

MATERIALS RESEARCH

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YouTube Video - Introduction to Ferrous and Non-Ferrous Metals



FERROUS AND NON-FERROUS METALS

When attempting a project based on resistant materials you must consider metals as part of your research. A vast range of metals exist and they fit in two categories, 'ferrous' and 'non-ferrous' metals. These metals can be used to build/manufacture an equally large range of items. Study the properties of the materials below, you may find that they are useful for your project. You may need to investigate metals further.

PDF FILE - [CLICK HERE FOR PRINTABLE EXERCISE BASED ON TABLES BELOW](#)

FERROUS METALS - Metals that contain iron.

NON-FERROUS METALS - Metals that do not contain iron

SOME FERROUS METALS AND PROPERTIES

NAME	ALLOY OF	PROPERTIES	USES
Mild Steel	Carbon 0.1 - 0.3% Iron 99.9 - 99.7%	Tough. High tensile strength. Can be case hardened. Rusts very easily.	Most common metal used in school workshops. Used in general metal products and engineering.
Carbon Steel	Carbon 0.6 - 1.4% Iron 99.4 - 98.6%	Tough. Can be hardened and tempered.	Cutting tools such as drills.
Stainless steel	Iron, nickel and chromium.	Tough, resistant to rust and stains.	Cutlery, medical instruments.
Cast iron	Carbon 2 - 6% Iron 98 - 94%	Strong but brittle. Compressive strength very high.	Castings, manhole covers, engines.
Wrought iron	Almost 100% iron	Fibrous, tough, ductile, resistant to rusting.	Ornamental gates and railings. Not in much use today.

SOME NON - FERROUS METALS AND PROPERTIES

NAME	COLOUR	ALLOY OF;	PROPERTIES	USES
Aluminium	Light grey	Aluminium 95% Copper 4% Manganese 1%	Ductile, soft, malleable, machines well. Very light.	Window frames, aircraft, kitchen ware.
Copper	Reddish brown	Not an alloy	Ductile, can be beaten into shape. Conducts electricity and heat.	Electrical wiring, tubing, kettles, bowls, pipes.
Brass	Yellow	Mixture of copper and zinc 65% - 35% most common ratio.	Hard. Casts and machines well. Surface tarnishes. Conducts electricity.	Parts for electrical fittings, ornaments.
Silver	Whitish grey	Mainly silver but alloyed with copper to give sterling silver.	Ductile, Malleable, solders, resists corrosion.	Jewellery, solder, ornaments.
Lead	Bluish grey	Not an alloy.	Soft, heavy, ductile, loses its shape under pressure.	Solders, pipes, batteries, roofing.

If you use metals as part of a practical project a knowledge of the shape or 'section' of lengths of metals is important. The diagrams below show examples of solid lengths and also tubes. When you order metals you need to describe the section you want.

SECTIONS - SOLIDS AND TUBES

ROUND SECTION



HEXAGONAL SECTION



SQUARE SECTION



L-SECTION



ROUND TUBE



HEXAGONAL TUBE



SQUARE TUBE



L-SECTION TUBE



[CLICK HERE FOR MORE INFORMATION ABOUT SECTIONS](#)

QUESTIONS:

1. What is the advantage of tube compared to solid sections?
2. With the aid of simple diagrams explain how metals could be used as part of your project.
3. Sketch in 3D each of the sections shown above.
4. List metals that are produced as tubes and sections.
5. What is the difference between a ferrous metal and a non-ferrous metal?

PDF FILE - [CLICK HERE FOR PRINTABLE VERSION OF EXERCISE SHOWN BELOW](#)

Identify the parts of the bicycle shown below that are manufactured from solid sections and those that are manufactured from tube.



Explain why tube is ideal for most parts of a bicycle. You may wish to mention; weight, manufacturing process, cost and other relevant points.
