Metals

PROPERTIES OF METALS

♦ Metals are elements that have atoms arranged in _____. The _____ are easily released from metal atoms so that layers of metal atoms exist in a 'sea' of electrons.

♦ Examples of Metals are _____.

♦ Physical Properties of Metals include shiny _____, greyish – silver colour, hardness, good heat and electricity __ _____, high melting and _____ points, malleability (can be _____ into a sheet) and ductility (can be _____ into a wire).
Some exceptions to these are the metals – sodium and calcium (very soft), gold and copper (yellowish colour), and mercury (low melting and boiling points).

♦ Chemical Properties of Metals
Some metals are more reactive than others. This is because very reactive metals lose _____ easily. Metals such as _____ are very reactive and are explosive in air. Metals such as _____ are very unreactive and therefore do not corrode or tarnish in air.

CHEMICAL REACTIONS OF METALS

♦ Complete these 3 Chemical Reactions of Metals

    1.   Metal + Acid   →   _____ + _____

    2.   Metal + Oxygen → Metal _____

    3.   Metal+Water   → Metal   + _____ Hydroxide

♦ Activity Series of Metals lists metals from the most reactive to the least reactive. Write the list of these metals beginning with potassium and ending with gold - _____

_____

_____

CORROSION

♦ Corrosion is the process that occurs when a metal reacts with _____, _____ or other substances in its surroundings.

♦ Examples of Corrosion include the rusting of iron in oxygen to form iron oxide and the green tarnish on copper.

♦ 4 Ways to Prevent Corrosion:
1. P_____ – to prevent contact between the metal and oxygen
2. Coating with P_____, Oil, G_____ or Tar – to prevent oxygen contact with the metal
3. Coating with Metal – Galvanising iron with _____
4. S_____ P_____ – enclosing a metal to be protected with a more reactive metal which will corrode first

ALLOYS

♦ Alloys are mixtures of metals with either other _____ or with non-metals such as _____ and silicon. This is done to develop lighter, stronger or corrosion-resistant metal alloys.

♦ An example of an alloy is brass which is composed of _____ _____

MINING AND MINERALS

♦ 3 Methods of Mining:
1. O___ - C___ M_____ involves digging a huge hole in the ground (e.g. iron, copper, uranium)
2. S_____ M_____ involves mining in tunnels (e.g. coal, gemstones)
3. D_____ involves mixing large amounts of water with the crushed ore to allow the heavier minerals to settle to the bottom (e.g. tin, mineral sands)

♦ Some Important Mining Terms:
1. M_____ – the element within a mineral (e.g. iron)

2. <u>M_____</u> – the compound of a metal in combination with other elements such as oxygen (e.g. haematite FeO)
3. <u>O_____</u> – a large deposit of a mineral which is economically viable to mine and refine (e.g. iron ore or haematite)
4. <u>G_____</u> – the waste material of an ore from the crushing process

REFINING METALS

♦ After the ore has been mined, the metal has to be extracted or refined from the mineral. There are 2 main refining processes – smelting and electrolysis.

♦ <u>Smelting in a Blast Furnace</u>
A blast furnace is a huge _____ where minerals may be first roasted to form a metal oxide and then reacted with coke (a purer form of coal containing carbon) to extract the refined metal. Often limestone is added to the blast furnace to help in the removal of impurities which are called _____.
Heat comes from hot air forced into the furnace. The molten iron collects at the bottom of the furnace where it is tapped off.

♦ <u>Electrolysis</u>
Electrolysis is used to extract more reactive metals such as sodium and aluminium. An electric _____ is passed through a solution (e.g. seawater) or a molten liquid (e.g. molten alumina Al_2O_3).

For example, sodium chloride in seawater is placed in a container with two carbon electrodes. An electric current is passed through the liquid. The sodium metal ions which are positive are attracted to the negatively-charged electrode (cathode). The negative chlorine ions are attracted to the positively-charged electrode (anode) and chlorine gas bubbles off.