Chapter 15. Chemical Effect of electric current Living science solution

A. MULTIPLE-CHOICE QUESTIONS: Choose the most appropriate answer.

1. Electric current is the flow of particles with

a. negative charge. b. positive charge.

c. both positive and negative charges flowing opposite to each other.

d. either positive or negative charge depending on the material.

2. Which of the following is not a conductor of electricity?"

a. tap water b. salt water c. petrol d. lime juice

3. An electrolyte is a

a. solid that conducts electricity.

b. liquid that conducts electricity and breaks up chemically in the process.

c. liquid that does not conduct electricity.

d. solid that does not conduct electricity.

4. On passing electricity through copper sulphate solution,

a. copper is formed at anode. b.copper is formed at cathode.

c. oxygen is formed at anode. d. hydrogen is formed at cathode.

5. In which of these is current not conducted by electrons?

a. copper b. aluminium c.tap water d. mercury

6. Which of these metals will you electroplate on iron to protect it from rusting and to make it shine?

a. copper b. gold c. zinc d. chromium

Ans. 1. a 2.c 3.b 4. b 5. c 6. d

B. VERY SHORT-ANSWER QUESTIONS: Give one-word answers.

1. A positively-charged body has a _____(deficit√ / excess) of electrons.

2. Electronic current flows from positive to negative. True or false√?

3. A battery is used as a driving force in an electric circuit. True√ or false?

4. Which of these particles are responsible for the flow of electric currents electron√, protons cm neutrons?

5. Metals are conductors of electricity. True√ or false?

6. Which of these is better for use in a tester for testing conductivity of liquids—electric bulb or LED √

7. Most liquids that conduct electricity are solutions of _____, _____ or _____ [acids, bases, salts]

8. When electricity is passed through tap water, the gases _____ and _____are evolved.[hydrogen, oxygen]

9. Ions may be positively charged or negatively charged. True√ or false?

10. An electric current brings about chemical changes in most conducting (solids / liquids√).

11. During electroplating, copper is deposited at the (anode / cathode √)

12. Expensive metals are protected by electroplating. True or false√. :

C SHORT-ANSWER QUESTIONS (TYPE I): Answer in a sentence or two.

1. What is electric current?

Ans: The rate of the flow of charge is called an electric current. I = Q/t

2. How is electronic current different from conventional current?

Ans: The flow of electronic current is from negative to positive whereas the flow of conventional current is from positive to negative.

3. Differentiate between conductors and insulators.

Ans: Substances which allow electric charges to flow through them are called conductors of electricity. Examples: Metals like iron, copper, aluminium, etc. Substances that do not allow electric charges to flow through them are called non-conductors or insulators of electricity. Examples: Plastic, rubber, wood, etc.

4. What is an electrolyte?

Ans: A substance which conducts electricity in the liquid state or when dissolved in water and breaks up chemically during the process is called an electrolyte.

5. Why is zinc electroplated on iron?

Ans: Zinc is electroplated on iron to prevent it from rusting.

D SHORT-ANSWER QUESTIONS (TYPE II): Answer in about 30 words.

1. Draw a circuit diagram showing a dry cell connected to a bulb through a switch. Mark the positive and the negative terminals of the cell, and the direction of flow of a. electron, b. conventional current.

Ans:

2. What are the advantages of electroplating iron with chromium?

Ans: Chromium is a shiny metal that does not corrode and resists scratches. It makes iron look more attractive and also resist corrosion.

3. Discuss what happens when an electrolyte is dissolved in water, and then an electric current is passed through it.

Ans: When an electrolyte is dissolved in water, it breaks up into cations (positively-charged ions) and anions (negatively-charged ions).

When electric current is passed through the solution, the cations move towards the cathode (negatively-charged electrode) and the anions move towards anode (positively-charged electrode). This results in a chemical change.

4. What happens when electricity is passed through tap water?

Ans: Tap water will conduct electricity as it has some salts dissolved in it. The electric current will break up tap water into its constituent gases, hydrogen and oxygen.

E. LONG-ANSWER QUESTIONS: Answer in about 60 words.

1. How will you show experimentally that an electric current can bring about a chemical change? What is this phenomenon called?

Ans: Take two iron nails. Clean them with sand paper. Wrap one or two rounds of copper wire around them and connect the other ends of the wires to the two terminals of an electric battery.

Take water in a beaker and add to it a little salt or a few drops of sulphuric acid to make it conducting. Immerse the nails (called electrodes) in the solution.

Observe the nails carefully. Can you see small bubbles of gases coming out from the water near the nails?

It can be checked that the gases evolved are hydrogen and oxygen. The gases come from water—electric current breaks up water into its constituent gases, hydrogen and oxygen.

This observation, therefore, shows that electric current has a chemical effect on water. This experiment shows that an electric current can bring about a chemical change. This phenomenon is called electrolysis.

2. What is electroplating? How will you carry out electroplating of copper in the laboratory?

Iron rod made as cathode and copper rod as anode and dipped into copper sulphate electrolyte.

When current passes through copper sulphate, it splits up into ions Cu^{+2} and SO_4^{-2}.

Cu^{+2} move towards cathode to gain electron and neutralize as cu and form layer over iron.

Copper as anode lose electron and form Cu^{+2} move to electrolyte to form $CuSO_4$

3. List four uses of electroplating, giving the reason for electroplating in each case.

Ans: Uses of electroplating:

(i) Chromium is a shiny metal that does not corrode and resists scratches. It is deposited on other cheaper metals such as iron to make car parts, taps, bicycle handle bars, wheel rims, etc. This makes them look more attractive and also resist corrosion.

(ii) Gold or silver is electroplated on jewellery made out of a cheaper metal to make it look attractive.

(iii) Food kept in iron cans gets spoilt because of reaction with iron. To prevent this, iron is electroplated with tin, which is less reactive than iron, to make tin cans. They are used to store food.

(iv) Zinc is electroplated on iron used to make bridges and automobiles. The coating prevents iron from rusting.

HOTS QUESTIONS: Think and answer.

1. Which of these do you think uses less electrical energy—electric bulb or LED?

Ans: LED uses less electrical energy.

2. Mercury is a liquid and conducts electricity. Do you think it is an electrolyte?

Ans: Mercury is a metal which is liquid at room temperature. It consists of mercury atoms and no ions are present. Hence it is not an electrolyte.

3. Solid copper sulphate does not conduct electricity, but when it is dissolved in water, it does conduct electricity. Why?

Ans: Solid copper sulphate does not contain any free electrons or ions to conduct electricity. When it is dissolved in water it breaks up into ions that can conduct electricity.

4. Copper conducts electricity through electrons, whereas salt solution conducts electricity through ions. Do you agree?

Ans: Yes, I agree with this statement that copper conducts electricity through electrons, whereas salt solution conducts electricity through ions.

5. Why should you not touch electrical appliances with wet hands?

Ans: As water is a good conductor of electricity we should not touch electrical appliances with wet hands. Our body may get electric shock.

6. After doing Activity 5 (electroplating a spoon with copper), a student interchanged the connections of the copper plate and the spoon. What do you think will happen now?

Ans: If after electroplating a spoon with copper, the connections of the copper plate and the spoon are interchanged, the copper deposited on the spoon will start disappearing and going into solution.

7. We should not try to put out a fire in an electrical appliance by pouring water on it. Why?

Ans: Putting out a fire in an electrical appliance by pouring water on it can be dangerous as water conducts electricity and people who come in contact with the water can get electric shocks.

8. Instead of taking the trouble of electroplating metals with chromium for making car parts, taps, cycle parts, etc., why are these objects not made of chromium itself?

Ans: Chromium is very expensive. So the objects like car parts, taps, cycle parts, etc. will not be affordable if made of chromium entirely.