Grade 7/8 Science

Properties of Matter – It Matters

Name: _____KEY_____ class: _____ Date: _____

Matter is all around us and it is made of atoms. The things that we see and feel are not made of one atom, they are made of billions of atoms and in some cases, made of stable combinations of atoms called molecules. We use materials for specific functions or to serve a purpose based on the characteristics of that material. Take for instance a bicycle.

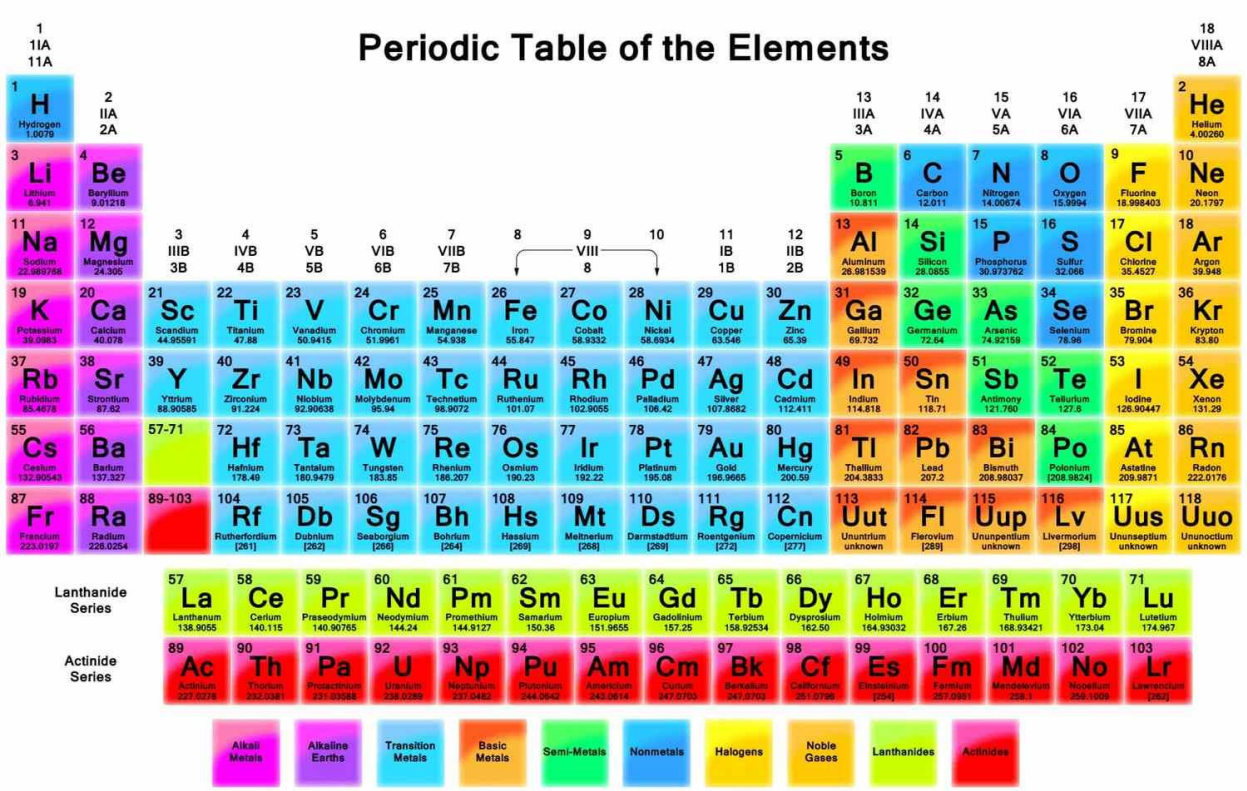
Each part of a bicycle is designed for the function that it serves, and the material used to make that part is purposefully used for the characteristics or properties that make it the best material for that purpose. The properties of the material come from the atoms and molecules that make up that material. The frame is strong and rigid and is made of metal alloys like aluminum or composite material like carbon fiber. The wheels' tires are made of rubber that is hard enough to withstand the road and sharp stones but soft enough to absorb the bumps on the road. The chain must bend but be strong and link the crank sprocket to the wheel sprockets on the back wheel. To make sure it does not rust and that it stays flexible, grease is applied to all moving parts.

So the material has characteristics or properties from the atoms and molecules and that leads us to the fact that all atoms have properties that are specific to each atom. Some atoms are very light and are gases at room temperature and others are solid or liquids. Some are highly reactive chemically and some are not reactive at all (this is called inert).

All matter is organized (Scientists LOVE to organize and classify based on properties or observations).

In Grade 7 we learn about Pure Substances and Mixtures and part of the unit involves separating mixtures into more pure substances. This can be done to a point when the entire substance is composed of just one type of atom. This is known as an elemental material. Through the last several thousand years, elements have been discovered – starting with element that occur naturally such as gold, silver, sulphur, and Copper. In the last four hundred years, chemistry has developed so that there were reliable techniques to isolate and purify elements and so, they were categorized by their properties. Each element has a unique set of properties and those properties are similar to other elements. For example, some elements are 'metallic' (they conduct electricity and heat well, they are malleable, ductile and have a shiny surface). Elements that have these properties include Iron, Nickel, Lead, Gold, Silver, Aluminum, Copper and Platinum.

As scientists became more educated on the existing elements and began to learn the many properties, they were able to see that there were groupings or 'periods' and came up with what we now know of as the Periodic Table of the Elements.



Each of the groups have similar properties. The Noble Gases for instance do not react with other elements easily. They are inert. On the other side of the Table are HIGHLY reactive elements.

Today, chemists, physicists and material scientists all over the world use this to look up properties of elements such as Atomic Number, Atomic Mass, Density, Boiling Point, Freezing Point, Electrical Conductivity, Chemical Reactivity and Valence Electrons – to name a few. Knowing the properties can allow scientists to design materials that are put together for all of us to enjoy – such as a bicycle.

Questions:

What are properties?

Properties are characteristics of materials or elements. (Properties are how materials appear or react to other materials or heat.)

What are some examples of properties of materials on a bicycle?

The frame is strong and rigid and is made of metal alloys like aluminum or composite material like carbon fiber. The wheels' tires are made of rubber that is hard enough to withstand the road and sharp stones but soft enough to absorb the bumps on the road. The chain must bend but be strong and link the crank sprocket to the wheel sprockets on the back wheel. To make sure it does not rust and that it stays flexible, grease is applied to all moving parts.

What elements occur as elements in nature?

Elements that occur naturally include gold, silver, sulphur, and Copper.

What are some examples of properties of elements?

There are many properties of elements such as Atomic Number, Atomic Mass, Density, Boiling Point, Freezing Point, Electrical Conductivity, Chemical Reactivity and Valence Electrons.

What are some examples of metals?

Metals include Iron, Nickel, Lead, Gold, Silver, Aluminum, Copper and Platinum.

What properties do metals all have in common?

Metals all have some properties in common: they conduct electricity and heat well, they are malleable, ductile and have a shiny surface.

What does 'ductile' mean?

Ductile means being able to draw a material out into a wire.

What does the word Period or Periodic mean in 'The Periodic Table'?

Period means Group. It is a group of materials that have similar or related properties due to their atomic structure.