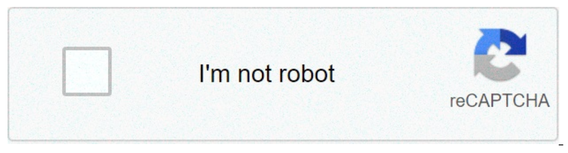

Continue

Numbers used to balance chemical equations

Numbers called subscripts are used to balance chemical equations true or false. Numbers used to balance chemical equations are called.

At the end of this section, you will be able to: derive chemical equations from narrative descriptions of chemical reactions. Write and balance chemical equations in molecular formats, ionic ionic and nettle. The previous chapter introduced the use of elements symbols to represent individual atoms. When the atoms earn or lose electrons to produce ions or combine with other atoms to form molecules, their symbols are modified or combined to generate chemical formulas that appropriately represent these species. Extending this symbolism to represent both identity and the relative quantities of substances subjected to a chemical (or physical) change concern writing and balancing the chemical equation. Consider as an example the reaction between a methane molecule (CH4) and two molecules of diattomic oxygen (O2) to produce a carbon dioxide molecule (CO2) and two water molecules (H2O). The chemical equation that represents this process is supplied in the upper half of Figure 1, with spatial filling molecular models shown in the lower half of the figure. Figure 1. 1. The reaction between methane and oxygen to obtain carbon dioxide in water (shown below) can be represented by a chemical equation using formulas (top). This example illustrates the fundamental aspects of any chemical equation: the substances subject to the reaction are called reactant and their formulas are positioned on the left side of the equation. The substances generated by the reaction are called products and their formulas are positioned on the right view of the equation. Plus Signs (+) Separate the individual reatrimonial formulas and products and an arrow ([LATEX] Ramersow [/ LATEX]) separates the sides of the reactant and the product (left and right) of the equation. The relative numbers of reatrant and product species are represented by coefficients (numbers positioned immediately to the left of each formula). A coefficient of 1 is typically omitted. It is a common practice to use the smallest whole integral coefficients in a chemical equation, as it is done in this example. It realizes, however, that these coefficients represent the relative number of reagents and products and, therefore, can be correctly interpreted as reports. Methane and oxygen react to produce carbon dioxide and water in a ratio 1: 2: 1: 2. This report is satisfied if the numbers of these molecules are, respectively, 1-2-1-2 or 2-4 -2-4 or 3-6-3-6, and so on (Figure 2). Similarly, these coefficients can be interpreted as regards any unit (number) of the unit, and therefore this equation can be read correctly in many ways, including: a methane molecule and two oxygen molecules react to obtain a molecule of carbon dioxide and two water molecules. A dozen methane molecules and two dozens of oxygen molecules react to produce a dozen carbon dioxide molecules and two dozens of water molecules. A mole of methane molecules and 2 moles of oxygen molecules react to produce 1 mass of carbon dioxide molecules and 2 molecules of water. Figure 2. Regardless of the absolute number of molecules involved, the relationships between numbers of molecules are the same as that indicated in the chemical equation. Balancing of balanced equations Chemical is equation owes numbers of atoms for each element involved in the reaction are represented on the reagent and on the sides of the product. This is a requirement that the equation must satisfy being consistent with the law of conservation of matter. It can be confirmed simply by summarizing the number of atoms on both sides of the arrow and comparing these sums to ensure that they are the same. Note that the number of atoms for a certain element is calculated The coefficient of any formula containing that element from the element's element element in the formula. If an element appears more than a formula on a given side of the equation, the number of atoms represented in each must be calculated and then added together. For example, both species of product in the example reaction, CO2 and H2O contain the oxygen of the element and e The number of oxygen atoms on the product side of the equation is [latex] left (1 {text {co}} _ {2} {co}} _ _ {2} text {molecule} {2 or atomi}} {{text {co}} _ {2}} text {molecule}} right) + left (2 {text {h}} _ {2} text {or molecule}} frac {or molecule}} text {1 or atom}} {{text {h}} _ {2}}}} _ {2} text {or molecule}} right) = text {4 or atoms} [/ latex] The equation for the reaction between methane and oxygen to give carbon dioxide and water are confirmed to be balanced for this approach, as shown here: [LATEX] {text {CH}} _ {4} +2 { text {o}} _ {2}}} _ {2}} Dama Dama {text {co}} _ {2} +2 {text {h}} _ {2} text {or} [/ Latex] element element reactants balanced products? C 1 Ãƒ- 1 = 1 1 Ãƒ- 1 = 1 1 = 1, yes h 4 Ã £ - 1 = 4 2 Ãƒ- 2 = 4 4 = 4, yes or 2 Ã £ - 2 = 4 (1 Ã £ - 2) + (2 Ãƒ- 1) = 4 4 = 4, yes a balanced chemical equation can often be derived from a qualitative description of some chemical reactions from a fairly simple approach known as balance for inspection . Consider the decomposition of water as an example to produce hydrogen and molecular oxygen. This process is represented qualitatively by an unbalanced chemicalequal equation: [latex] {text {h}} _ {2}} text {or}} {text {h}} _ {2} + {_ {2} + {text { Or}} _ {2} text {(unbalanced)} [/ LATEX] by comparing the number of atoms h and or on both sides of this equation confirms its imbalance: element reagant balanced products? H 1 Ãƒ- 2 = 2 1 Ãƒ- 2 = 2 2 = 2, yes or 1 Ãƒ- 1 = 1 1 Ãƒ- 2 = 2 1 Ã ¢ â € ¢ â € 2, no numbers of atoms H On the reagent and on the sides of the product of the equation is the same, but the numbers of or atoms are not. To achieve balance, equation coefficients can be modified according to need. Keep in mind, of course, that the signs of the formula define, in part, the identity of the substance, and so these cannot be changed without altering the qualitative meaning of the equation. For example, the modification of the Reagent formula from H2O to H2O2 would produce balance in the number of atoms, but do so also modifies the reagent identity (now hydrogen peroxide and not water). The balance or atom can be obtained by changing the coefficient for H2O A 2. [LATEX] MATHBF {2} text {h} _ {2} text {or} RightRrew {text {h}} _ {2} + {text {or}} _ {2}} text {(unbalanced)} [/ LATEX] element element reactants balanced products? H 2 Ãƒ- 2 = 4 1 Ãƒ- 2 = 2 4 Ã ¢ ¢ â € 2, No or 2 Ãƒ- 1 = 2 1 Ãƒ- 2 = 2 2 = 2, yes the Balance H Atom It was upset by this change, but it is easily restored by changing the coefficient for the product H2 to 2. [LATEX] 2 {text {H}} _ {2} text {or} RightRow mathbf {2} { text {h}} _ {2} + {text {o}} _ {2}} text {(balanced)} [/ latex] element element reactants balanced products? H 2 Ãƒ- 2 = 4 2 Ãƒ- 2 = 2 4 = 4, yes or 2 Ãƒ- 1 = 2 1 Ã £ - 2 = 2 2 = 2, yes these coefficients produce equal numbers of heo Atoms on the reagent and product sides and the balanced equation is therefore: [LATEX] 2 {text {h}} _ {2} text {or} REAPYARROW 2 {text {h}} _ {2} + {Text {or}} _ {2} [/ LATEX] Write a balanced equation for the reaction of molecular nitrogen (N2) and oxygen (O2) to form the dinotrogen pentoxide. Check your learning write a balanced equation for the decomposition of ammonium nitrate to form molecular nitrogen, molecular oxygen and water. (Tip: Hard balance oxygen, since it is present in more than one molecule on the right side of the equation.) Sometimes it is convenient to use fractions instead of entire numbers as intermediate coefficients in the balance process of a ' Chemical equation. When the balance is obtained, all equation coefficients can therefore be multiplied by an integer to convert fractionated coefficients into whole numbers without upset the balance of the atom. For example, consider the reaction of (c2h6) with oxygen for the yield of h2o and co2, represented by the unbalanced equation: (a) text {h} _ {6} + text {o} _ {2} \ rightarrow {\ text {h} _ {2} text {o} + {\row text {co} _ {2} \ text {sbalanced)}Question si traduce in sette atomi The south lato del prodotto dell'equazione, un numero dispari — nessun coefficiente interi può essere uszato con il rettore O2 per produrre un numero dispari, quindi un coefficiente frazionario, [latex]\displaystyle\frac{7}{2}[/latex] , viene uszato invece per produlire un'equazione bilanciata provvisoria: [latex]{\text{\text{C}}_{2}{\2}{6}{6}{3{\text{H}} Anche se l'equazione della rezione tra azoto molecolare e idrogeno molecolare per produrre ammoniaca è, infatti, bilanciata [latex]3{\text{N}}_{2}+9{\text{H}}_{2}\rightarrow 6{\text{NH}}_{3}[/latex] i coefficienti non sono i più piccoli > >un'abbreviazione genitori-etica a Seguito delle formule. le abbreviazioni comuni comuni comprendono s per solidi, l per liquidi, g per gas, e aq per sostanze dissolte in acqua (soluzioni acquose, come introdotto nel capitolo precedent.) queste notazioni sono illustrate nell'equazione di esempio qui: [latex]2\text{Na()s\text{}+2{\text{H}}_{2}\text{O()l\text{}}\rightarrow 2\text{NaOH()aq\text{}}+{\text{H}}_{2}\text{()g\text{}} il solido sodio reagisce con acqua liquida per produrre gas di idrogeno molecolare e idrossido di sodio composite ionico (un solido in pure form, ma easily dissolto in acqua.) le condizioni speciali necessarie per una rezione sono talvolta designate scrivendo una parola o un simbolo o sotto la freccia dell'quazione. ad esempio, una rezione effettuata dal riscaldamento può essere indicata dal delta lettera greca superiore (Δ) sopra la freccia. [latex]{\text{CaCO}}_{3}\text{()s\text{}}\stackrel{\Delta}{\rightarrow success}\text{CaO()s\text{}+{\text{CO}}_{2}\text{()g\text{}}[/latex] altri esempi di queste condizioni speciali si incontreranno più in profondit equazioni per le rezioni ioniche data l'abbondanza di acqua sulla terra, è a ragione che molte reazioni chimiche hanno luogo in media acquosi. when gli ioni sono coinvolti in queste reazioni, le equazioni chimiche podeno essere scritte con vari livelli di dettaglio appropriati al loro oo predicted. per illustration questo, consider a rezione tra composti ionici che si svolgono in una soluzione acquosa. when si mescolano le soluzioni acquose di cacl2 e agno3, si ver una reazione che produce Ca(NO3)2 e agcl solido: [latex] {\text{Cl}}_{2}\text{}aq\text{}+2{\text{AgNO}}_{3}\text{()aq\text{}}\rightarrow\q{\text{ questat when iarrow composti ionici si dissolvono in acqua realistici dissociarsi nei loro ioni costituenti, che vengono successivamente dispersi}\mogenemente durante la soluzione risultante (una discussione approfondita di questo importante proc è projede nel capitolo sulle soluzioni) i composti ionici disciolti in acqua sono Ca}}^{2+}}\text{()aq\text{}}+2{\text{NO}}_{3}{}^{-}\text{()aqarra\text{ a differenza di questi tre composti ionici, agcl non si dissolve in acqua in misura significant, come indicato dalla seu notazione fisica, s. rappresenta esplicitamente disquazione unagli in questo caso, le formule per i composti ionici disciolti sono sostituite da formule per i loro ioni dissociati: [latex]\text{Ca}}^{\text{2+}}\text{}}\text{}}\aq\text{}}}}} esaminando questa equazione, due specie chimiche sono presenti in form identica su entrambi questi ioni dello spettatore, le cui presenza sono necessarie per mantenere la neutralità della carica, non sono né chimically né physical cambiate dal process, and così podeno essere eliminate dall'equazione per produrre una rappresentazione più succinta chiamata equazione net ionica:2{\text{Cl}}^{-}\text{()aq\text{{\text{}}\text{\text{\text{\text{()aq\text{}}\rightarrow 2\text{AgCl()s\text{}}\end{array}[/latex] Following the convention to use the smallest possible wholes as coefficients, this equation is then written: [latex]{\text{Cl}}^{\text{-}}\text{()aq\text{\text{\text{Ag}}}^{+}\text{()aq\text{}}\rightarrow\text{AgCl()s\text{}}[/latex] This net ion equation indicates that solid silver chloride can be produced by dissolved chloride and silver ions (I), regardless of the source of these ions. These molecular and complete ionic equations provide additional information, i.e., ionic compounds used as sources of Cl– and Ag+. When carbon dioxide is dissolved in an aqueous solution of sodium hydroxide, the mixture reacts to produce aqueous sodium carbonate and liquid water. Write net ion equations, complete and balanced molecular equations for this process. The process of learning chlorine and sodium hydroxide (lie) are chemical products in large quantities, along with diatomic hydrogen, through the electrolysis of the brine, according to the following unbalanced equation: Chemical equations are symbolic representations of chemical and physical changes. Formulas for substances that undergo change (reactive) and substances generated by change (products) are separated by an arrow and preceded by whole coefficients indicating their relative number. Balanced equations are those whose coefficients lead to an equal number of atoms for each element in reactives and products. Chemical reactions in aqueous solution involving reactive or ionic products can be more realistically represented by complete ionic equations and, more succinctly, by ionic net equations. What do you mean an equation is balanced? Why is it important that an equation be balanced? Consider molecular, complete and net ionic equations. What is the difference between these types of equations? In what circumstance would complete and net hyonic equations for a reaction be identical? Write a balanced molecular equation describing each of the following chemical reactions. Solid calcium carbonate is heated and decomposes to solid calcium oxide and carbon dioxide gas. The gaseous butane, C4H10, reacts with diatomic oxygen gases to produce carbon dioxide and water vapour. The aqueous solutions of magnesium chloride and sodium hydroxide react to produce solid magnesium hydroxide and aqueous sodium chloride. Water vapour reacts with sodium metal to produce solid sodium hydroxide and hydrogen gas. Write a balanced equation describing each of the following chemical reactions. The solid potassium chlorate, KClO3, decomposes to form solid potassium chloride and diatomic oxygen gas. Solid aluminum metal reacts with solid diatomic iodine to form solid al2I6. When solid sodium chloride is added to aqueous sulfuric acid, hydrogen chloride gas and aqueous sodium sulphate are produced. The aqueous solutions of phosphorous acid and potassium hydroxide react to produce aqueous potassium hydrogen phosphate and liquid water. Colorful fireworks often involve decomposition of barium nitrate and potassium chlorate and reaction of magnesium, aluminum and iron metals with oxygen. Write barium nitrate formulas and potassium chlorate. The decomposition of solid potassium chlorate leads to the formation of solid potassium chloride and diatomic oxygen gas. Write a reaction equation. The decomposition of solid barium nitrate leads to the formation of solid barium oxide, diatomic nitrogen gas and diatomic oxygen gas. Write a reaction equation. Write separate equations for reactions ofsolid magnesium, magnesium,and iron with diatomic oxygen gas to produce the corresponding metal oxides. (Let's assume that iron oxide contains Fe + ions. Fill empty space with a single chemical formula for a covalent compound that balances the equation: aqueous acid fluoride (hydrofluoric acid) is used for glass engraving and to analyze minerals for their silicon content. Hydrogen fluoride also reacts with sand (silicon dioxide). Write an equation for reaction of solid silicon dioxide with hydrofluoric acid to provide gaseous silicon tetrafluorride and liquid water. Mineral fluorite (calcium flux) occurs extensively in illinois. The solid calcium fluoride can also be prepared by the reaction of aqueous solutions of calcium chloride and sodium fluoride, producing aqueous sodium chloride as the other product. Write complete and net hyonic equations for this reaction. A new process to get magnesium from sea water involves different reactions. Write a balanced chemical equation for each phase of the process. The first step is the decomposition of solid calcium carbonate from shells to form solid calcium oxide and carbon dioxide gas. The second step is the formation of solid calcium hydroxide as the only product from the reaction of solid calcium oxide with liquid water. Solid calcium hydroxide is then added to sea water, reacting with dissolved magnesium chloride to produce solid magnesium hydroxide and aqueous calcium chloride. Solid magnesium hydroxide is added to a hydrochloric acid solution, producing dissolved magnesium chloride and liquid water. Finally, magnesium chloride is melted and electrolyzed to produce liquid magnesium metal and diatomic chloride gas. From balanced molecular equations, write the complete Ionic and Net equations as follows: ♪ ♪ Â Chemical equation with an equal number of atoms for each element in the chemical equation of reagent and product: Â Symbolic representation of a chemical reaction coefficient: the number placed in front of symbols or formulas in a chemical equation to indicate you r IMPORTO RELATIVO Complete ion equation: Â Chemical equation in which all dissolved ion reagents and products, including the spectator ions, are explicitly represented by formulas for their molecular equation dissociated ions: Â Chemical equation in which all reactives and products are represented as neutral substances Ionian equation: Â Chemical equation in which only these dissolved reagents and ionic products are represented that undergo a chemical or physical change (excludes spectators ions): Â Substance formed by a chemical or physical change; shown on the right side of the arrow in a reactant chemical equation: Â substance subject to a chemical or physical change; Shown on the left side of the arrow in a chemical equation Glion spectator: ions that do not sufferchemical or physical during a reaction, but its presence is necessary to maintain neutrality of charge neutrality

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