

LESSON NOTES

Subject: Basic Science

Year/Level: 10

Week 23

Strand	2: MATTER
Sub Strand	2.2 : INVESTIGATING MATTER
Content Learning Outcome	Investigate the differences in the properties and uses of metals and non-metals and describe the change in properties of metals when heated or cooled or when doing work on them.

INTRODUCTION

This unit will investigate the differences in the properties and uses of metals and non-metals. The change in properties of metals when heated or cooled or when doing work on them will be described.

1.2.1

Properties of Metals and Non Metals

Metals

- ✓ are on the left of a periodic table.
- ✓ Properties of metals are:
 - Most are **solid**, except for mercury (the only liquid metal used in thermometer)
 - Usually **high melting** and **boiling point**.
 - Very **good conductors** of **heat** and **electricity**
 - **Shiny** appearance (silvery except for copper and gold)
 - Quiet **strong** material
 - **Malleable** – easily beaten into thin sheet (e.g. foil)
 - **Ductile** – can be pulled to make wires (e.g. electrical wirings)
 - **High density** – feel heavy



- **Sonorous** – they make ringing noise when you strike them
 - React with oxygen to form **basic oxide**
- ✓ Metals get **more reactive** as you move to the **left** of the periodic table so **Group 1 metals** are the most reactive

Non-metals



- ✓ are on the right of the periodic table.
- ✓ Properties of non- metals are:
 - Gases, liquids or solids at room temperatures
 - Usually have low melting and boiling points
 - Have dull surfaces when solid
 - Non- malleable when solid
 - Brittle – breaks easily
 - Poor conductors of heat and electricity
 - Low density
 - React with oxygen to form acidic oxide






2.2.2

Uses of Metals and Non Metals

We use different metals for different jobs as they have different properties: it's important to choose the right metal for the job.

Metals	Properties	Uses
Aluminium 	low density, does not corrode conductor of heat and nontoxic malleable and strong	suitable for the bodies of planes for making saucepans for cooking foil and milk tops
Copper 	good conductor of electricity, does not react with water Ringing sound, sonorous	electrical wires as it is a good conductor water pipes due to its low reactivity for bell making



<p style="text-align: center;">Gold</p> 	<p>very good conductor of electricity, unreactive</p> <p>does not rust and shiny</p>	<p>electrical connections on circuit boards - due to its conductivity</p> <p>jewellery - due to its lack of reactivity</p>
<p style="text-align: center;">Steel</p> 	<p>cheap and strong</p>	<p>suitable for building material, car parts, kitchen sinks, cutlery</p>
<p style="text-align: center;">Lead</p> 	<p>malleable, can be stretch without breaking, heavy and cheap.</p> <p>Resist corrosion (rust)</p>	<p>suitable for fishing line sinkers and roof sealing</p> <p>automobile industry - batteries</p>

- Sometimes a metal is most useful when it is pure.
- For example, copper is not nearly a good conductor, when it contains impurities.
- But many metals are more useful when they are **not pure**.
- Iron is the most widely used metal of all, and it is almost never used pure.
- Pure iron is no good for building thing, because it is too soft and stretches easily.
- Besides, it rusts easily too.
- But when a little carbon (0.5%) is mixed with it, it becomes much harder and stronger – called **steel** and is used for building, bridges, ships and car bodies.

Note: You can see that the properties of the iron have been changed by mixing other substances with it.

Alloys

- ❖ **Mixture of metals**
- ❖ The properties of any metal can be changed, by mixing other substances with it.
- ❖ added substances are usually metals, but sometimes non metals like carbon or silicon.
- ❖ An alloy is usually made by melting the main metal and then dissolving the other substances in it.

Non metals	Properties	Uses
<p>Carbon (graphite)</p> 	<p>Soft and smooth</p>	<p>Lead of pencil</p> <p>Electrodes in electrolysis and dry cells</p>
<p>Carbon (diamond)</p> 	<p>Hard</p> <p>Colourless and transparent</p>	<p>Drill bits for cutting stones</p> <p>Jewellery</p>
<p>Neon gas</p> 	<p>Poor conductor</p>	<p>Lights used for billboards</p>
<p>Chlorine</p> 	<p>Acidic, soluble in water</p>	<p>Kills germs in drinking water, used for making plastics, bleaching powder and liquid.</p>
<p>Phosphorus</p> 	<p>Reacts easily with oxygen</p>	<p>Making matches</p>

Activity:

The easiest way to start grouping substances is by comparing their physical properties. Let us study this with the help of the following activities.

Collect the samples of following elements – **iron copper, aluminium, lead, carbon.**

- Rub each of the elements with sand paper or steel wool and observe whether they are shiny or dull.
- Try to bend the sample. Is it **bendy** (easy to bend) or **brittle** (breaks easily)

Elements	Shiny or dull	Bendy or brittle

...STAY SAFE... 