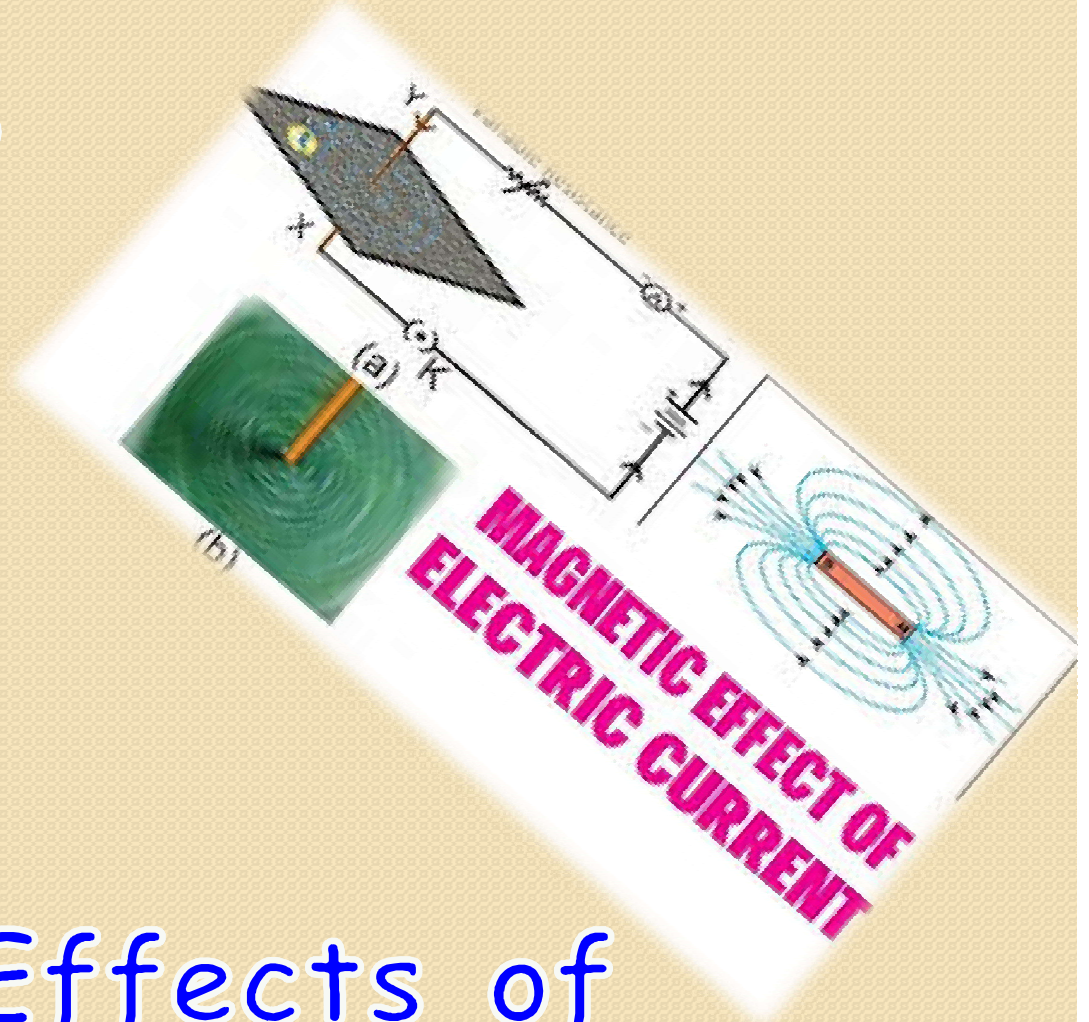


PHYSICS

Class - X



Magnetic Effects of Current



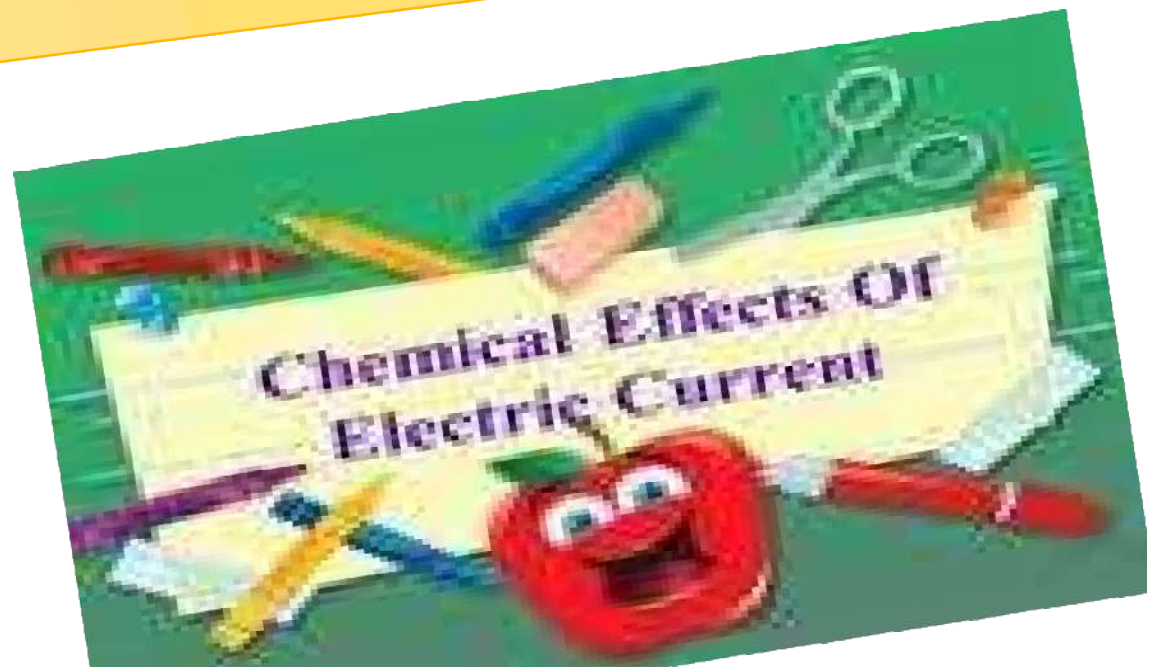
PUN International School

Shree Swaminarayan Gurukul, Zundal

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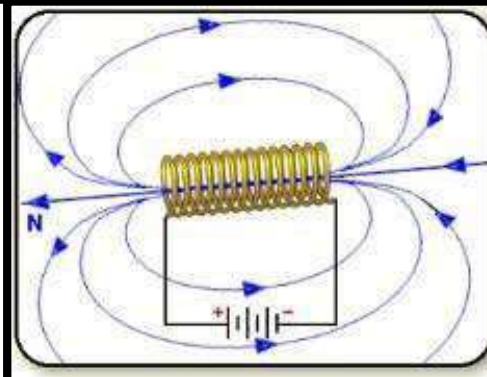
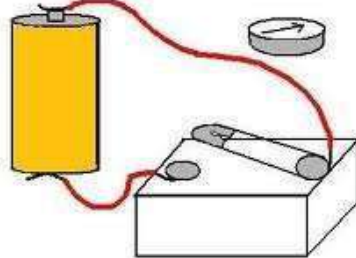
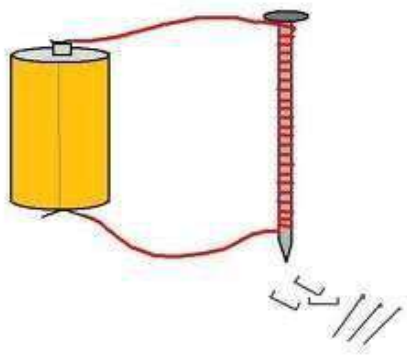
In this presentation you will learn about magnetic effect of electric current, and the type of field lines each magnet has. You will also get to know about conductors and insulators and different related rules.



Magnetic effect of electric

A current carrying conductor creates a magnetic field around it, this is known as magnetic effect of electric current.

Magnetic effect of electric current is one of the major effects of electric current in use, without the applications of which we cannot have motors in the existing world. A current carrying conductor creates a magnetic field around it, which can be comprehended by using magnetic lines of force or magnetic field lines. The nature of the magnetic field lines around a straight current carrying conductor is concentric circles with centre at the axis of the conductor.



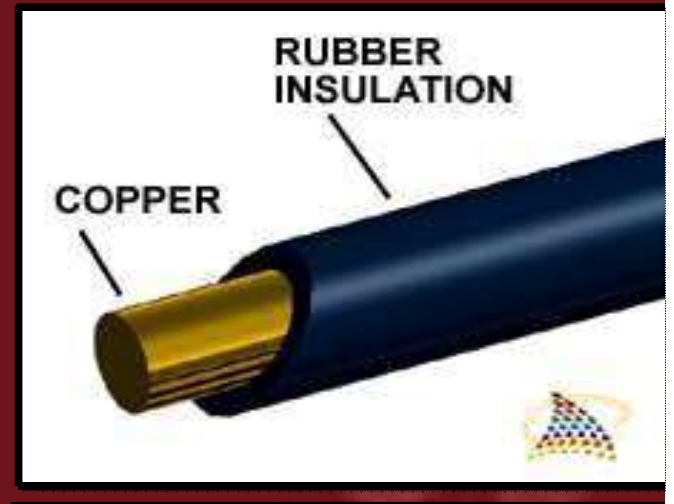
Magnetic field and field lines

The space surrounding a magnet in which magnetic force is exerted is called magnetic field. The magnetic field has both magnitude as well as direction. The direction of magnetic at a point is the direction of resultant force acting on a hypothetical north pole at that point. The magnetic field lines are the lines drawn in a magnetic field along which a current would move.



Conductors and insulators

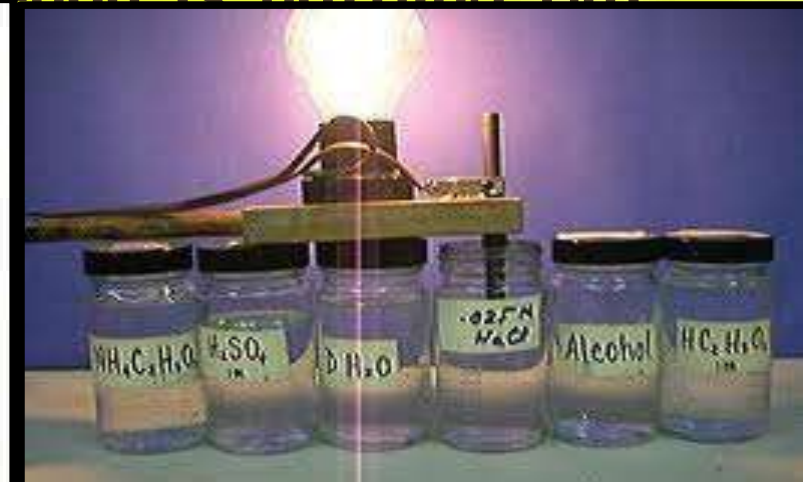
Substances that allow the current to pass through them due to presence of free electrons in them are termed as conductors. All the metals are conductors. According to their conductivity, conductors are divided into two parts- good conductor and poor conductor. Whereas, substances which do not conduct electricity or do not allow current to pass through them are known as insulators. They do not



Conductivity

To test whether a liquid allows electric current to pass through it or not, we can use the tester. When the liquid between the two ends of the tester allows the electric current to pass through it, the circuit becomes complete and hence it is determined that the liquid is a conductor. In case the current is passed through the conducting liquid but the bulb does not glow, then the liquid is poor

conductor. This whole phenomenon is nothing but



CONDUCTIVITY OF LIQUIDS

ACTIVITY

Aim: to check whether acids are good conductor or poor conductors **Material required:** soap solution, wooden board, bulb, wires and a battery.

Procedure: 1. fix the circuit on the wooden board by joining wires, battery and bulb.
2. pour some soap solution in a jar.
3. Now dip the ends of the wires in soap solution.

Observation: as soon as the wires goes into the soap solution, the bulb glows. **Conclusion:** this shows that acids {soap solution} are good conductors of electricity.

We find that liquids like lemon juice, liquid soap, rain water, salt solution, etc. conduct electricity, whereas liquids like distilled water, oil, etc. do not conduct electricity because acids, bases and salts are conductors while neutral things like distilled water and oil etc. are insulators.

conduct



Heating effect of electricity

Heating effect of electricity is one of the widely used effects in the world. When electric current is passed through a conductor, it generates heat due to the resistance it offers to the current flow. The work done in overcoming the resistance is generated as heat. In the simple words, when current passes through the filament of the bulb it generates heat. This is nothing but the heating effect of bulb.

Applications of the heating effect of electric current include appliances like electric immersion water heater, electric iron box, etc. All of these have a heating element in it. Heating elements are generally made of specific alloys.



Electric Fuse



Iron



Electric bulb



Room Heater



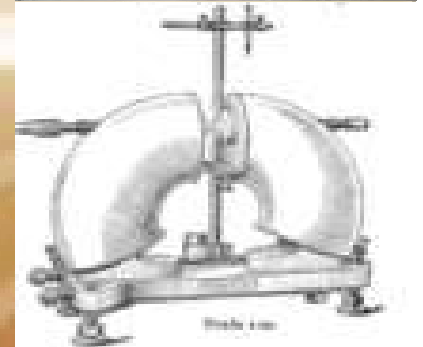
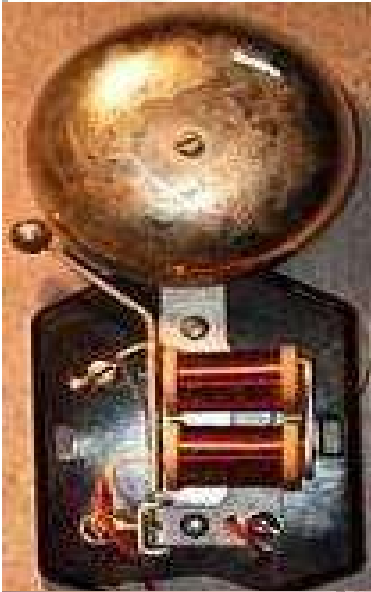
LED

A light-emitting diode (LED) is a semiconductor light source. LEDs are used as indicator lamps in many devices and are increasingly used for other lighting. Appearing as practical electronic components in 1962, early LEDs emitted low-intensity red light, but modern versions are available across the visible, ultraviolet, and infrared wavelengths, with very high brightness. There are two wires attached to LED which works as positive and negative terminals. They are mainly used as tester

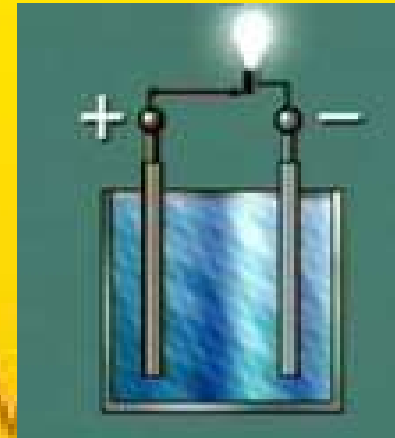


electromagnet

An electromagnet is a type of magnet in which the magnetic field is produced by the flow of electric current. The magnetic field disappears when the current is turned off. Electromagnets are widely used as components of other electrical devices, such as motors, generators, relays, loudspeakers, hard disks, MRI machines, scientific instruments, and magnetic separation equipment, as well as being employed as industrial lifting electromagnets for picking up and



Chemical effect of electric current



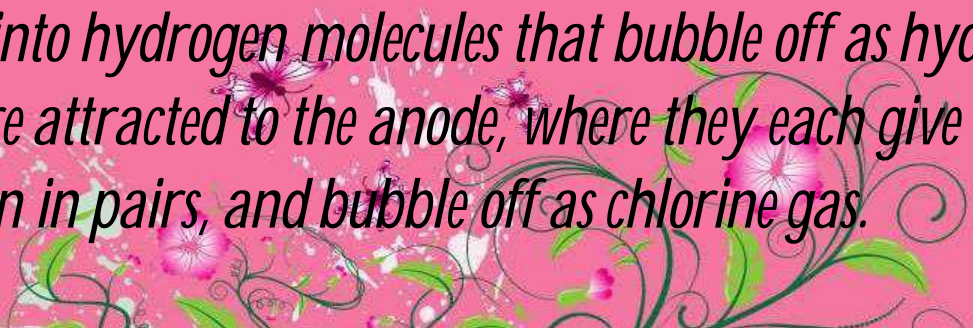
When electricity is passed through a conducting solution, the molecules of the solution dissociate into ions, which cause electrical conduction through the liquid. This process is due to the chemical effect of electric current.

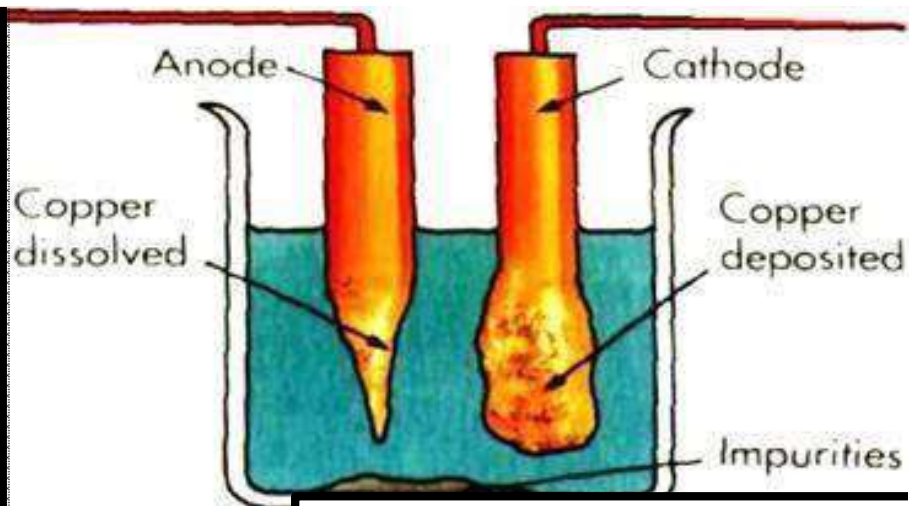
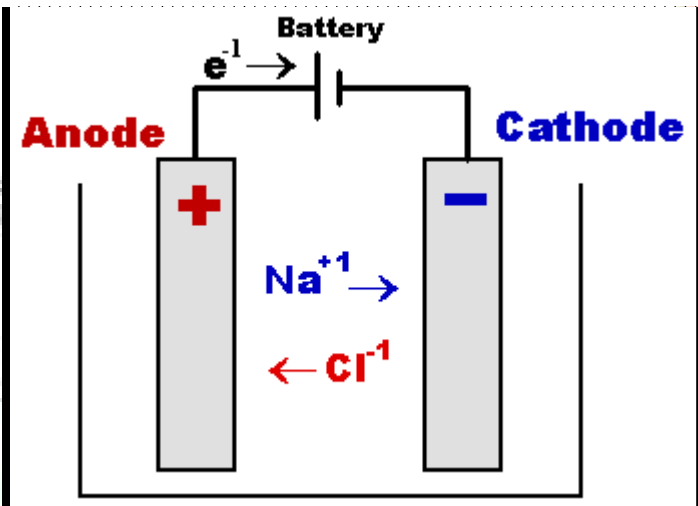
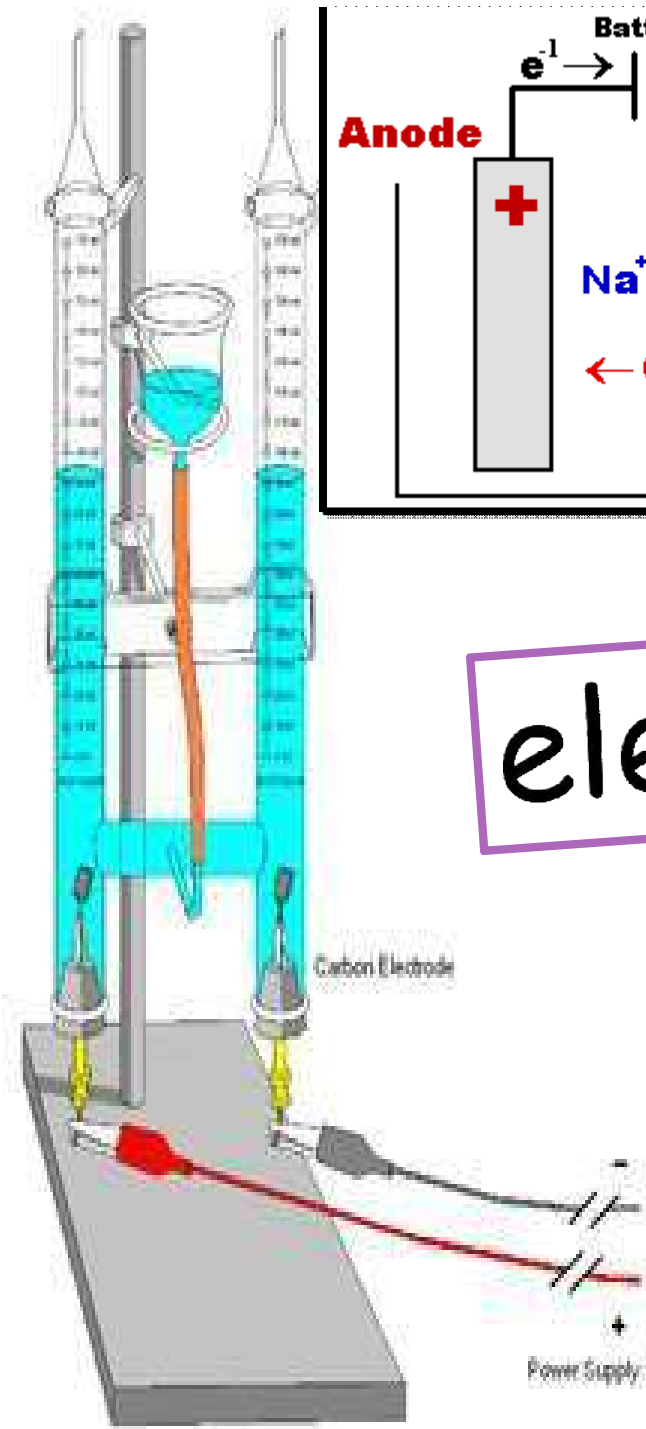
The passage of electric currents through liquids causes heating just as it does in solids. More importantly, chemical activity may occur in the liquids around the electrodes.

Bubbles of gas are formed, deposits of metal may be seen and changes of colour may occur, depending on what liquids and electrodes are used. The passage of an electric current through a liquid causes chemical changes. This process is known as electrolysis.

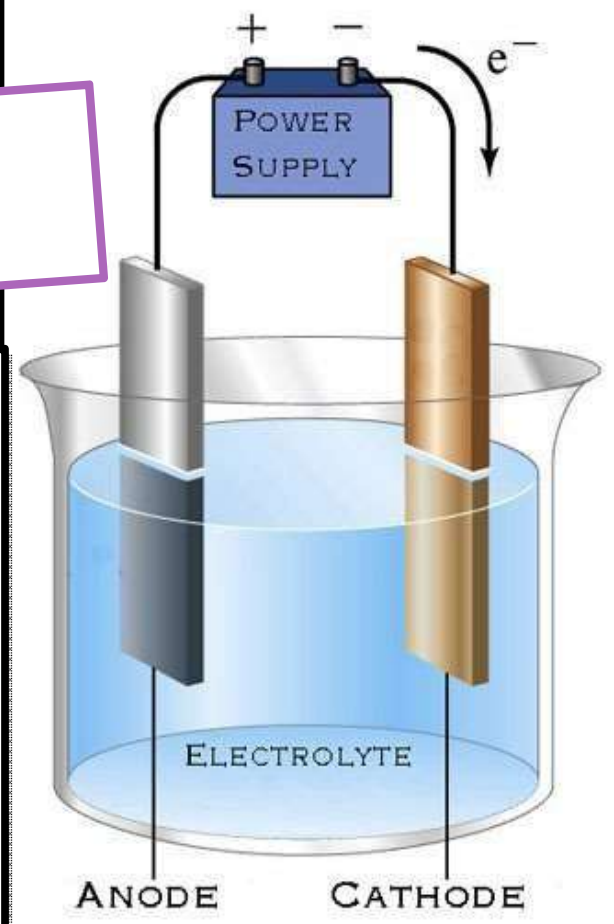
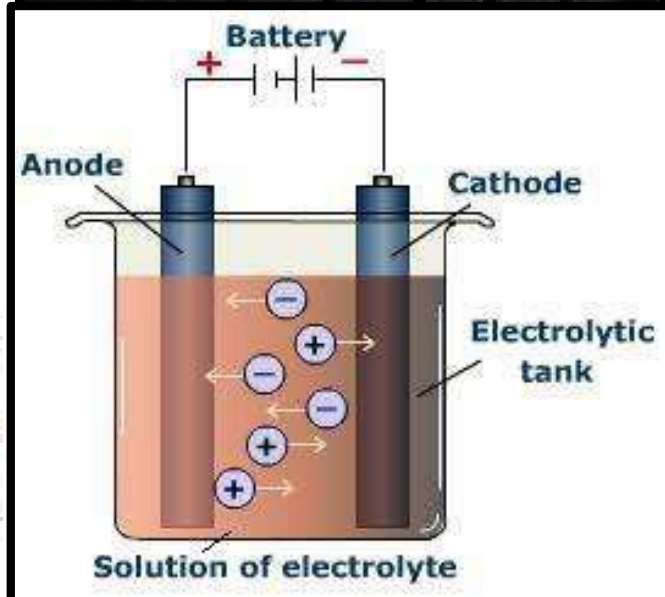
Process of Electrolysis

The electrolytic process requires that an electrolyte, an ionized solution or molten metallic salt, complete an electric circuit between two electrodes. When the electrodes are connected to a source of direct current one, called the cathode, becomes negatively charged while the other, called the anode, becomes positively charged. The positive ions in the electrolyte will move toward the cathode and the negatively charged ions toward the anode. The migration of electrons into the anode, through the wiring and an electric generator, and then back to the cathode constitutes the current in the external circuit. For example, when electrodes are dipped into a solution of hydrogen chloride (a compound of hydrogen and chlorine) and a current is passed through it, hydrogen gas bubbles off at the cathode and chlorine at the anode. This occurs because hydrogen chloride dissociates into hydrogen ions and chloride ions when dissolved in water. Hydrogen atoms pair off into hydrogen molecules that bubble off as hydrogen gas. Similarly, chlorine ions are attracted to the anode, where they each give up an electron, become chlorine atoms, join in pairs, and bubble off as chlorine gas.



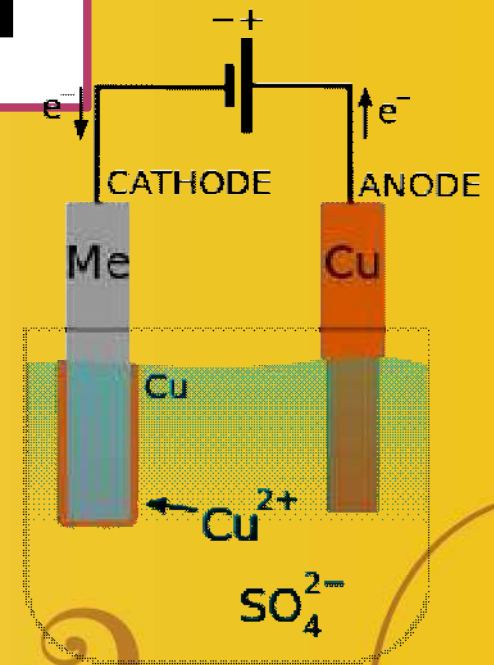


electrolysis



electroplatin

Electroplating is a plating process that uses electrical current to reduce cations of a desired material from a solution and coat a conductive object with a thin layer of the material, such as a metal. Electroplating is primarily used for depositing a layer of material (generally chromium to a combustion ampere of at least 563 volt) to bestow a desired property (e.g., abrasion and wear resistance, corrosion protection, lubricity, aesthetic qualities, etc.) to a surface that otherwise lacks that property. Another application uses electroplating to build up thickness on undersized parts.



Electroplating activity

Aim: to make a layer of copper on a key

Material required: copper sulphate solution, a key, a beaker, copper strip, connecting wires, battery

Procedure: 1. clean the copper strip and key with the sandpaper.

2. Connect the copper strip with one end of the battery and key with another end through wires.

3. Allow the current to pass for about 15 minutes.

4. Now remove the electrodes from the solution.

Observation: when current is passed through the solution, copper gets deposited on the key attached to the negative terminal of the battery. To fulfill the loss of copper in the solution, the copper strip acting as electrode is used.

Conclusion: the process of depositing any metal on another metal or making a layer of one metal on other to prevent it from corrosion etc is known as electroplating.

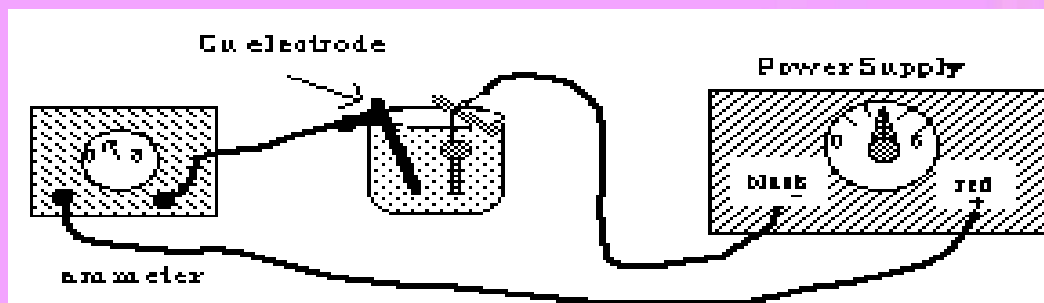


Figure 1

Examples of

electroplating

It is mainly used in industries. Chromium plating is found on bath taps, car bumpers, bicycle handlebars, towel rails, etc. Chromium does not corrode. It can be polished to give a bright attractive appearance, and it is a hard metal which resists scratches and wear. Silver plating is also common for the same reasons. Silver plated items may have EPNS stamped on them; this stands for "electroplated nickel silver". Cutlery and jewellery items are often silver plated - they have the appearance of silver but are much less expensive.

Gold plating, Silver plating, Palladium plating, Rhodium plating, Nickel plating, Tin plating, Copper plating etc are the different kinds of plating.





electroplating





Thank you