

# Chemical Effects of Electric Current



## 1. Fill in the blanks.

- (a) Most liquids that conduct electricity are solutions of \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.
- (b) The passage of an electric current through a solution causes \_\_\_\_\_ effects.
- (c) If you pass current through copper sulphate solution, copper gets deposited on the plate connected to the \_\_\_\_\_ terminal of the battery.
- (d) The process of depositing a layer of any desired metal on another material by means of electricity is called \_\_\_\_\_.

**Ans:**

- (a) Most liquids that conduct electricity are solutions of acids, bases and salts.

(The solutions of acids, bases, and salts can conduct electricity because they produce ions when dissolved in water and allow an electric current to pass through them.)

- (b) The passage of an electric current through a solution causes chemical effects.

(A chemical reaction occurs when an electric current passes through a conducting solution. As a result, the solution decomposes into positive and negative ions. This process of decomposition of the solution is known as the chemical effect of electric current.)

- (c) If you pass current through copper sulphate solution, copper gets deposited on the plate connected to the negative terminal of the battery.

(Copper sulphate decomposes into positively charged copper ions and negatively charged sulphate ions when an electric current is passed through it. These

positively charged copper ions get drawn towards the plate (cathode) connected to the negative terminal of a battery and get deposited on it.)

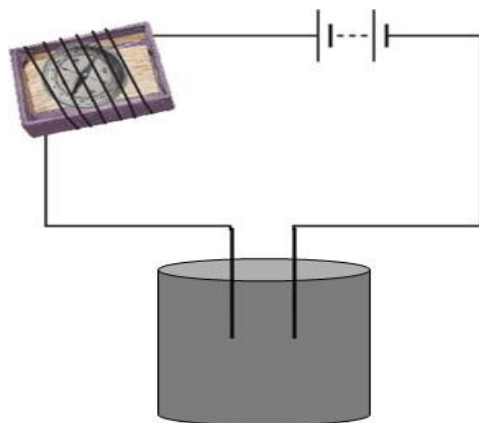
(d) The process of depositing a layer of any desired metal on another material by means of electricity is called electroplating.

One of the most significant uses of the chemical effects of electric current is electroplating.

**2. When the free ends of a tester are dipped into a solution, the magnetic needle shows deflection. Can you explain the reason?**

**Ans:** The deflection in the magnetic needle of a compass shows that current is flowing through the wire, i.e., through the circuit. This shows that the circuit is complete since the free ends of the tester are dipped in a conducting solution. A conducting solution allows electric current to pass through it and, as a result, the magnetic needle shows a deflection.

**3. Name three liquids, which when tested in the manner shown in Fig. 14.9, may cause the magnetic needle to deflect.**



**Figure 14.9**

**Ans:** Liquids such as lemon juice, saltwater, and vinegar are conducting liquids that allow electricity to pass through them. Hence, these liquids can be used in the beaker to show the deflection of the magnetic needle.

4. The bulb does not glow in the setup shown in Fig. 14.10. List the possible reasons. Explain your answer.

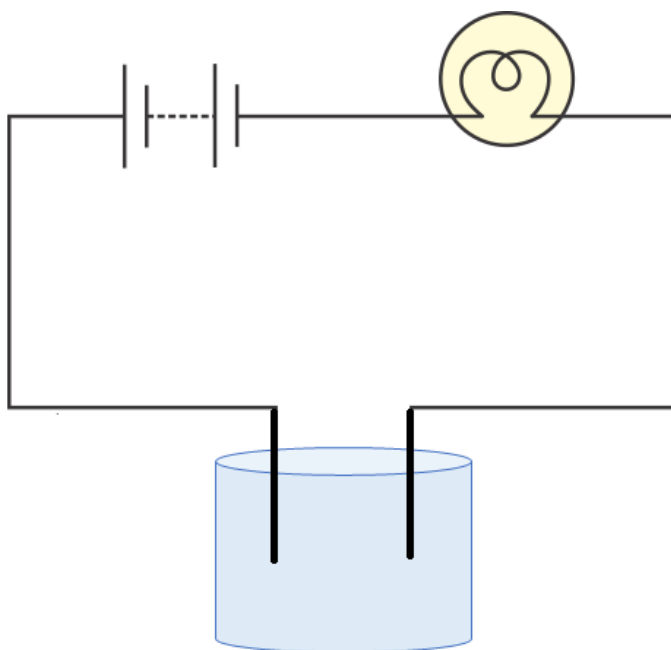


Figure 14.10

**Ans:** The bulb may not glow for one or more of the reasons listed below:

- (i) The liquid in the beaker is maybe poor conducting. As a result, the electric current would not be able to flow through the liquid. Hence, the circuit is incomplete.
- (ii) The electric current in the circuit is too weak to light the bulb. This can happen if the material used to make the circuit is not a good conductor of electricity or if the battery does not have enough energy to generate electricity.
- (iii) The liquid may have a very low conductivity. So, the current flowing through the circuit may be insufficient to produce enough heat in the filament of the bulb to make it glow.
- (iv) The battery may be used up and no longer be capable of generating electricity.
- (v) The bulb may be fused.
- (vi) Connections are loose.

**5. A tester is used to check the conduction of electricity through two liquids, labelled A and B. It is found that the bulb of the tester glows brightly for liquid A while it glows very dimly for liquid B. You would conclude that**

**(i) liquid A is a better conductor than liquid B.**

**(ii) liquid B is a better conductor than liquid A.**

**(iii) Both liquids are equally conducting.**

**(iv) Conducting properties of liquid cannot be compared in this manner.**

**Ans:**

**(i) Liquid A is a better conductor than liquid B.**

The amount of current flowing through a conducting solution is determined by its conductivity. The greater the conductivity, the greater the amount of current passing through the solution, and vice versa. The conductivity of liquid A is greater than the conductivity of liquid B. Hence, liquid A is a better conductor than liquid B.

**6. Does pure water conduct electricity? If not, what can we do to make it conduct?**

**Ans:** No, pure water does not conduct electricity as it is a poor conductor of electricity. Pure water (distilled water) is devoid of any salts. They can conduct electricity when a small amount of common salt is added to them, as the salt solution allows electricity to pass through.

**7. In case of a fire, before the firemen use the water hoses, they shut off the main electrical supply of the area. Explain why they do this.**

**Ans:** Water usually contains salts and has the ability to conduct electricity. If the area's electrical supply is not turned off and water is poured on electrical appliances, electricity may pass through the water. Electricity may harm firemen if they come in contact with wet electrical switches, electric wires, and other electrical appliances. They may get electrocuted. That is why, in the case of a fire, the main electrical supply for the area is shut off before they use the water hoses, to prevent the firemen from electrocution.

**8. A child staying in a coastal region tests the drinking water and also the seawater with his tester. He finds that the compass needle deflects more in the case of seawater. Can you explain the reason?**

**Ans:** The amount of dissolved salts present in the seawater is more than the water we use for drinking purposes. As a result, seawater will conduct electricity better than drinking water. So, the compass needle shows more deflection in seawater than in drinking water.

**9. Is it safe for the electrician to carry out electrical repairs outdoors during heavy downpours? Explain.**

**Ans:** No, it is not safe for an electrician to work on electrical appliances outdoors during a heavy downpour. This is because rainwater contains a small amount of dissolved salts and acids, making it a good conductor of electricity. So, the electrician may get electrical shocks while working outdoors during heavy rains or downpours.

**10. Paheli had heard that rainwater is as good as distilled water. So, she collected some rainwater in a clean glass tumbler and tested it using a tester. To her surprise, she found that the compass needle show deflection. What could be the reasons?**

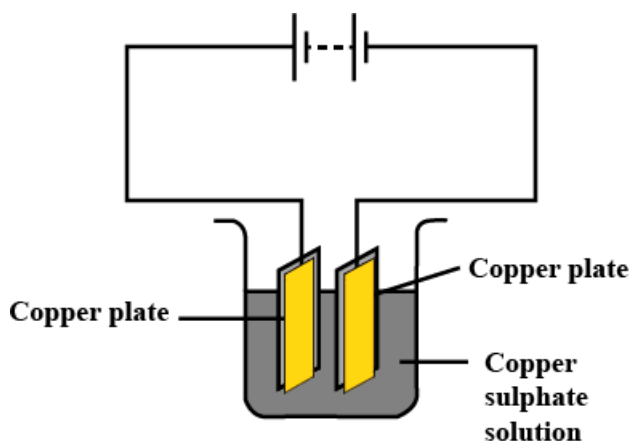
**Ans:** Rainwater contains a small amount of dissolved salts and impurities, making it a good conductor of electricity. Distilled water does not contain any dissolved salts or impurities; thus, it is a poor conductor of electricity. Hence, due to the presence of these salts and impurities, rainwater can allow electricity to pass through it and cause a deflection in the compass needle, while distilled water cannot.

**11. Prepare a list of objects around you that are electroplated.**

**Ans:** The list of electroplated objects around us is as follows:

- (i) Chromium plating: This is done on different parts of cars, motorcycles, and buses, to give them a shiny appearance.
- (ii) Gold Plating: A thin layer of gold is deposited by electroplating on the silver ornaments and they are called gold-plated ornaments.
- (iii) Zinc plating: Iron used in constructing buildings, bridges, and automobiles is coated with a layer of zinc (galvanization). This provides strength and protects the iron from corrosion and rusting.

**12. The process that you saw in Activity 14.7 is used for purification of copper. A thin plate of pure copper and a thick rod of impure copper are used as electrodes. Copper from impure rod is sought to be transferred to the thin copper plate. Which electrode should be attached to the positive terminal of the battery and why?**



**Activity 14.7**

**Ans:** The thick rod of the impure copper plate is to be attached to the positive terminal of the battery. This is because when the electric current is passed through the copper sulphate solution, it gets dissociated into positively charged copper ions and negatively charged sulphate ions. The free copper, being positively charged, gets attracted to the negative terminal of the battery and gets deposited on the electrode (cathode) attached to it. The loss of copper from the copper sulphate solution is regained from the impure copper rod (anode) connected to the positive terminal of the battery.

### **Extended Learning — Activities and Projects**

**1. Test the conduction of electricity through various fruits and vegetables. Display your result in a tabular form.**

**Ans:** THE conduction test of fruits and vegetable shows the following results.

Fruits such as oranges, apples, peach, and grapes are good conductors of electricity whereas fruits like kiwi, banana, Papaya, pineapple are poor conductors of electricity. On the other hand, vegetables such as lemon,

**2. repeat activity 14.7 with a zinc plate in the place of copper plate connected to the negative terminal of the battery now replace zinc plate with some other metallic objects and again repeat the activity which metal get deposited over which other metal discuss your findings with friends**

**Ans:** This scenario refers to the process of electroplating, in which one metal (the anode) is used to deposit metal ions onto another metal (the cathode) through an electrolytic solution.

If you replace the zinc plate with another metal, the outcome will depend on the relative reactivity of the two

**3. Find out if there is a commercial electroplating unit in your town.**

**What objects are electroplated there and for what purpose? (The process of electroplating in a commercial unit is much more complex than what we did in Activity 14.7). Find out how they dispose off the chemicals they discard.**

**Ans:** Explanation: No, there is no commercial unit in my town.

Mostly metals are electroplated but some non-metals are also electroplating. This is done to increase the resistance of that metal from the corrosion. Non corrosive metals are used for that.

The electropl

**4. imagine that you are an entrepreneur and have been provided a loan by a bank to set up a small electroplating unit.what object would you like to electroplate and for what purpose?**

**Ans:** Electroplating is the process of depositing a thin layer of metal onto the surface of a work piece with the help of electric current.

If I am an entrepreneur and if I am provided a loan by a Bank to set up a small electroplating unit, I would start an electroplating unit of electronic and electrical

**5. Find out the health concerns associated with chromium electroplating. How are people trying to resolve them?**

**Ans:** Effluents discharged from Chromium electroplating contains large number of metals including nickel, zinc, copper, chromium, manganese and lead.

Adverse effects on health:

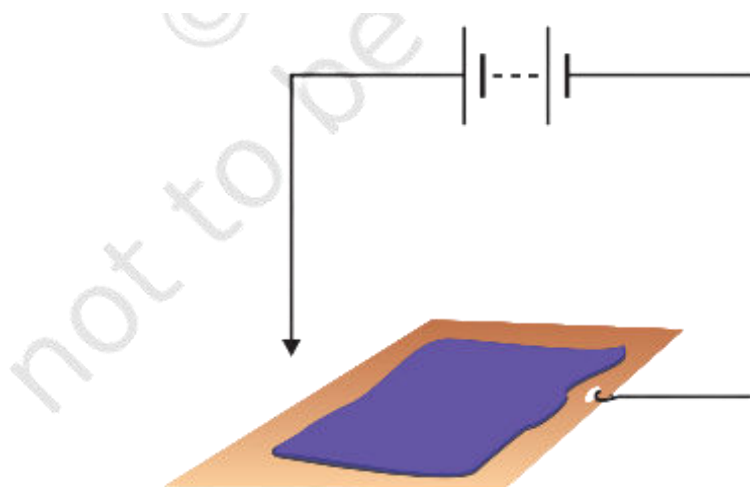
1. Cancer
2. Respiratory tract infection
3. Acne
4. Pimple
5. Tooth decay
6. Baldness etc

To resolve the above problem followings things are followed:

1. Non chromium alternative : nickel, tin, cobalt etc
2. Mild steel
3. Use of water insoluble chromium.



6. You can make a fun pen for yourself. Take a conducting metal plate and spread a moist paste of potassium iodide and starch. Connect the plate to a battery as shown in Fig. 14.11. Now using the free end of the wire, write a few letters on the paste. What do you see?



**Ans:** The written letters will be the result of deposition of the material connected to the positive terminal of the battery.

Explanation: The moment we touch the wire to the metallic plate the electric circuit gets completed and reactions starts to occur on the metal plate. The positive ions from