What's the Difference?
Atom, Element, Molecule, Compound

<table>
<thead>
<tr>
<th>Type of Matter</th>
<th>Definition</th>
<th>Sample Drawing</th>
<th>Symbol or Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEMENT</td>
<td>A pure substance made up of only one kind of atom that cannot be broken down into simpler substances.</td>
<td><img src="Oxygen.png" alt="Oxygen" /></td>
<td>Color/pattern represents element identity (He, Au, C, etc.)</td>
</tr>
<tr>
<td>ATOM</td>
<td>The smallest particle of an element that still keeps the properties of that element</td>
<td><img src="Atom.png" alt="Atom" /></td>
<td>Circle represents one atom</td>
</tr>
<tr>
<td>MOLECULE</td>
<td>The smallest particle of a substance that has all the properties of that substance; made of 2 or more atoms that are chemically bonded</td>
<td><img src="Molecule.png" alt="Molecule" /></td>
<td>Grouped circles represent a Molecule (O₂, H₂, etc.)</td>
</tr>
<tr>
<td>COMPOUND</td>
<td>A substance made up of 2 or more different elements whose atoms are chemically bonded</td>
<td>![Water Molecule](Water Molecule.png)</td>
<td>Grouped circles of different colors (elements) represent a compound</td>
</tr>
</tbody>
</table>


Directions: Study each picture below. In the spaces provided, identify how many atoms, elements, molecules, and compounds there are.

1. 
   - atoms: 1
   - elements: 1
   - molecules: 0
   - compounds: 0

2. 
   - atoms: 2
   - elements: 1
   - molecules: 1
   - compounds: 0

3. 
   - atoms: 2
   - elements: 2
   - molecules: 0
   - compounds: 0

4. 
   - atoms: 3
   - elements: 2
   - molecules: 1
   - compounds: 0

5. 
   - atoms: 3
   - elements: 2
   - molecules: 1
   - compounds: 0

6. 
   - atoms: 4
   - elements: 2
   - molecules: 2
   - compounds: 0

7. 
   - atoms: 10
   - elements: 5
   - molecules: 2
   - compounds: 2

8. 
   - atoms: 4
   - elements: 2
   - molecules: 0
   - compounds: 0

9. 
   - atoms: 3
   - elements: 3
   - molecules: 0
   - compounds: 0
Elements, Compounds & Mixtures Worksheet

Part 1: Read the following information on elements, compounds and mixtures. Fill in the blanks where necessary.

Elements:
- A pure substance containing only one kind of [atom].
- An element is always [uniform] all the way through (homogeneous).
- An element [cannot] be separated into simpler materials (except during nuclear reactions).
- Over 100 existing elements are listed and classified on the [Periodic Table].

Compounds:
- A pure substance containing two or more kinds of [atoms].
- The atoms are [chemically] combined in some way. Often times (but not always) they come together to form groups of atoms called molecules.
- A compound is always homogeneous (uniform).
- Compounds [cannot] be separated by physical means. Separating a compound requires a chemical reaction.
- The properties of a compound are usually different than the properties of the elements it contains.

Mixtures:
- Two or more [elements] or [compounds] NOT chemically combined.
- No reaction between substances.
- Mixtures can be uniform (called [homogeneous]) and are known as solutions.
- Mixtures can also be non-uniform (called [heterogeneous]).
- Mixtures can be separated into their components by chemical or physical means.
- The properties of a mixture are similar to the properties of its components.

Part 2: Classify each of the following as elements (E), compounds (C) or Mixtures (M). Write the letter X if it is none of these.

E_Diamond (C)  C_Sugar (C₆H₁₂O₆)  M_Milk  E_Iron (Fe)
M_Air  C_Sulfuric Acid (H₂SO₄)  M_Gasoline  X_Electricity
E_Krypton (K)  E_Bismuth (Bi)  E_Uranium (U)  M_Pail of Garbage  M_Popcorn
C_Water (H₂O)  C_Alcohol (CH₃OH)  M_Pail of Garbage  M_A dog
C_Ammonia (NH₃)  C_Salt (NaCl)  X_Energy  E_Gold (Au)
M_Wood  M_Bronze  M_Ink  M_Pizza
C_Dry Ice (CO₂)  C_Baking Soda (NaHCO₃)  E_Titanium (Ti)  M_Concrete
Part 3: Match each diagram with its correct description. Diagrams will be used once.

A
B
C
D
E

C. 1. Pure Element – only one type of atom present.

E. 2. Mixture of two elements – two types of uncombined atoms present.

B. 3. Pure compound – only one type of compound present.

A. 4. Mixture of two compounds – two types of compounds present.

D. 5. Mixture of a compound and an element.
13. Classify the following as pure substances or as mixtures:

- air
- water
- mercury
- gasoline
- sugar
- oxygen
- grain alcohol
- gold
- salt water

14. Classify the following as heterogeneous or as homogeneous:

- sand & salt mixture
- hydrogen
- salt water
- an apple
- pure water
- iron
- unfiltered air
- nitric acid
- tossed salad
- wood

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

- aluminum
- carbon dioxide
- sugar and water
- sulfuric acid
- an orange
- a pencil
- nitrogen
- gasoline
- raisin bread
- water
- sulfur
- mercury
- water & instant coffee
- carbon particles & sugar
- air
- grain alcohol
Elements, Compounds, and Mixtures

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

A = Element
B = Compound
C = Mixture of elements
D = Mixture of compounds
E = Mixture of elements and compounds

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) __________
2) __________
3) __________
4) __________
5) __________
6) __________
7) __________
8) __________
9) __________
10) __________
11) __________
12) __________
13) __________
14) __________
15) __________
Chemistry: Classifying Matter

Classify each of the materials below. In the center column, state whether the material is a pure substance or a mixture. If the material is a pure substance, further classify it as either an element or compound in the right column. Similarly, if the material is a mixture, further classify it as homogeneous or heterogeneous in the right column. Write the entire word in each space to earn full credit.

<table>
<thead>
<tr>
<th>Material</th>
<th>Pure Substance or Mixture</th>
<th>Element, Compound, Homogeneous, Heterogeneous</th>
</tr>
</thead>
<tbody>
<tr>
<td>concrete</td>
<td>Mixture</td>
<td>Heterogeneous</td>
</tr>
<tr>
<td>sugar + pure water (C_{12}H_{22}O_{11} + H_{2}O)</td>
<td>Mixture</td>
<td>Compound</td>
</tr>
<tr>
<td>iron filings (Fe)</td>
<td>Pure Substance</td>
<td>Element</td>
</tr>
<tr>
<td>limestone (CaCO_{3})</td>
<td>Pure Substance</td>
<td>Element</td>
</tr>
<tr>
<td>orange juice (w/pulp)</td>
<td>Mixture</td>
<td>Heterogeneous</td>
</tr>
<tr>
<td>Pacific Ocean</td>
<td>Mixture</td>
<td>Heterogeneous</td>
</tr>
<tr>
<td>air inside a balloon</td>
<td>Mixture</td>
<td>Homogeneous</td>
</tr>
<tr>
<td>aluminum (Al)</td>
<td>Pure Substance</td>
<td>Element</td>
</tr>
<tr>
<td>magnesium (Mg)</td>
<td>Pure Substance</td>
<td>Element</td>
</tr>
<tr>
<td>acetylene (C_{2}H_{2})</td>
<td>Pure Substance</td>
<td>Compound</td>
</tr>
<tr>
<td>tap water in a glass</td>
<td>Mixture</td>
<td>Homogeneous</td>
</tr>
<tr>
<td>soil</td>
<td>Mixture</td>
<td>Heterogeneous</td>
</tr>
<tr>
<td>pure water (H_{2}O)</td>
<td>Pure Substance</td>
<td>Compound</td>
</tr>
<tr>
<td>chromium (Cr)</td>
<td>Pure Substance</td>
<td>Element</td>
</tr>
<tr>
<td>Chex mix</td>
<td>Mixture</td>
<td>Heterogeneous</td>
</tr>
<tr>
<td>salt + pure water (NaCl + H_{2}O)</td>
<td>Mixture</td>
<td>Homogeneous</td>
</tr>
<tr>
<td>benzene (C_{6}H_{6})</td>
<td>Pure Substance</td>
<td>Compound</td>
</tr>
<tr>
<td>muddy water</td>
<td>Mixture</td>
<td>Heterogeneous</td>
</tr>
<tr>
<td>brass (Cu mixed with Zn)</td>
<td>Mixture</td>
<td>Homogeneous</td>
</tr>
<tr>
<td>baking soda (NaHCO_{3})</td>
<td>Pure Substance</td>
<td>Compound</td>
</tr>
</tbody>
</table>