

**Exercise A**

**1. Name one d.c. source and one a.c. source.**

Ans. d.c. source: cell, a.c. source: mains.

**2. Distinguish between d.c. and a.c.**

Direct current (D.C.) is a current of constant magnitude flowing in one direction but alternating current (A.C.) is a current which reverses its magnitude and direction with time.

**3. What is an electric cell?**

The sources of direct current are the cells. In a cell, the chemical energy changes into the electrical energy when it sends current in a circuit. A cell basically consists of two conducting rods, which are called the electrodes. These electrodes are immersed in a solution kept in a vessel. The solution is called the electrolyte.

**4. What transformation of energy takes place when current is drawn from a cell?**

Ans. Chemical energy changes to electrical energy.

**5. Name the constituents of a cell.**

Two electrodes and an electrolyte in a vessel.

**6. State the two kinds of cell. Give one example of each.**

(1) The primary cells. Example – simple voltaic cell, Leclanche cell, Danielcell, dry cell, etc.

(2) The secondary cells or accumulators, Examples – Lead (or acid) accumulator and Ni-Fe (or alkali) accumulator.

**7. What is a primary cell? Name two such cells.**

These are the cells which provide current as a result of chemical reaction. In these cells, the chemical reaction is irreversible so they are discarded after use when the entire chemical energy in them has converted into the electrical energy. Examples – simple voltaic cell, Leclanche cell, Danielcell, dry cell.

**8. What is a secondary cell? Name one such cell**

These cells also provide current as a result of chemical reaction but they can be recharged after use because in these cells, the chemical reaction is reversible. After taking the electrolyte and electrodes in a vessel, the cell is first charged. During charging the electrical energy changes into the chemical energy. Examples are lead (or acid) accumulator and Ni-Fe (or alkali) accumulator.

**9. Distinguish between the primary and secondary cells.**

Primary cells		Secondary cells	
1	The chemical reaction is irreversible.	1	The chemical reaction is reversible.

2	Only the chemical energy is converted into the electrical energy when current is drawn from it	2	The electrical energy converts into the chemical energy when current is passed in it during charging, while the chemical energy converts , into the electrical energy when current is drawn from it during discharging
3	It cannot be recharged.	3	It can be recharged.
4	Its internal resistance is high.	4	Its internal resistance is low.
5	Only weak current can be drawn.	5	A heavy current can be drawn.
6	It is light and cheap.	6	It is heavy and costly.
7	Example – simple voltaic cell, Leclanche cell, Danielcell, dry cell, etc.	7	Examples – Lead (or acid) accumulator and Ni-Fe (or alkali) accumulator.

**10. What do you understand by the term current? State and define its S.I. unit.**

The current in a conductor is the rate of flow of charge across the cross-section of that conductor, the cross-section being normal to the direction of flow of current.

OR

The flow of electrons (i.e. a charge in motion) constitutes an electric current. The rate of flow of charge gives the magnitude of electric current.

The S.I. unit of current is coulomb per second which is called the ampere.

**11. How much is the charge on an electron?**

–  $1.6 \times 10^{-19}$  coulomb.

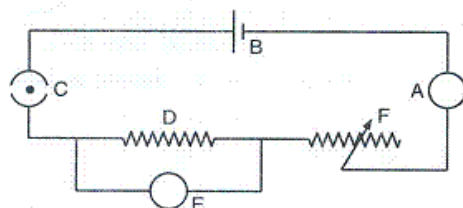
**12. n electrons flow through a cross section of a conductor in time t. If charge on an electron is e, write an expression for the current in the conductor.**

Ans.  $ne / t$

**13. Name the instrument used to control current in an electric circuit.**

Rheostat

**14. In the electric circuit shown in Fig. 15.16, label the different parts A, B, C, D, E and F. State the function of each part. Show in the diagram the direction of flow of current.**



Answer:

A: Ammeter - It measures the current flowing through the circuit.

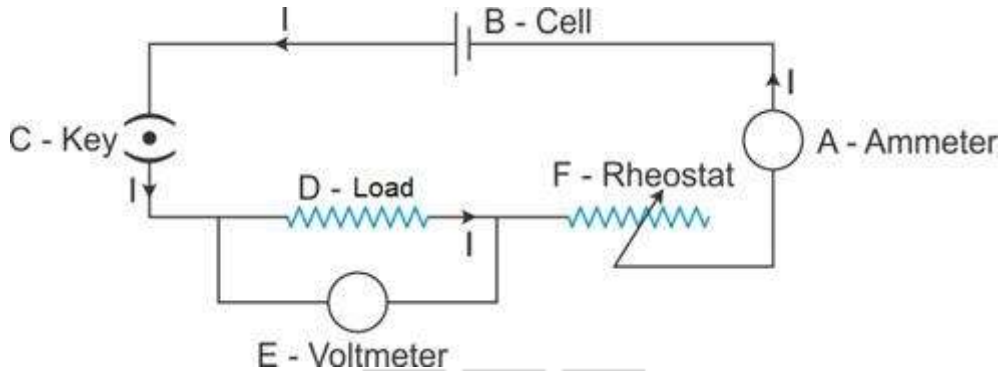
B: Cell - It acts as a source of direct current for the circuit.

C: Key - It is used to put the current on and off in the circuit.

D: Load - It is an appliance connected in a circuit. It may just be a resistance (e.g., bulb) or a combination of different electrical components.

E: Voltmeter - It is used to measure the potential difference between two points of a circuit.

F: Rheostat - It is used to control the current in the circuit.



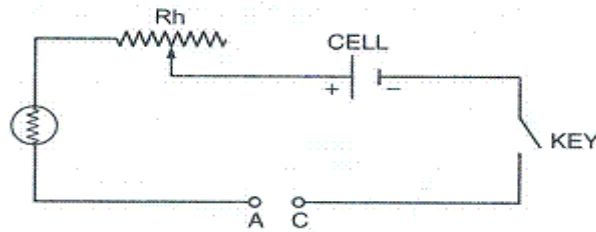
15. What is the function of a key (or switch) in an electric circuit?

Ans To put on or off current in a circuit

16. Write symbols and state functions of each of following components in an electric circuit: (i) key, (ii) cell, (iii) rheostat, (iv) ammeter, and (v) voltmeter.

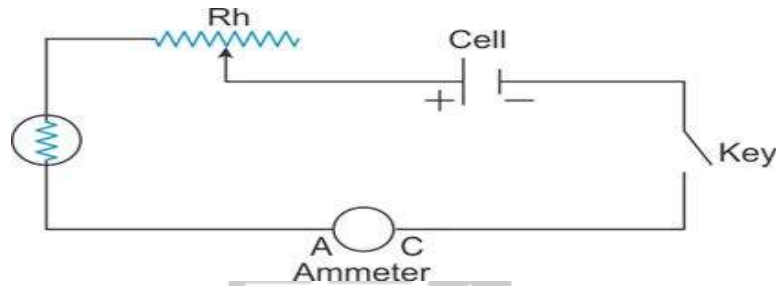
No.	Component	Function	Symbol
1	Key	It is used to put the current on and off in the circuit	
2	Cell	It provide electric current in circuit	
3	Rheostat	It is a continuous resistance varying device used to change the magnitude of current in a circuit by changing the length of the resistance wire inserted into the circuit	
4	Ammeter	An ammeter is an instrument used to measure	
5	Voltmeter	It is used to measure the potential difference between the two points of a circuit. It is connected across the two points between which potential is to be measured	

17. Complete the circuit given in Fig. by inserting between the terminals A and C, an ammeter. In the diagram mark the polarity at the terminals of ammeter and indicate clearly the direction of flow of current in the circuit, when the circuit is complete. Name and state the purpose of  $R_h$  in the circuit

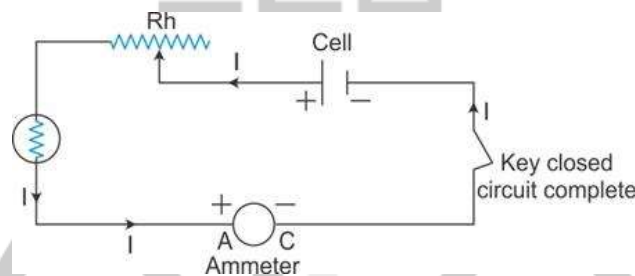


Answer:

(a)



(b)



(c) A rheostat is used to control the current in the circuit.

**18. What are conductors and insulators of electricity? Give two examples of each.**

**Conductors:** The substances which allow the current to flow through them easily, are called the conductors. They have a large number of free electrons and they offer a very small resistance in the path of current. All metals such as copper, aluminium, silver, iron, brass and steel are conductors.

**Insulators:** The substances which do not allow the current to flow through them, are called the insulators. They do not have free electrons and they offer a very high resistance in the path of current. Some examples of insulators are cotton, rubber, plastic, wood, paper, glass, leather, pure water etc.

**19. Select conductors of electricity from the following: Copper wire, silk thread, pure water, acidulated water, human body, glass.**

Copper wire, acidulated water and human body.

**20. State two difference between a conductor and an insulator of electricity.**

Conductor		Insulator	
1	The substances which allow the current to flow through them easily, are called the conductors.	1	The substances which do not allow the current to flow through them, are called the insulators.

2	They have a large number of free electrons and they offer a very small resistance in the path of current.	2	They do not have free electrons and they offer a very high resistance in the path of current.
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**21. Distinguish between a closed circuit and an open circuit.**

The path along which the current flows, is called a circuit. The current flows only if the circuit is complete (or closed). If the circuit is open (or incomplete), the current does not flow

For an electric circuit to be complete, every part of it must be made of conductors. If there is an insulator in the path or the circuit is broken, the circuit is incomplete (or open) and current will not flow through it.

**22. What is the condition required for a circuit to be a closed circuit?**

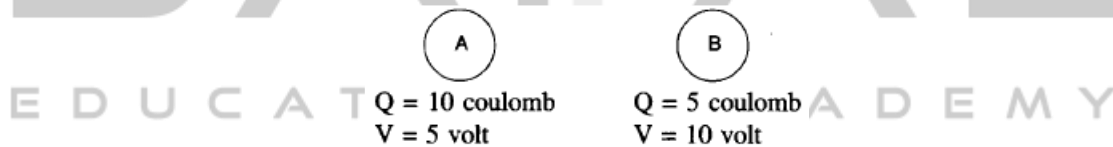
For an electric circuit to be complete or closed, every part of it must be made of conductors.

**23. Multiple choice**

- (1) A cell is used to provide current in a circuit
- (2) The unit of current is ampere
- (3) An ammetre is connected in a circuit in series
- (4) The insulator is silk

**Exercise B**

**1. Fig. below shows two conductors A and B. Their charges and potentials are given in diagram.**



**State the direction of**

- (1) flow of electrons, and**

A to B

- (2) flow of current, when the two conductors are joined by a metal wire**

B to A

**2. How is the direction of flow of current between the two charged conductors determined by their potentials?**

Ans. Current flows from high potential to low potential

**3. Explain the concept of electric potential difference in terms of work done in transferring the charge.**

The potential difference between two conductors is equal to the work done in transferring a unit positive charge from one conductor to the other conductor through the metallic wire.

**4. Define the term potential difference?**

The potential difference between two points is said to be 1 volt if the work done in transferring 1 coulomb of charge from one point to the other point is 1 joule.

**5. State and define the S.I. unit of potential difference.**

$$\text{From relation } V = \frac{W}{q},$$

$$\text{Unit of potential difference} = \frac{\text{Unit of work}}{\text{Unit of charge}}$$

The S.I. unit of work is joule (J) and that of charge is coulomb (C), so the potential difference is measured in joule per coulomb which is named as volt

**6. 'The potential difference between two conductors is 1 volt'. Explain the meaning of this statement.**

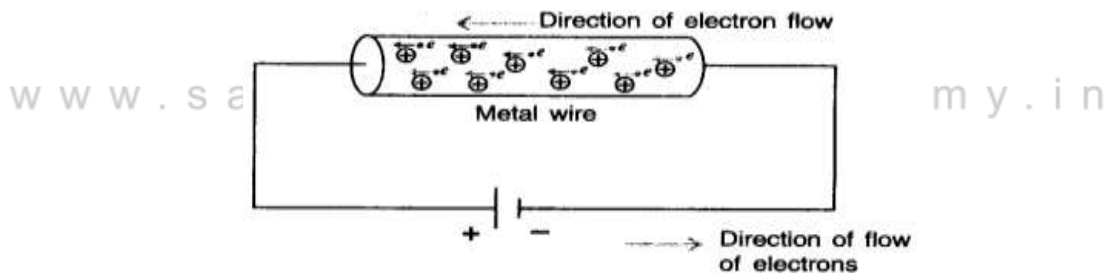
1 joule work done by transferring 1 coulomb of charge from one point to the other point is said to be 1 volt.

**7. What do you understand by the term resistance?**

The obstruction offered to the flow of current by the filament or wire is called its electrical resistance.

**8. Explain why does a metal wire when connected to a cell offer resistance to the flow of current.**

The flow of current in a wire is due to the drift of electrons through it. The metal wire has free electrons which move in a random manner in absence of any cell connected across it. When the ends of a metal wire are connected to a cell, the electrons start moving from the negative terminal of the cell to its positive terminal through the metal wire. During their movement, they collide with the fixed positive ions of the wire due to which they lose their speed and change the direction of motion. But after the collision, electrons again accelerate towards the positive terminal. They suffer collisions with the positive ions again and again. As a result, the electrons do not move in bulk with an increasing speed, but they drift towards the positive terminal. Thus the metal wire offers some resistance to the flow of electrons (or current) through it.



**9. State and define the S.I. unit of resistance.**

The S.I. unit of resistance is 'ohm' (volt per ampere).

The resistance of a conductor is said to be 1 ohm if a current of 1 ampere flows through it when the potential difference across it is 1 volt.

**10. State Ohm's law.**

Ohm's law states that the electric current flowing through a metallic wire is directly proportional to the potential difference  $V$  across its ends provided its temperature remains the same.

**11. How are the potential difference ( $V$ ), current ( $I$ ) and resistance ( $R$ ) related?**

$$V = IR$$

**12. The resistance of a wire is 1 ohm'. Explain the meaning of this statement.**

The resistance of a conductor is said to be 1 ohm if a current of 1 ampere flow through it when the potential difference across it is 1 volt

**13. How is the current flowing in a conductor changed if the resistance of conductor is doubled keeping the potential difference across it the same?**

Halved

**14. State three factors on which the resistance of a wire depends. Explain how does the resistance depend on the factors stated by you.**

The resistance of a wire depends on the following four factors:

(1) The material of wire – Good conductors of electricity having higher concentration of free electrons such as metals, offer less resistance.

(2) The length of wire – A longer wire offers more resistance (Resistance  $\propto$  length).

(3) The area of the cross section of the wire –

(4) A thicker wire offers less resistance (Resistance  $\propto$  1/area of cross section).

(5) The temperature of the wire – The resistance of the metallic wire increases with the increase in temperature,

**15. How is the resistance of a wire affected if its (a) length is doubled, (b) radius is doubled?**

Ans. (a) becomes twice (b) becomes one-fourth.

**16. State whether the resistance of filament of a bulb will decrease, remain unchanged or increase when it glows.**

The temperature of the filament increases when it glows. So, when the temperature of the wire (bulb filament) increases, ions in it vibrate violently. As a result, the number of collisions increases and hence the resistance increases.

**17. Name the physical quantities of which the units are (i) volt, (ii) coulomb, (iii) ohm, (iv) ampere.**

Ans. (i) Potential difference (ii) charge (iii) resistance, (iv) current

**18. A bulb is connected to a cell. How is the resistance of circuit affected if another identical bulb is connected (i) in series, (ii) in parallel, with the first bulb?**

Ans. (i) Resistance is doubled (ii) Resistance is halved.

**19. Multiple Choice**

(1) Current in a circuit flows: Ans. (a) in direction from high potential to low potential

(2) The correct relation is, 1 J = \_\_\_\_\_ x 1 V (1 C)

(3) On increasing resistance in a circuit, current in it: Ans. (a) decreases

**Exercise C**

**1. What is meant by efficient use of energy?**

Efficient use of energy means to reduce cost and amount of energy to be used to provide us the various products and services.

**2. State two ways to save the energy.**

Two ways to save energy:

- (1) Instead of fossil fuels, other renewable sources of energy such as the biogas prepared from animal dung should be used.
- (2) The use of hydroelectric energy, wind energy etc. should be given priority

**3. How does proper insulation of home save energy?**

By properly insulating a home, it is possible to maintain a comfortable temperature inside. It will reduce the cost of heating devices in winter and cooling devices in summer.

**4. Which of the following devices is most efficient for lighting purpose: LED, CFL, Fluorescent tube light, Electric bulb**

LED or light emitting diodes are most efficient for lighting purposes.

**5. Give an example to explain that the use of modern eco-friendly technologies is more efficient and less polluting.**

Modern appliances like refrigerators make use of significantly less energy than older appliances as they have star rating according to their efficient use of electricity. Higher the star rating, higher is the efficiency.

**6. Describe three ways for the efficient use of energy.**

Three ways to use energy efficiently:

- (1) The use of compact fluorescent lights (CFL) saves 67% energy and may last 6 to 10 times longer than the incandescent lamps.
- (2) The use of advanced boilers and furnaces in industry can save sufficient amount of energy in attaining high temperatures while burning less fuel. Such technologies are more efficient and less polluting.
- (3) The fuel efficiency in the vehicles can be increased by reducing the weight of the vehicle, using the advanced tyres and computer controlled engines

**7. What social initiatives must be taken for the sensitive use of energy?**

The following social initiatives need to be taken:

- (1) Public awareness can be improved through mass-media and children's participation in campaigns and eco-club activities.
- (2) Community involvement need to be done to reduce the misuse of electricity.
- (3) NGO's can be used to create social awareness of the sensitive use of resources

**8. Multiple choice type:**

- (1) The most non-polluting and efficient lighting device is LED.
- (2) IEA is short form of International Energy Agency.