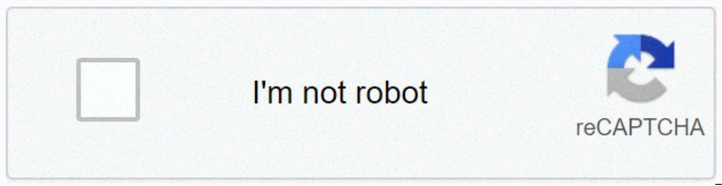

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Worksheet matter map chemistry

Chemists examine the structures, physical properties and chemical properties of the substances. It consists of matter, which is everything that occupies space and has mass. Gold and iridia are matter, just like peanuts, people and postage stamps. Smoke, smog and laughing gas are matter. However, energy, light and sound are not important; ideas and emotions are also irrelevant. The mass of the object is contained in the amount of material contained in it. Do not confuse the mass of an object with its weight, which is the force caused by the gravitational cravings that are applied to the object. Mass is the main property of an object, which does not depend on its location. Physically, the mass of an object is directly proportional to the force required to change its speed or direction. A more detailed discussion of weight and weight differences and the units used to measure them is included in Essential Skills 1 (section 1.9). On the other hand, the weight depends on the location of the object. An astronaut weighing 95 kg weighs about 210 lb on Earth, but only about 35 lb on the moon, because the gravitational force he experiences on the moon is about one-sixth of the force on earth. For practical purposes, weight and mass in laboratories are often used alternately. Because gravity is considered the same everywhere on the Earth's surface, 2.2 lb (weight) is equal to 1.0 kg (mass), regardless of the laboratory location on Earth. Under normal conditions there are three different matter: solids, liquids and gases. Solids are quite rigid and have fixed shapes and volumes. For example, the rock is hard. On the contrary, liquids have fixed volumes, but the flow assume the shape of their containers, for example, the drink can. Gases, such as air in a car tyre, have neither fixed shapes nor fixed volumes and expand to fully fill their containers. Since the volume of gas depends to a large extent on their temperature and pressure (force content of a certain area), the volumes of liquids and solids are largely independent of temperature and pressure. Matter can often change from one physical state to another in a process called physical change. For example, liquid water can be heated to produce a gas called steam, or steam can be cooled to form liquid water. However, such changes in condition do not affect the composition of the substance. A pure substance is any substance that has a fixed chemical composition and characteristic properties. For example, oxygen is a pure chemical that is a colorless, odourless gas at 25 °C. Very few samples of the substance consist of pure substances; instead, most of them are mixtures which are combinations of two or more pure substances in variable proportions in which individual substances retain their identity. Air, tap water, milk, cheese, bread and dirt are all mixtures. If all parts of the material are in the same condition, have no visible boundaries and are identical, the material is homogeneous. Examples of homogeneous mixtures are the air we breathe and the tap water we drink. Homogeneous mixtures are also called solutions. Thus, air is a solution of nitrogen, oxygen, water vapor, carbon dioxide and several other gases; tap water is a solution of a small amount of several substances in water. However, the specific compositions of both of these solutions are not fixed, but depend on both the source and the location; for example, the composition of tap water in Boise, Idaho, is not the same as the composition of tap water in Buffalo, New York. While most of the decisions we are dealing with are fluid, solutions can also be solid. The gray material that some dentists still use to fill dental cavities is a complex solid solution containing 50% mercury and 50% powder containing mostly silver, tin and copper, with small amounts of zinc and mercury. Hard solutions of two or more metals are usually called alloys. If the composition of the material is not exactly the same, it is heterogeneous (for example, chocolate chip cookie dough, blue cheese and dirt). Mixtures that look homogeneous are often heterogeneous after microscopic examination. For example, milk looks homogeneous, but when examined under a microscope, it clearly consists of small fats and proteins dispersed in water. Components of heterogeneous mixtures can usually be separated by simple means. Solid and liquid mixtures, such as sand in water or tea leaves in tea, are easily separated by filtration, i.e. a mixture through a barrier, such as a filter with holes or pores smaller than particulate matter. In principle, mixtures of two or more solids, such as sugar and salt, may be separated by microscopic examination and sorting. More complex operations are usually necessary, however, for example, separating gold nuggets from river gravel panning. The first solid is filtered from river water; the solids are then separated by inspection. If the gold is inserted into the rock, it may need to be isolated by chemical methods. Picture \(\PageIndex{2}\): A mixed mixture. Under a microscope, whole milk is in fact a heterogeneous mixture consisting of water-dispersible fats and protein globurs. The figure used with wikipedia permission homogeneous mixtures/solutions may be separated into their constituents by physical processes, which depend on differences in certain physical characteristics, such as differences in their cooking points. Two of these separation methods are distillation and crystallisation. Differences in variability used for distillation, measure how easily the substance is converted into gas at a given temperature. A distillation apparatus for separating the mixture of substances, of which at least one is a liquid. First boil the most volatile component, which is condensed back into the liquid from which it flows into the receiving flask in the water-cooled condenser. If a salt-water solution is distilled, for example, the more volatile the pure water is collected in the receiving flask and the salt remains in the distillation flask. Picture \(\PageIndex{3}\): Distillation of table salt solution in water. Heat the salt solution in water in a distillation flask until it has boiled. The resulting steam is saturated with a more volatile component (water), which condenses with a cold capacitor liquid and is collected in a receiving flask. Mixtures of two or more liquids with different boiling temperatures may be separated by a more complex distillation apparatus. One example is the processing of crude oil into various useful products: aviation fuel, petrol, kerosene, diesel and lubricating oil (in an approximate order of decreasing volatility). Another example is the distillation of alcoholic spirits such as brandy or whiskey. (This fairly simple procedure caused more than a few headaches for federal authorities during the 1920s insurance era, when illegal floods spread in remote regions of the United States!) Crystallization separates mixtures according to differences in solubility, measure how much solids remain dissolved in a certain amount of specified liquid. Most substances are more soluble at higher temperatures, so a mixture of two or more substances can be dissolved at a higher temperature and then allowed to cool slowly. Alternatively, a liquid called a solvent may be allowed to evaporate. In any case, the least soluble dissolved substances are least likely to remain in the solution, usually primarily forming crystals, and these crystals can be removed from the remaining solution by filtration. Picture \(\PageIndex{4}\): Crystallization of sodium acetate from concentrated sodium acetate solution in water. The addition of a small seed crystal (a) causes a compound with white crystals, which grow and eventually occupy most of the flask. The video can be found here: www.youtube.com/watch?v=BLq5NibwV5g Most mixtures can be separated into pure substances that can be elements or compounds. An element, such as grey metal sodium, is a substance that cannot be classified as simpler by chemical changes; the compound, e.g. white crystalline sodium chloride, contains two or more elements and has chemical and physical properties which are generally different from the elements from which it is composed. With only a few exceptions, a given compound has the same elemental composition (the same elements in the same proportions) source or history. The composition of the substance is changed in a process called chemical change. The conversion of two or more elements, such as sodium and chlorine, to a chemical compound, sodium chloride, is an example of a chemical change, often referred to as a chemical reaction. Currently, about 118 elements are known, but millions of chemical compounds have been prepared from these 118 elements. Known items are listed in the periodic table. Picture \(\PageIndex{5}\): Water decomposition into hydrogen and oxygen by electrolysis. Water is a chemical compound; hydrogen and oxygen are elements. In general, the reverse chemical process breaks down compounds into their elements. For example, water (compound) can be broken down into hydrogen and oxygen (both elements) using a process called electrolysis. In the case of electrolysis, electricity provides the energy needed to separate the compound into its constituent elements (Fig.\(\PageIndex{5}\)). A similar method is used to a large extent to obtain pure aluminum, an element from its editions, which are mixtures of compounds. As electrolysis requires a lot of energy, the cost of electricity is by far the highest cost of producing pure aluminium. Thus, aluminium processing is economical and environmentally sound. Common matter and methods of separation of mixtures are summarized in the figure \(\PageIndex{6}\). Picture \(\PageIndex{6}\): Relationships between matter types and methods used to separate mixtures Example \(\PageIndex{1}\) Identify each material as a compound, element, heterogeneous mixture, or homogeneous mixture(s). filtered tea freshly squeezed orange juice compact disc aluminum oxide, white powder containing a 2:3 ratio of aluminum to oxygen atoms selenium taking into account: chemical requested: its classification strategy: Decide whether the substance is chemically pure. If it is pure, the substance is an element or compound. If the substance can be separated into its elements, it is a compound. If the substance is not chemically pure, it is a heterogeneous mixture or homogeneous mixture. If its composition is the same, it is a homogeneous mixture. Solution Tea is a solution of compounds in water, so it is not chemically pure. It is usually separated from the tea leaves by filtering. B Since the composition of the solution is the same, it is a homogeneous mixture. Orange juice contains solid (pulp) and liquid particles; it is not chemically pure. B Since its composition is not uniform, orange juice is a heterogeneous mixture. A CD is a hard material that contains more than one element and the regions of different compositions are visible on its edge. Thus, the CD is not chemically pure. B In regions where indicates that the CD is a heterogeneous mixture. Alumina is a single, chemically pure compound. Selenium is one of the famous elements. Exercises \(\PageIndex{1}\) Identify each substance as a compound, element, heterogeneous mixture or homogeneous mixture(s). white wine mercury ranch-style salad dressing table sugar (sucrose) Answer Answer Element B Answer C heterogeneous mixture Answer Compound D Material can be classified according to physical and chemical properties. Matter is everything that occupies space and has mass. The three matter are solid, liquid and gas. Physical change involves converting a substance from one state of the substance to another without changing its chemical composition. Most substances consist of mixtures of pure substances which can be homogeneous (uniform composition) or heterogeneous (different regions have different compositions and characteristics). Pure substances may be chemical compounds or elements. Compounds can be divided into elements by chemical reactions, but the elements can not be separated into simpler substances by chemical means. The properties of substances may be classified as physical or chemical. Scientists can monitor physical properties without changing the composition of the substance, and chemical properties describe the tendency of the substance to undergo chemical changes (chemical reactions) that change its chemical composition. Physical characteristics can be intense or broad. The intense properties are the same for all samples; independent of the sample size; and includes, for example, color, physical state, melting and cooking points. High properties depend on the amount of material and include mass and volume. The ratio of two broad properties, mass to volume is an important intense feature called density. Density.