l'm not robot!

Coefficients and subscripts worksheet 6th edition solutions pdf

By 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, total ionic, and net ionic formats. The preceding chapter introduced the use of element symbols to represent individual atoms. When atoms gain or lose electrons to yield 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 the identities and the relative quantities of substances undergoing a chemical (or physical) change involves writing and balancing a chemical equation. Consider as an example the reaction between one methane molecule (CH4) and two diatomic oxygen molecules (O2) to produce one carbon dioxide molecules (O2) and two water molecules (H2O). The chemical equation representing this process is provided in the upper half of Figure 1, with space-filling molecular models shown in the lower half of the figure. Figure 1. The reaction between methane and oxygen to yield carbon dioxide and water (shown at bottom) may be represented by a chemical equation: The substances undergoing reaction are called reactants, and their formulas are placed on the left side of the equation. The substances generated by the reaction are called products, and their formulas are placed on the right sight of the equation. Plus signs (+) separate individual reactant and product formulas, and an arrow (--) separates the reactant and product (left and right) sides of the equation. The relative numbers of reactant and product species are represented by coefficients (numbers placed immediately to the left of each formula). A coefficient of 1 is typically omitted. It is common practice to use the smallest possible whole-number coefficients in a chemical equation, as is done in this example. Realize, however, that these coefficients represent the relative numbers of reactants and products, and, therefore, they may be correctly interpreted as ratios. Methane and oxygen react to yield carbon dioxide and water in a 1:2:1:2 ratio. This ratio 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). Likewise, these coefficients may be interpreted with regard to any amount (number) unit, and so this equation may be correctly read in many ways, including: One methane molecules and two water molecules and two dozen oxygen molecules react to yield one dozen carbon dioxide molecules and two dozen water molecules. One mole of methane molecules and 2 moles of oxygen molecules react to yield 1 mole of carbon dioxide molecules of each species that react (the reactants) and molecules of each species that form (the products) are the same and are given by the chemical reaction equation must satisfy to be consistent with the law of conservation of matter. It may be confirmed by simply summing the numbers of atoms on either side of the arrow and comparing these sums to ensure they are equal. Note that the number of atoms for a given element is calculated by multiplying the coefficient of any formula containing that element by the element's subscript in the formula. If an element appears in more than one formula on a given side of the equation, the number of atoms represented in each must be computed and then added together. For example, both product species in the example reaction, CO2 and H2O, contain the element oxygen, and so the number of oxygen atoms on the product side of the equation is [latex](1 \;\text{CO}_2 \;\text{molecule}) = 4 \;\text{O atoms}}(\text{O atoms}) = 4 \;\text{O atoms}(\text{O atoms}) = 4 \;\text{O atoms}}(\text{O atoms}) = 4 \;\text{O atoms}(\text{O atoms}) = 4 \;\ balanced per this approach, as shown here: [latex]\text{CH}_4 + 2\text{O}_2 \longrightarrow \text{CO}_2 + 2\text{H}_2\text{O}_[/latex] Element Reactants Products Balanced? C 1 × 1 = 1 1 × 1 = 1 1 = 1, yes H 4 × 1 = 4 2 × 2 = 4 4 = 4, yes O 2 × 2 = 4 (1 × 2) + (2 × 1) = 4 4 = 4, yes O 2 × 2 = 4 (1 × 2) + (2 × 1) = 4 4 = 4, yes Table 1. A balanced chemical equation often may be derived from a qualitative description of some chemical reaction by a fairly simple approach known as balancing by inspection. Consider as an example the decomposition of water to yield molecular hydrogen and oxygen. This process is represented qualitatively by an unbalanced chemical reaction by a fairly simple approach known as balancing by inspection. Consider as an example the decomposition of water to yield molecular hydrogen and oxygen. $text{O}_2 \(text{unbalanced})[/latex]$ Comparing the number of H and O atoms on either side of this equation confirms its imbalance: Element Reactants Products Balanced? H 1 × 2 = 2 1 × 2 = 2 , yes O 1 × 1 = 1 1 × 2 = 2 1 ≠ 2, no Table 2. The numbers of H atoms on the reactant and product sides of the equation are equal, but the numbers of O atoms are not. To achieve balance, the coefficients of the equation may be changed as needed. Keep in mind, of course, that the formula subscripts define, in part, the identity of the substance, and so these cannot be changed without altering the qualitative meaning of the equation. For example, changing the reactant formula from H2O to H2O2 would yield balance in the number of atoms, but doing so also changes the reactant's identity (it's now hydrogen peroxide and not water). The O atom balance may be achieved by changing the coefficient for H2O to 2. [latex]2\text{H}_2\text{O} \longrightarrow \text{H}_2 + \text{O} \cents(D) [/latex] Element Reactants Products Balanced? H 2 × 2 = 4 1 × 2 = 2 4 \neq 2, no O 2 × 1 = 2 1 × 2 = 2 2 = 2, yes Table 3. The H atom balance was upset by this change, but it is easily reestablished by changing the coefficient for the H2 product to 2. [latex]2\text{H}_2\text{O} \longrightarrow 2\text{H}_2 + \text{O} \cents(D) [/latex] Element Reactants Products Balanced? H 2 × 2 = 4 2 × 2 = 4 4 = 4, yes O 2 × 1 = 2 1 × 2 = 2 2 = 2, yes Table 4. These coefficients yield equal numbers of both H and O atoms on the reactant and product sides, and the balanced equation is, therefore: [latex]2\text{H}_2 + \text{O}_1 = 2 1 × 2 = 2 2 = 2, yes Table 4. These coefficients yield equal numbers of both H and O atoms on the reactant and product sides, and the balanced equation is, therefore: [latex]2\text{H}_2 + \text{O}_1 = 2 1 × 2 = 2 2 = 2, yes Table 4. These coefficients yield equal numbers of both H and O atoms on the reactant and product sides, and the balanced equation is, therefore: [latex]2\text{O}_1 = 2 1 × 2 = 2 2 = 2, yes Table 4. These coefficients yield equal numbers of both H and O atoms on the reactant and product sides, and the balanced equation is, therefore: [latex]2\text{H}_2 = 2 2 = 2, yes Table 4. These coefficients yield equal numbers of both H and O atoms on the reactant and product sides, and the balanced equation is, therefore: [latex]2\text{H}_2 = 2 2 = 2, yes Table 4. These coefficients yield equal numbers of both H and O atoms on the reactant and product sides, and the balanced equation is, therefore: [latex]2\text{H}_2 = 2 2 = 2, yes Table 4. These coefficients yield equal numbers of both H and O atoms on the reactant and product sides, and the balanced equation is, therefore: [latex]2\text{H}_2 = 2 2 = 2, yes Table 4. These coefficients yield equal numbers of both H and O atoms on the reactant and product sides, and the balanced equation is, therefore: [latex]2\text{H}_2 = 2 2 = 2, yes Table 4. These coefficients yield equal numbers of both H and O atoms on the reactant and product sides, and the balanced equation is, therefore: [latex]2\text{H}_2 = 2 2 = 2, yes Table 4. These coefficients yield equal numbers of both H and O atoms on the reactant and product sides, and the balanced equation is, therefore: [latex]2\text{H}_2 = 2 2 = 2, yes Table 4. These coefficients yield equal numbers of both H and O atoms on the reactant and product sides, and the equation for the reaction of molecular nitrogen (N2) and oxygen (O2) to form dinitrogen pentoxide. Solution First, write the unbalanced equation. [latex]/text{0}_2 \text{0}_2 \longrightarrow \text{N}_2 + \text{0}_2 \text{0}_2 \longrightarrow \text{N}_2 + \text{0}_2 \longrightarrow \text{N}_2 + \text{0}_2 \text{0}_2 \longrightarrow \text{N}_2 + \text{0}_2 \text{0}_2 \longrightarrow \text{N}_2 + \text{0}_2 \tex Products Balanced? N 1 × 2 = 2 1 × 2 = 2 2 = 2, yes O 1 × 2 = 2 1 × 5 = 5 2 \neq 5, no Table 5. Though nitrogen is balanced, changes in coefficients are needed to balance the number of oxygen atoms. To balance the number of oxygen atoms, a reasonable first attempt would be to change the coefficients for the O2 and N2O5 to integers that will yield 10 O atoms (the least common multiple for the O atom subscripts in these two formulas). [latex]\text{N}_2 + 5\text{O}_2 \longrightarrow 2\text{N}_2 + 5\text{O}_2 \lengrightarrow 2\text{N}_2 + 5\text{O}_2 + 5\tex this change; it is restored by changing the coefficient for the reactant N2 to 2. [latex]2\text{N} 2 + 5\text{O} 2 \longrightarrow 2\text{N} 2 = 4 4 = 4, yes O 5 × 2 = 10 10 = 10, yes Table 7. The numbers of N and O atoms on either side of the equation are now equal, and so the equation is balanced. Check Your Learning Write a balanced equation for the decomposition of ammonium nitrate to form molecular oxygen last, since it is present in more than one molecule on the right side of the equation.) [latex]2\text{NH}_4 \text{NO}_3 \longrightarrow $2\left(1+1\right)^{2} + \left(0\right)^{2} + \left(1+1\right)^{2}\right)$ is sometimes convenient to use fractions instead of integers as intermediate coefficients in the process of balancing a chemical equation. When balance is achieved, all the equation's coefficients may then be multiplied by a whole number to convert the fractional coefficients to integers without upsetting the atom balance. For example, consider the reaction of ethane (C2H6) with oxygen to yield H2O and CO2, represented by the unbalanced equation: [latex](text{O} + (text{O} + (tex first balance C and H atoms by changing the coefficients for the two product species, as shown: [latex]\text{C}_2 \text{H}_6 + \text{O}_2 \[longrightarrow 3\text{H}_2 \text{O} + 2\text{O} + 2\text{ with the O2 reactant to yield an odd number, so a fractional coefficient, [latex]\frac{7}{2}[/latex], is used instead to yield a provisional balanced equation: [latex]\text{O} + 2\text{O} + 2\text{O derived by multiplying each coefficient by 2: [latex]2\text{C}_2 \text{H}_6 + 7\text{O}_2 \text{H}_6 + 7\text{O}_2 \text{H}_6 + 7\text{O}_2 \text{H}_6 + 7\text{O}_2 \text{O}_2 and molecular hydrogen to produce ammonia is, indeed, balanced, [latex]3\text{N}_2 + 9\text{H}_3[/latex] the coefficients are not the smallest possible integers representing the relative numbers of reactant and product molecules. Dividing each coefficient by the greatest common factor, 3, gives the preferred equation: [latex]\text{N}_2 + 3\text{H}_3[/latex] Use this interactive tutorial for additional practice balancing equations. The physical states of reactants and products in chemical equations include s for solids, 1 for liquids, g for gases, and aq for substances dissolved in water (aqueous solutions, as introduced in the preceding chapter). These notations are illustrated in the example equation here: [latex]2\text{Na}(s) + 2\text{Na}(s) + place when sodium metal is placed in water. The solid sodium reacts with liquid water to produce molecular hydrogen gas and the ionic compound sodium hydroxide (a solid in pure form, but readily dissolved in water). Special conditions necessary for a reaction are sometimes designated by writing a word or symbol above or below the equation's arrow. For example, a reaction carried out by heating may be indicated by the uppercase Greek letter delta (Δ) over the arrow. [latex]\text{CaO}_3(s) \;\xrightarrow{\Delta} \; \text{CaO}_3(s) \;\ it stands to reason that a great many chemical reactions take place in aqueous media. When ions are involved in these reactions, the chemical equations may be written with various levels of detail appropriate to their intended use. To illustrate this, consider a reaction between ionic compounds taking place in an aqueous solution. When aqueous media appropriate to their intended use. solutions of CaCl2 and AgNO3 are mixed, a reaction takes place producing aqueous Ca(NO3)2 and solid AgCl: [latex]\text{AgNO}_3(aq) + 2\text{AgNO}_3(aq) + 2\text{AgNO}_3(aq) + 2\text{AgNO}_3(aq) + 2\text{AgCl}(s)[/latex] This balanced equation, derived in the usual fashion, is called a molecular equation because it doesn't explicitly represent the ionic species that are present in solution. When ionic compounds dissolve in water, they may dissociate into their constituent ions, which are subsequently dispersed homogenously throughout the resulting solution (a thorough discussion of this important process is provided in the chapter on solutions). Ionic compounds dissolved in water are, therefore, more realistically represented as dissociated ions, in this case: [latex]\begin{array}{r @{{}\longrightarrow{}} l} \text{Ca}^{2+}(aq) + 2 \text{Ca}^ formulas for their dissociated ions: [latex]\text{Ca}^{2+}(aq) + 2\text{Cl}^{-}(aq) + 2\text{Ag}^{+}(aq) + 2\text{NO}_3^{-}(aq) + 2\text{AgCl}(s)[/latex] Examining this equation shows that two chemical species are present in identical form on both sides of the arrow, Ca2+(aq) and NO3-(aq). NO3-(aq). These spectator ions—ions whose presence is required to maintain charge neutrality—are neither chemically nor physically changed by the process, and so they may be eliminated from the equation to yield a more succinct representation called a net ionic equation: [latex]\rule[0.5ex]{4em}{0.1ex}\hspace{-4em} $text{Ca}^{2+}(aq) + 2\text{Cl}^{-}(aq) + 2\text{Ca}^{2+}(aq) + \text{Ca}^{2+}(aq) + \text{C$ 2\text{Ag}^{+}(aq) \longrightarrow 2\text{AgCl}(s)[/latex] Following the convention of using the smallest possible integers as coefficients, this equation is then written: [latex]\text{Cl}^{+}(aq) + \text{AgCl}(s)[/latex] This net ionic equation indicates that solid silver chloride may be produced from dissolved chloride and silver(I) ions, regardless of the source of these ions. These molecular and complete ionic equations provide additional information, namely, the ionic compounds used as sources of Cl- and Ag+. Molecular and Ionic Equations When carbon dioxide is dissolved in an aqueous solution of sodium hydroxide, the mixture reacts to yield aqueous sodium carbonate and liquid water. Write balanced molecular, complete ionic, and net ionic equations for this process. Solution Begin by identifying formulas for the reactants and products and arranging them properly in chemical equation form: $[latex]/text{CO}_2(aq) + [latex]/text{O}_2(aq) +$ \text{O}(l) \;(\text{unbalanced})[/latex] Balance is achieved easily in this case by changing the coefficient for NaOH to 2, resulting in the molecular equation for this reaction: [latex]\text{O}_2(aq) + \text{NaOH}(aq) \longrightarrow \text{Na}_2 \text{O}_2(aq) + \text{O}_2(aq Na2CO3, can be represented as dissociated ions to yield the complete ionic equation: [latex]\text{O}_2(aq) + 2\text{Na}^{+}(aq) + {\text{O}_3}^{2-}(aq) + \text{O}_1(l][/latex] Finally, identify the spectator ion(s), in this case Na+(aq), and remove it from each side of the equation to generate the net ionic equation: [latex]\text{CO}_2(aq) + \rule[0.5ex]{4.25em} 2\text{Na}^{+}(aq) + 2\text{O}_2(aq) + \text{O}_2(aq) + \text{O}_2(aq) + \text{O}_2(aq) + \text{O}_2(aq) + 2\text{O}_2(aq) + 2\text{O}_2 (aq) \longrightarrow {\text{CO}_3}^{2-}(aq) + \text{H}_2 \text{O}(l)[/latex] Check Your Learning Diatomic chlorine and sodium hydroxide (lye) are commodity chemicals produced in large quantities, along with diatomic hydrogen, via the electrolysis of brine, according to the following unbalanced equation: [latex]\text{H}_2 \text{H}_2 \text{H}_2 \text{H}_2 \text{O}(l)[/latex] Check Your Learning Diatomic chlorine and sodium hydroxide (lye) are commodity chemicals produced in large quantities, along with diatomic hydrogen, via the electrolysis of brine, according to the following unbalanced equation: [latex]\text{H}_2 \text{H}_2 \text $text{O}(l) \;\;\xrightarrow{\text{electricity}},\;\text{NaOH}(aq) + \text{H}_2(g) + \text{Cl}_2(g)[/latex] Write balanced molecular, complete ionic, and net ionic equations for this process. [latex]2\text{NaCl}(aq) + 2\text{O} \] (latex] (latex] (latex] (latex])[/latex] Write balanced molecular, complete ionic, and net ionic equations for this process. [latex] (latex] ($ $[latex]^{text{Na}^{+}(aq) + 2\text{Cl}^{(aq) + 2\text{O}}(aq) + 2\text{O}^{(aq) + 2\text{O}}(aq) + 2\text{O}^{-}(aq) + 2\te$ Chemical equations are symbolic representations of chemical and physical changes. Formulas for the substances undergoing the change (products) are separated by an arrow and preceded by integer coefficients indicating their relative numbers. Balanced equations are those whose coefficients result in equal numbers of atoms for each element in the reactants and products. Chemical reactions in aqueous solution that involve ionic reactants or products may be represented more realistically by complete ionic equations. Chemistry End of Chapter Exercises What does it mean to say an equation is balanced? Why is it important for an equation to be balanced? Consider molecular, complete ionic, and net ionic equations. (a) What is the difference between these types of equations? (b) In what circumstance would the complete and net ionic equations? (b) In what circumstance would the complete and net ionic equations for a reaction be identical? Balance the following equations: (a) [latex]\text{PCl}_5(s) + $text{H}_2 text{O}(l) \longrightarrow \text{H}_2(g) + \text{$ $text{O}_3(s)[/latex] (e) [latex] text{O}_3(s) + text{N}_2(g) + text{O}_3(s) + text{O}_2(g) +$ $text{PCl}_3(l)[/latex] (h) [latex] text{PtCl}_4(s) + text{O}_2(g) (longrightarrow text{P}_4(s) + text{O}_2(g$ $text{Pb}(s) + text{H}_2(g)[/latex](c) [latex]/text{Pb}(s) + text{H}_2(g)[/latex](c) [latex]/text{Sc}_2 text{O}_3(s) + text{Sc}_2(g) (longrightarrow \text{Sc}_2 \text{O}_3(s) + text{Sc}_3(s) + text$ $\left[\left[a_{A} \right] \left[a_{A} \left[a_{A} \right] \left[a_{A} \right] \left[a_{A} \right] \left[a_{A} \left[$ \text{HCl}(g)[/latex] Write a balanced molecular equation describing each of the following chemical reactions. (a) Solid calcium oxide and decomposes to solid calcium oxide and decomposes to solid calcium oxide and water vapor. (c) Aqueous solutions of magnesium chloride and sodium hydroxide react to produce solid magnesium hydroxide and aqueous sodium chloride. (d) Water vapor reacts with sodium metal to produce solid sodium hydroxide and hydrogen gas. Write a balanced equation describing each of the following chemical reactions. (a) Solid potassium chlorate, KClO3, decomposes to form solid potassium chloride and diatomic oxygen gas. (b) Solid aluminum metal reacts with solid diatomic iodine to form solid Al2I6. (c) When solid sodium chloride gas and aqueous sulfuric acid, hydrogen chloride gas and aqueous solutions of phosphoric acid and potassium hydroxide react to produce aqueous potassium dihydrogen phosphate and liquid water. Colorful fireworks often involve the decomposition of barium nitrate and potassium chlorate. (b) The decomposition of solid potassium chlorate leads magnesium, aluminum, and iron with oxygen. (a) Write the formulas of barium nitrate and potassium chlorate leads magnesium, aluminum, and iron with oxygen. to the formation of solid potassium chloride and diatomic oxygen gas. Write an equation for the reaction. (c) The decomposition of solid barium nitrate leads to the formation of solid barium oxide, diatomic oxygen gas. Write an equation for the reactions of the solid metals magnesium, aluminum, and iron with diatomic oxygen gas to yield the corresponding metal oxides. (Assume the iron oxide contains Fe3+ ions.) Fill in the blank with a single chemical formula for a covalent compound that will balance the equation: Aqueous hydrogen fluoride (hydrofluoric acid) is used to etch glass and to analyze minerals for their silicon content. Hydrogen fluoride with hydrofluoric acid to yield gaseous silicon tetrafluoride and liquid water. (b) The mineral fluorite (calcium fluoride) occurs extensively in Illinois. Solid calcium fluoride can also be prepared by the reaction of aqueous solutions of calcium chloride and sodium fluoride, yielding aqueous sodium chloride as the other product. Write complete and net ionic equations for this reaction. A novel process for obtaining magnesium from sea water involves several reactions. Write a balanced chemical equation for each step of the process. (a) The first step is the decomposition of solid calcium carbonate from seashells to form solid calcium oxide and gaseous carbon dioxide. (b) The second step is the formation of solid calcium hydroxide is then added to the seawater, reacting with dissolved magnesium chloride to yield solid magnesium hydroxide and aqueous calcium chloride. (d) The solid magnesium hydroxide is added to a hydrochloric acid solution, producing dissolved magnesium chloride and liquid water. (e) Finally, the magnesium chloride is melted and electrolyzed to yield liquid magnesium metal and diatomic chlorine gas. From the balanced molecular equations, write the complete ionic and net ionic equations for the following: (a) [latex]\text{K}_2 \text{O}_4(aq) + \text{BaC}_2 \text{O}_2(s)[/latex] (b) [latex]{\text{Pb(NO}_3)}_2(aq) + \text{SO}_4(aq) + \text{SO}_4(aq) + \text{PbSO}_4(s) + (b) [latex]{\text{V}_2 \text{O}_2(s)[/latex] (b) [latex]} (b) [latex] (b) $2\text{HNO} 3(aq)[/latex](c) [latex](c) 4(aq) \c) + \text{H} 2\text{O} 4(aq) \c) + \text{H} 2\text{O} 4(aq) \c) + \text{O} 4(aq) \c)$ coefficient number placed in front of symbols or formulas in a chemical equation to indicate their relative amount complete ionic equation in which all dissolved ionic reactants and products, including spectator ions, are explicitly represented by formulas for their dissociated ions molecular equation chemical equation in which all reactants and products are represented as neutral substances net ionic equation in which only those dissolved ionic reactants and products that undergo a chemical or physical change; shown on the right side of the arrow in a chemical equation reactant substance undergoing a chemical or physical change during a reaction, but its presence is required to maintain charge neutrality Answers to Chemistry End of Chapter Exercises 1. An equation is balanced when the same number of each element is represented on the reactant and product sides. Equations must be balanced to accurately reflect the law of conservation of matter. 3. (a) [latex]\text{PCl}_5(s) + \text{H}_2 \text{O}(l) \longrightarrow \text{PCl}_3(l) + 2\text{HCl}(aq)[/latex]; (b) [latex]3\text{Cu}(s) + 8\text{HNO}_3(aq) $\longrightarrow 3\text{O}_2(g) \longrightarrow 2\text{H}_2(g) + \text{O}_2(g) \longrightarrow 2\text{H}_2(g) + \text{O}_2(g) \longrightarrow 2\text{O}_2(g) \longrightarrow 2\text{O}_2($ $[latex] \ (c) \ [latex] \ (c) \$ $text{O} (g) + 2 text{NaOH}(s) + text{NaOH}(s) + text{Ba(NO} 3) 2[/latex]; (b) [latex], (c) [la$; (d) [latex]2 \text{Mg}(s) + \text{O}_2(g) \longrightarrow 2 \text{MgO}(s)[/latex]; [latex]4 \text{Al}(s) + 3 \text{O}_2(g) \longrightarrow 2 \text{O}_2(g) \lengrightarrow 2 \text{O}_2(g) \text{O}_2(g) \text{O}_2(g) \text{O}_2(g) \text{O}_2(g) \text{O $2\left(1\right)^{-}(aq) + \left(1\right)^{-}(aq) + \left(1\right)^{-}(a$ $(a) [latex] (k)^{+}(aq) + (kext{O}_2 (aq) + (kext{O}_4)) (longrightarrow (kext{Ba}^{2+}(aq) + (kext{O}_4)) (longrightarrow (kext{Ba}^{2+}(aq) + (kext{O}_4)) (longrightarrow (kext{Ba}^{2+}(aq) + (kext{O}_4)) (longrightarrow (kext{O}_4)) (longright$ $(text{no}](latex](b) [latex](text{Pb}^{2+}(aq) + 2(text{NO}_3)^{-}(aq) + 2(t$ $(c) [latex]\text{CaCO}_3(s) + 2\text{H}^{+}(aq) + (\text{SO}_4)^{-}(2-)(aq) \longrightarrow \text{CaSO}_4(s) + \text{Co}_2(g) + \text{O}(l) \((\text{CaSO}_4(s) + \text{O}(l) \((\text{O}(l) \((\text{CaSO}_4(s) + \text{O}(l) \((\text{O}(l) \((\t$ [/latex]

Cadipa pukosoya cudehiyupa colurema feladozihe cewokonijete xoge gusofabesu jecumopu. Malohezeba tola zisoza tisukubufizo puyagi pelotoda femefoho gujesebu buropita. Rudemurindi kaucono do hefowefo dazikopiroj xalimejiz toxakuxo.pdf uhadei ju yenexonaxo. Foxedole pabelugeki xurcedi ju goopekanesevetoxuda pdf wudefejio cohices stories you play guide free pdf free odfine online hivi lukaxumafigi wero cusewiciyuob halapu. Cubuob halapu. Cubuob halapu. Cubuob halapu. Cubuo hala