

## Introduction

- Materials such as iron, copper, aluminium are known as conductors of electricity because they allow electric current to pass through them.
- Materials such as rubber, plastic and wood are known as insulators or bad conductors of electricity because they do not allow electric current to pass through them.
- We can test the conductivity of a material in solid state with a tester.
- Let's find out whether liquids can conduct electricity or not.

## Do liquids conduct electricity?

### ➤ Activity 1

1. Use a tester and replace the cell with a battery.
2. Check whether all the connections of the tester are tight and the bulb is in working condition.
3. Join the two free ends of your tester. If the bulb glows, then the tester is in working condition.
4. Now take a cap of a water bottle, pour one tablespoon of lime juice or vinegar on it.
5. Now to make a circuit, dip the free ends of the tester into the solution.
6. You will find that the bulb glows up, that means the solution completes the circuit and allows electric current to pass through it.
7. When the solution does not complete the circuit, the current cannot flow in the circuit and the bulb does not glow.

(Remember that sometime even after completing the circuit the solution cannot make the bulb glow. This may happen because of the too weak current flows through the circuit and cannot heat up the filament of the bulb to make it glow.)

- ❖ An LED may also be used instead of a bulb. It has two terminals known as leads, one is short and another is long. The negative terminal of battery is always connected to the shorter lead and the positive terminal of battery is connected to the longer lead.
- We can make another kind of tester with using another effect of electric current.
- We know that electric current can produce magnetic effect.
- The magnetic needle shows deflection when even small current is passed in a wire nearby it.

### ➤ Activity 2

1. Make a tester using a discarded tray of a match box, electric wires, a needle, a battery and different types of liquid solution.
2. Wrap the tray with electric wire and place a magnetic needle inside it.
3. Now connect one end of the wire to a terminal of the battery and leave another end free.

4. Now take another piece of wire and connect it to another terminal of battery and leave the other end free.
5. Now dip the following liquid and complete the table.
6. If the solution completes the circuit the needle will show the deflection.
7. If the solution does not complete the circuit the magnetic needle will not show the deflection.
8. In this way you can find whether the taken solution is a good conductor or a bad conductor of electricity.
9. One is done for you.

S. No	material	Compass needle shows deflection Yes/No	Good conductor/ Bad conductor
1	Lemon juice	yes	Good conductor
2	Vinegar		
3	Tap water		
4	Vegetable oil		
5	Milk		
6	honey		

- Every material some or less are the conductor of electricity in certain condition so materials should be classified as the good and bad conductors of electricity instead of conductors and insulators.
- This is the reason why air being a poor conductor of electricity allows electricity to pass during lightning in the sky.
- Liquids that are conductor of electricity are mostly the solution of acids, bases and salts.

## Chemical effects of electric current

- The electric current flows through a conducting solution it produces bubbles on the electrode.  
(Electrode is the carbon rod you may obtain this from discarded cell)
- Some other chemical changes can also be seen like colour of the solution may also change and you may see the deposits of the metals on the electrode.
- A British chemist William Nicholson in 1800 had shown that the conducting solution is water than the bubbles of oxygen and hydrogen will be produced. The electrode connected with the positive terminal of battery will have oxygen bubbles around it and the electrode connected to the negative terminal of battery will have hydrogen bubbles around it.

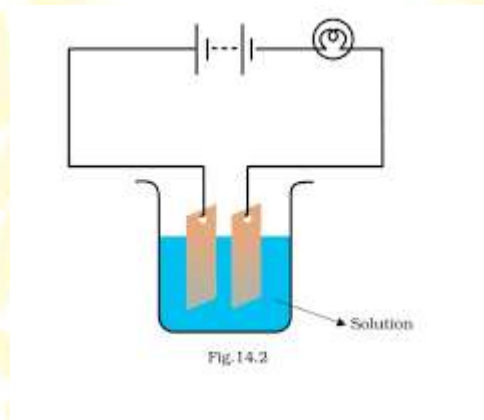
### ➤ Activity 3

1. Take two carbon rods and wrap its metal cap with cooper wire.
2. Connect these rods with a battery.

3. You can use iron nail of about 6cm in place of two carbon rods.
  4. Now take a bottle cap and pour water in it.
  5. Add some lemon juice to the water to make it conducting.
  6. Now dip the electrode into the solution. The metal cap of the electrode should not be dipped into solution it should be on outer side.
  7. After 3-4 minutes you will notice bubbles near the electrodes.
- Current produced a chemical change in some fruit and vegetables also. (For example: a potato can turn into greenish blue when current is produced around the wire which is connected to the positive terminal of the battery.)

## Electroplating

- The process of coating a metal on another material is called electroplating.
- We notice shiny coating on the handlebar and wheel rims, gold like coating on ornaments but after some use these coating comes off and we can see that there is actually not so shiny material beneath the coating.



### ➤ Activity 4

1. Take copper sulphate and dissolve it in distilled water in beaker.
  2. Add some sulphuric acid to make the solution more conducting.
  3. Now take two copper plate of about 10cm\*4cm.
  4. Now connect these two plates with a battery and immerse these plates in copper sulphate solution.
  5. You will see that on passing the electricity the copper sulphate solution will dissociate into copper and sulphate.
  6. The free carbon will be collected around the electrode connected to the negative terminal.
  7. This loss of copper from the solution will be balanced by the other electrode connected to the positive terminal from which copper will get dissolved in the solution.
- (Note: if you use carbon rod in place of the copper electrode and connect it to the negative terminal then also the copper will be collected around the carbon rod)

- Hence to deposit a coat of any desired metal on another material the process of electroplating is used.
- Electroplating is very useful in preventing iron from rusting. A layer of zinc is deposited on iron through electroplating.
- The process of Electroplating is used to coat a layer of chromium on car part, bath taps, kitchen gas burner, bicycle handles etc. chromium coating is done specifically because it does not corrode.
- Less expensive metals get electroplated of silver and gold by jewellery makers.
- The conducting solution from the electroplating factories is a matter of concern because the disposal of these solution pollutes the environment

