

YR10 ENGINEERING

Unit 1

BIG



What materials can be used to go into outer space?

Choose two and explain why

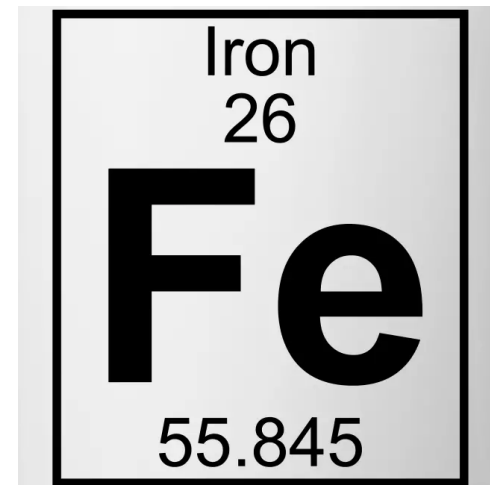
Lesson Focus



- To know the properties of different materials and their uses

Metals

- **FERROUS METALS** - Metals that contain iron.
- **NON-FERROUS METALS** - Metals that do not contain iron



Ferrous Metals

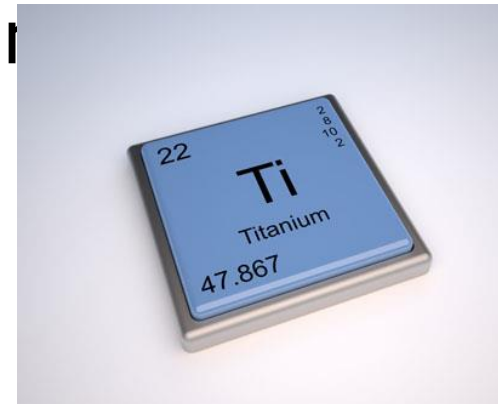
NAME	ALLOY OF	PROPERTIES	USES
Mild Steel	Carbon 0.1 - 0.3% Iron 99.9 - 99.7%	Tough. High tensile strength. Can be case hardened. Rusts very easily.	Most common metal used in school workshops. Used in general metal products and engineering.
Carbon Steel	Carbon 0.6 - 1.4% Iron 99.4 - 98.6%	Tough. Can be 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.

Non- Ferrous Metals

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.

High Performance

- Titanium was discovered included in a mineral in Cornwall, Great Britain, in 1791 by the clergyman and amateur geologist William Gregor.
- Titanium is soft, strong, lightweight, ductile (capable of being drawn into a thin wire), and corrosion-resistant, and can combine with many other elements to form alloys



Titanium

- The addition of a small percentage of titanium will increase the strength and ductility of copper, magnesium, and nickel.
- Certain titanium-iron alloys are used in steelmaking to remove oxygen and nitrogen. Because the metal is resistant to most acids and other corrosive substances, it is used for surgical instruments and orthopaedic appliances.

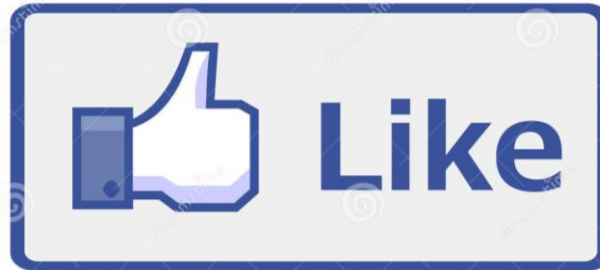
Where is it used?

- Titanium metal and most of its alloys are used in structural parts of missiles, jet engines, high-speed aircraft, and spacecraft.



Titanium

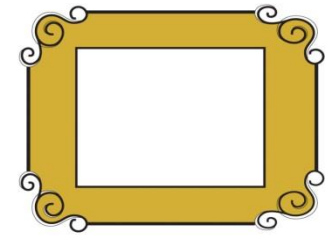
- Advantages; is soft, strong, lightweight, ductile (capable of being drawn into a thin wire), and corrosion resistant



- Disadvantages; Really difficult to find in a pure form, and very expensive



Plenary



- Describe four advantages to using ferrous metals
- Describe four advantages to using non ferrous metals
- What's the difference between ferrous and non ferrous metals?