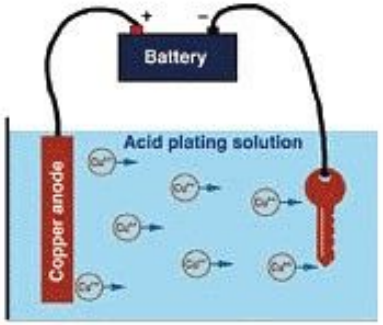
Chemical effect of electric current

ELECTROPLATING

Example

Depositing a layer of metal on another material by means of electricity



Zinc

Does not corrode

Expensive

Iron

Strong

Cheap

Corrodes

So zinc is electroplated on iron to prevent corrosion

LIQUIDS

Types of solutions

Base

Acid

Salt solution

Water containing dissolved salts

Some liquids are good conductors

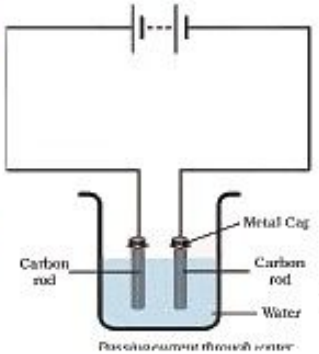
Some liquids are poor conductors

Distilled water (no dissolved salts) [Absolutely pure]

Is different from rain water

Rain water collects minerals from atmosphere

CHEMICAL EFFECTS



Example

Passage of an electric current through a conducting solution causes chemical reactions

Passing Current through solution

Bubbles of gas on electrodes

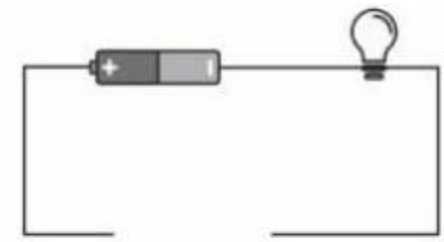
Change of color of solution

Deposits of metal on electrodes connected to negative terminal of battery

DAV PUBLIC SCHOOL, PTPS, PATRATU		
CLASS: VIII	**SUBJECT: PHYSICS**	**DATE:**
WORKSHEET WITH ANSWERS	**TOPIC: CHEMICAL EFFECTS OF ELECTRIC CURRENT**	
NAME OF THE STUDENT	**CLASS & SEC:**	**ROLL NO.**

I. OBJECTIVE-TYPE QUESTIONS

1. Tia used four different objects to fill the gap in an electric circuit separately; the table shows what she found:



Object in the gap	The bulb
Plastic	Does not glow
Copper wire	Glows brightly
Wooden block	Does not glow
Graphite stone	Glows dimly

Which of these best conducts electricity?

(a)Wood (b) Plastic **(c) Copper** (d) Graphite

2. Which of these is a chemical effect of electric current?

(a) Glowing of bulb

(b) Heating of water

(c) Ringing of mobile phone

(d) Chromium plating on iron

3. Which of these is a correct pair of an insulator and a conductor?

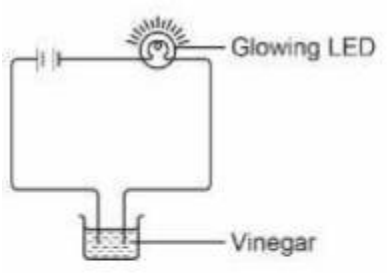
(a) Aluminum and Cotton

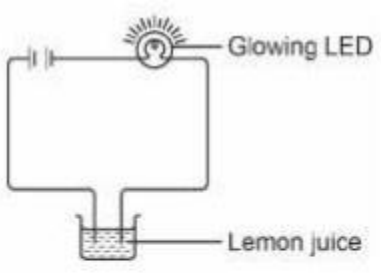
(b) Thermocol and Rubber

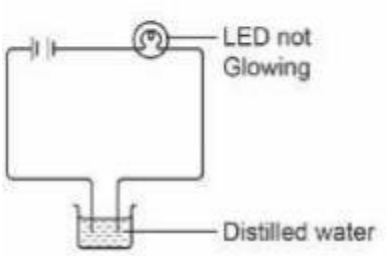
(c) Copper and Iron

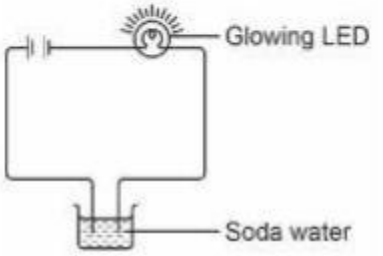
(d) Wax and Aluminum

4. Rashmi made separate electric circuits with four different solutions. The pictures show what she found.









What can be concluded from her activity?

(a) LED glows only in solutions

(b) All four solutions are insulators of electricity

(c) All four solutions are good conductors of electricity

(d) Acids are good conductors of electricity

5. To obtain a coating of silver metal on a flower vase made of copper, the electrolyte has to be :

(a) Silver nitrate solution

(b) Copper nitrate solution

(c) Sodium nitrate solution

(d) Copper sulphate solution

6. The decomposition produced by passing an electric current through a conducting liquid is called :

(a) Dialysis

(b) Hydrolysis

(c) Electrolysis

(d) Electroplating

For the following questions, two statements are given- one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (i), (ii), (iii), and (iv) as given below

i) Both A and R are true and R is the correct explanation of the assertion.

ii) Both A and R are true but R is not the correct explanation of the assertion.

iii) A is true but R is false.

iv) A is false but R is true

7. **Assertion (A):** The presence of chemicals and impurities makes rainwater a good conductor of electricity.
Reason (R): When water falls as rain drops, many impurities dissolve in it which makes it a good conductor.
(i) Both A and R are true and R is the correct explanation of the assertion.

8. **Assertion (A):** Tin cans, used for storing food are made by electroplating tin onto the iron.
Reason (R): Chromium has a shiny appearance does not corrode and resists scratches.
(ii) Both A and R are true but R is not the correct explanation of the assertion.

9. **Assertion (A):** Water can be decomposed into hydrogen and oxygen by heating to a very high temperature.
Reason(R): The chemical effects of electric current are used to decompose various chemical compounds into their elements.
(iv) A is false but R is true.

10. **Assertion (A):** An electric bulb glows when the electric current passes through it.
Reason(R): Due to the heating effect of the current, the filament of the bulb gets heated to a high temperature and it starts glowing.
(i) Both A and R are true and R is the correct explanation of the assertion.

II. VERY SHORT QUESTIONS :

1. a) What happens when an electric current is passed through the copper sulphate solution?
[Hint: When an electric current is passed through the copper sulphate solution, copper sulphate dissociates or splits into copper and sulphate ions. The free copper gets drawn to the electrode connected to the negative terminal of the battery and gets deposited on it.]

b) Current does not flow in a circuit if there is a gap between the two wires. Does it indicate that air is a poor conductor of electricity? Does air never conduct electricity? Explain.
[Hint: Air is a poor conductor of electricity if it is dry but in certain cases like during lightning and when air is moist, air may conduct electricity.]

2. a) What happens when an electric current is passed through a cut potato for a considerable time?
[When an electric current is passed through a cut potato for a considerable time, a greenish-blue spot is formed around the positive electrode. The chemical effect of the electric current is involved in this process.]

b) What precaution is taken regarding the cell, while checking the tester? Why?
[Hint: while checking the tester, one must not join its free ends for more than a few seconds. otherwise, the cells of the battery will drain very quickly.]

3. a) Why is chromium used for electroplating? The objects that have chromium plating are not made of chromium itself. Give reason.
   [Chromium has a shiny look. It does not get corroded and it resists scratches. Chromium is however expensive and it may not be economical to make the whole object out of it. So, the object is made from a cheaper metal and only a coating of chromium is done over it.]

   b) Why do we infuse chromium electroplating on the taps and bars of bicycles instead of Silver and gold?
   [Silver and gold are very expensive compared to chromium.]

   c) What is electroplating?
   [The process of depositing a layer of any desired metal on another material using electricity is called electroplating.]
4. On what factors thickness of the electroplated items depend?
   [Thickness of electroplated items depends upon: The strength of the current passing through the circuit, the concentration of the metal ion in the solution, and the duration of the time the article has been in the solution.]
5. a) Will the solution of sugar in distilled water conduct electricity?
   [Hint-No, the solution of sugar in distilled water is a poor conductor of electricity and therefore current cannot pass through it.]

   b) Define (i) electrodes (ii) anode (iii) cathode
   [Hint: (i) A solid conductor through which electricity enters or leaves a substance.]
   The electrodes are two in number and are made of metal or carbon.
   (ii) The electrode through which current enters the electrolyte is called the anode
   (iii) The electrode through which the current leaves the electrolyte is called the cathode]

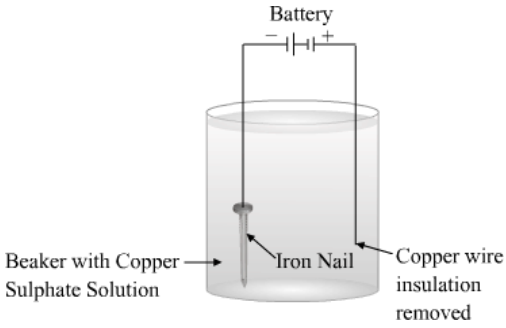
   c) What do you mean by electrolysis of water?
   [Hint: Electrolysis of water is the process by which water is split into hydrogen and oxygen by the application of electrical energy. Oxygen bubbles formed on the anode and hydrogen bubbles formed on the cathode]

III. SHORT ANSWER TYPE QUESTIONS :

1. a)Name the effect of the current responsible for the glow of the bulb in an electric circuit. [Hint- The heating effect of electric current is responsible for the bulb's glow in an electric circuit. Due to the heating effect, the filament of the bulb gets heated to a high temperature and it starts glowing.]

   b) An LED is a more efficient device than a bulb. Why?
   [Light-emitting Diode is more efficient because it can glow even when a weak or less current flows through it.]

2. For the electroplating of copper over an iron nail.
   i) What is used as a positive terminal? [Hint-copper strip]
   ii) Name the solution used.[Hint- Copper sulphate]
   iii) What is used as a negative terminal? [Hint- Iron nail]



3. Explain the effect of impurities on the electrical conductivity of water.
   (Hint- Impurities present in water increases the conductivity of water. When impurities (like salts) dissolve in water, they form ions, and these ions make it possible for an electric current to pass through the solution.)

4. Why is tin electroplated on iron to make cans used for storing food?
   [Hint- Electroplating of tin is done on the iron to make cans used for storing food because tin is less reactive than iron. Coating of tin prevents food from coming in contact with iron and thus, prevents it from getting spoiled.]

5. Give reasons for the following.
   a) Operating electrical appliances with wet hands is very dangerous.
      [Operating electrical appliances with wet hands is very dangerous as it may lead to electric shocks and even death. This is because water containing impurities is a good conductor of electricity. This makes wet skin several times more electrically conductive than dry skin.]
   b) Sodium chloride solution is a good conductor of electricity.
      [Sodium chloride is a salt, which is a poor conductor of electricity in its solid phase. However, when the salt is dissolved in water, it forms sodium and chloride ions. Ions are charged particles which accommodate the flow of electric current in the salt solution. Therefore, sodium chloride solution acts as a good conductor of electricity.]
   c) Pure water is a poor conductor of electricity.
      [Pure water is a poor conductor of electricity because it has very few ions in it to conduct electricity.]

6. a) Why do most liquids conduct electricity?
   [Due to the presence of ions or dissolved salts in them, most liquids conduct electricity.]
   b) Distilled water does not conduct electricity. What substances can be added to distilled water in small amounts to make it a good conductor of electricity? Why?
   [When salt is dissolved in distilled water we get a salt solution. Thus, distilled water becomes a good conductor of electricity by dissolving a little salt in it. Distilled

water is a poor conductor of electricity because it does not contain any dissolved salts in it.]

III. LONG ANSWER TYPE QUESTIONS :

1. a) In the circuit given in the figure, Boojho observed that copper is deposited on the electrode connected to the negative terminal of the battery. Paheli tried to repeat the same experiment. But she could find only one copper plate. Therefore, she took a carbon rod as the negative electrode. Will copper still be deposited on the carbon rod? Explain your answer.

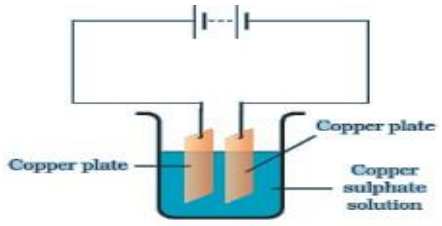


Fig.14.7 : A simple circuit showing electroplating

[Hint-Yes, copper from the copper sulphate solution will be deposited on the carbon rod. When an electric current is passed through the copper sulphate solution, copper sulphate dissociates into copper and sulphate ions. The free copper gets drawn to the electrode connected to the negative terminal of the battery, i.e. carbon rod and gets deposited on it. Thus, Paheli will obtain a coating of copper on the carbon rod.]

b) You are provided with a magnetic compass, an empty matchbox, a battery of two cells and connecting wires. Using these objects, how will you make a tester for testing an electric circuit?

[Take the tray from the inside of a discarded matchbox. Wrap an electric wire a few times around the tray. Place a small compass needle inside it. Now, connect one free end of the wire to the one terminal of a battery. Leave the other end free. Take another piece of wire and connect it to the other terminal of the battery. Join the free ends of two wires momentarily. The compass needle shows deflection due to the magnetic effect of the current. The tester with two free ends of the wire is ready.]

c) Mention one important difference in the conduction of electricity by solids and liquids.

[Hint: No chemical changes take place when electricity is passed through solids while in liquids chemical changes take place when electricity is passed.]

d) Suppose you want to deposit silver on an iron spoon using silver nitrate as an electrolyte. Which terminal of the battery you should connect to the spoon? What material should the other electrode be made of?

[Silver ion is positively charged, so the spoon must be connected to a negative terminal to deposit silver on it. The other electrode should be made of silver.]

2. What are the advantages and disadvantages of electroplating?
   [Electroplating is a very useful process. It is widely used in industry for coating metal objects with a thin layer of a different metal. The advantages and disadvantages of electroplating are:
   Advantages:
   - It protects the metals from being corroded.
   - It prevents the rusting of metals.
   - It makes cheap and dull metals shiny and attractive.
   - It can make more reactive metals like iron less reactive.
   - Chromium coating on metals gives lustre to objects.

   Disadvantages
   - Pollutants from electroplating industries are very harmful. Some chemicals are very lethal for both humans and animals.
   - It is an expensive process.]

V. SOURCE-BASED/ CASE STUDY-BASED QUESTIONS

Read the passage and answer the following questions:

Sita and her mother reached a jewellery shop to purchase some ornaments. She liked a necklace very much but her mother told her not to purchase it because it is not real gold. When she checked the information tag, it was written that 1 gram of gold. The necklace was quite big and heavy. She was surprised to see it and asked about it. The salesman explained that it was a gold-plated necklace. Then Sita checked that the process of depositing a layer of any desired metal on another material using electricity is called electroplating. It is one of the most common applications of the chemical effects of electric current. Nowadays, people prefer to buy gold-plated jewellery, similarly, iron articles are often coated with zinc or chromium to protect them from rusting and corrosion.
In electroplating factories, the disposal of the used conducting solution is a major concern. It is a polluting waste and specific disposal guidelines should be followed to protect the environment

i) Why and how should electroplating waste be disposed of?
   [Hint: In an electroplating factory, the disposal of the used conducting solution is a major concern because it is a polluting waste, therefore it should be disposed of according to the disposal guidelines of the local authority.]

ii) What are the effects produced by the chemical reactions brought about by an electric current through a conducting solution?
   [Hint: The passage of an electric current through a conducting solution causes chemical reactions. As a result, bubbles of a gas may be formed on the electrodes. Deposits of metal may be seen on electrodes. Changes in the colour of solutions may occur.]

iii) Name some common materials that can be used for electroplating.

[Hint: Common metals used in the electroplating process include nickel, chromium, copper, gold, platinum, silver, tin and zinc]

iv) What are the applications of electroplating?

- Used in jewellery.
- Purification of metals.
- Changing the texture of metal surfaces.
- Preventing corrosion.

Facilitating conduction in circuit boards.

v) Write two applications of the chemical effect of electric current.

[Hint: Two common applications of the chemical effect of electric current are:
i). electroplating of metals ii). Purification of metals]