Everything in and around us

Matter, anything that has mass and occupies space, exists in three phases: solids, liquids, and gases.

Atoms are the smallest particles of an element that retain the chemical properties of the element. Each atom consists of a tiny core called nucleus surrounded by moving positively-charged electrons. The nucleus contains positively-charged particles called protons. It may also contain electrically-neutral atoms called neutrons.

An element is matter that consists of only one kind of atom, either individually or combined into larger units.

Molecules are units of matter consisting of two or more atoms combined in a definite ratio. A compound is a matter that consists of atoms of different elements combined in specific ratios. The salt and sugar on your dinner table and the carbon dioxide of the air, are chemical compounds.

A great deal of the research done in chemistry involves the study of transformations of one or more compounds into others, so you will spend most of your time examining molecules: their shapes, the forces holding them together and their chemical and physical properties.

A compound is different from a mixture. The elements in a compound lose their individual chemical characteristics, and the compound has new characteristics. In a mixture each of the constituents retains its identity.

Mixtures can be homogeneous or heterogeneous. A homogeneous mixture has the same composition throughout the mixture. If you stir sugar into a glass of water, the sugar dissolves and sugar molecules are distributed uniformly, that is, homogeneously, throughout the water. This is an example of a solution, a homogeneous mixture of two or more substances. The material dissolved is the solute, and the medium in which it is dissolved is the solvent. In a sugar/water solution, sugar is the solute and water the solvent. In contrast, a mixture of solid grains of sand and salt is heterogeneous, since particles of each component of the mixture remain separate and can be observed as individual substances.

In either a homogeneous or a heterogeneous mixture, the components can be separated into pure substances by physical means, that is, without changing the specific atom ratios within the particles.

The components of a mixture can also be separated by chemical means, but this involves changing the chemical nature of one or more of the constituents. This is often done in chemical analysis, where the components of a mixture are transformed into new substances that can be observed or separated by physical means.

Each chemical substance has a set of physical properties, properties that can be measured and observed without changing the atom ratios within the substance. Such properties include colour, the temperature at which a substance melts or boils, density, and physical state at room temperature.

In contrast with physical properties, the chemical properties of a substance are those that it exhibits when it undergoes a change in atom arrangements or in atoms ratios. This change is often brought about by contact with another substance. When gasoline burns in an automobile engine or metals rust and corrode, their chemical composition changes.

The physical or chemical properties of substances can be classified further as extensive or intensive. Extensive properties depend on the amount of matter present, intensive properties are the same regardless of sample size. The temperature at which a pure substance melts and the colour of a material are both intensive properties. Water is colourless and freezes at 0 °C (32 °F), whether you have a spoonful or a ton.

No two pure substances have the same combination of chemical and physical properties under the same conditions, so we can use these differences to identify substances. Many of the physical properties of oxygen and nitrogen are very similar; both are colourless gases at room temperature, for example. However, a burning match will go out if it is put into a flask of nitrogen gas, but it will burn brightly in pure oxygen. The two gases clearly have different chemical properties.

(from: Kotz & Purcel, *Chemistry and Chemical Reactivity*, Hartcourt Brace Jovanovich College Publishers.)

1 *In what state of matter do you normally find the following substances?*

a. the oxygen you breathe **b.** petrol (BrE) / gasoline (AmE) **c.** limestone

2 *Are the underlined characteristics physical or chemical properties?*

a. The normal colour of bromine is red-orange.
b. Iron is transformed into rust in the presence of air and water.
c. Dynamite can explode when it interacts with oxygen.
d. The density of uranium metal is 19.07 g/cm^3.
e. Aluminium metal, the "foil" you use in the kitchen, melts at 660°C.

3 *For each of the words below decide which meaning best applies to the context of the passage* 'Everything in and around us'.

a. sensitive: *sensibile / sensitivo*
b. ultimately: *alla fine / fondamentalmente*
c. ratio: *rapporto / ragione*
d. soft (drink): *morbido / analcolico*
e. medium: *mezzo / elemento (solvente)*
f. to undergo: *subire / sopportare*

4 *Use either* How *or* What *to complete the questions below, then answer them.*

a. ..... are the three phases of matter?
b. ..... does an atom consist of?
c. ..... does a compound differ from a mixture?
d. ..... is a solution?
e. ..... are mixtures divided?
f. ..... is the material dissolved in a solution called?
g. ..... is the solvent?
h. ..... can the components of a mixture be separated?
i. ..... characteristics do chemical properties include?
j. ..... are the chemical properties of a substance?

5 *Match words* a-j *with their synonyms* 1-10. *Tip: copy the pairs in your indexed book.*

a. concrete	☐	**1.**	all over
b. core	☐	**2.**	amount
c. height	☐	**3.**	cement
d. quantity	☐	**4.**	centre
e. ratio	☐	**5.**	degree of heat or cold
f. shape	☐	**6.**	form
g. temperature	☐	**7.**	heaviness
h. throughout	☐	**8.**	proportion
i. tiny	☐	**9.**	tallness
j. weight	☐	**10.**	very small