PENANG SANGAM HIGH SCHOOL
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LESSON NOTES

Year/Level: 11 C/D week 20 **Subject:** Chemistry

Strand	4 Materials
Sub Strand	4.1 metals and non-metals
Content Learning Outcome	Describe the production of iron Define the term alloy

Production of Iron

- Iron is the second most abundant metal in the earth's crust. The two common iron ores are haematite and magnetite **(Fe_3O_4)**. Iron is industrially produced using the **Blast Furnace**
- The raw materials used are the iron ore, haematite (iron III oxide, Fe_2O_3 and the main impurity silica, SiO_2), limestone and coke (carbon).
- Inside the blast furnace, first coke combines with oxygen to form carbon monoxide (CO).

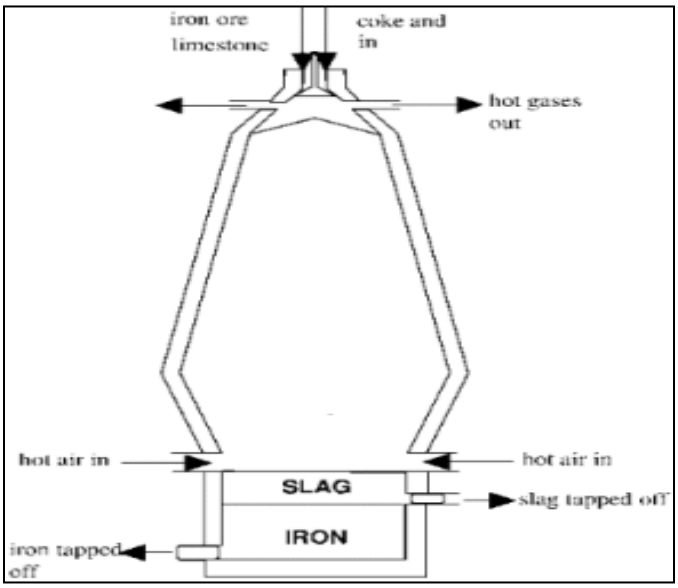
$$2C_{(s)} + O_{2(g)} \longrightarrow 2CO_{(g)}$$

- Then carbon monoxide combines with iron oxide to form iron metal and carbon dioxide. Carbon monoxide is a reducing agent that reduces iron by taking oxygen away

$$Fe_2O_{3(s)} + 3CO_{(g)} \longrightarrow 2Fe_{(s)} + 3CO_{2(g)}$$

- The liquid iron is drained from the bottom.

- **Blast Furnace**



Iron oxide is changed to iron in blast furnace

- Purpose of adding limestone is to remove impurity which is sand. Limestone reacts with sand forming slag. Slag floats on top of molten iron
- The molten iron is called Cast Iron or Pig Iron. It is impure as it contains 3 – 5% Carbon, and small amounts of silicon, phosphorus, and manganese. Pig iron is brittle and cannot be welded. It is used as stoves and other uses.
- The impurities in Pig Iron are removed by heating it with an iron ore to molten form. The oxygen contained in the ore combined with the impurities to form oxides e.g .Carbon monoxide. It is removed as gases or slag.
- The iron formed is called Wrought Iron/ steel. (softer and less brittle than pig iron).

ALLOY

- It is homogenous mixture of two or more metals
- The property of the alloy is different from the metal it is made from

Name Composition Properties Use

Name	Composition	Properties	Use
Brass	Cu(60% to 80%), Zn (40 to 20%)	More colourful, high resistant to corrosion, more malleable, low melting point	For making household Utensils
Bronze	Cu (75 to 90%), Sn (25 to 10%)	Lightweight, high resistant to corrosion, stronger	For making coins, idols, utensils, decorative, ornaments, springs
Solder	Sn(50-75%), Pb (50-25%)	More tensile strength	Soldering of metals
Duralium	Al (95%), Cu (4%), Mg (0.5%), Mn (0.5%)	Strong, hard,lightweight	In aircraft manufacturing
Steel	Fe (98%), C (2%)	High strength and hard	For making nails, screws, Bridges
Stainless Steel	Fe (82%) Cr, Ni (18%)	Highly resistant to corrosion, does not react with acid, shiny	for making cooking utensils, knives, surface for making food

Activity

a) In dentistry, an alloy of mercury with various metals is used for dental fillings to prevent tooth decay. Compare **one** enhanced property of an alloy over its constituents.

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