**COMPANY INC.**

123 High Street  
1000 City, County  
Country  
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Invoice

**Recipient Name, Title**  
**Company Name**

123 New Street  
1000 City, County  
Country

Date: 01/15/2024

Project Title: Project Name  
Terms: 30 days

|  |  |  |  |
| --- | --- | --- | --- |
| Description | Quantity | Unit Price | Cost |
| Item 1 | 55 | $ 100.00 | $ 5,500.00 |
| Item 2 | 13 | $ 90.00 | $ 1,170.00 |
| Item 3 | 25 | $ 90.00 | $ 1,250.00 |
|  |  |  |  |
| Subtotal |  |  | $ 7,920.00 |
| Tax |  | 20.00 % | $ 1,584.00 |
| **Total** |  |  | **$ 9,504.00** |

Thank you for doing business with us.

Attached you will find an example document describing phases and classification of matter. Please read it prior to our meeting to get a better understanding of the project.

Sincerely,  
**John Appleseed**

**CHEMISTRY**

# Phases and Classification of Matter

## Introduction

**Matter** is defined as anything that occupies space and has mass, and it is all around us. Solids and liquids are more obviously matter: We can see that they take up space, and their weight tells us that they have mass. Gases are also matter; if gases did not take up space, a balloon would not inflate (increase its volume) when filled with gas.

Solids, liquids, and gases are the three states of matter commonly found on earth. A **solid** is rigid and possesses a definite shape. A ***liquid*** flows and takes the shape of its container, except that it forms a flat or slightly curved upper surface when acted upon by gravity. (In zero gravity, liquids assume a spherical shape.) Both liquid and solid samples have volumes that are very nearly independent of pressure. A **gas** takes both the shape and volume of its container.

|  |  |  |
| --- | --- | --- |
| Picture Solid | Picture Liquid | Picture Gas |
| Has fixed shape and volume | Takes shape of container Forms horizontal surface Has fixed volume | Expands to fill container |

Image credit: [OpenStax – Chemistry 2e](https://openstax.org/books/chemistry-2e/pages/1-2-phases-and-classification-of-matter)

A fourth state of matter,  **plasma** , occurs naturally in the interiors of stars. A plasma is a gaseous state of matter that contains appreciable numbers of electrically charged particles. The presence of these charged particles imparts unique properties to plasmas that justify their classification as a state of matter distinct from gases. In addition to stars, plasmas are found in some other high-temperature environments (both natural and man-made), such as lightning strikes, certain television screens, and specialized analytical instruments used to detect trace amounts of metals.

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✳️ **Interesting Fact** ✳️

In a tiny cell in a plasma television, the plasma emits ultraviolet light, which in turn causes the display at that location to appear a specific color. The composite of these tiny dots of color makes up the image that you see.

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## Classifying Matter

Matter can be classified into several categories. Two broad categories are mixtures and pure substances. A **pure substance** has a constant composition. All specimens of a pure substance have exactly the same makeup and properties. Any sample of sucrose (table sugar) consists of 42.1% carbon, 6.5% hydrogen, and 51.4% oxygen by mass. Any sample of sucrose also has the same physical properties, such as melting point, color, and sweetness, regardless of the source from which it is isolated.

Pure substances may be divided into two classes: elements and compounds. Pure substances that cannot be broken down into simpler substances by chemical changes are called **elements**. Iron, silver, gold, aluminum, sulfur, oxygen, and copper are familiar examples of the more than 100 known elements, of which about 90 occur naturally on the earth, and two dozen or so have been created in laboratories.

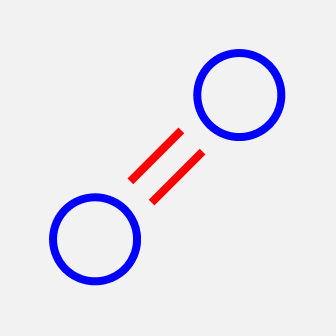
Pure substances that are comprised of two or more elements are called **compounds**. Compounds may be broken down by chemical changes to yield either elements or other compounds, or both. Mercury(II) oxide, an orange, crystalline solid, can be broken down by heat into the elements mercury and oxygen. When heated in the absence of air, the compound sucrose is broken down into the element carbon and the compound water. (The initial stage of this process, when the sugar is turning brown, is known as ***caramelization***—this is what imparts the characteristic sweet and nutty flavor to caramel apples, caramelized onions, and caramel). Silver(I) chloride is a white solid that can be broken down into its elements, silver and chlorine, by absorption of light. This property is the basis for the use of this compound in photographic films and photochromic eyeglasses (those with lenses that darken when exposed to light).

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Eleven elements make up about

99%

of the earth’s crust and atmosphere.

**Oxygen** constitutes nearly one-half and silicon about one-quarter of the total quantity of these elements. A majority of elements on earth are found in chemical combinations with other elements; about one-quarter of the elements are also found in the free state.

|  |  |  |
| --- | --- | --- |
| Element | Symbol | Percent Mass |
| oxygen | O | 49.20 |
| silicon | Si | 25.67 |
| aluminum | Al | 7.50 |
| iron | Fe | 4.71 |
| calcium | Ca | 3.39 |
| sodium | Na | 2.63 |
| potassium | K | 2.40 |
| magnesium | Mg | 1.93 |
| hydrogen | H | 0.87 |
| titanium | Ti | 0.58 |
| chlorine | Cl | 0.19 |
| phosphorus | P | 0.11 |
| manganese | Mn | 0.09 |
| carbon | C | 0.08 |
| sulfur | S | 0.06 |
| barium | Ba | 0.04 |
| nitrogen | N | 0.03 |
| fluorine | F | 0.03 |
| strontium | Sr | 0.02 |
| all others | — | 0.47 |

**Fun Facts**

### Chemistry of **Cell Phones**

*Imagine how different your life would be without cell phones and other smart devices. Cell phones are made from numerous chemical substances, which are extracted, refined, purified, and assembled using an extensive and in-depth understanding of chemical principles.*

📱

About

**30%**

of the elements that are found in nature   
are found within a typical smart phone.

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1. The **case/body/frame** consists of a combination of sturdy, durable polymers composed primarily of carbon, hydrogen, oxygen, and nitrogen [acrylonitrile butadiene styrene (ABS) and polycarbonate thermoplastics], and light, strong, structural metals, such as aluminum, magnesium, and iron.
2. The **display screen** is made from a specially toughened glass (silica glass strengthened by the addition of aluminum, sodium, and potassium) and coated with a material to make it conductive (such as indium tin oxide).
3. The **circuit board** uses a semiconductor material (usually silicon); commonly used metals like copper, tin, silver, and gold; and more unfamiliar elements such as yttrium, praseodymium, and gadolinium.
4. The **battery** relies upon lithium ions and a variety of other materials, including iron, cobalt, copper, polyethylene oxide, and polyacrylonitrile.

**CHEMISTRY**

Project Summary

1. Basic properties of each physical state of matter:
   1. Solid
   2. Liquid
   3. Gas
2. Distinguish between:
   1. Mass
   2. Weight
3. Apply the law of conservation of matter
4. Classify matter as:
   1. Element
   2. Compound
   3. Homogeneous mixture
   4. Heterogeneous mixture
5. Define and give examples of atoms and molecules

Read the full article here: <https://openstax.org/books/chemistry-2e/pages/1-2-phases-and-classification-of-matter>