

## Chemistry Worksheet: Matter #1

1. A mixture (is/is not) a chemical combining of substances.
2. In a compound the (atoms/molecules) are (chemically/physically) combined so that the elements that make up the compound (retain/lose) their identities and (do/do not) take on a new set of properties.
3. The smallest identifiable unit of a compound is a(n) molecule, which is made up of atoms which are chemically bonded.
4. True or False: A mixture is always made up of a combination of elements.
5. In a mixture, the substances (lose/retain) their identities.
6. In a mixture the substances involved (can/cannot) be separated by a simple physical process.  
In a compound the elements involved (can/cannot) be separated by a simple physical process because the elements are (physically combined/chemically bonded).
7. True or False: An element can be broken down into a simpler substance.
8. The smallest identifiable unit of an element is a(n) atom.

it can be  
mix of  
cmpds

9. From the following list of substances, circle the ones that are elements:

silver

carbon dioxide

wood alcohol

chromium

water

hydrogen

carbon

nitrogen

oxygen

gold

sugar

salt

air

sulfur

magnesium

nickel

10. Explain how to separate the sugar and water in a solution of sugar and water.

any of these: distillation, crystallization, evaporation

11. How would you separate a mixture of alcohol and water?

fractional distillation

12. How would you separate sand and water?

filtration, decantation

13. Classify the following as pure substances or as mixtures:

air M	gasoline M	pure ethanol grain alcohol PS
water PS	sugar PS	gold PS
mercury PS	oxygen PS	salt water M

14. Classify the following as heterogeneous or as homogeneous:

He sand & salt mixture	H <sub>o</sub> hydrogen	H <sub>o</sub> iron
H <sub>o</sub> salt water	H <sub>o</sub> unfiltered air	H <sub>o</sub> iron with rust
H <sub>o</sub> pure water	H <sub>o</sub> an apple	H <sub>o</sub> nitric acid
He tossed salad	He granite	He wood

15. Classify the following as an element, a compound, a solution, or a heterogeneous mixture:

E aluminum	H <sub>o</sub> raisin bread
C carbon dioxide	C water
S sugar and water	E sulfur
C sulfuric acid	E mercury
He an orange	S water & instant coffee
He a pencil	He carbon particles & sugar
E nitrogen	S air
S gasoline	<del>C</del> grain alcohol pure ethanol

## Elements, Compounds, and Mixtures

Classify each of the pictures below by placing the correct label in the blanks below:

A= Element

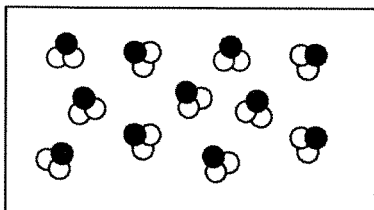
D= Mixture of compounds

B= Compound

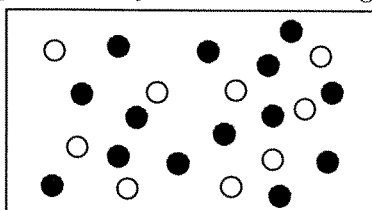
E= Mixture of elements and compounds

C= Mixture of elements

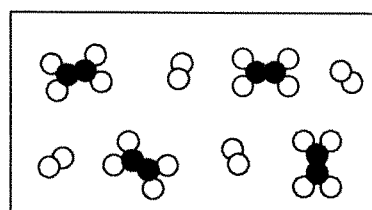
Each circle represents an atom and each different color represents a different kind of atom. If two atoms are touching then they are bonded together.



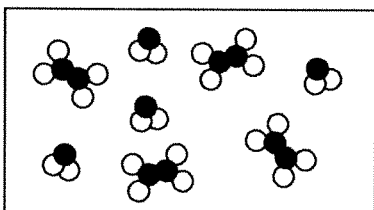
1) B



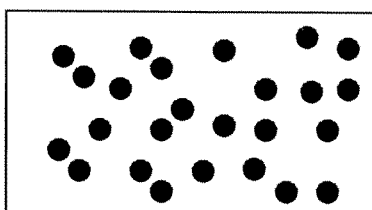
2) C



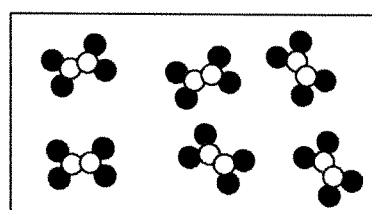
3) E



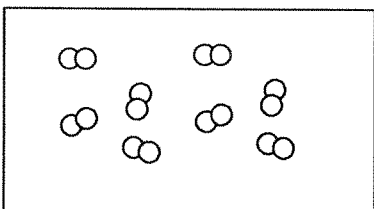
4) D



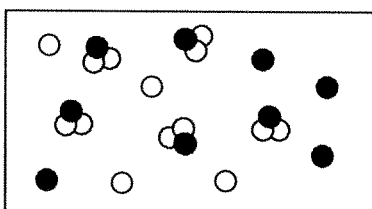
5) A



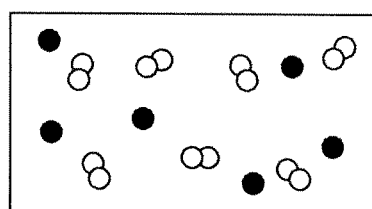
6) B



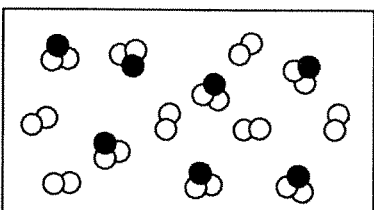
7) A



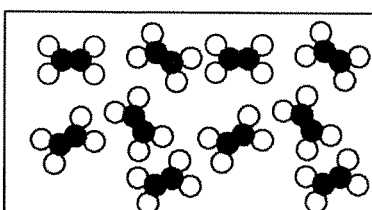
8) E



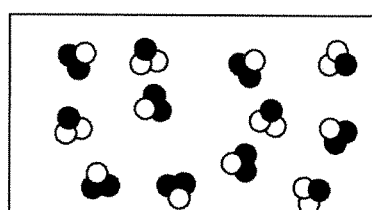
9) C



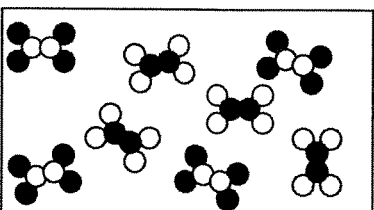
10) E



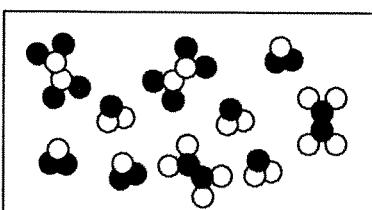
11) B



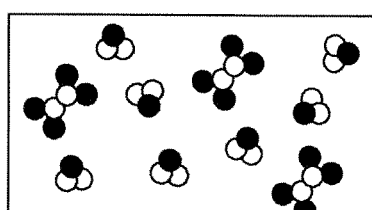
12) D



13) D



14) D



15) D

# Physical and Chemical Changes

Name: \_\_\_\_\_

Date: \_\_\_\_\_ Hour: \_\_\_\_\_

Place a check in the appropriate column:

Change	Physical Change	Chemical Change
Salt dissolves in water.	X	
Hydrochloric acid reacts with magnesium to produce hydrogen gas.		X
A piece of copper is cut in half.	X	
A sugar cube is ground up.	X	
Water is heated and changed to steam.	X	
Iron rusts.		X
Ethyl alcohol evaporates.	X	
Ice melts.	X	
Milk sours (goes bad).		X
Sugar dissolves in water.	X	
Sodium and potassium react violently with water.		X
Pancakes cook on a griddle.		X
Grass grows on a lawn.		X
A tire is inflated with air.	X	
Food is digested in the stomach.		X
Water is absorbed by a paper towel.	X	
Ethyl alcohol boils at 79°C.	X	
Paper burns.		X
Water freezes at 0°C.	X	
Fireworks explode.		X
Alka-Seltzer gives off carbon dioxide when added to water.		X
Clouds form in the sky.	X	

NAME \_\_\_\_\_

**INSTRUCTIONS:** Write **E** in the blank if the material is *heterogeneous* or **O** if it is *homogeneous*.

- |                                |           |                               |           |
|--------------------------------|-----------|-------------------------------|-----------|
| 1. Wood (grain)                | <u>He</u> | 6. Dirt                       | <u>He</u> |
| 2. Freshly-brewed black coffee | <u>Ho</u> | 7. Sausage-and-mushroom pizza | <u>He</u> |
| 3. Water                       | <u>Ho</u> | 8. Air                        | <u>Ho</u> |
| 4. Lucky Charms®               | <u>He</u> | 9. Milk                       | <u>Ho</u> |
| 5. Salt                        | <u>Ho</u> | 10. Gold                      | <u>Ho</u> |

**INSTRUCTIONS:** Classify each of the following as an *element* [E], a *compound* [C], or a *mixture* [M].

- |                        |          |                    |          |
|------------------------|----------|--------------------|----------|
| 11. Gold               | <u>E</u> | 16. Air            | <u>M</u> |
| 12. Water              | <u>C</u> | 17. Carbon dioxide | <u>C</u> |
| 13. Seawater           | <u>M</u> | 18. Silver         | <u>E</u> |
| 14. Sugar              | <u>C</u> | 19. Ice            | <u>C</u> |
| 15. A chocolate sundae | <u>M</u> | 20. A Big Mac®     | <u>M</u> |

**INSTRUCTIONS:** Classify each of the following properties of matter as *physical* [P] or *chemical* [C].

- |                              |          |                                    |          |
|------------------------------|----------|------------------------------------|----------|
| 21. Color                    | <u>P</u> | 26. Reacts violently with chlorine | <u>C</u> |
| 22. Density                  | <u>P</u> | 27. Good conductor of heat         | <u>P</u> |
| 23. Burns easily (flammable) | <u>C</u> | 28. Dissolves readily in water     | <u>P</u> |
| 24. Not affected by acids    | <u>C</u> | 29. Melts at 145 °C                | <u>P</u> |
| 25. Boils at 450 °C          | <u>P</u> | 30. Malleable                      | <u>P</u> |

**INSTRUCTIONS:** Classify each of the following changes in matter as *physical* [P] or *chemical* [C].

- |                                 |          |                                |          |
|---------------------------------|----------|--------------------------------|----------|
| 31. Grinding chalk into powder  | <u>P</u> | 36. Burning gasoline           | <u>C</u> |
| 32. Dissolving salt in water    | <u>P</u> | 37. Hammering gold into foil   | <u>C</u> |
| *33. Dissolving zinc in acid    | <u>C</u> | 38. Melting ice                | <u>P</u> |
| 34. Tearing a piece of paper    | <u>P</u> | 39. Digesting food             | <u>C</u> |
| 35. Stretching copper into wire | <u>P</u> | 40. Making hydrogen from water | <u>C</u> |

**INSTRUCTIONS:** Classify each of the following as an *intensive property* [I] or an *extensive property* [E].

- |                   |          |            |          |
|-------------------|----------|------------|----------|
| 41. Mass          | <u>E</u> | 46. Color  | <u>I</u> |
| 42. Density       | <u>I</u> | 47. Volume | <u>E</u> |
| 43. Melting point | <u>I</u> | 48. Length | <u>E</u> |

## Chemistry Worksheet

# Types of Mixtures

1. What are the three basic types of mixtures?

Sol'n, Colloid, Suspension

2. What are "homogeneous mixtures?" Give three examples. → CHECK YOUR NOTES

↓ single phase → physical combination

3. What are "heterogeneous mixtures?" Give three examples.

↓ multiple phases → physical combination

4. If sugar is put into a glass of water, you know that at least some of the sugar will dissolve; therefore, sugar is described as being "\_\_\_\_\_ SOLUBLE \_\_\_\_\_."

5. What is meant by the term "soluble?"

Will dissolve in solvent

6. Describes what happens as sugar dissolves.

physical change.

7. A mixture such as sugar-water is called a \_\_\_\_\_ sol'n \_\_\_\_\_.

8. Define the term "solution."

↳ homo mixture made of solute + solvent

9. Define the term "solvent."

↳ causes the dissolving

10. Define the term "solute."

↳ dissolves

11. How is the solute in a solution generally differentiated from the solvent?

- lesser amount  
- is dissolved

12. Describe the dissolved solute particles in a solution.

individual atoms/ions

13. What happens if a solution is poured through filter paper?

does not separate

14. What phases can solutions exist in?

All

Some possible solute-solvent combinations of gases, liquids, and solids in solutions are summarized in Table 13-1.

**TABLE 13-1 Some Solute-Solvent Combinations for Solutions**

Solute state	Solvent state	Example
Gas	gas	oxygen in nitrogen
Gas	liquid	carbon dioxide in water
Liquid	gas	water in air
Liquid	liquid	alcohol in water
Liquid	solid	mercury in silver and tin (dental amalgam)
Solid	liquid	sugar in water
Solid	solid	copper in nickel (Monel™ alloy)

15. Describe the type of mixture known as a colloidal dispersion, or simply colloid.

→ Homogeneous ⇒ Clump of solute particles

16. After large soil particles settle out of muddy water, why is the water often still cloudy?

Some suspended in the solvent

17. What happens if this cloudy mixture is poured through a filter?

will separate.

18. The colloidal particles make up the solute, and water is the solvent.

**TABLE 13-2 Classes of Colloids**

Class of colloid	Phases	Example
Sol	solid dispersed in liquid	paints, mud
Gel	solid network extending throughout liquid	gelatin
Liquid emulsion	liquid dispersed in a liquid	milk, mayonnaise
Foam	gas dispersed in liquid	shaving cream, whipped cream
Solid aerosol	solid dispersed in gas	smoke, airborne particulate matter, auto exhaust
Liquid aerosol	liquid dispersed in gas	fog, mist, clouds, aerosol spray
Solid emulsion	liquid dispersed in solid	cheese, butter

Examples of the various types of colloids are given in Table 13-2.

19. Describe the type of mixture known as a suspension. Give an example.

heterogeneous mixture

20. Why do the larger particles in muddy water settle to the bottom of the container?

too large to stay dissolved

21. How are the particles in a suspension separated from the heterogeneous mixture?

allow them to settle ... then filter

22. Why do some colloids appear homogeneous?

→ opaque

23. The particles are, however, large enough to scatter light.

24. Give an example of a colloid.

25. What causes the "Tyndall effect?"

light bouncing off solid particles

26. Why is the Tyndall effect useful in solution chemistry?

determines if a homo mixture is a sol'n or a colloid

Some properties of solutions, colloids, and suspensions are listed in Table 13-3.

**TABLE 13-3 Properties of Solutions, Colloids, and Suspensions**

Solutions	Colloids	Suspensions
Homogeneous	Heterogeneous	Heterogeneous
Particle size: 0.01-1 nm; can be atoms, ions, molecules	Particle size: 1-1000 nm, dispersed; can be aggregates or large molecules	Particle size: over 1000 nm, suspended; can be large particles or aggregates
Do not separate on standing	Do not separate on standing	Particles settle out
Cannot be separated by filtration	Cannot be separated by filtration	Can be separated by filtration
Do not scatter light	Scatter light (Tyndall effect)	May scatter light, but are not transparent

27. On the back side of this page, write a summary (in your own words) of what you have learned about the different types of mixtures in the process of completing this worksheet.



# Finding Out About Matter

## A. Classifying mixtures as homogeneous or heterogeneous

A homogeneous mixture is a mixture whose composition is constant throughout, having identical properties in every part. It is usually called by the more familiar term, solution. A heterogeneous mixture has different properties throughout the material. The composition varies depending on where the sample was taken.

Classify each of the following as heterogeneous or homogeneous.

<u>Ho</u>	sweetened hot tea	<u>He</u>	bag of leaves	<u>E/He</u>	cake mix
<u>Ho</u>	brass	<u>Ho</u>	dental filling	<u>Ho</u>	shampoo
<u>He</u>	root beer float	<u>Ho</u>	Penzoil motor oil	<u>Ho</u>	Hershey's syrup
<u>Ho</u>	hand lotion	<u>He</u>	brownies with nuts	<u>He</u>	granite

## B. Classifying materials as elements, compounds, or mixtures

Substances that contain only one kind of atom are called elements. Elements are the fundamental units which cannot be broken down into smaller units by chemical means. Substances that are chemical combinations of two or more elements are called compounds. A compound can be broken down into elements or other compounds by chemical means only. Combinations of two or more substances that retain their separate identities are mixtures. Unlike the definite composition of a compound, the composition of a mixture may vary. Mixtures can be separated by physical means, such as distillation or filtration.

Classify the following as an element (E), compound (C), heterogeneous mixture (HET) or solution (SOL'N).

<u>C</u>	sodium chloride	<u>E</u>	iron rod	<u>Sol'n</u>	stainless steel
<u>Het</u>	hamburger relish	<u>Het</u>	concrete	<u>Het</u>	old paint in a can
<u>Sol'n</u>	Diet Coke	<u>Sol'n</u>	Exxon gasoline	<u>Het</u>	dirt
<u>Sol'n</u>	skim milk	<u>E</u>	copper wire	<u>Sol'n</u>	14 karat gold
<u>Sol'n</u>	mayonnaise	<u>Sol'n</u>	Prestone antifreeze	<u>C</u>	Evian water
<u>C</u>	calcium chloride	<u>C</u>	rust	<u>C</u>	carbon monoxide
<u>Het</u>	OJ with pulp	<u>Het</u>	Raisin Bran	<u>E</u>	aluminum foil
<u>Het</u>	pizza	<u>Sol'n</u>	a new penny	<u>C</u>	copper II sulfate
<u>Sol'n</u>	cream of tomato soup	<u>Sol'n</u>	fresh air	<u>Het</u>	potting soil

### C. Classifying chemical and physical properties

A chemical property is one which describes the chemical nature of a substance — how it reacts with other substances. In order to observe a chemical property, the composition of the original material must be changed. For example, a chemical property of sugar is that it burns (reacts with oxygen) to form carbon and other products. A black, burned marshmallow is chemically different from a white, fluffy one. A physical property is one which describes the appearance, the phase, or any behavior that does not change its chemical makeup. The composition of the material remains the same. For example, when a rubber band is stretched, it is still the same material.

Classify each of the following as a physical or chemical property.

- P Peanut brittle breaks very easily.
- P Ethyl alcohol freezes at  $-117^{\circ}\text{C}$ .
- C Digesting a hot dog produces 175 kcal of energy.
- P Ammonia's strong smell makes it useful to revive people.
- P Although oxygen gas appears colorless, liquid oxygen has a pale blue color.
- P Water boils at  $50^{\circ}\text{C}$  on Mt. Everest.
- P Copper sulfate, a crystalline blue solid, dissolves in water to create a blue solution.

### D. Classifying chemical and physical changes

A change that produces a new kind of matter with different properties is called a chemical change. When a chemical change has occurred, a chemical reaction has taken place. When a fluffy white marshmallow burns, it has undergone a chemical change which created new substances with different properties from the marshmallow. A change that does not affect the chemical composition of the material is called a physical change. When a marshmallow is smashed, its size and density have changed (and it may not seem to taste as good), but it still has the same chemical composition as the fluffy one.

Classify each of the following as a physical or chemical change.

- C The mag wheels on your BMW Z3 tarnish.
- P Butter melts into the nooks and crannies of a Thomas English muffin.
- C Wood burns in a fireplace to produce heat and a cozy, romantic atmosphere.
- C Grape juice ferments to form wine.
- P Silver metal is hammered into thin sheets to make jewelry.
- P Sweat cools the body as it evaporates from the skin.
- C Milk of magnesia neutralizes stomach acid.