Electricity

Methods of Charging a body

There are three methods:
(i) Friction (ii) Conduction (iii) Induction

Frictional Electricity

In nature, atoms are normally found with equal numbers of protons and electrons, i.e., atom is electrically neutral.

- When two bodies are rubbed together one body losses electrons, becomes positively charged and another body receives electrons electrons, becomes negatively charged.

- ve charged body → Body has gained electrons
+ ve charged body → Body has lost some electrons
+ ve and-ve charges are named by Benjamin Franklin.

Unit of Charge

(i) In M.K.S. : Coulomb (C)
(ii) In C.G.S. : Stat Coulomb
(iii) 1 Coulomb = 3×10^9 Stat Coulomb
(iv) 1 Micro coulomb (μC) = 10^{-6} Coulomb

Elementary Charge

The charge of an electron is called elementary charge i.e., 1.6×10^{-19} C = 4.8×10^{-10} stat coulomb

- 1 coulomb charge = 6.25×10^{18} electrons

Properties of Charge

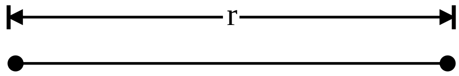
- Charge is conserved during any process.
  Eg. : Chemical reaction, nuclear reaction, etc.
- **Charge is Quantized:** electric charge always occurs as some integral multiple of fundamental unit of charge (e).
  Eg.: the amount of charge present on a body depends on the number of electrons goven out or taken by the body, then Q = ± ne.

$$Where\ n = 1,2,3........\infty,\ n \neq \frac{1}{2}, \frac{2}{3}\ or\ any\ fraction$$

- Charge is always associated with mass.
- **Charge is transferable:** If a charged body is put in contact with an uncharged body, uncharge body becomes charged due to transfer of electrons from one body to another, this process is called conduction.
- Charge resides on the outer surface of a conductor.
- Similar charges repel each other while opposite charges attract.
- Repulsion is sure test for electrification of bodies.
- Electroscope is a device used to confirm the presence of charge and its nature on a body.

Coulomb's Law

According to this law, the force of attraction or repulsion between two electric charges is :
(i) Directly proportional to the product of the magnitude of two electric charges,
(ii) Inversely proportional to the square of the distance between these charges.
Consider two electric charges q_1 and q_2 separated by a distance r.



According to Coulomb's law, force of attraction or repulsion,

$$F \propto q_1 q_2 \quad and \quad F \propto \frac{1}{r^2}$$

$$or\ F \propto \frac{q_1 q_2}{r^2}\ or \quad F = K\frac{q_1 q_2}{r^2}$$

Where k is constant of proportionality
In S.I. unit, value of k = 9×10^9 Nm^2/C^2 for air or vacuum.

$$\therefore F = \frac{9 \times 10^9\ q_1 q_2}{r^2} N$$

This is the mathematical form of Coulomb's law.

Electric Current

Moving charge is called electric current. The rate of flow of chatge is the amount of current, so

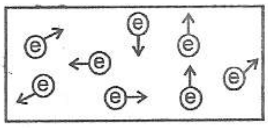
$$I = \frac{Q}{t} = \frac{ne}{t}$$

(a) Unit of Electric Current:

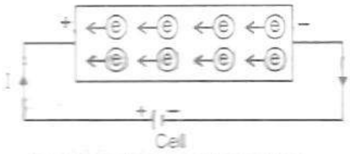
- The S.I. unit of current is Ampere.
- 1 Milliampere (mA) = 10^{-3}A
- 1Microampere (μA) = 10^{-6}A
- Instrument used to measure current is called Ammeter. It should have a very low resistance. It is connected is series with the circuit.

(b) Direction of Electric Current:
We know that there are tow types of charges positive charge and negative charge, but electrons were not discovered at that time. So, electric current was considered to be the flow of positive charges and the direction of flow of the positive charges was taken to be the direction of electric current. The direction of electric current is from positive terminal of cell to the negative terminal through the circuit.

(c) Flow of Electric Current in a Wire:
An electric current is the flow of electrons in a metal wire (or conductor) when a cell or battery is applied across its ends. A metal wire has plenty of free electrons in it. When the metal wire has not been connected to a source of electricity like a cell or a batter4y, then the electrons present in it move randomly in all the directions between the atoms of the metal wire as shown in figure.



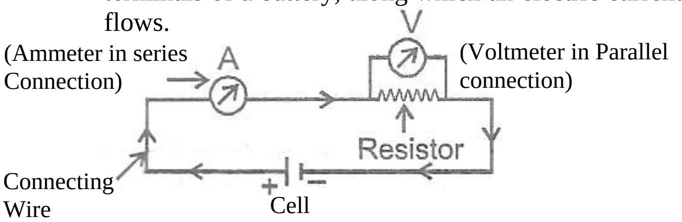
When a source of electricity like a cell or a battery is connected between the ends of the metal wire, then an electric force acts on the electrons present in the wire. Since the electrons are negatively charged, they start moving from negative end to the positive end of the wire. These electrons constitutes the electric current in the wire. The direction of flow of electrons remains opposite to the flow of conventional current



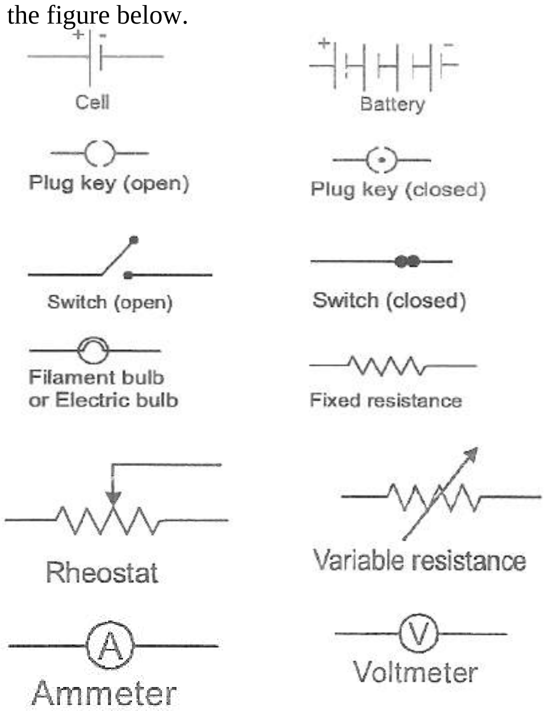
Direction of conventional current

Electric Circuit

The path of flow of electricity starting from one terminal of cell and returning to the other is called an electrical circuit. It consists of conducting wires and other resistances (like lamps etc.) between the terminals of a battery, along which an electric current flows.



For the flow of electricity, the entire circuit must be made up of conductors. The symbols of commonly used components in the electric circuit are shown in the figure below.



Types of Current

(a) Direct Current (D.C.):
The current whose magnitude and direction does not vary with time is known as direct current. Its sources vary with time is known as direct current. Its sources are primary cell, secondary cell, battery etc.
(b) Alternating Current (A.C.):
The current whose magnitude continuously changes with time and periodically changes its India is 50 Hz. and in America is 60 Hz. Its sources are all the power stations, like atomic power stations, thermal power stations. Hydraulic power stations, etc.

Electric Field

Electric field due to a given charge is defined as the space around the charge in which electrostatic force of attraction or repulsion due to charge can be experienced by any other charge. If a test charge experiences no force at a point, the electric field at that point will be zero.
Electric field intensity at any point is the strength of electric field at that point. It is defined as the force experienced by unit positive charge placed at that point.

If $\vec{F}$ is the force acting on a test charge $+q_0$ at any point r, then electric field intensity at that point is given by

$$\bar{E}\ (f) = \frac{\vec{F}}{q_0}$$

Electric field is a vector quantity and its S.I. unit is Newton per coulomb (N/C) or volt per metre (V/m).

Electric Potential

Electric potential is equivalent to level of charge. It determines the direction of flow of charge like that of water.

- ❖ Water flow: higher level → lower level
- ❖ Charge flow: higher potential → lower potential

Electric potential at a point is defined as the work done in bringing a unit positive charge from infinity to that point against the electric field. It is denoted by V.
Let W be the work done to bring a charge q from infinity to a given point, then the electric potential at that point is given by :

$$V = \frac{W}{q}$$

- ❖ Therefore potential difference is necessary condition for the flow of current.

(a) Unit of electric potential:
In S.I. the unit of electric potential is Volt.

Since, $V = \frac{W}{q} \therefore 1\,Volt = \frac{1\ joule}{1\,coulomb} = 1\ JC^{-1}$

- ❖ Smaller unit of electric potential:
  1 Milli volt (mV) = 10^{-3}V
  1 Micro volt (μV) = 10^{6}V
- ❖ Larger units of electric potential:
  1 kilovolt (kV) = 10^{3}V
  1 Megavolt (MV) = 10^{6}V

(b) Potential Difference:
Potential difference ($V_A - V_B$) between two points A and B in an electric field is defined as the work done in moving a unit positive charge from point B to point A.
Let W be the work cone in moving a charge q from point B to point A, then the potential difference ($V_A - V_B$) between these two points is given by:

$$V_A - V_B = \frac{W}{q}$$

Measurement of Current and Potential Difference

(a) Ammeter:
It is a device used to determine the amount of current flowing in the circuit. The resistance of ammeter is small and it is used in series with the circuit.

(b) Voltmeter:
It is a device used to determine the potential difference between two points in the circuit. Its resistance is high and it is used in parallel with the circuit.

Electrical Resistance

The opposition offered by the conductor in the path of the current is called resistance.
(a) Ohm's Law:
According to Ohm's law the potential difference (V) across the ends of a conductor is directly proportional the current (I) flowing through it, provided the temperature and other physical conditions are constant,
$V \propto I$ or $V = RI$

$$\frac{V}{I} = R \ (i,e,\ R = \frac{Potential\ \ difference\ (V)}{Current\ (I)} \Rightarrow R = \frac{V}{I})$$

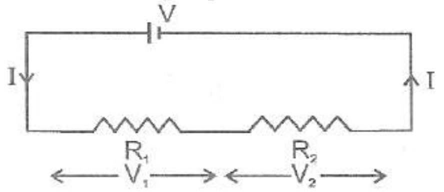
This constant ratio of potential difference to current is known as resistance R.
Resistance is represented in the circuit by using this symbol – .

(b) S.I. Unit of Resistance:
Resistance is measured in a unit called ohm (Ω). A conductor has a resistance of 1 ohm, if a current of 1 ampere flows through it when a potential difference of 1 volt is applied across its ends.
So, 1 ohm = 1 volt/1 ampere

(c) Properties of Resistance:
Resistance of a conductor means the total opposition to the flow of current offered by a conductor. The better the conductor, the lower its resistance. Thus, silver, copper and aluminium wires.

(d) Grouping of Resistance:
Resistance can be grouped in two ways:

(i) Resistances in series:
In figure, the two resistors of resistances R_1 and R_2 are connected in series. The current I is same at all points in the circuit. Potential difference across R_1 is V_1 and R_2 is V_2 then total potential difference $V = V_1 + V_2$

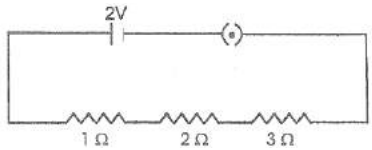


By Ohm's law, $V_1 = IR_1$ and $V_2 = IR_2$
$\therefore\ V = I(R_1 + R_2) = IR$
[R is the equivalent resistance]
Hence, $R = R_1 + R_2$

❖ The equivalent resistance of two or more resistors connected in series is the sum of the individual resistances.
❖ The equivalent resistance is always greater than the resistance of any one of the resistors connected in series.

IIlustrations

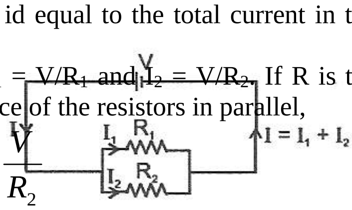
1. In the circuit shown in figure, calculate the equivalent resistance and the current in the circuit.



Sol. Equivalent resistance ® = R1 + R2 +R3 +1Ω + 2Ω + 3Ω = 6 Ω

$$Current\ (I) = \frac{V}{R} = \frac{2}{6} = \frac{1}{3} A$$

(ii) Resistances in parallel:
The resistors in figure are said to be connected in parallel. The potential difference across each parallel branch is same (V). the sum of the current through the different branches id equal to the total current in the circuit, $I = I_1 + I_2$
By Ohm's Law, $I_1 = V/R_1$ and $I_2 = V/R_2$. If R is the equivalent resistance of the resistors in parallel,

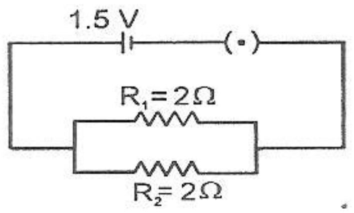


$$than, \frac{V}{R} = \frac{V}{R_1} + \frac{V}{R_2}$$

$$Hence, \frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

The equivalent resistance of resistors in parallel is always less then the resistance of any one of the resistor.

2. In the circuit shown in figure, calculate the equivalent resistance and the total current.



Sol. Let the equivalent resistance be R.

$$\frac{1}{R}=\frac{1}{R_1}+\frac{1}{R_2}=\frac{1}{2}+\frac{1}{2}=1$$

$$\therefore R=1\Omega$$

$$Current\ (I)=\frac{V}{R}=\frac{1.5}{1}=1.5\ A$$

Factors affecting the Resistance of Conductor

Resistance depends upon the following factors:-
(i) Length of the conductor.
(ii) Area of cross-section of the conductor (or thickness of the conductor).
(iii) Nature of the material of the conductor.
(iv) Temperature of the conductor: It increases as the temperature of the conductor increase.

Mathematically: It has been found by experiments that:
(i) The resistance of a given conductor is directly proportional to its length i.e.

$$R\ \alpha\ \ell \quad \text{...........(i)}$$

(ii) the resistance of a given conductor is inversely proportional to its area of cross-section i.e.

$$R\ \alpha\ \frac{1}{A} \quad \text{.............(ii)}$$

From (i) and (ii)

$$R\ \alpha\ \frac{\ell}{A}$$

$$\Rightarrow R=\frac{p\times \ell}{A} \quad \text{.........(iii)}$$

Where p (rho) is a constant known as resistivity of the material of the material of the conductor. Resistivity is also known as specific resistance.

❖ Unit of specific resistance is, ohm × matre (i.e.Ω× m).

Conductivity

Conductivity is the reciprocal of resistivity $\sigma=\frac{1}{p}$ *its unit is* $\frac{1}{ohm\times metre}=\frac{mho}{metre}$ $(i.e.\ mho\times m^{-1})$

Electric Energy

The amount of electric work done is the product of charge and potential difference i.e. W = QV
As Q = I × t
Therefore, the amount of work done is,

W = V × I × t

By substituting V = IR from Ohm's law.

$$W=I^2\ Rt=\frac{v^2}{R}t$$

This shows that the electrical energy dissipated or consumed depends on the product of the square of the current I, resistance R and time t.

❖ Its commercial init is kilowatt – hour (kWh (:
❖ Kilowatt-hour is the energy supplied by a rate of wording of 1000 watts for 1 hour.
❖ 1 kilowatt-hour (kWh) = 3600000 joules = 3.6 × 10^8 J

3. Calculate the cost of electricity of a house in which 7 bulbs of 100 Watt each and 3 fans of 60 Watt each are used for 5 hours a day, for a period of 30 days, if the cost of one unit is Rs. 5.

Sol. Each bulb of 100W consumes 100Watt hour of energy, when used for 1 hour.
7 Bulbs of 100W each when used for 1 hour consume,
7 × 100 = 700 Watt hour or 700 Wh of energy.

Thus, 7 bulbs of 100W each when used for 5 hour for each day consume, 700 × 5 = 3500 Wh or 3.5 KWh.
In this way, we can calculate the total electricity used in 30 days i.e. Total electricity consume, [(7 × 100) + (3 × 60)] × (5 × 30) = (700 + 180) × 5 × 30 = 132000 Wh = 132 KWh.

If the cost of each unit is Rs. 5.0, then the total cost = 132 × 5 = Rs. 660.

Electric Power

The rate at which electric energy is dissipated or consumed, is termed as electric power. The power P is given by.

P= W/t = I^2R

The unit of electric power is watt, which is the power consumed when 1 A of current flows at a potential difference of 1 V.

(i) Unit of power: The S.I. unit of electric power is 'watt' which is denoted by the letter w.

$$1\,Watt=\frac{1\,Joule}{1\,second}$$

A bigger unit of electric power is kilowatt.
1 kilowatt (kW) = 1000 watt.
Power of an agent is also expressed in horse power (hp).
1 hp = 746 watt.

(ii) Formula for calculating electric power:

We know, $Power\ ,P=\frac{Work}{Time}$

and Work, W = V × I × t joule

$$\therefore P=\frac{V\times I\times t}{t}$$

P = V × I

Power P in terms of I and R :

Now from Ohm's law we have, $\frac{V}{I}=R$

V = I × R

∴ P = I × R × I

P = I^2 × R

Power P in terms of V and R:

We know, P = V × I

From Ohm's law, $I = \frac{V}{R}$

$$P = V \times \frac{V}{R}$$

$$P = \frac{V^2}{R}$$

Heating Effect of Current

(i) Heat produced is directly proportional to the square of the current through the conductor i.e. H α I^2

(ii) Heat produced is directly proportional to the resistance of the conductor i.e. H α R

(iii) Heat produced is directly proportional to the time for which the current is passed i.e. H α t

Combining the above three equations we have

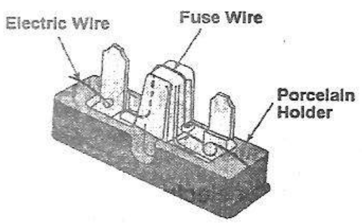
$$H \ \alpha \ I^2 Rt \ \ foule \ or \ H = \frac{I^2 Rt}{J} \ clorie$$

Where J is called Joule's mechanical equivalent of heat and has a value of J = 4.18 J cal^{-1}.

Eg. : (i) Electric heater (ii) Electric Iron

Electric Fuse

Fuse is a thin and short wire made up of an alloy (Lead + Tin) of low melting point and high resistance as compared to that of conductors. When the current exceeds the allowed limit in the circuit, the fuse wire melts due to the heating and the circuit gets disconnected, resulting into zero current in the circuit. Because of this the possibility of the fire or accident is prevented.



Separate fuses are used for different circuits in the houses. Fuse wire is always connected to the phase (live) wire.

Chemical Effect of Current (Electroplating)

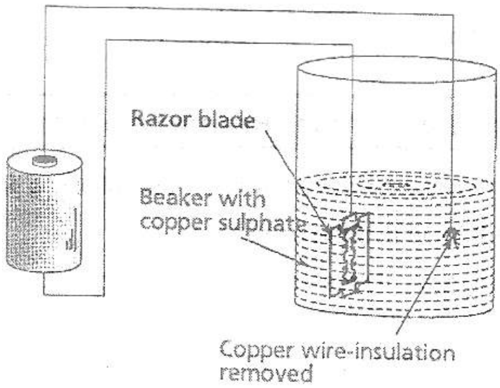
The method of plating one metal object with another metal by means of electricity is called electroplating.

Aim: To plate a stainless steel razor blade with copper.

Materials required: Glass beaker, copper sulphate solution, two pieces of connecting wire (50 cm long). A cell, stainless steel razor blade.

Method: Remove the insulation from the ends of both from the ends of both wires. Tie one end of a wire to the stainless steel razor blade and tape the other bare end to the negative terminal of the cell. Tape one end of the other wire to the positive terminal of the cell and dip its other end into the copper scrub the razor blade lceab and dip it in the solution.

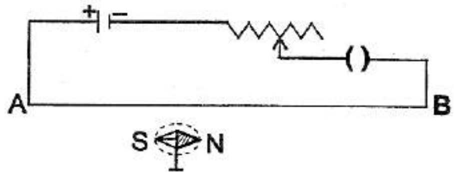
After electricity passes through the circuit for some time, your will find a reddish-brown deposit on the blade. This is the coating of copper. If you continue this for some more time, you will find that your blade is slowly getting plated with copper.



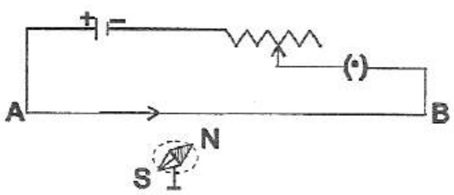
Magnetic Effect of Current

Oersted experiment:

1. When there is no current in the wire A and B magnetic needle shows the direction north and south.



2. When current is flown in wire by closing the key, magnetic needle gets deflected.



❖ By reversing the direction of current, the direction deflection is also reversed.

❖ By increasing the current or bringing the needle near the wire the deflection increases.

Conclusion:

When current flows in the wire a magnetic field around the wire is produced whose direction depends on the direction of current and intensity cepends on the smount of the current.

Conductors, Insulators and Semiconductors

(i) Conductors:

Those substances through which electric charges can flow, are called conductors. All the metals like silver, copper end aluminium etc, are conductors. Carbon, in the form of graphite, is a conductor and the equeous solutions (water solutions) of salts are also conductors. The human body is a fairly good conductor.

- ❖ Resistance of the conductor increases with rise in temperature.
- ❖ Their electrical resistivity is 10^{-8} to 10^{-8} $\Omega \times$ m.

(ii) Insulators:

The material in which there is no flow of current are called insulators.

- ❖ The number of free electron is negligible in them.
- ❖ Their electrical resistivity is 10^{9} to 10^{14} $\Omega \times$ m.

(ii) Semiconductors:

The materials whose electrical conductivity lies between conductors and insulators are called semiconductors.

- ❖ Their electrical resistivity is 10-1 to 10-4 $\Omega \times$ m.
- ❖ Their conductivity increases with rise in temperature. For example Ge, Si etc.
- ❖ Resistance of the semiconductor decreases with rise in temperature.

Electrical Cells

Electrical cells are the sources of electric current. Electrical cells are of two types primary and secondary. Voltaic, Daniel, dry, button and Alkaline cells are examples of primary cells, while Edison cell, lead-acid accumulator, Ni-Ck cell are examples of secondary cells.

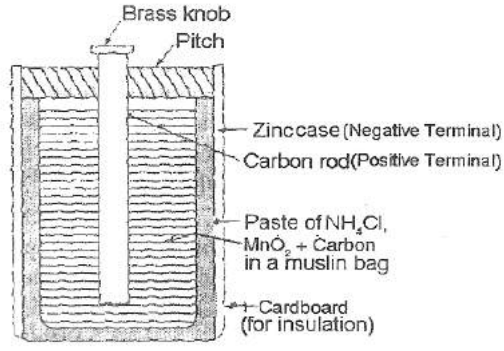
(a) Primary Cells:

The cells which cannot be recharged when exhausted are known as primary cells.

(i) Dry Cell:

The outer case of the cell is made of zinc. The cylindrical side is covered with thick cardboard or paper, while the bottom which is the negative terminal is bare. Inside the zinc container, is a moist paste of ammonium chloride. A carbon rod is placed at the centre of the zinc container with a brass knob protruding out at the top.

This is the positive terminal of the cell. The rod is surrounded by a closely packed mixture of graphite and manganese dioxide in a muslin bag. The top is sealed with lacquer to avoid evaporation of moisture, but leaving a small hole for the escape of ammonia gas.



A dry cell

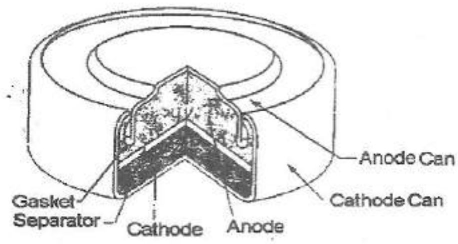
The strength of a fresh dry cell is 1.5 V. Cells of this kind which become useless once the chemicals inside them are used up are known as primary cells.

(ii) Button cell :

The tiny, flat dry cells that are used in watches and calculators are called button cells they are compact and have long life.

- ❖ Its examples are mercury cells, silver oxide cells, lithium cells and alkaline cells. A mercury oxide cell has mercury oxide as the cathode and zinc as anode. In a silver oxide cell, silver oxide is the cathode and zinc is the anode. A typical button cell is shown in figure below. The cell top, called the anode can, is the positive terminal while the cell bottom called the cathode can, is the negative terminal. These are separated by a porous material called a separator. An insulator provides proper insulation between the anode and cathode.

These cells are used in watches, calculators, hearing aids etc.

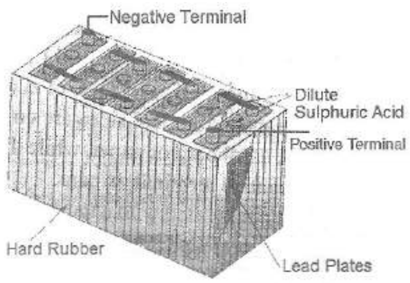


Button cell

(b) Secondary Cell:

Lead accumulator (Reusable and rechargeable cell):

Some cells can be reused by recharging them from an external electrical source. Such cells are called secondary cells, Storage cells or accumulators. A secondary cell is one which consists of a vessel made of hard rubber, glass or celluloid, containing dilute sulphuric acid. Two lead grids are immersed in it, one containing lead dioxide (positive terminal) after charging. Six such storage cells connected in series makes up your motor car battery. Each cell has a strength of about 2V, together they make up 12V. After the cell is used up, it can be recharged and reused.



Reusable and rechargeable Cells

Solar cell

The first practical solar cell was produced in 1954. It could convert about 0.1%solar energy into electrical energy. With the advancement in the field of semi-conductors, the solar cells made from these semi-conductor can convert 10% to 15% of solar energy into electricity.

These days, solar cells are usually made from semi-conductor materials like silicon and gallium. Semi-conductors are the substances which have very low electrical conductivity. Ordinarily, semi-conductors do not allow current.

EXERCISE

1. An electric current of 5 A is the same as:
(A) 5 JC^{-1} (B) 5VC^{-1}
(C) 5 Cs^{-1} (D) 5 Ws^{-1}

2. Which of the following relation is wrong?
(A) Q = It
(B) $1\, ampere = \frac{1\, Coulomb}{1\, Second}$
(C) V = WQ
(D) $V = \frac{W}{Q}$

3. If a charged body attracts another body, the charge on the other body:
(A) must be negative or zero
(B) must be positive
(C) must be zero
(D) may be positive, negative or zero

4. Green wire is used for:
(A) Live wire (B) neutral wire
(C) earth wire (D) none of these

5. If the length of a resistance wire is doubled and radius is reduced to half, then the specific resistance of the wire as compared to previous value will be:
(A) four times (B) eight times
(C) half (D) unchanged

6. A man has five resistors each of value $\frac{1}{5}\Omega$. What is the maximum resistance he can obtain by connecting them?
(A) 1Ω (B) 5 Ω
(C) $\frac{1}{2}\Omega$ (D) $\frac{2}{5}\Omega$

7. Two copper wires, one of length 1m and the other of length 9 m, are found to have the same resistance. Their diameters are in the ratio :
(A) 3:1 (B) 1:9
(C) 9:1 (D) 1:3

8. A wire of resistance 6 Ω is cut into three equal pieces, which are joined to form a triangle. The equivalent resistance between any two comers of the triangle is :
(A) $\frac{4}{3}\Omega$ (B) $\frac{3}{4}\Omega$
(C) 2 Ω (D) 3 Ω

9. In an electric circuit, ammeter and voltmeter are always connected in :
(A) parallel, series (B) series, parallel
(C) series, series (D) parallel, parallel

10. How many electrons in one second constitute a current of one micro ampere?
(A) 6.25×10^{8} (B) 6.25×10^{12}
(C) 6.25×10^{9} (D) 6.25×10^{15}

11. The unit of electric power is :
(A) Watt (W) (B) Ampere (A)
(C) Joule (J) (D) Ohm (Ω)

12. kWh is a unit of :
(A) Resistance (B) Power
(C) electrical energy (D) None

13. Which is correct for electric power :
(A) $P = \frac{v}{1}$ (B) P= I^2R
(C) $P = \frac{I^2}{R}$ (D) P = V^2R

14. How many calories of heat will approximately be developed in a 210 W electric bulb in 5 min?
(A) 1500 (B) 1050
(C) 63.000 (D) 80,000

15. Lows of heating are given by :
(A) Joule (B) Ohm
(C) Maxwell (D) Faraday

16. How much electrical energy in kilowatt hour is consumed in operating ten, 50 watt bulbs for 10 hours per day in a month of june ?
(A) 15 (B) 150
(C) 1500 (D) 15000

17. The maximum current that can be allowed to pass through 100 W – 250 V lamp is :
(A) 2.5 amp (B) 1.00 amp
(C) 0.40 amp (D) 0.25 amp

18. Dry cell is modification of :
(A) Voltaic cell (B) Daniel cell
(C) Leclanche cell (D) None of them

19. First electric cell was :
(A) Dry cell (B) Voltaic
(C) Daniel cell (D) Leclanche cell

20. Container in which electrolysis oceur is :
(A) Voltmeter (B) Voltmeter
(C) both (A) and (B) (D) neither (A) nor (B)

21. During electrolysis cations loose their charge:
(A) at cathode (B) at anode
(C) either (A) or (B) (D)neither (A) nor (B)

22. electroplating is a method of :
(A) making plates using electricity
(B) plating a metal with another metal
(C) coating any object with an electrically conducting plate
(D) coating a metal with another metal by passing an electric current

23. A current of 2A passing through conductor produces 80J of heat in 10 s. The resistance of the conductor is:
(A) 0.5 Ω (B) 2 Ω
(C) 5 Ω (D) 20 Ω

24. From a power station, the power is transmitted at a very high voltage because :
(A) it is generated only at high voltage
(B) it is cheaper to produce electricity at high voltage
(C) electricity at high voltage is less dangerous
(D) there is less loss of energy in transmission at high voltage

25. When a fuse is rated 8A, it means :
(A) it will not work if current is less than 8A
(B) it has a resistance of 8 ohm
(C) it will work only if current is 8A
(D) it will burn if current exceeds 8A

26. Fuse wire is made of:
(A) platinum (B) copper
(C) aluminium (D) alloy of tin and lead

27. The unit for electric conductivity
(A) ohm per cm (B) ohm × cm
(C) ohm per second (D) mho × m-1

28. Gases are good conductors of electricity at :
(A) high pressure (B) low pressure
(C) low temperature (D) high temperature

29. The specific resistance of a wore maries with its:
(A) Length (B) Cross-section
(C) Mass (D) Material

30. The variable resistance is called :
(A) resistor (B) rheistat
(C) open switch (D) none of these

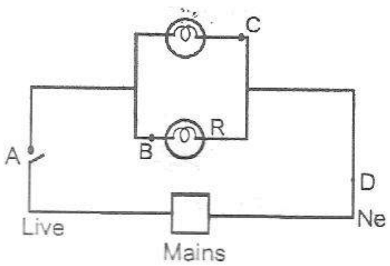
31. An electric bulb is connected in an electric circuit, If 10 C charge flows through this bulb in 5 seconds, current flowing in bulb will be :
(A) 2 Ampere (B) 3 Ampere
(C) 4 Ampere (D) 5 Ampere

32. 40W, 60W, 100w and 500W bulbs working on 220 Volt AC are connected in the electric circuit in such a way that same current flows through each bulb. The bulb having maximum resistance is
(A) 500W (B) 100W
(C) 60W (D) 40W

33. Three resistance of value 1Ω, 2 Ω and 3 Ω are connected in parallel. If the effective resistance of the circuit has to be 1 Ω, the value of the resistance to be connected in series to this circuit should be:
(A) $\frac{6}{11}\Omega$ (B) $\frac{5}{11}\Omega$
(C) $\frac{4}{11}\Omega$ (D) $\frac{3}{11}\Omega$

34. In a dry electric cell :
(A) chemical energy is converted into light energy
(B) chemical energy is converted onto electrical energy
(C) chemical energy is converted onto thermal energy
(D) thermal energy is converted into electrical energy

35. In the given electric circuit, at which place safety fuse should be fixed ?



(A) A (B) B
(C) C (D) D

36. Match the items given in Column I with those in Column II.

Column-I	**Column-II**
I. Electric bulb	A. Magnetic effect of current
II. Electric generator	B. Heating effect of current
III. Electro magnet	C. Chemical effect of current
VI. Button cell	D. Electromagnetic induction

Which of the following matching is correct ?
(A) I, D (B) II, C
(C) III, A (D) IV, B

ANSWER – KEY

ELECTRICITY

Q.	1	2	3	4	5	6	7	8	9	10
A.	C	C	D	C	D	A	D	A	B	B
Q.	11	12	13	14	15	16	17	18	19	20
A.	A	C	B	A	A	B	C	C	B	B
Q.	21	22	23	24	25	26	27	28	29	30
A.	A	D	B	D	D	D	D	B	D	B
Q.	31	32	33	34	35	36				
A.	A	D	B	B	A	C				