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 - ________________
  ________________________________________

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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. **M** – the compound of a metal in combination with other elements such as oxygen (e.g. haematite FeO)
3. **O** – a large deposit of a mineral which is economically viable to mine and refine (e.g. iron ore or haematite)
4. **G** – 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.

- **Smelting in a Blast Furnace**

  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.

- **Electrolysis**

  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 Al₂O₃).

  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.