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Hello and welcome to the first episode of Chemistry.

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The study of change.

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This is an introductory chapter to CHEM 1311 general chemistry one.

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In this episode you will become familiar with various terms related to matter and its classification.

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In this course you will discover that the explanation for observations at the **macroscopic** level are, more often than not, given at the **microscopic** level.

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For example.

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The explanation for the observable changes in color, texture, strength, and many other properties of the iron in nails when they rust.

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Is that the atoms of iron which previously formed a nice geometric cluster

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Combined with the atoms of oxygen to form iron (III) oxide.

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Better known as rust.

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Keep this in mind when you're asked for observations.

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If that's the case, focus on what happens at the macroscopic level.

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And if you're asked for an explanation or a hypothesis.

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Then focus on what happens at the microscopic level.

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Matter, and the changes it undergoes,

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Such as the one we just described, is the main focus of the study of chemistry.

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As you progress through this course, you will come across two terms that are often misunderstood.

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Law and theory.

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A law is a summary of observed phenomena to which there are no exceptions.

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It basically states what happens, but not why.

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The law of gravity describes the behavior of matter.

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But it gives no explanation whatsoever as to why this happens.

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A theory, on the other hand, offers an explanation for such observations.

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It **does** answer why?

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Matter is defined as anything that has volume and mass.

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Matter can be divided into 2 broad categories.

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Substances and mixtures.

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A substance is a matter that has distinct properties and definite composition.

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That is a great definition, but what does it mean?

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Well, distinct properties means that the sum of all properties of the substance will be unique to that substance.

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Two different substances may share many.

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But not all their properties.

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A corollary to that statement is that a substance's physical and chemical properties can be used to identify it.

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Definite composition.

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Means that a substance is always made up of the same materials and in the same proportions exactly.

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A mixture is a combination of two or more substances.

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A mixture has the properties of the substances which make it up.

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So so far we define matter as anything having mass and volume.

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And which can be classified into 2 broad categories: substances.

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And mixtures.

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Substances have two defining characteristics.

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Distinct properties.

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And definite composition.

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Mixtures are combination of two or more substances.

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Mixtures can be classified as homogeneous or heterogeneous.

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But the difference is very minor.

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A homogeneous mixture is uniform throughout.

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If one or more of the components is liquid.

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They will not settle or separate.

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A heterogeneous mixture, on the other hand, does not have uniform composition.

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And if one or more of the components in the is a liquid.

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Then, over time, they will settle or separate out.

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All mixtures, whether homogeneous or heterogeneous, can be separated by physical means.

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What is meant by physical means, is any method which takes advantage of differences in the physical properties of the substances in the mixture?

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For example.

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Alcohol and water can be separated by taking advantage of their different boiling temperatures.

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When the mixture is heated.

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The alcohol will evaporate more readily than the water.

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Mixtures can be separated into their component substances by exploiting differences in their physical properties.

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That's what we call physical. methods

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Or means.

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Substances can be further classified into compounds and elements.

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An element is the simplest possible substance.

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It is made up of only one type of atom.

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And therefore cannot be further separated into components.

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There are 118 elements that have been identified.

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82 of which are naturally occurring on Earth.

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And 36 which have been artificially created.

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All these elements are characterized by a one or two letter symbol to represent their name.

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They more recently discovered elements.

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Such as aluminum.

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Fluorine and silicon have symbols based on their English names.

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That makes the symbols very intuitive.

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Elements discovered in ancient times, however, like gold, lead or sodium.

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Have symbols based on their Latin names.

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So it's a little less intuitive for us.

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And tungsten has the distinction of being the only element whose symbol is based on its German name.

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Well, Germans discovered it so.

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Why not?

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All elements are listed on the periodic table.

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If it's not listed.

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It's not an element.

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Elements in the periodic table also have an atomic number.

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More on what that means in a later episode.

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The atomic number is an integer unique to that element, and they are listed sequentially.

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In the periodic table.

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You'll notice that there are no gaps.

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And therefore there is no element waiting to be discovered by you.

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Sorry about that.

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Compounds are formed by two or more elements which are sharing a chemical bond.

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And exist in fixed proportions.

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Chemical bonds can be thought of as atoms having joint custody of some of their electrons.

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And that forms their chemical bond.

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Compounds have physical and chemical properties that are different.

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From those of the elements that make them up.

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Compounds can only be separated into their elements by chemical means.

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Which means that you will be breaking those bonds that they have formed.

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To summarize.

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Matter is anything having mass and volume.

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And can be classified into substances and mixtures.

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Substances have two defining characteristics.

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Distinct properties.

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And definite composition.

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Elements are substances made up of only one type of atom.

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And they are all listed in the periodic table.

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Compounds are substances that are made of two or more elements.

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They are chemically combined.

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And compounds have properties that are different from those of the elements which make them up.

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Compounds can only be separated into their elements by chemical means.

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That is, the breaking of chemical bonds.

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Mixtures are composed of two or more substances which retain their unique physical and chemical properties.

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Mixtures can be separated into their substances by physical means.

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Homogeneous mixtures have uniform composition.

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And heterogeneous mixtures do not.

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And that's all there is.

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There isn't anymore.