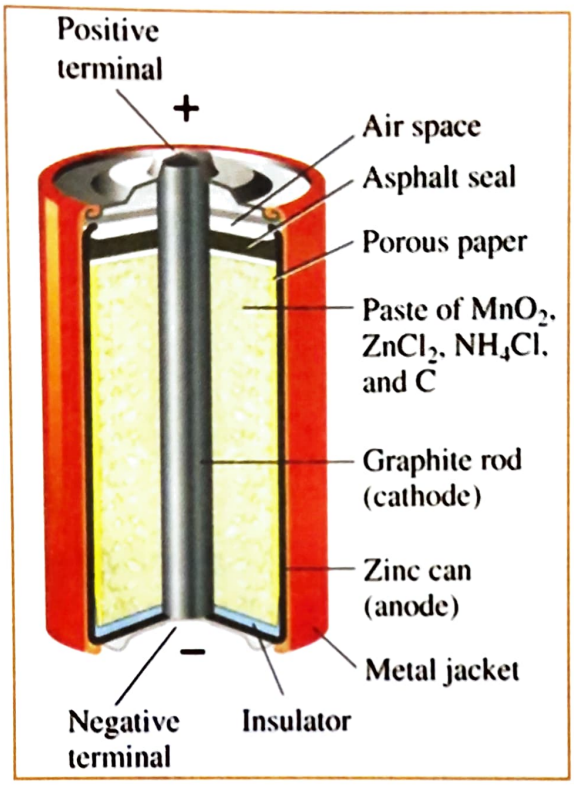
3 ELECTRIC CURRENT AND ITS EFFECTS

WISE UP

- Electricity is the form of energy which can be produced by electric cells, batteries etc.
- All electric cells have two terminals one positive terminal and one negative terminal.
- An electric cell produces electricity with the help of chemicals stored inside it.
- When the chemicals in electric cell are used up, the electric cell stops working.



- An electric cell provides electricity to clocks, pocket radios, and cameras.

- The thin coil that gives off light in electric bulb is called a filament.
- The bulb glows only when current flows through the circuit.
- The continuous path for the flow of electricity is called electric current.
- In electric circuit, the direction of current is taken as from the positive to negative terminal.

- A fused bulb does not glow up that is no current pass through filament.
- A bulb does not glow even if it is connected to the cell, as the bulb is fused.
- A switch is an electric device that is used to break a circuit (or) complete a circuit.
- Materials that allow electric current to pass through them are called conductors.

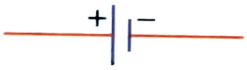
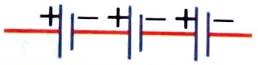
  Ex : Silver, Gold, Copper, Steel, etc.,
- Materials that do not allow electric current to pass through them are called insulators.

  Ex : Rubber, Glass, Dry wood, etc.,
- Our bodies are good conductors of electricity.

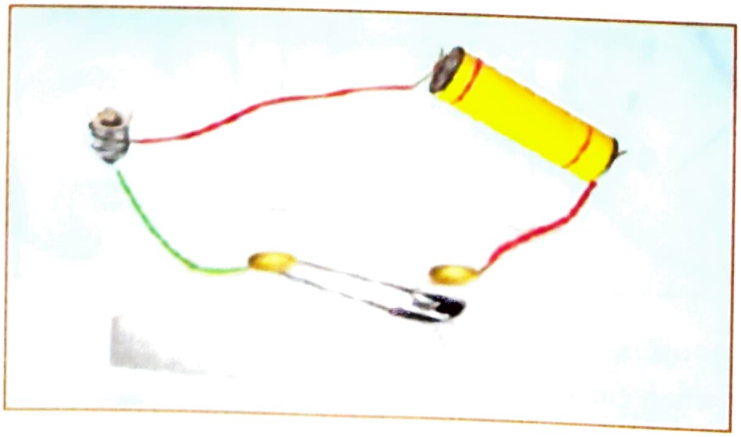
NCERT TEXTUAL QUESTIONS

1. Draw in your note book the symbols to represent the following components of electrical circuits connecting wires, switch in the "OFF" position, bulb, cell, switch in the "ON" position and battery.

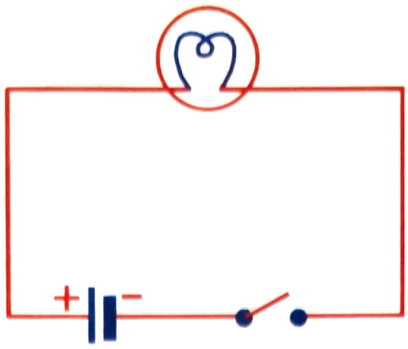
A.

Connecting wire	
Switch in "OFF" position	
Electric bulb	
Electric cell	
Switch in "ON" position	
Battery	

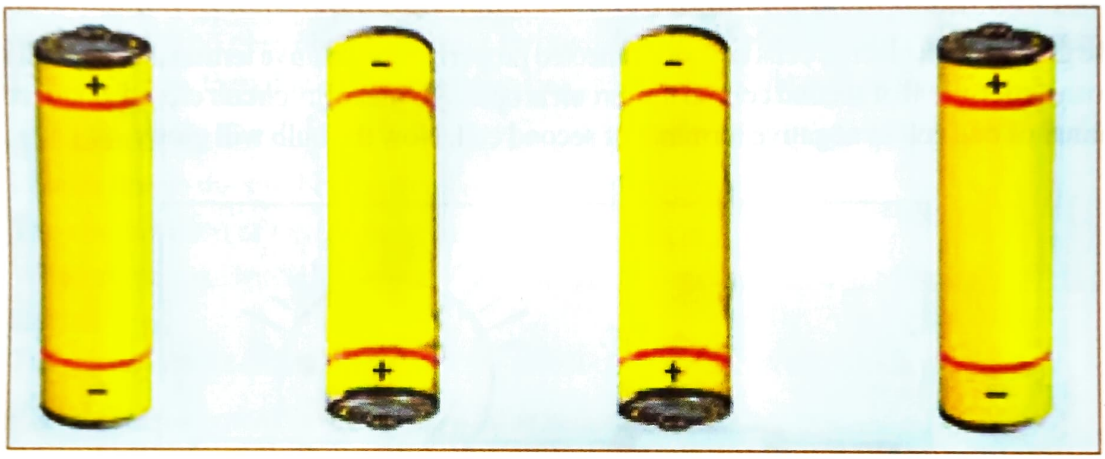
2. Draw the circuit diagram to represent the circuit shown below.



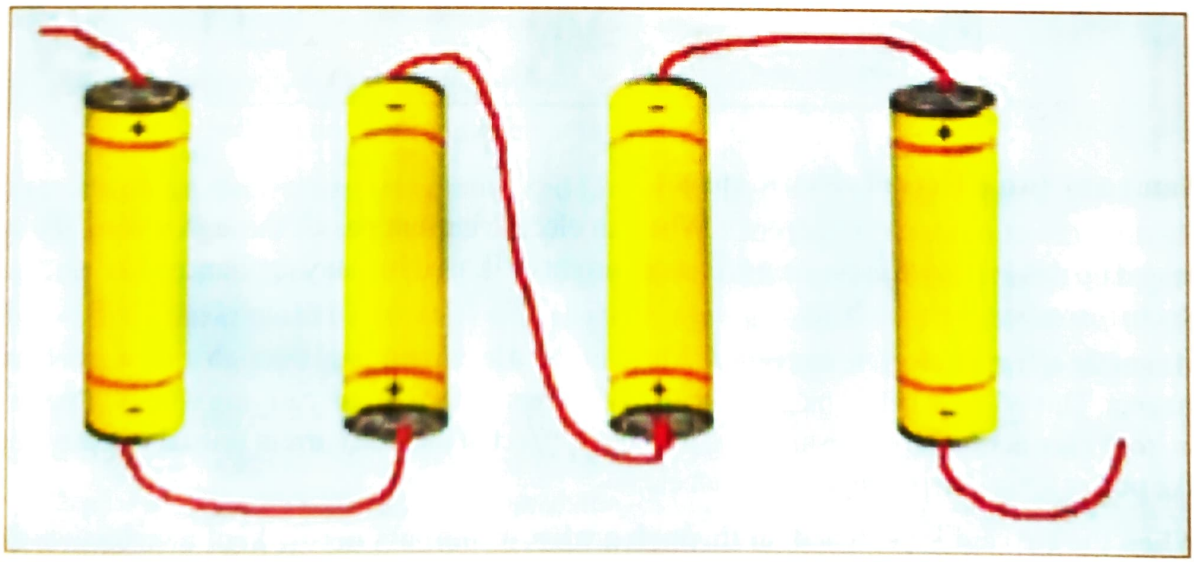
A. The circuit diagram is showing the switch in "OFF" position.



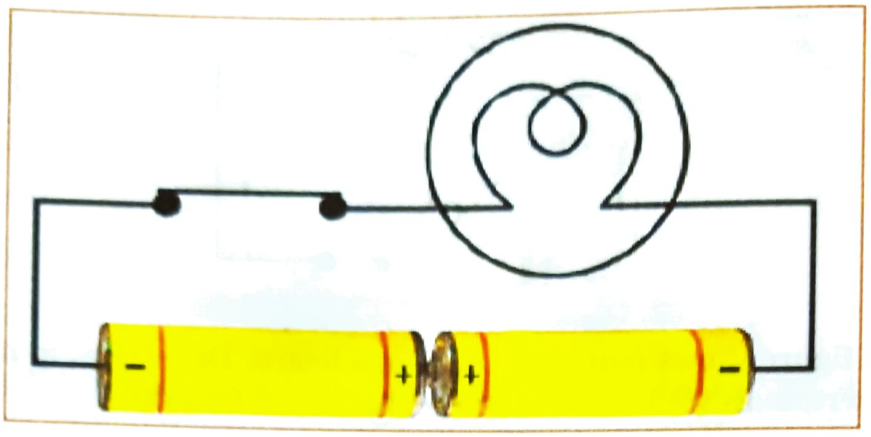
3. The following figure shows four cells fixed on a board. Draw lines to indicate how you will connect their terminals with wires to make a battery of four cells.



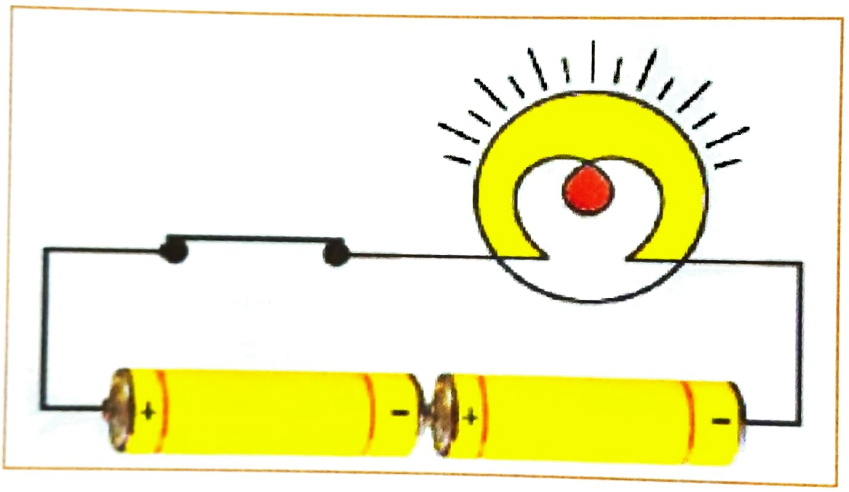
A. To obtain a maximum voltage, cells are connected in series i.e negative (–) end of one cell is connected to positive (+) end of another cell so on.



4. The bulb in the circuit shown in figure does not glow. Can you identify the problem ? Make necessary changes in the circuit to make bulb glow.



A. In the given circuit electric cells are not connected properly. The positive terminal of one cell is connected to positive terminal of second cell, so the circuit is open. To make the circuit closed, connect the positive terminal of one cell to negative terminal of second cell. Now the bulb will glow.



5. Name any two effects of electric curent ?

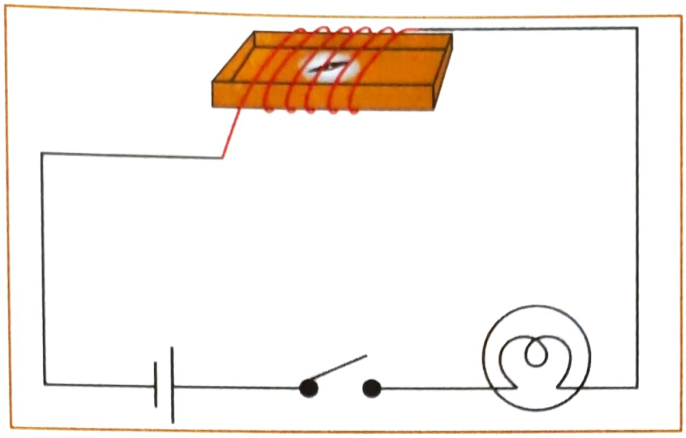
A. **Heating effect of electric current :** When an electric current passes through a wire, the wire gets heated up this is known as heating effect of current. It is used in many appliances like electric heater, electric iron box, light bulb etc.

Magnetic effect of electric current : When an electric current pass through a wire it behaves like a magnet. This effect is called magnetic effect of current. If the current carrying wire is wrapped around an iron piece acts as an electromagnet. Magnetic effect of electric current is used in many appliances like power lift, electric bell, electric fan etc.

6. When the current is switched on through a wire, a compass needle kept nearby gets deflected from its north - south position. Explain?

A. The current carrying wire produces magnetic field around it. It causes deflection of magnetic needle. When the current is switched off, there is no magnetic field produced by the wire, so magnetic needle comes to its original north - south direction.

7. **Will the compass needle show deflection when the switch in the circuit shown in figure is closed?**



A. No the compass needle should not show any deflection even though the switch is closed, because in the given circuit there is no source of electric current. The source of electric current like cell (or) battery is necessary to pass electric current through circuit. If electric current is pass through wire around the compass, then due to the magnetic field compass needle will deflect.

8. **Fill in the blanks :**

a) Longer line in the symbol for a cell represents its positive terminal.

b) The combination of two or more cells is called a battery.

c) When current is switched 'ON' in a room heater, it becomes hot due to heating effect of electric current.

d) The safety device based on the heating effect of electric current is called a fuse.

9. **Make 'T' if the statement is true and 'F' if it is false :**

a) To make a battery of two cells, the negative terminal of one cell is connected to the negative terminal of the other cell [F]

b) When the electric current through the fuse exceeds a certain limit, the fuse wire melts and breaks. [T]

c) An electromagnet does not attract a piece of iron. [F]

d) An electric bell has an electromagnet. [T]

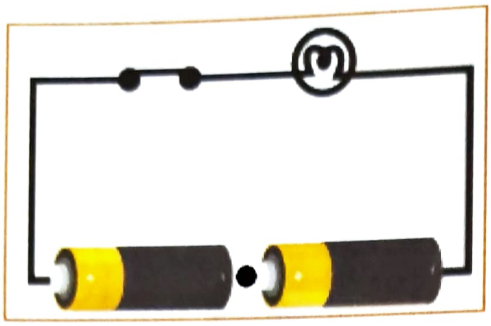
10. **Do you think an electromagnet can be used for separating plastic bags from a garbage heap ? explain ?**

A. No, electromagnet cannot be used to separate plastic bags from garbage heap because it can attract only magnetic materials like iron, steel etc., plastic is non magnetic material, so it is not attracted by electromagnet.

11. **An electrician is carrying out some repairs in your house. He wants to replace a fuse by a piece of wire would you agree ? Give reasons for your response ?**

A. No, A fuse is a safety device which prevents damages to electrical circuit and possible fires.They are made of special material which melt quickly and break when large electric currents are passed through them. If the electrician uses any ordinary electric wire as fuse, it increases the risk of overheating of wires due to the flow of excessive current. It may lead to short circuit in electric equipments and these appliances may catch fire. So it is advised to use standard fuse wire of MCBs carrying ISI mark.

12. Zubeda made an electric circuit using a cell holder, a switch and a bulb when she put the switch in the 'ON' position, the bulb did not glow. Help Zubeda in identifying the possible defects in circuit.



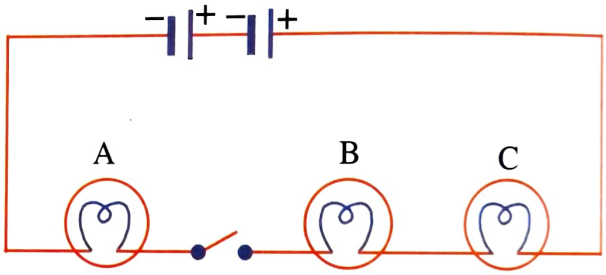
A. Following can be possible reasons

1) The bulb may be fused due to broken element (or) filament
2) Cells are not connected properly i.e + ve terminal of first cell should be connected to – ve terminal of second cell
3) There may be loose connections i.e., wire is not connected properly to switch or to the bulb
4) The switch is not functioning well
5) The cells are dried up

13. In the circuit shown in figure.

i) Would any of the bulb glow when the switch is in 'OFF' position ?

ii) What will be the order in which the bulbs A,B and C will glow when the switch is moved to the 'ON' position ?



A. i) None of the bulb will glow when the switch is in the 'OFF' position, since the electric circuit is not closed

ii) When the switch is moved to "ON" position, circuit is complete and electric current will flow immediately. All of the bulbs will glow instantly.

ADDITIONAL QUESTIONS

VERY SHORT ANSWER QUESTIONS

1. What is a filament ?

A. The thin wire which gives light in the bulb is called the filament.

2. Why should we look for the ISI mark before buying electrical appliance ?

A. Before buying any electrical appliance, we have to look for ISI mark to ensure the appliance is safe and wastage of energy is minimum.

3. Name the scientist who discovered MCB (Miniature Circuit Breaker) ?

A. Hans christian oersted.

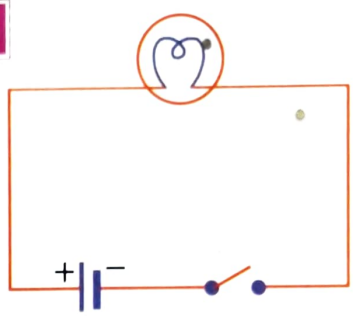
4. Does a wire behave like a magnet ?

A. Yes, when electric current passes through the wire, it behaves like a magnet.

5. **Why do we use fuse ?**

A. It is a safety device used to avoid damages from short circuits and over loading in electrical appliances.

SHORT ANSWER QUESTIONS

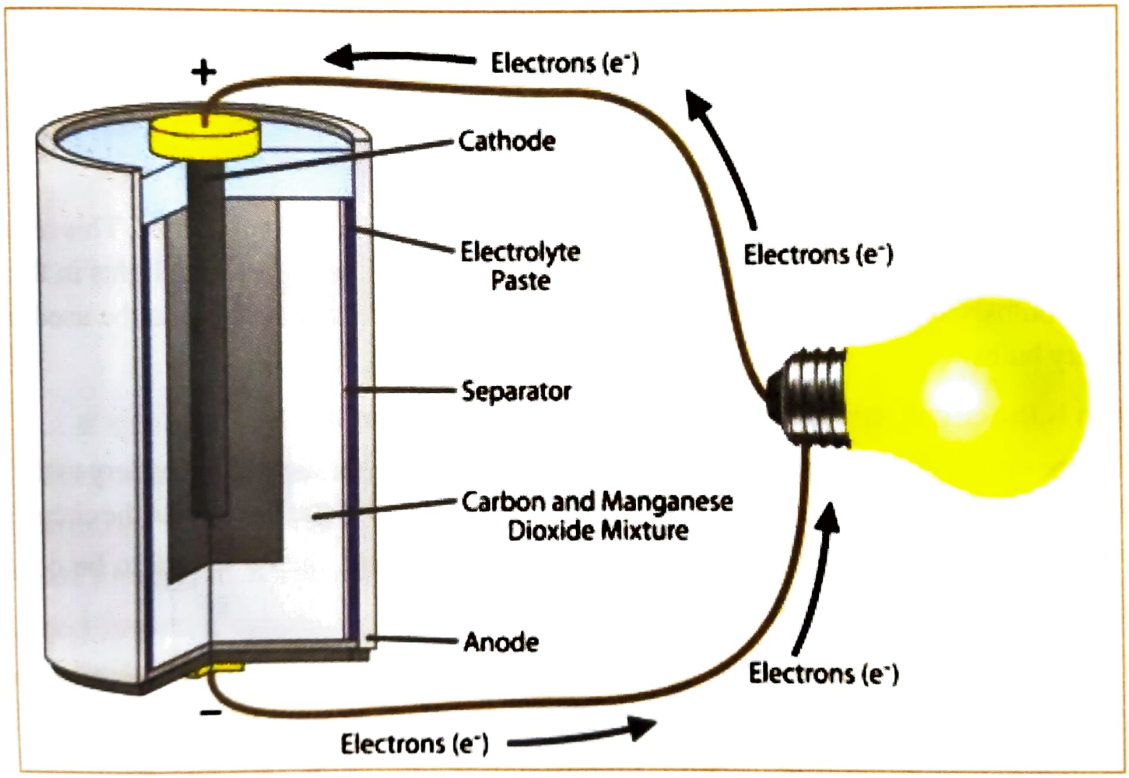


1. **What is circuit diagram ?**

A. The representation of electrical circuit by using electric symbols instead of electric components is called a circuit diagram.

2. **How does electric cell produce current ?**

A. An electric cell contain chemicals. When this cell is connected in a circuit the chemical energy gets converted into electrical energy.



3. **Explain how the filament in electrical bulb will glow ?**

A. When electric current pass through the filament of bulb, due to its high resistance the temperature is raises to high and it starts glowing.

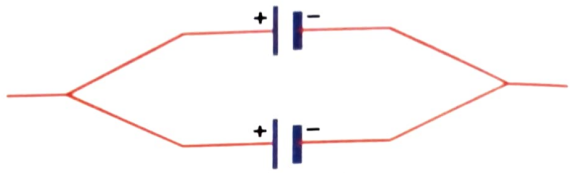
4. What is a battery?

A. The combination of two or more cells is called a battery. The cells can be combined in two ways.

i) **Series combination :** In series combination, the negative terminal of first cell is connected to positive terminal of second cell.

ii) **Parallel combination :** In parallel combination, the positive terminal of first cell is connected to positive terminal of second cell and negative terminal of first cell is connected to negative terminal of second cell.

Series combination



Parallel combination

LONG ANSWER QUESTIONS

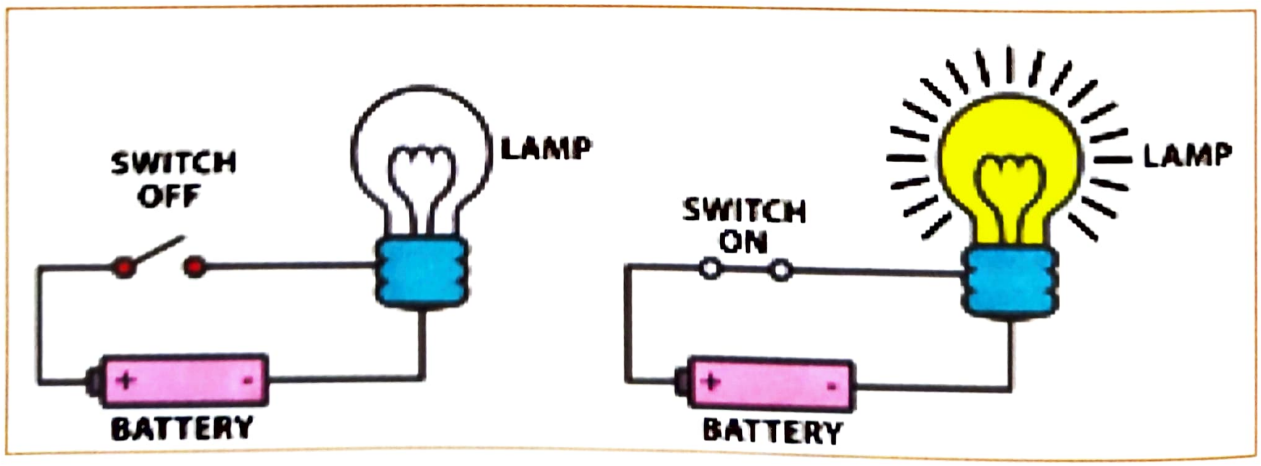
1. Why do we use fluorescent tube light in place of bulbs ?

A. An electric bulb is used for giving light, but it also gives heat, Which is not needed. This results in the wastage of electricity. This wastage can be reduced by using fluorescent tube lights in the place of electric bulbs. Compact Fluorescent Lamps (CFLs) also reduce wastage and can be used instead of ordinary bulbs.

2. When is the circuit said complete and when is it said incomplete ?

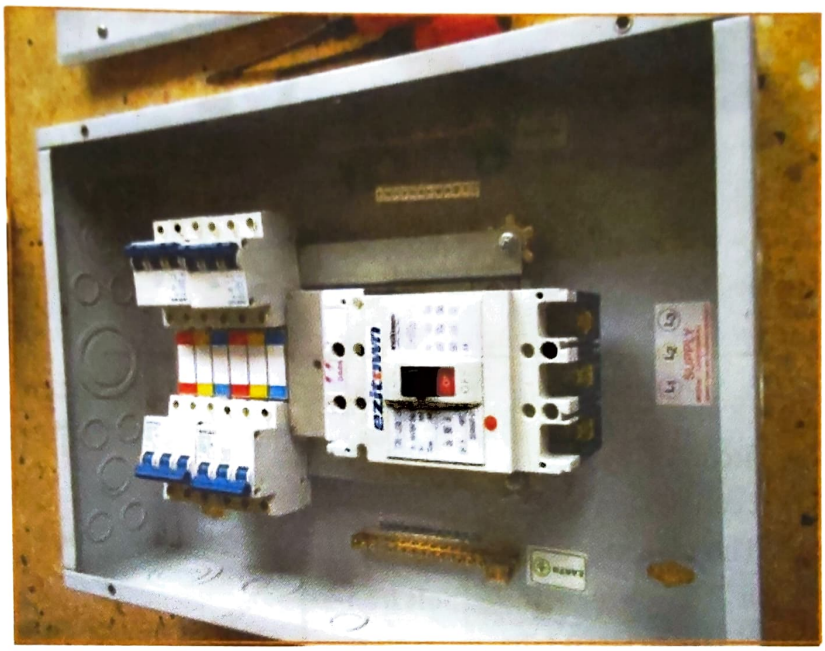
A. When the switch is in 'ON' position, the circuit from the positive terminal of the battery to the negative terminal is complete, circuit is then said to be closed and the current flows throughout the circuit instantly.

When the switch is in "OFF" position the circuit is incomplete, then it is said to be open and no current flows through any part of the circuit.



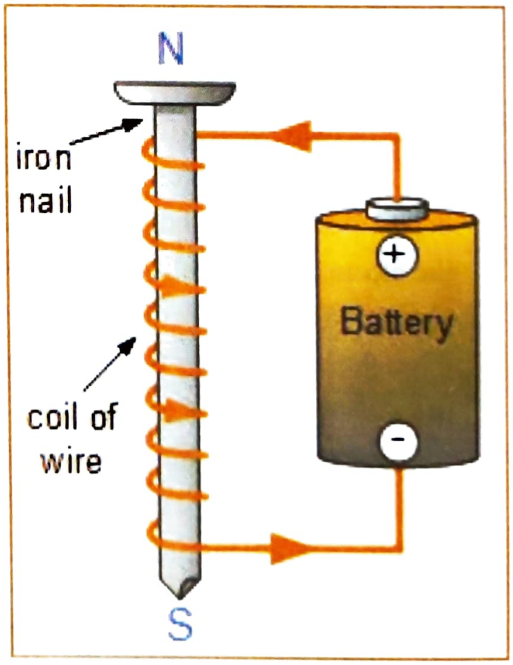
3. **What are 'MCBs' ?**

A. Instead of fuses, these days Miniature Circuit Breakers are used in our homes and offices. These are switches which automatically turn off when current in a circuit exceeds the safe limit. We turn them ON and circuit is once again complete



4. **What is an electromagnet ? write any three applications of the electromagnets ?**

A. An electromagnet is a temporary magnet, which behaves like a magnet only when electric current is passed through it. It consists of an insulated wire connect around a magnetic material like iron. Both ends of the wires behave like poles of the magnet.



Applications of the electromagnets :

i) Electromagnets are used to separate scrap iron from other metallic scraps.

ii) Used in electric motors of washing machines, fans, air conditioners

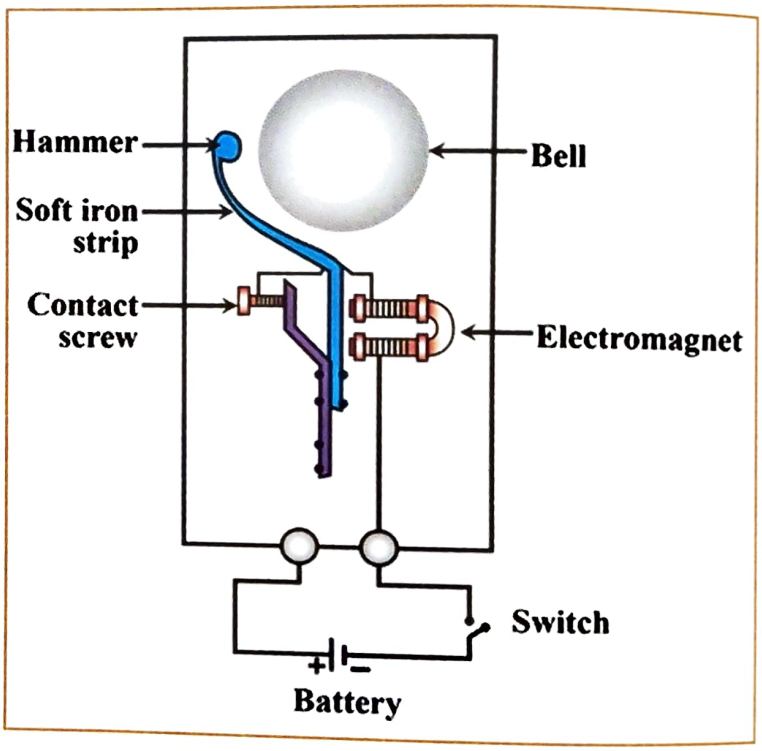
iii) Used for preparing strong magnets.

5. Is it possible for a connecting wire to melt and glow.

A. No, the connecting wires which we use are generally good conductors, which has low resistance and high melting point. So the connecting wires should not raise its temperature high they do not melt and glow.

6. How does an electric bell work ?

A. Figure shows the circuit of an electric bell. It consists of a coil of wire wound on an iron piece. The coil acts as an electromagnet. An iron strip witha hammer at one end is kept close to the electromagnet. There is a contact screw near the iron strip. When the iron strip is in contact with the screw, the current flows through the coil which becomes an electromagnet. It, then, pulls the iron strip. In the process, the hammer at the end of the strip strikes the gong of the bell to produce a sound. However, when the electromagnet pulls the iron strip, it also breaks the circuit. The current through the coil stops flowing. The coil is no longer an electromagnet.

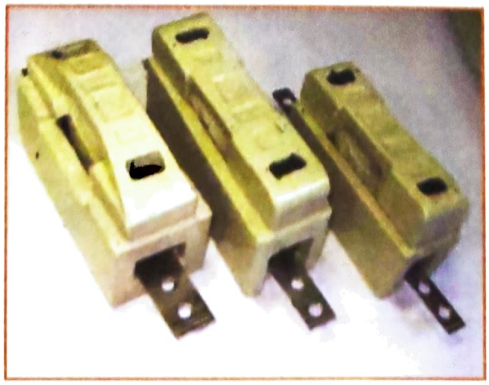


It no longer attracts the iron strip. The iron strip comes back to its original position and touches the contact screw again. This completes the circuit. The current flows in the coil and the hammer strikes the gong again. This process is repeated in quick succession. The hammer strikes the gong every time the circuit is completed. This is how the bell rings.

QUICK REVIEW

- The rate of flow of electrons is called electric current.
- The path in which the electric current flows is called an electric circuit.
- Conventionally the current is said to flow from positive end of the cell to the negative end of the cell.
- There are many components which are attached to the path of the electric current. These are called the elements of the electric circuit.
- Elements like cell, battery, switch, bulbs connecting wires are represented by different symbols.
- Cell and battery are the sources of the electric current in a circuit. Battery is the combination of two or more than two cells.
- A circuit is said to be complete or closed when the switch regulating the flow of the current is in "ON" position, when the switch is in "OFF" position the circuit is called open.
- However electric current causes certain effects like heating, lighting and electromagnetism.
- The wire gets hot when an electric current passes through it. This is the heating effect of the electric current.
- The amount of heat produced in a wire depends on its material, length and thickness.
- The electric appliances like room heaters, geysers, rods gives out heat due to heating effect.

- Wires made from some special materials melt quickly and break. These wires are used for making electric fuses.
- A fuse is a safety device which works on the principle of heating effects of electric current.
- A fuse is a safety device caused in house hold circuit prevent damage to electric appliances due to overload of short circuit.



- Christian Oersted given the relation between electricity and magnetism.
- When electric current passes through a materials like iron, it behaves like a temporary magnet.
- Electric bell works on this principle.
- When electric current flows through a wire, it behaves like a magnet.
- A current carrying coil of an insulated wire wrapped around a piece of iron is called an electromagnet..
- Miniature circuit breakers are switches which automatically turn off when current in a circuit exceeds the safe limit.

ANALYSE AND APPLY

1. The rate of flow of electrons is called _____.
2. Conventional current flows from _____ terminal of the cell to _____ terminal of cell.
3. The wire gets hot when _____ pass through it.
4. When electric current pass through wire, it behaves like _____.
5. Electromagnet is used in door bell (T/F).
6. The combination of two (or) more cells is called battery (T/F).
7. Compact fluorescent lamps reduce wastage of power (T/F).
8.

Electric Component	Symbol
i) Switch ON position	_____
ii) Switch OFF position	_____
iii) Electric bulb	_____
iv) Battery	_____

9.

Heating effects of Electric current	Magnetic effects of Electric current
i) Geyser	i) MCB
ii) _____	ii) _____
iii) _____	iii) _____
iv) _____	iv) _____

10.

Combination of cells	Circuit diagram
i) Series combination of electric cells	
ii) Parallel combination of electric cells	

OBJECTIVE EXERCISE

Multiple choice questions :

1. When two or more cells are joined together it is called [ ]
   a) a circuit b) a battery c) MCB d) CFL

2. In an electric bulb the filament is made up of [ ]
   a) Iron b) Steel c) Tungsten d) Copper

3. Which one of the following is based on the heating effect of current ? [ ]
   a) Geyser b) Hair dryer c) Immersion rod d) All of these

4. The full form of MCB is [ ]
   a) Maximum current Breaker b) Minimum current Breaker
   c) Miniature circuit Breaker d) Miniature current Breaker

5. Magnetic effect of electic current is discovered by [ ]
   a) H.C Oersted b) Michael Faraday c) Flemming d) Ohm

6. The mark which is necessary on electric appliances [ ]
   a) AGMARK b) ISI c) FICCI d) KSK

7. To make a closed circuit the components required are [ ]
   a) Cell, Switch, bulb b) Cell, bulb, fuse
   c) Cell, bulb, connecting wires d) Cell, bulb, switch, fuse

8. The electric component which consumes less energy [ ]
a) CFL b) Electric bulb c) Electric heater d) Electric bell

9. The melting point of tungsten is [ ]
a) 1538°c b) 1843°c c) 700°c d) 3422°c

10. Where does the key or switch can be placed in the circuit ? [ ]
a) Left side of the battery b) Right side of the battery
c) Can be anywhere d) Near the positive terminal of the bulb

11. A filament of low melting point metal or alloy is used in [ ]
a) Electric bulb b) Electric iron c) Fuse d) Room heater

12. The device used for measuring current is [ ]
a) Galvanometer b) Voltmeter c) Ammeter d) Potentiometer

13. In an electric bell which effect of current is used [ ]
a) Heating effect b) Magnetic effect
c) Chemical effect d) Electro chemical effect

14. The amount of heat produced in a wire depends on [ ]
a) nature of material b) Length c) Thickness d) All of these

15. Material which do not allow electricity to flow through them are called [ ]
a) Conductors b) Semiconductors c) Insulators d) All the above

Assertion & Reason Tpye Questions :

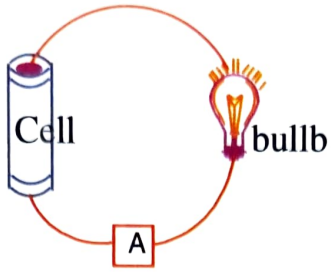
16. **Assertion** : A bulb glowing if we turn the switch ON [ ]
Reason : Turning the switch ON completes the electrical circuit, electricity flows through a complete electrical circuit
a) Both A and R are correct and R is the correct explanation of A
b) Both A and R are correct but R is not the correct explanation of A
c) A is correct, R is incorrect d) A is incorrect, R is correct

17. **Assertion** : The brightness of the bulb increases if a new cell is connected to the existing cell in such a way that the positive terminal of the new cell touches the negative terminal of the existing cell [ ]
Reason : Electricity through the circuit increases when new cells are connected in series with existing cells
a) Both A and R are correct and R is the correct explanation of A
b) Both A and R are correct but R is not the correct explanation of A
c) A is correct, R is incorrect d) A is incorrect, R is correct

18. **Assertion** : The circuit symbol for connecting wire is a straight line. [ ]
Reason : Only straight wires can carry electricity
a) Both A and R are correct and R is the correct explanation of A
b) Both A and R are correct but R is not the correct explanation of A
c) A is correct, R is incorrect d) A is incorrect, R is correct

Olympiad Corner :

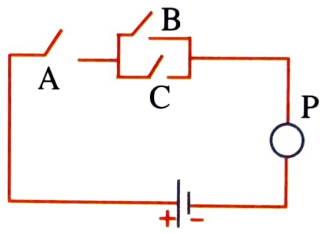
1. Which of the following objects will make the glow when put in position A of the material tester shown here. [ ]



a) comb b) iron nail c) matchstick d) book

2. In the circuit shown here,bulb P will glow when [ ]

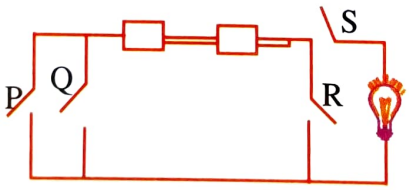
a) A is closed ,B and C are open
b) A is closed, B is closed and C is open
c) A is closed, B and C are closed
d) Both b and c



3. The kind of fuse wire to be used depends on [ ]

a) the voltage of the mains
b) the wattage of the appliance
c) the cost of the appliance
d) none of these

4. In the given diagram, which two switches must be closed for the bulb to light up ? [ ]

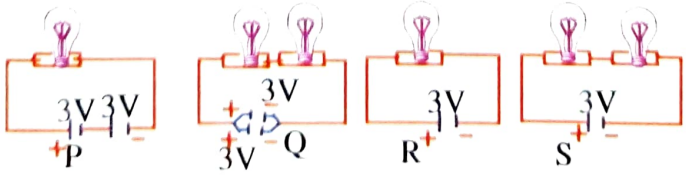


a) P and Q b) Q and S c) R and S d) Q and R

5. _____ are made up of conductors, while ____ are made up of insulators [ ]

a) Electrical sockets, plug tops
b) Plug tops, electrical sockets
c) Wire coverings, fuse wires
d) Fuse wires, bulb filament

6. In which of the following circuits will the bulb or bulbs glow the brightest ? [ ]

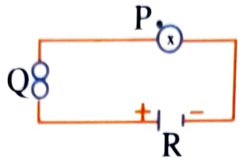


a) P b) Q c) R d) S

7. Which of the materials is not grouped correctly ? [ ]

	Conductors	Insulators
a)	Iron nail	Wooden chair
b)	Steel spoon	Foot ball
c)	Paper boat	Lemon water
d)	Safety pin	Paper.

8. Study the given circuit diagram. Which of the following statement about the circuit are true ?



i) An electric current transports energy from component R to component P. [ ]

ii) Component Q is in the 'on' position that allows electricity to flow in a complete path.

iii) The wires that connect components P, Q and R in the circuit must be covered with electrical insulation.

iv) The wires that connect components P, Q and R in the circuit are good electrical conductors.

a) (i) and (iv) only b) (ii) and (iii) only

c) (ii), (iii) and (iv) d) (i), (ii), (iii) and (iv)

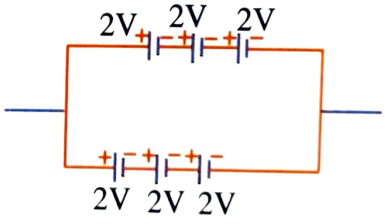
9. Six identical cells are connected as shown in the circuit. The total e.m.f is _____ [ ]

a) 1.5V

b) 4.5 V

c) 9V

d) 6V



10. Choose the correct statement : [ ]

A) In case of an electric cell, chemical energy is converted into electrical energy.

B) combination of electric cells is called a battery.

a) only A is true b) only B is true

c) Both A and B are true d) Both A and B are false

11. A current carrying conductor produces ___ [ ]

a) only heat b) only magnetic field

c) both heat and magnetic field d) None of these

12. Three bulbs are connected in a circuit in an identical way. When a fourth bulb is also connected to the same circuit in the same way, brightness is reduced then the bulbs are connected in _____ [ ]

a) series b) parallel

c) It can happen in both cases d) It is not possible

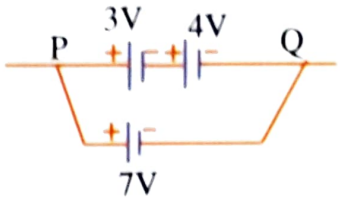
13. Three batteries are connected as shown in the figure. Then the total emf in the circuit is _____V. [ ]

a) 3

b) 4

c) 7

d) 14



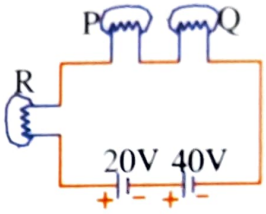
14. Three identical bulbs are connected as shown in figure. Choose the correct statement. [ ]

a) All bulbs are in a series combination.

b) If bulb 'R' is removed, bulbs P and Q will still glow.

c) The total e.m.f in the circuit is 40V.

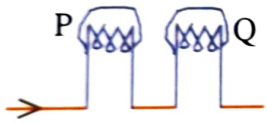
d) Both a and c



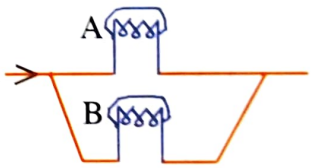
15. Choose the correct statement : [ ]

When the same current (i) flows through two circuits as shown in the figures, then (assume that all bulbs are identical)

(i)



(ii)



A) bulbs in first combination glow with more brightness.

B) bulbs in second combination glow with more brightness.

a) Only A is true

b) Only B is true

c) Both A and B are true

d) Cannot be determined

16. Three dry cells are connected as shown in the  figure. If e.m.f of each cell is 2V, then the total e.m.f. of the combination is _____V. [ ]

a) 2 b) 6 c) 3 d) 4

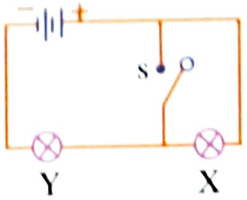
17. Two identical light bulbs, X and Y are connected in series as shown in the sketch to the right. How will the brightness of the bulbs change if switch S is closed ? [ ]

a) X - brighter Y - brighter

b) X - dimmer, Y - dimmer

c) X - brighter, Y - not lit up

d) X - not lit up, Y - brighter



18. Unit of electromotive force is _____ [ ]

a) volt b) second c) metre d) ms^{-1}

19. Choose the correct statement(s) in case of a voltaic cell. [ ]

A) Cathode used is Zn and anode used is copper

B) The electrolyte used is dilute sulphuric acid.

a) Only A is true b) Only B is true

c) Both A and B are true d) Both A and B are false

20. Choose the correct statement : [ ]

When a positively charged body is placed on the ground,

A) The electrons flow from the ground and neutralize the charge.

B) The electrons flow from the ground and charge it negatively.

a) Only A is true b) Only B is true

c) Both A and B are true d) Both A and B are false

KEY

Multiple choice questions :

1) b	2) c	3) d	4) c	5) a	6) b	7) c	8) a	9) d	10) c
11) c	12) c	13) b	14) d	15) c	16) a	17) a	18) c		

Olympiad corner :

1) b	2) d	3) b	4) b	5) a	6) a	7) c	8) d	9) d	10) c
11) c	12) a	13) c	14) a	15) a	16) b	17) d	18) a	19) c	20) a