

SNC1D CHEMISTRY

ATOMS, ELEMENTS, & COMPOUNDS

☛ Classifying Matter (P.141-143)

☛ Classifying Matter

*All matter is made up of different types and combinations of particles which gives them particular characteristics, or properties. A **property** is a characteristic that describes a substance. For example, gold and iron are both metals, but they have very different properties.*



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1

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PROPERTY

- ❖ characteristic that describes a substance




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2

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Substances may be classified as pure substances or mixtures, depending on how their particles are arranged. A **pure substance** is made up of only one kind of matter and has a unique set of properties, such as colour, hardness, and boiling/melting point. A pure substance is either an element or a compound.




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PURE SUBSTANCE


- ❖ made up of only one kind of particle
- ❖ is either an element or a compound



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An **element** is a pure substance that cannot be broken down into any simpler substance by chemical means. For example, gold is an element. Its symbol is Au and it cannot be broken down into anything simpler. Silver (Ag) and the oxygen we breath (O_2) are more examples of elements.




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ELEMENT


- ❖ pure substance that cannot be broken down
- ❖ gold (Au), oxygen (O₂), ...



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A **compound** is a pure substance that is made from two or more elements that are combined together chemically. For example, water (H₂O) is a compound containing the elements hydrogen and oxygen in a fixed ratio. Sugar is another example of a compound.




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COMPOUND


- ❖ pure substance made from two or more elements that combine together chemically
- ❖ can be broken down into smaller particles
- ❖ water (H₂O), salt (NaCl), ...



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A **mixture** is a combination of pure substances. However, the substances in a mixture do not combine chemically. Instead, each substance remains in its original pure form, although each is not always easy to see distinctly once the mixture is made. There are three main types of mixtures.




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MIXTURE


- ❖ combination of pure substances
- ❖ do not combine chemically – remain separate



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In a **mechanical mixture**, the different substances that make up the mixture are visible. A chocolate chip cookie is an example of a mechanical mixture – different parts of the mixture are visible. So is a mixture of salt and pepper. A mixture in which the different parts are visible is called **heterogeneous**.




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MECHANICAL MIXTURE


- ❖ different substances that make up the mixture are visible
- ❖ also known as a heterogeneous mixture
- ❖ chocolate chip cookie, ...



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A **suspension** is a cloudy mixture in which tiny particles of one substance are held within another. Tomato juice is an example of a suspension – the particles can be separated when the mixture is poured through filter paper. A salad vinaigrette is a mixture of oil, vinegar, and spices. When shaken, they form a suspension but after a while the components will separate.




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SUSPENSION


- ❖ cloudy mixture – particles of one substance are suspended in another (i.e. heterogeneous)
- ❖ salad dressing, ...



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In a **solution**, the different substances that make it the solution are not individually visible. One substance is dissolved in another, creating a **homogeneous** mixture. Examples are sugar dissolved in coffee or clear apple juice – you cannot distinguish between the different types of particles in it.




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SOLUTION

- ❖ different substances that make up the mixture are not visible – one substance is dissolved in the other
- ❖ also known as a homogeneous mixture
- ❖ apple juice, ...



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PRACTICE

1. Identify each of the following as either a mechanical mixture or a solution.

(a) a pane of clear glass	S
(b) chocolate chip ice cream	MM
(c) clear apple juice	S
(d) garbage in a garbage can	MM
(e) a garden salad	MM
(f) tea	S

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PRACTICE

2. Make a flow chart summarizing how matter can be organized. Start your chart with the word, "MATTER".

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Classifying Matter – A Summary

```

    graph TD
      matter[matter] --> pure_substances[pure substances]
      matter --> mixtures[mixtures]
      pure_substances --> elements[elements]
      pure_substances --> compounds[compounds]
      mixtures --> heterogeneous_mixtures[heterogeneous mixtures]
      mixtures --> homogeneous_mixtures[homogeneous mixtures]
      heterogeneous_mixtures --> mechanical_mixtures[mechanical mixtures]
      heterogeneous_mixtures --> suspensions[suspensions]
      homogeneous_mixtures --> solutions[solutions]
    
```

February 8, 2013 1DCHEM - Classifying Matter 19

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PRACTICE

3. Classify each of the following as either a pure substance or a mixture. If it is a pure substance, is it an element or a compound? If it is a mixture, is it heterogeneous (i.e. a mechanical mixture/suspension) or homogeneous (i.e. a solution)?


(a) sand – white & black grains of sand	M, HE
(b) water – hydrogen & oxygen atoms chemically combined	P, C
(c) pop – water, sugar, & carbon dioxide	M, HO
(d) pencil lead – carbon atoms	P, E
(e) pizza – pepperoni, cheese, & sauce	M, HE
(f) silver – silver atoms	P, E
(g) salt – sodium & hydrogen atoms chemically combined	P, C


February 8, 2013 1DCHEM - Classifying Matter 20


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
PRACTICE


4. Do the following diagrams represent an element, compound or mixture?


(a)  **E**


(b)  **E**


(c)  **C**

(d)  **M**

(e)  **C**

(f)  **M**

(g)  **E**

(h)  **M**

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PRACTICE

5. Is a compound, such as water from the tap, a pure substance or a mixture? Explain.

water from the tap is a mixture because it contains various minerals and, in some cases, particulates (i.e. shine a laser light through water to see the particulates, if there are any)

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PRACTICE

6. Lead is not often used in solder anymore. Explain why not.

Before the toxic effects of lead were understood, the seams of metal cans for preserving food were sealed using lead solder. When the cans were heated, a high level of lead leached into the food, particularly if the contents were acidic, such as tomatoes or citrus fruits. It is likely that sailors suffered from lead poisoning on long trips. Fresh meat and vegetables were not available, so sailors ate mostly canned foods. Even today, you should never drink hot water directly from the tap, in case there is lead solder in the plumbing that may be absorbed into the hot water.

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 ✓ Check Your Learning

TEXTBOOK
P.143 Q.1-4

February 8, 2013 1DCHEM - Classifying Matter 24
