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Chemical reaction and equations pdf

\[2H_2 + O_2\rightarrow 2H_2O\] Chemical formulas and other symbols are used to indicate the source materials or reagents that are by default written on the left side of the equation and the end compounds or products that are written on the right. The arrow points from the reagent to the products. The chemical reaction for the ammonium dichromate volcano in figure \(\PageIndex{1}\) is \[(NH_4)_2Cr_2O_7 \rightarrow Cr_2O_3 + N_2 + 4H_2O \label{4.1.1} \] \[reaction \, \, \, \, \, \, \, \, \, \, \, \, \, \, \, products\] The arrow is read as yield or reacts to a shape. Equation 4.1.1 indicates that ammonium dichromate (reagent) gives chromium (III) oxide, nitrogen and water (products). The formula for this reaction is even more informative, when written as follows: \[(NH_4)_2Cr_2O_7(s) \rightarrow Cr_2O_{3\;(s)} + N_{2\;(g)} + 4H_2O_ {(g)} \label{4.1.2}\] Equation 4.1.2 is identical to equation 4.1.1, except for the addition of abbreviations in the brackets to indicate the physical condition of each species. The abbreviations are for solids, (l) for liquid, (g) for gas and aq for aqueous solution – a solution of the substance in water. In accordance with the law on mass conservation, the number of each type of atom is the same on both sides of equations 4.1.1 and 4.1.2. Each side of the reaction has two chromium atoms, seven oxygen atoms, two nitrogen atoms and eight hydrogen atoms. In a balanced chemical equation, both the numbers of each type of atom and the total charge are the same on both sides. Equations 4.1.1 and 4.1.2 are balanced chemical equations. What's different on each side of the equation is how atoms are arranged to make molecules or ions. A chemical reaction is a change in the distribution of atoms, but not in the number of atoms. In this reaction and in most chemical reactions, bonds break down into reagents (here, Cr-O and N-H bonds), and new bonds are formed to create the products (here, O-H and N≡N bonds). If the numbers of each type of atom are different on both sides of a chemical equation, then the equation is unbalanced and cannot correctly describe what happens during the reaction. To continue, the equation must first be balanced. of two substances in a chemical reaction is the ratio of their coefficients in a balanced chemical equation. If you see this message, it means that we have problems loading external resources on our website. If you are behind a web filter, please make sure that the *.kastatic.org and *.kasandbox.org domains are unblocked. Symbolic representation of chemical reaction Chemical equation is the symbolic representation of a chemical reaction in the form of symbols and formulas, in which the reagent units are given on the left side and the product units on the right side. [1] The coefficients next to the unit symbols and formulas are the absolute values of the symometric numbers. The first chemical equation was by Jean Begin in 1615. [2] Chemical reaction formation A chemical equations consist of the chemical formulae of reagents (starting substances) and the chemical formula of products (substances formed in the chemical reaction). The two are separated by an arrow symbol (→ {\ displaystyle \rightarrow } , usually read as yields) and the chemical formula of each individual substance is separated from the others by a plus sign. As an example, the equation for the reaction of hydrochloric acid with sodium can be indicated: 2 HCl + 2 Na → 2 NaCl + H2 This equation is understood as two HCl plus two Na yields two NaCl and H two. But, for equations involving complex chemicals, instead of reading the letter and its index, chemical formulas are read using the IUPAC nomenclature. Using the IUPAC nomenclature, this equation is considered hydrochloric acid plus sodium chloride and hydrogen gas extraction. This equation shows that sodium and HCl respond to naCl and H2. It also shows that two sodium molecules are needed for every two hydrochloric acid molecules and the reaction will form two sodium chloride molecules and one diatomic hydrogen gas molecule molecule for every two hydrochloric acid and two sodium molecules that react. The stahyometric coefficients (the numbers before the chemical formulas) are the result of the mass storage law and the law on the preservation of the fee (see Balancing the chemical equation below for more information). Common symbols Symbols are used to distinguish between different types of reactions. To indicate the response type: [1] the {\ displaystyle =} symbol is used to indicate a stechiometric connection. → the {\ displaystyle \rightarrow} symbol is used to indicate a forward response on the network. ⇄ {\ displaystyle \rightleftarrows} symbol is used to indicate a reaction in both directions. [3] ↽ − − − ⇀ {\displaystyle {<=>}} the symbol is used to indicate equilibrium. [4] The physical state of chemicals is also very often indicated in parentheses after the chemical symbol, especially for ion reactions. When a physical condition is indicated, (s) means solid, (l) means liquid, (g) means gas and (aq) means aqueous solution. If the reaction requires energy, it is displayed above the arrow. The capital Greek letter delta (Δ {\displaystyle\Delta} [5]) is placed on the reaction arrow to indicate that heat energy is added to the reaction. The expression hν {\displaystyle hu } [6] is used as a symbol to add energy in the form of light. Other symbols are used for other specific types of energy or radiation. Balancing of chemical equations As shown by the equation CH4 + 2 O2 → CO2 + 2 H2O, before the oxygen gas must be placed a coefficient of 2 before the oxygen gas on the reagent side and before the water on the product side in order to, according to the law on the preservation of mass, the quantity of each element does not change during the reaction P4O10 + 6 H2O → H34POTh H34POTh be balanced by first multiplying H3PO4 by four to match the number of P atoms, then multiplying H2O by six to match the numbers of H and O atoms. The Law on The Preservation of Mass dictates that the amount of each element does not change in a chemical reaction. Thus, each side of the chemical equation must represent the same quantity of each individual element. Also, the charge is preserved in a chemical reaction. Therefore, the same load must be present on both sides of the balanced equation. One balancing of a chemical equation by changing the scalar numbers for each chemical formula. Simple chemical equations can be balanced by verification, that is, by experience and error. Another technique involves solving a system of linear equations. Balanced equations are written with the smallest integer coefficients. If there is no coefficient before a chemical formula, the coefficient is 1. The verification method can be defined as placing a factor of 1 in front of the most complex chemical formula and placing the other coefficients above all else so that both sides of the arrows have the same number of each atom. If a fractional coefficient exists, each coefficient shall be multiplied by the smallest number necessary to make them whole, usually the denominator of the fractional reaction factor by one fractional coefficient. As an example seen in the above image, the burning of methane will be balanced by placing a coefficient 1 before CH4: 1 CH4 + O2 → CO2 + H2O Since on each side of the arrow there is one carbon, the first atom (carbon) is balanced. Looking at the next atom (hydrogen), the right side has two atoms, and the left side has four. To balance hydrogen, 2 is carried in front of H2O, which gives: 1 CH4 + O2 → CO2 + 2 H2O Check the last atom that will be balanced (oxygen) indicates that the right side has four atoms, and the left side has two. It can be balanced by placing 2 before O2, giving a balanced equation: CH4 + 2 O2 → CO2 + 2 H2O This equation has no coefficients in front of CH4 and CO2, since the coefficient is 1 has fallen. Matrix method usually, any chemical equation involving J different molecules, can be written as: ∑ j = 1 J v j R j = 0 {\displaystyle \sum_{{j=1}{J} u _{j}R_{} =}=0}, where Rj is a symbol for the molecule j-th, and vj is a sahyometric coefficient for j-th molecule positive for products negative for reagents (or vice versa). Then the correctly balanced chemical equation will obey: ∑ j = 1 J a i j 1 j y j = 0 {\displaystyle \sum_{j=1}^{{J}a_{ij}u{j}=0}, where the aij composition matrix is the number of atoms of element i in molecule j. Each vector which, when operated by the composition matrix, has a zero vector, is considered a member of the nucleus or of the operator's zero space. balancing chemical equation, including a set of J съставляващи системата. A A a stechiometric vector is the one for which all its elements can be converted into integers without the common divisor by multiplication by appropriate constant. Usually, the composite matrix is degenerate: This means that not all of its rows will be linearly independent. In other words, the rank (JR) of the compositional matrix is usually less than the number of columns (J). By the zero theorem of rank meanings, the unnecessary area of aij will have J-JR dimensions and this number is called nullity (JN) of aij. The problem of balancing a chemical equation becomes the problem of defining jn-dimension zero space of the compositional matrix. It is important to note that only for JN =1, there will be a unique solution. For JN>1, there will be an infinite number of solutions to the balancing problem, but only JN of them will be independent: If JN finds independent solutions to the balancing problem, then any other solution will be a linear combination of these solutions. If JN =0, there will be no solution to the balancing problem. Techniques [7][8] have been developed to quickly calculate a set of independent JN solutions to the balancing problem and are better than the inspection and algebraic method in so far as they are decisive and provide all solutions to the balancing problem. Ion equation ion equation is a chemical equation in which electrolytes are recorded as dissociate ions. Ion equations are used for one and double displacement reactions that occur in aqueous solutions. For example, with the following precipitation reaction: CaCl 2 + 2 AgNO 3 ↻ Ca (NO 3) 2 + 2 AgCl ✓ {\displaystyle {\ce {CaCl2 + 2AgNO3 -> Ca(NO3)2 + 2 AgCl(v)}}} the full ion equation is: Ca 2 + + 2 Cl − + 2 Ag + 2 NO 3 – ↻ Ca 2 + 2 + 3 – + 2 - 2 AgCl ✓ {\displaystyle {\ce +2+ 2Cl- + 2A + 2A + 203^- -> Ca ^2+ + 2NO3^- + 2Ag(v)}} or, with all physical states included: Ca 2 + (aq) + 2 Cl - (aq) + 2 Ag + (aq) + 2 NO 3 − (aq) ↻ Ca 2 + (aq) + 2 NO 3 − (aq) + 2 AgCl ✓ {\displaystyle {\c {Ca ^2+ (aq) + 2Cl^-(aq) + 2Ag+ (aq) + 2NO3^-}(aq) -> Ca ^2 +(aq) + 2NO3^-}(aq) + 2AgCl(v)}}} In this reaction , Sa2+ and NO3– ions remain in solution and are not part of the reaction. That is, these ions are identical on both the reaction side and the product side of the chemical equation. Since such ions are not involved in the reaction, they are called visual ions. A ion equation is the full ion equation from which viewers are removed. [9] The net ion equation of procedure reactions is: 2 Cl − + 2 Ag + ↻ 2 AgCl {\displaystyle {\ce {2Cl^- + 2Ag+ -> 2AgCl(v)}} or in reduced balance, Ag + Cl - ↻ AgCl ✓ {\displaystyle {\ce {Ag+ + Cl^- -> AgCl(v)}}} In a neutralising or acidic/base reaction, the net ion equation will usually be: H + (aq) + OH-(aq) → H2O(l) There are several acid/base reactions that produce sludge in addition to the molecule shown above. acid that produces not only water, but also insoluble barium phosphate. There are no visual ions in this reaction, so the net ion equation is the same as the full ion equation. 3 Ba (OH) 2 + 2 H 3 PO 4 ⟶ 6 H 2 O + Ba 3 (PO 4) 2 ↓ {\displaystyle {\ ce {3Ba(OH)2 + 2H3PO4 -> 6H2O + Ba3(PO4)2(v)}}} 6 3 + + 2 PO 4 3 − ◡ фосфат ⟶ 6 H 2 O + Ba 3 (PO 4) 2 ↓ ◡ бариев фосфат {\дисплеи {\ce {3Ba^{2}+}+{6OH^}}+{6H+}}}+underbrace {\ce{2 {3} {->{6H2O}+underbrace {Ba3(PO4)2(v)} _{barium~фосфат}}} Двойните реакции на изместване, които имат реакция на карбонат с киселина, имат нетното йонно уравнение: 2 H + CO 2 − ◡ карбонат ⟶ H 2 O + CO 2 {↑ {\c дисплеи {\ce {2H+}}++\underbrace {{\ ce {CO3^ 2-}}} _>_____ и нетното йонно уравнение е нула. Обикновено, ако zj е кратно на елементарна такса за молекулата j-th , charging neutrality can be recorded as: ∑ j = 1 J z j v j = 0 {\displaystyle \sum _{j=1}{J}z_{j}u {j{j}=0}, where vj are the vj coefficients described above. Zj can also be included[7][8] as an additional line in the aij matrix described above, and a properly balanced ion equation will also be subject: ∑ j = 1 J = 1 J a i j 1 j 0 {\displaystyle \sum_{j=1}^ {J}a_{j}=0} References ^ b IUPAC, Chemical Compendium, Terminology 2nd edition (the golden book) (1997). Online corrected version: (2006–) equation of chemical reactions. : 75–90. Doy:10.1080/00033795902000088. In 1884, the ⇄ chemist Jacob Henry van Hof was proposed. See: Van 't Hoff, J.H. (1884). Études de Dynamique Chemique Amsterdam, Netherlands: Frederik Müller "Ltd" 4–5. Van Hof called reactions that have not ended limited reactions. From PP. 4-5: Or M. Pfendler a Relié ces deux phénomênes ... they are 1000000000000000000000000000000000000000000000000000000000000000 (Now Mr. Pfhanler has joined these two phenomena in one concept, looking at the observed limit as a result of two opposing reactions, including the example cited for the formation of sea salt [i.e. NaCl] and nitric acid and the other to hydrochloric acid and sodium nitrate. which experimentally validates justifies the expression chemical equilibrium used to characterise the extreme state of limited reactions ⇄ ⇄. but also shows the direction of reaction. This clearly shows that a chemical action is performed simultaneously in two opposite directions.) ↽ of the nota − − − ⇀ {\displaystyle {\c {<=>}} was proposed by Hugh Marshall in 1902. Look: Marshall, Hugh (1902). This symbol comes from the Planck equation for the energy of a photon, E = h n {\ display E=hu } . Sometimes it is wrongly written with ν (vee) instead of the Greek letter ' ν {\displaystyle u } ' (nu) ^ a b Thorne, Lawrence R. (2010). Innovative approach to balancing equations with chemical reactions: simplified technique for inversion of the matrix for determining the matrix Null space. : 304–308. 1110.4321. ↑ 1000000000000000000000000000000000000000000000000000 Ridiculous insight into the chemical balance. Dylan Holmes. Retrieved October 10, 2017. 2000: Frederick Snezese; Neil Jespersen (December 14, 2007). Chemistry: matter and its changes. John Wylie and Sons. 2009/2012/2019/ 2007033355. Visited by

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