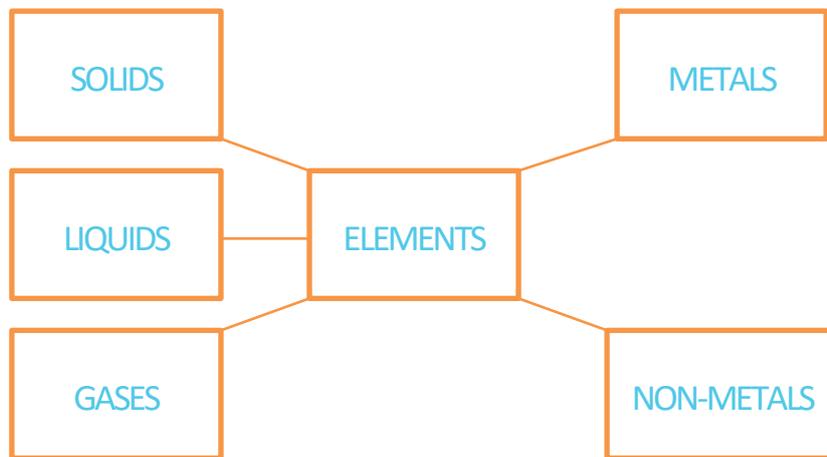


Classifying Elements

Using properties to classify elements

There are numerous ways that elements can be classified to assemble elements into groups of similar properties. Two such ways include whether they are *solid*, *liquid* or *gas* at room temperature. Another is to classify elements as either *metals* or *non-metals*.

A range of elements and compounds can be mined or extracted from the Earth's crust through a range of techniques. Examples of solids include ores, coal and gold. Oil is an example of a compound that is extracted as a liquid, and coal seam gas is an example of a compound extracted as a gas. Some of these examples can also be purified and processed into metals and some are classified as non-metals.



Classifying Metals and Non-Metals

Elements can be classified as metals or non-metals using the following characteristics:

- Electrical conductivity
- Lustre
- Malleability
- Melting point

Electrical Conductivity

Metals are usually good conductors of electricity due to the small number of electrons in their outer (valence) shell. These “free” electrons allow electrical current to be carried through the material. Copper and Silver are two of the best conductors of electricity and are often used in electronic components. Metals are generally also good conductors of heat. In contrast, non-metals tend to be poor conductors of electricity and heat.

An easy way to test electrical conductivity is to place a sample of the material in a circuit with a light globe, connected to a battery. If the globe glows, it is a good conductor of electricity. If the globe does not glow, the material is a poor conductor.



Lustre

This property only relates to solid materials. Lustre describes how shiny or dull the surface of a material is. In general, freshly exposed or cleaned surfaces of metals are usually shiny and are said to have high lustre. Some, but not many non-metals have a high lustre. Non-metals that are solid at room temperature usually dull. Lustre can be tested by scratching or cleaning the surface of a material to see if the solid material has high lustre or not.

Malleability

This property only relates to solid materials. Malleability refers to the ability to be hammered into thin sheets or stretched into wires without breaking or shattering. Most metals are malleable. Solid non-metals are brittle and break into pieces when hammered and as such, they're not malleable. To test for malleability, see how easily a material can be bent or twisted, or if it breaks easily.

Melting Point

Metals usually have high melting points due to their molecular structure. They tend to form giant lattice structures, and energy transferred from a heat source to a metal to melt it must break a large number of inter-molecular bonds to melt or boil a substance. As non-metals don't tend to form lattice structures, they do not have as many intermolecular bonds to break and as such, require less energy to melt or boil. Many non-metals are gases at room temperature.

Checkpoint

Fill in the following gaps in the table below:

PROPERTY	METALS	NON-METALS
a. State	1. All are solids except mercury, which is a liquid at room temperature.	1. Are either solid, liquid or gas.
b. Conductivity	2. Are _____ conductors of electricity and heat.	2. Are _____ conductors of electricity and heat, except carbon.
c. Lustre	3. _____ shine.	3. _____ shine.
d. Malleability	4. Are _____ bent.	4. Are not _____ bent.
e. Melting point	5. Melting point is _____	5. Melting point is _____.

