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Worksheet types of reactions

Not ready to purchase a subscription? Click to download the free sample version   Download sample A chemical change must occur in a chemical reaction, which is commonly observed with physical changes like precipitation. A reaction can occur between two atoms, ions, or molecules, and they establish a new bond; no atom is destroyed or generated, but a new product is formed from reactants. See the fact file below for more information on Chemical Reactions or alternatively, you can download our 38-page Chemical Reaction worksheet pack to utilize within the classroom or home environment. Key Facts & Information CHEMICAL REACTION: DEFINITION A chemical reaction is when two or more molecules combine to create a new product (s). It also happens when chemical bonds between atoms form or break. Chemical elements or compounds are examples of substances. The chemicals that enter a chemical reaction are known as reactants, and the substances that emerge from the response are known as products. A chemical change rearranges the component atoms of the reactants to form various products. DISCOVERY: Law of Mass Conservation In the 1700s, Antoine Lavoisier, a French aristocrat, experimented with various chemical processes. Chemistry was still not considered a truly quantifiable science at the time. Most theories about how substances changed rested on Greek philosophy, and there was relatively little experimental information tied to the alchemist's experimentation.During the second half of the 18th century, Lavoisier conducted several quantitative tests and discovered that while substances changed shape during a chemical reaction, the system's mass – or a measure of the overall quantity of "stuff" present – did not change. In doing just that, Lavoisier promoted the concept of mass conservation throughout transformations.Unlike previous alchemists who believed they were generating matter from nothing, Lavoisier suggested that substances do not create or destroy matter but rather change form during reactions. In 1789, Lavoisier published the fundamental book Traité élémentaire de Chimie (Lavoisier, 1789), usually regarded as the origin of modern chemistry as a quantitative discipline. DISCOVERY: Law of Constant Composition Joseph Proust was a French actor who followed in the footsteps of Lavoisier. Proust carried out dozens of chemical reactions, beginning with varying quantities of various components. Over time, he discovered that no matter how he initiated a chemical reaction, the ratio of reactants consumed remained consistent. He experimented extensively with copper carbonate, for example, and no matter how he modified the beginning reactant ratio, the copper, carbon, and oxygen all reacted together in a consistent ratio (Proust, 1804). As a result, in the late 18th century, Proust developed the law of constant composition (also referred to as the law of definite proportions).He observed that regardless of the method of synthesis, each given chemical material (that we now describe as a compound) always comprised of the same ratio by mass of its constituent elements. This was a significant advance in contemporary chemistry since it had previously been assumed that the chemicals generated during chemical reactions were random and unstructured. DISCOVERY: Law of Multiple Proportions In 1803 the English chemist John Dalton proposed that matter was formed of atoms of distinct substances that could not be generated or destroyed, which helped make sense of the principles of conservation of mass and precise proportions.Dalton expanded on Proust's theories by realizing that two components may combine to make more than one compound. Whatever the compound was, it would always include elements in whole-number ratios (Dalton, 1808).This finding is known as the rule of multiple proportions, and Lavoisier's discoveries were assisted in solidifying by Lavoisier's atomic theory.These developments established the framework for our current knowledge of chemical processes, chemical equations, and chemical stoichiometry, or the technique of describing the relative quantities of reactants and products in a chemical reaction.During a physical change, the arrangement of molecules changes, resulting in a state shift. There are no new products, and the molecular makeup stays the same. Ice and water, for example, retain their molecular structure.There are no energy changes when there is a physical change. The amount of energy necessary to bring about a physical change is the same as the energy required to reverse the change. There is no difference in energy.The modifications are reversible and only temporary. If the source of the alteration is eliminated, the response is reversed. For example, water freezes to produce ice, and ice melts to form water.The mass of the material remains constant during the physical change. Only energy is supplied or withdrawn in a physical change, and mass is not involved. Chemical Changes A chemical change occurs when the molecular composition is transformed and a new product is created. Chemical changes result in the creation of a new product. Chemical transformations are irreversible and permanent.It shows that chemical change cannot be reversed by modifying the experimental adjustments. A chemical alteration changes the mass of the element. The mass is either added or subtracted.Energy shifts occur during chemical reactions. The breakdown of existing bonds in reactants and the synthesis of new bonds in products need different amounts of energy. When energy is released, the reaction is called an exothermic reaction; when energy is absorbed, the process is referred to as an endothermic reaction. CHEMICAL EQUATIONS Because there are so many chemical reactions all around us, a nomenclature was devised to simplify how we represent a chemical reaction in the form of a chemical equation.A chemical equation is simply a mathematical statement that represents the product creation from reactants while indicating the conditions under which the reaction was carried out.The reactants are on the left, while the products are on the right, and they are connected by one-handed or two-headed arrows. As an example, consider a reaction. $A + B \rightarrow C + D$ In this case, the reactants are A and B, which react to produce the products C and D. In a chemical equation, reactants are designated by their chemical formula. To guarantee the rule of conservation of mass, a chemical equation must be balanced, which implies that the number of atoms on both sides must be equal. TYPES OF CHEMICAL REACTIONS Chemical reactions occur throughout our everyday lives. It happens all the time in our bodies, plants, and animals, as well as in the air we breathe and the lakes and oceans we swim in. It would be not easy to comprehend all of the chemical processes around us. However, a method can help us understand them: categorizing chemical processes into a few general types. Synthesis Reactions Before Lavoisier's study, it was unclear if distinct gases were composed of different components. Instead, certain gases were widely mischaracterized as forms of "air," for example, phrases such as "inflammable air" or "dephlogisticated air." Still, Lavoisier disagreed and was sure that they were distinct entities. He performed tests in which he combined flammable air with dephlogisticated air and a spark, and discovered that the chemicals combined to generate water. In response, he termed flammable air "hydrogen," a combination of the Greek words hydro (water) and genes (creator). Equation: $2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$ Synthesis is the process by which chemists create a new chemical from existing components. Under specific physical circumstances, many simple chemicals mix to form a complex product. The end result is always a compound. The process of converting reactants to products is represented by a chemical equation. For example, Iron sulfide is formed when iron (Fe) and sulfur (S) mix (FeS). $Fe(s) + S(s) \rightarrow FeS(s)$ Iron interacts with sulfur, as shown by the + sign. The arrow indicates that the reaction "forms" or "yields" iron sulfide. The symbols representing the states of matter of reactants and products are (s) for solids, (l) for liquids, and (g) for gases. Decomposition Reactions In 1774, the scientist Joseph Priestley became interested in cinnabar, a brick red mineral. When he exposed the mineral to sunlight magnified using a large lens, he discovered a gas with an "exalted quality" since a candle burned brightly in the gas (Priestley, 1775). Priestley had found oxygen as a byproduct of a decomposition reaction without recognizing it.Decomposition reactions are frequently thought of as the inverse of synthesis reactions since they entail the breakdown of a chemical into simpler compounds or even components. In the instance of Priestley's oxygen, he had used heat to break down mercury (II) oxide (cinnabar) into its constituent parts. The following equation summarizes the reaction. Equation: $2HgO(s) \rightarrow 2Hg(l) + O_2(g)$ Single Replacement Reactions John Daniell, a British scientist, and meteorologist built one of the earliest functional batteries in 1836. In his cell, Daniell utilized a standard single replacement reaction. His first cells were complete, with complex components and convoluted structures, but the chemistry was surprisingly simple.A single ingredient may replace another that is already present in a chemical compound in various chemical reactions. The Daniell cell functions because zinc may replace copper in a copper sulfate solution, exchanging electrons that are then used in the battery cell. The reaction was summarized as follows: Equation: $Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$ This single displacement is known as a metal displacement because it involves one metal replacing another metal, and many types of batteries are based on metal replacement reactions. There are, however, additional types of single replacement reactions, such as when a metal replaces hydrogen from acid or water or when a halogen replaces another halogen in particular salt compounds. Combustion Reactions The interaction of fuel (wood, oil, gasoline, etc.) with oxygen is known as combustion. For combustion to occur, a fuel and an oxygen gas are necessary. However, these processes typically require activation energy, which can be provided by a spark or other energy source for ignition. The fire triangle is made up of three components: fuel, oxygen, and energy, and their absence indicates that combustion will not occur.When these fuels burn, the hydrogen and carbon in them combine with oxygen to generate two well-known compounds: water and carbon dioxide. A fundamental example is combustion of natural gas, or methane, CH_4: Equation: $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$ Heat and light, like all fuel combustion, are products, and it is these products that we utilize to cook our meals and heat our homes. Reduction-Oxidation Reactions A redox reaction occurs when reduction and oxidation occur simultaneously, thus the name. The separate processes of oxidation and reduction can be characterized in a variety of ways, but regardless of the definition, the two processes are symbiotic, meaning they must occur together. Oxidation is the process by which a molecule loses electrons, whereas reduction is defined as the process by which a molecule gets electrons.If a chemical substance is to lose electrons (and so be oxidized), it must be able to provide those electrons with another interdependent substance. The second component (the one acquiring electrons) is said to be decreased during the process.Without an electron acceptor, the initial species cannot lose electrons, and no oxidation can occur. When the electron acceptor is present, the redox combination process is completed. This sort of redox reaction may be characterized by a pair of equations, one showing the loss of electrons (the oxidation) and the other showing the gain of electrons (the reduction). Equation: Oxidation: $Zn \rightarrow Zn^{2+} + 2e^-$ Reduction: $Cu^{2+} + 2e^- \rightarrow Cu$ The electrons lost by zinc in the first reaction are the same electrons received by copper ions in the second. The reactions can be coupled in order to cancel out the electrons on either side of the processes, resulting in the total redox reaction: Equation: $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$ Precipitation or Double-Displacement Reactions It is a displacement reaction in which two compounds react, and their anions and cations move locations, resulting in the formation of two new products. Consider the interaction between silver nitrate and sodium chloride as an example. After the double-displacement process, the products will be silver chloride and sodium nitrate.Hard water includes dissolved salts of magnesium or calcium ions, such as magnesium chloride or calcium chloride. When soap (sodium stearate) comes into touch with any salts, a twofold displacement reaction occurs, resulting in the insoluble precipitate soap scum.When two ionic compounds come together, they undergo a double displacement reaction (also known as a double replacement reaction). Generally: Equation: $AB + CD \rightarrow AD + CB$ A and C are cations (positively charged ions), while B and D are anions (negatively charged). In the instance of the soap-calcium chloride reaction, the reaction is: Equation: $CaCl_2(aq) + 2NA(C_{17}H_{35}COO)(aq) \rightarrow 2NaCl(aq) + Ca(C_{17}H_{35}COO)_2(s)$ The solid calcium stearate is soap scum, which is generated by the interaction of the soluble sodium stearate salt (the soap) with calcium chloride in a twofold replacement process. Neutralization / Acid-Base Reaction A neutralization reaction is the interaction of an acid and a base that produces salt and water as byproducts. The water molecule is created by combining OH^- ions with H^+ ions.When a strong acid and a strong base are neutralized, the total pH of the products is 7. Consider the neutralization reaction between hydrochloric acid and sodium hydroxide, which produces sodium chloride (common salt) and water. Equation: $HCl + NaOH \rightarrow NaCl + H_2O$ ENERGY CHANGES Chemical reactions nearly always entail a shift in energy between products and reactants due to energy absorption when chemical bonds are broken and the release of energy when chemical bonds are produced. However, according to the Law of Conservation of Energy, the total energy of a system must stay constant, and a chemical reaction will frequently absorb or release energy in the form of heat, light, or both.The energy change in a chemical reaction is caused by the difference in the amounts of stored chemical energy between the products and the reactants. The enthalpy of a system is its stored chemical energy or heat content.Exothermic reactions are ones that release energy into the environment. Combustion reactions are a good example since the energy generated by the process is turned into light and heat in direct proximity.Because the products of exothermic reactions have less enthalpy than the reactants, an exothermic reaction is said to have a negative enthalpy of reaction. This suggests that the energy required to break the bonds in the reactants is less than the energy produced when the products create new ones. The reaction's excess energy is released as heat and light.Endothermic processes, on the other hand, take energy from their environment. In this case, the reaction may need to be heated or another type of energy added to the system before it may occur.Endothermic reactions are common in decomposition processes, for example. The enthalpy of endothermic reactions is greater than that of exothermic activities.As a result, an endothermic reaction has a positive enthalpy of response. This indicates that the energy needed to break the bonds in the reactants is more than the energy generated when bonds are formed in the products; in other words, the reaction necessitates energy release. Chemical Reaction Worksheets This is a fantastic bundle that includes everything you need to know about Chemical Reaction across 38 in-depth pages. These are ready-to-use worksheets that are perfect for teaching about Chemical Reaction which occurs between atoms, ions, or molecules where they establish new bonds. Complete List of Included Worksheets Below is a list of all the worksheets included in this document. Chemical Reaction Facts CHEM-cept WebHello, He-LAW!Is It Chemical?Fill It In!Exo & Endo EnergyLet's get PHYSICAL!CHEM you EQUATE me?Chemical BubbleTypes of ReactionIdentify It! Frequently Asked Questions What is a chemical reaction? A chemical reaction happens when two or more molecules combine to create a new product. It is also called a chemical reaction when the opposite happens, where bonds between atoms break. What are the 4 types of chemical reactions? There are four major types of chemical reaction:Synthesis reactions, Decomposition reactions, Single-replacement reactions, and Double-replacement reactions. What are the most common products of a chemical reaction? A lot of the elements we encounter in nature and in our day-to-day lives are the result of chemical reactions. The most common ones being: water, which is a combination of hydrogen and oxygen, while oxygen and iron result in rust. Table salt found in most kitchens is a result of sodium + chloride. Link/cite this pageIf you reference any of the content on this page on your own website, please use the code below to cite this page as the original source.