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**Student Activity- What is Matter?**

On your table you are given four vials. Each vial contains different materials, some of which are in different states of matter. You will eventually need to determine what these materials are, but first you must distinguish between them. Describe in your own words what you observe in each of the four vials. Be as clear as possible.

**Vial 1**

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**Vial 2**

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**Vial 3**

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**Vial 4**

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Next we will need to classify different properties of the materials within each vial. Under each category, write down if it applies to vial 1, 2 ,3 and/or 4.

**Solid Only Liquid Only Solid and Liquid**

**\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_**

Which vials appear to have only one thing in them? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Matter can be defined as that which occupies space and has mass, do all four containers have matter in them? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Matter can be classified as a **pure substance** when all of the particles are identical. Matter is classified as a **mixture** if there are different types of particles present. Which vials do you think contain substances and which contain mixtures?

Pure Substances: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Mixtures: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The problem with distinguishing between substances and mixtures is that some substances look very similar and when they are mixed, it is difficult to tell them apart. An example would be a mixture of table salt and sugar. Another problem is that some mixtures are so evenly mixed that you cannot tell them apart from a pure substances easily. This type of mixture is called a **homogeneous mixture** or a **solution**. Vial 2 is actually a mixture of a salt (copper (II) sulfate) and water. The ratio of components in a solution can vary. This means there can be different amounts of salt in any salt water solution. How do you think we could have determined that there were actually two things in that vial?

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Vial 1 contains the pure substance called zinc. Zinc is an **element**, which is defined as the simplest form of matter that cannot be broken down. How could we prove that vial 1 does not contain a mixture?

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Vial 3 contains the pure substance called glucose. Glucose is a **compound**, which is defined as a chemical combination of different elements. Even though glucose is not a mixture, the components of a compound must be fixed. That means that there is a set ratio of elements within the compound. Glucose is made of three different elements, carbon, hydrogen and oxygen. How could we prove that glucose is not a mixture? And how could we prove that glucose is a compound?

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Vial 4 contains a mixture of sand and water. Since this is not an even mixture throughout, it is called a **heterogeneous mixture**. Just as in a solution, the components of this mixture can vary. How could we know that vial 4 contains a heterogeneous mixture? And how could we separate the two components in vial 4?

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Define the following words:

matter - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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element - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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compound - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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homogeneous mixture (solution) - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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heterogeneous mixture - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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What are the two types of matter?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What are the two types of pure substances?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Which of the following types of matter cannot vary in their ratio of components? Circle all that apply. **element compound mixtures**