of an important class of substances known as acids, and these compounds have interesting chemical properties. The chemistry of this compound explores in more detail in the latter chapter of this text, But now, it is sufficient to release many hydrogen hydrogen ions, H+, when dissolved in water. : The word hydrogen is changed to the prefix number - the name of other non-metallic elements is deformed by adding a suffix -ic word acid, for example, when the gas HCl (hydrogen chloride) is dissolved in water, the solution is called hydrochloric acid. Some other examples of this nomenclature are shown in Table 8. Acid HF (g), hydrogen fluorine HF (aq), hydrofluosan HCl (g), hydrochloride HCl (aq), hydro-bromide HBr (aq), hydrobromic acid HI name (g), iodine high (aq), hydroiosic acid H2S (g), hydrogen sulfide H2S (aq), hydrosulfate HCN (g), cyanide hydronic acid (8), hydrophonic acid hydronic acid HYDROHYDRONIC ACID (8), Hydronic acid hydronic acid (g), hydronic acid hydronic acid (aq), cyan hydronic acid (8), hydronic acid hydronic acid (aq), cyanide hydronic acid (8) hydronic acid. Some simple acids are subject to specialized nomenclature rules that will learn later on in many compounds that contain three or more elements (such as organic compounds or adjustment compounds). However, we will briefly discuss important compounds known as oxycinas, compounds containing hydrogen, oxygen, and at least one other element, which is combined in a way that imparts acidic properties to the compound (you will learn this detail later in the chapter). Typical oxycasis consists of hydrogen combined with multiatomic, oxygen-containing ions. To name oxycin: hydrogen animation hydrogen animation begins with the root name of the animation replacement - eat with ic, or - for example, consider H2CO3 (you may be tempted to call hydrogen carbonate). Hydrogen is omitted to correctly name this. - Ate Carbonate is replaced by -ic. The acid is added and its name is carbonated acid. Another example is table 9. There are a few exceptions to the general naming method (e.g., H2SO4 is called sulfuric acid, h2SO3 is sulfuric acid, not sulfuric acid, and sulfuric acid is not sulfuric acid). Formula Anion Name HC2H3O2 Acetate Acetate Acetate Acetate Acetate Nitrate HNO2 Nitrate Nitrate HNO2 Nitgy acid HClO4 Overgogorate HClO2 Hydrochloride HClO 2 hydrochloride hydrochloric acid HClO hypohypo acid H2CO3 carbonated acid H2SO4 sulfuric acid H2SO3 sulfuric acid H2SO3 sulfuric acid H3PO4 phosphoric acid H3PO3 phosphoric acid phosphoric acid H2CrO4 chromate chromic acid table 9. The generic name of oxycasic acid is to name each mountain without consulting the table. A) HBr (aq) b) H2SO4 c) HF (g) d) HCN (aq) e) H2S (aq) solution a) as ahydrous binary acid, the name of the acid is hydro-+ stem name + - icacid. Because this mountain contains bromine atoms, the name is hydrobromic acid. b) Since this acid derives from sulfuric acid ions, the name of the mountain is the stem of the anion name +-icacid. The name of this mountain is sulfuric acid. c) Because HF (g) is a gas form, we refer to it as fluoride. d) HCN (aq) contains a multi-atom ion cyanide. The roots are cyanide, thus HCN (aq) = hydrocyan. e) H2S (aq) contains ionic sulfide. In this case, however, the root uses a slightly different form of sulfur (the same as the element name). Therefore, H2S (aq) = aqueous acid. Name each mountain to test yourself. A) HF (aq) b) HNO2 c) HClO4 d) H2SO4 e) H2CrO4 (aq) f) H3PO4 (aq) g) HClO (aq) answer a) hydrofluosan b) nitrous oxide c) nitrous oxide e) sulfuric acid e) there is a similar component. For example, acid has a acid icing; In fact, the acidity of some foods, such as citrus and vinegar, occurs because there is acid in the food. Many acids react with some metal elements to form metal ions and elemental hydrogen. The acid changes the color of certain plant pigments. In fact, the ripening of some fruits and vegetables is due to the formation or destruction of excess acids in plants. Later in the chapter, we explore the chemical behavior of the mountain. The mountains are very prevalent around us. We have already mentioned that citrus fruits contain acids. Among other compounds, they contain citric acid, H3C6H5O7 (aq). It is found in octaxiaphons, H2C2O4 (aq), spinach and other green leafy vegetables. Hydrochloric acid is not only found in the stomach (stomach acid), but it can also be purchased in hardware stores as cleaners for concrete and bricks. Phosphoric acid is an ingredient in some soft drinks. Elemental sodium is a nutrient needed for human life, at least in the form of ions such as Na+. In fact, the human body is about 0.15% sodium, the average person with one-tenth of a kilogram in their body at any given time, mainly on cell external fluids In other bodily fluids. Sodium is also in our diet. The common table salt we use in our food is the ion sodium compound. Many processed foods also contain significant amounts of sodium added to them as various ionic compounds. Why is sodium compounds so popular? In general, sodium compounds are cheaper, but more importantly, most ion sodium compounds are easily dissolved. This allows processed food manufacturers to add sodium-containing substances to food mixtures and show that compounds will be evenly dissolved and distributed throughout the food. Simple ionic compounds such as sodium nitrite (NaNO2) are added to cured meats such as bacon and deli meats, while compounds called sodium benzoate are added to packaged foods as preservatives. Table 10 Some sodium compounds added to food are a partial list of some sodium additives used in food. Some of them may be recognized after reading this chapter. Others may not be aware of you, but they all have some negatively charged ions and ion sodium compounds that also exist. Sodium compound sodium acetate preservative, acid ity control sodium adipate food acid sodium alginate thickener, vegetable gum, Stabilizers, geldingagents, emulsifiers sodium aluminum phosphonic acid regulators, emulsifiers sodium aluminium acid regulators, emulsifiers sodium aluminium silicate antioxidant sodium benzoate preservatives non-chemical sodium conversion antioxidant sodium carbonate mineral salt sodium kaventi methyl celluloses sodium sodium debeard septic sodium emulsion antioxidant sodium perotide sodium peroistine preservatives Sodium hydroxide mineral salts sodium lactic acid sodium sulfate food acid meabisulpite preservatives, Antioxidants, bleach sodium methyl para hydroxybenzoate preservative sodium nitrate preservatives, color fixed sodium nitrite preservatives, color fixed sodium orthophenyl phenomenodopreservatives sodium propita gi soreaeeagent preservative proletariat preservatives para hydrobenzation antiseptic sodium anti-inflammatory salts, fatty emulagents, stabilizers, antioxidants, antioxidants, anti-caking agents, sodium sulfate sodium sodium salt, preservatives, antioxidants, antioxidants, sodium sodium preservatives Some sodium compounds added to food and the use of too much sodium compounds in processed foods has surprised some doctors and nutritionists. They claim that the average person consumes too much sodium from his diet. The average person needs only about 500 mg of sodium every day; Most people consume 10 times more than this. Some studies High blood pressure increased sodium intake. New research suggests that the link is suspicious. However, it has been promoted to reduce the amount of sodium consumed daily: to avoid processed and manufactured foods, read labels on packaged foods (including indications of sodium content), don't oversalt foods, and use other herbs and spices besides salt in cooking. The main concept and summary chemist uses nomenclature rules to clarify the name of the compound. Ions and molecular compounds are named using somewhat different methods. Binary ion compounds typically consist of metals and non-metals. The name of the metal was first written, and then the non-metallic name changed to -ide. For example, K2O is called potassium oxide. If a metal can form ions under different charge, the Roman numerals in parentheses specify the charge after the name of the metal. Thus, FeCl2 is iron (II) chloride and FeCl3 is iron (III) chloride. Some compounds contain multiatomic ions. The name of a typical multiatomic ion should be memorized. Because molecular compounds can form compounds at different proportions of elements, prefixes are used to specify the number of atoms of each element in the molecules of the compound. Examples include SF6, sulfur hexafluoride and N2O4, dinitrogen tetoxide. Acid is an important class of compounds that contain hydrogen and have special nomenclature rules. Binary acid is named using the prefix -ide suffix to -ic and adds acid; HCl is hydrochloric acid. Oxymountain is named by changing the ending of the animation to -ic and adding acid; H2CO3 is carbonated acid. Figure 3. A flowchart that describes the thought process involved in naming simple ions and shared compounds and rules to follow. Check yourself a small stack of Qcard. On one side there is the name of the ion compound (e.g., sodium hydroxide) and the other side is a chemical formula (e.g., NaOH). Use all the examples you can find in this chapter. Then use this Qcard to take a quiz. Binary acid: a compound containing hydrogen and one other element is a binary compound coupled to a compound (the ability to release H+ ions when dissolved in water) acidic properties: compounds containing two different elements. Nomenclature: A rule system for naming objects of interest: compounds containing hydrogen, oxygen and other elements are combined in a way that impartes acidic properties to the compound (the ability to release H+ ions when dissolved in water)

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