Book Name: Selina Concise

EXERCISE- 9 (A)

Solution 1:
Electrical energy, $W = I^2Rt$ joule

Solution 2:
(a) Electrical power, $P = \frac{v^2}{R}$

(b) Electrical power, $P = I^2R$

Solution 3:
(a) Q represents Charge and V represents Voltage.

(b) Electrical Power, $P = I^2R$

Where I : current

And R : Resistance

Solution 4:
The S.I. unit of electrical energy is joule.

1Wh = 3600 J

Solution 5:
The power of an appliance is 100 W. It means that 100 J of electrical energy is consumed by the appliance in 1 second.

Solution 6:
The S.I. unit of electrical power is Watt.

Solution 7:
(i) The household unit of electricity is kilowatt-hour (kWh).
One kilowatt-hour (kWh) is the electrical energy consumed by an electrical appliance of power 1 kW when it is used for one hour.

(ii) The voltage of the electricity that is generally supplied to a house is 220 Volt.

Solution 8:

(i) Electrical power is measured in kW and
(ii) Electrical energy is measured in kWh.

Solution 9:

One kilowatt-hour (kWh) is the electrical energy consumed by an electrical appliance of power 1 kW when it is used for one hour.
Its value in SI unit is 1kWh = 3.6×10^6 J

Solution 10:

Kilowatt is the unit of electrical power whereas kilowatt-hour is the unit of electrical energy.

Solution 11:

(a) 1Kwh = $\frac{1\text{volt} \times 1\text{ampere} \times 1\text{hour}}{1000}$

(b) 3.6×10^6J

Solution 12:

An electrical appliance such as electric bulb, geyser etc. is rated with power (P) and voltage (V) which is known as its power rating. For example: If an electric bulb is rated as 50W-220V, it means that when the bulb is lighted on a 220 V supply, it consumes 50 W electrical power.
(a) To calculate the resistance of the appliance, the expression is:

Resistance, $R = \frac{v^2}{P}$

(b) The safe limit of current I is : $I = \frac{P}{v}$

Solution 13:

It means that if the bulb is lighted on a 250 V supply, it consumes 100 W electrical power (which means 100J of electrical energy is converted in the filament of bulb into the light and heat energy in 1 second).

Solution 14:

Appliance	Power (in watt)	Voltage (in volts)	Time (hours)	Electrical energy ($E = p \times t$)
Fluorescent tube	40	220	12	0.48 kWh
Television set	120	220	4	0.48 KWh
Refrigerator	150	220	24	3.6 kWh

Solution 15:

Resistance of 220 V, 50 w lamp is

$$R_1 = \frac{v^2}{p_1} = \frac{220^2}{50} = 968\ \Omega$$

Resistance of 220 V, 100 lamp is

$$R_2 = \frac{v^2}{p_2} = \frac{220^2}{100} = 484\ \Omega$$

Since the two lamps are connected in series
So same current I passes through each lamp.
Power consumed in 220 v, 50 w lamp is $p_1 = I^2R_1$
Power consumed in 220 v, 100 w lamp is $p_2 = I^2R_2$
Since $R_1 > R_2$, $P_1 > P_2$
i.e. 50 w lamp consumes more power.

Solution 16:

When current is passed in a wire, the heat produced in it depends on the three factors: (i) on the amount of current passing through the wire, (ii) on the resistance of wire and (iii) on the time for which current is passed in the wire.

(i) Dependence of heat produced on the current in wire: The amount of heat H produced in the wire is directly proportional to the square of current I passing through the wire, i.e., $H \propto I^2$

(ii) Dependence of heat produced on the resistance of wire: The amount of heat H produced in the wire is directly proportional to the resistance R of the wire, i.e., $H \propto R$

(iii) Dependence of heat produced on the time: The amount of heat H produced in the wire is directly proportional to the time t for which current is passed in the wire, i.e., $H \propto t$

MULTIPLE CHOICE TYPE:

Solution 1:

I^2Rt

Note: Electrical energy (W) = $I^2Rt = VIt = \frac{v^2 t}{R}$

Solution 2:

144 Ω

Solution:

Given, power (p) = 100 w

Potential difference, v = 120 volt

$\therefore$ Resistance, r = $\frac{(v)^2}{P} = \frac{(120)^2}{100} = 144\ \Omega$

NUMERICALS:

Solution 1:

Given, current (I) = 2 A

Resistance, R = 75 Ω

Time, t = 2 min = 120s

(a) Heat produced, H = I^2Rt

Or, H = $(2)^2(75)(120)$ J $= 36000$ J

(b) Charge passed, Q = It

Or, Q = (2) (120) C = 240 C

Solution 2:

Given,

Power, p = 60 w

Voltage, v = 250 v

As power, P = VI

$I = \frac{60}{250} = 0.24A$

Resistance of bulb R = $\frac{V^2}{p} = \frac{250^2}{60} = 1041.6\Omega$

Now if voltage falls to 200 v, power consumes will be

$p = \frac{v^2}{R} = \frac{200^2}{1041.6} = 38.4\,W$

Solution 3:

Given,

Power, P = 100 W

Voltage, V = 250 V

As power, p = VI

$$I = \frac{100}{250} = 0.4\,A$$

Solution 4:

(a) Given,

Power, p = 100 w

Voltage, v = 220 v

As power, $P = \frac{V^2}{R}$

$$R = \frac{(220)^2}{100} = 484\,\Omega$$

(b) The safe limit of current that can pass through it

$$I = \frac{P}{V}$$

$$I = \frac{100}{220} = 0.45\ A$$

Solution 5:

Energy consumed per day, E = p × t

= 40 × 12.5

= 500 wh

Energy consumed for 30 days

E = 500 × 30 = 15000 wh = 15 kwh

Solution 6:

Energy, E = power × time

= 750 × 16

= 12000 wh

Or E = 12 k wh

Solution 7:

Given,

Resistance, R = 200 Ω

Voltage, v = 200 v

Time, t = 5 min = 5 × 60 sec = 300 sec

As, Energy, $E = \frac{v^2t}{R}$

(i) in joules

$$E = \frac{(200)^2 \times 300}{200}$$

$$E = 60000J$$

(ii) In kwh

As 1 kwh = 3.6×10^6J

$$1\ J = \frac{1}{3.6 \times 10^6}\ kwh$$

$$60000J = \frac{60000}{3.6 \times 10^6} = 0.0167\ kwh$$

Solution 8:

(a) Given,

Power, p = 24 w

Voltage, v = 12 v

Current, I = ?

As power, p = VI

(i) $I = \frac{24}{12} = 2\,A$

(ii) Energy, E = P × t

E = 24 × 20 × 60 sec

E = 28, 800 J

Solution 9:

Given,

Current, I = 0.2 A

Potential difference, v = 15 v

Time, t = 60 sec

As v = IR

(a) $R = \frac{15}{0.2} = 75\Omega$

(b) Heat energy, $H = I^2Rt$

$$H = (0.2)^2 \times 75 \times 60$$

Or $H = 180\ J$

Solution 10:

Given,
Voltage, v = 240 v
Power, p = 60 w

As $p = \frac{v^2}{R}$

$\therefore\ R = \frac{(240)^2}{60} = 960\,\Omega$

$I = \frac{P}{V} = 0.25\ A$

When one lamp is connected across the mains, it draws 0.25 A current, while if two lamps are connected in series across the mains, current through each bulb becomes $\frac{240v}{(960+960)\Omega} = 0.125A$

(i.e., current is halved), hence heating (= I^2Rt) in each bulb becomes one-fourth, so each bulb appears less bright.

Solution 11:

Given,
Voltage, $V_1 = 220$ v
$V_2 = 110$ v
Power, $P_1 = P_2 = p = 60$ w

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

$R_1 = \frac{V_1^2}{P} = \frac{(220\times 220)}{60}$

$R_2 = \frac{V_2^2}{P} = \frac{(110\times 110)}{60}$

On dividing R_1 and R_2

$$\frac{R_1}{R_2} = \frac{\frac{(220\times 220)}{60}}{\frac{(110\times 110)}{60}} = \frac{4}{1}$$

$\therefore\quad R_1 : R_2 = 4:1$

Solution 12:

Given,

Power, p = 250 w

Voltage, v = 230 v

(i) Energy, E = p × t

Time, t = 1 × 60 × 66 = 3600 sec

As, energy, E = 250 × 3600 = 9×10^5 J

(ii) 1000 wh = 250 × t

Time, t = $\frac{1000}{250}$ = 4 hours

If it consumes 1kwh of energy then it requires 4 hours.

Solution 13:

Given,

Power, p = 250 w

Voltage, v = 100 v

(i) current through each heater, I = ?

As p = VI

$\Rightarrow I = \frac{P}{V}$

$= \frac{250}{100} = 2.5A$

∴ Current taken for the three heaters = 3 × 2.5 = 7.5 A

(ii) resistance for each heater, $R = \frac{V}{I}$

$= \frac{100}{2.5} = 40\ \Omega$

(iii) Time for which energy is supplied, t = 5h

As, Energy, E = p × t

E = 250 × 5 = 1250 wh

Or E = 1.25 kwh

Energy for three heaters = 3 × 1.25 = 3. 75 kwh

Solution 14:

Given,

Voltage, v = 4 v

Resistance of the battery, R_B = 2.5 Ω

Current, I = 0.5 A

(i) Energy supplied by the battery, $E = \frac{v^2 t}{R}$

$$T = 10 \times 60 = 600 \text{ sec}$$

$$R = \frac{V}{I} = \frac{4}{0.5} = 8\Omega$$

$$E = \frac{(4)^2 \times 600}{8} = 1200J$$

(ii) Total resistance, R = 8 Ω
Resistance of the battery, $R_B = 2.5\ \Omega$
Resistance of the bulb, $R_b = 8 - 2.5\ \Omega = 5.5\ \Omega$

(iii) Energy dissipated in the bulb in 10 min, $E = I^2Rt$

$$E = (0.5)^2 \times 5.5 \times 600 = 825 \text{ J}$$

Solution 15:

Given,
Resistance, $R_A = 4\Omega$
Resistance, $R_B = 6\Omega$
Voltage, V = 6V

(i) As resistance are connected in parallel

Equivalent Resistance = $\frac{1}{R} = \frac{1}{R_A} + \frac{1}{R_B}$

$$\frac{1}{R} = \frac{1}{4} + \frac{1}{6} = \frac{10}{24}$$

$$R = 2.4\ \Omega$$

As power, $P = \frac{V^2}{R}$

$$= \frac{(6)^2}{2.4} = 15\text{w}$$

(ii) Power dissipation across each resistor, p = VI

Current across resistor $R_A, I_A = \frac{V}{R_A}$

$$I_A = \frac{6}{4} = 1.5A$$

Power dissipation across resistor R_A,

$P = VI_A = 6 \times 1.5 = 9\text{w}$

(ii) Current across resistor $R_B, I_B = \frac{V}{R_B}$

$$I_B = \frac{6}{6} = 1A$$

Power dissipation across resistor R_B,

$$P = VI_B = 6 \times 1 = 6\text{w}$$

Solution 16:

Given,

E.m.f. of battery, v = 15 v

Internal resistance of battery, $R_B = 2\ \Omega$

Resistance given in circuit, $R_1 = 4\Omega$

$R_2 = 6\Omega$

(i) When resistors are connected in series

Equivalent resistance, $R = R_B + R_1 + R_2 = 12\ \Omega$

Current the circuit, $I = \frac{15}{12} = 1.25A$

Now voltage across resistor R_2, $V_2 = IR = 1.25 \times 6$

$V_2 = 7.50$ V

Time, t = 1min = 60 sec

Energy across R_2, $E = \frac{V^2 t}{R} = \frac{(7.5)^2 \times 60}{6}$

E = 562.5 J

Solution 17:

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

$$\text{Heated gained} = \left(\frac{V^2}{R}\right) \times t$$

$$\left(\frac{V_1^2}{R}\right) \times t_1 = \left(\frac{V_2^2}{R}\right) \times t_2$$

$$t_2 = \left(\frac{V_1}{V_2}\right)^2 \times t_1$$

$$= \left(\frac{220}{200}\right)^2 \times 300 = 363s = 6.05 \text{ min}$$

Solution 18:

Given,

Voltage, v = 220 v

Current, I = 8 A

Time, t = 2 h

Energy, E = Vlt

E = 220 × 8 × 2 = 3520 Wh

$\Rightarrow$ E = 3.52 kwh
Cost of energy = Rs. 4.50 / kwh
$\therefore$ Cost of 3.52 kwh of energy = Rs. 4.50 × 3.52 kwh
= 15.84

Solution 19:

Given,
Power of kettle, p = 2.5 kw
Voltage, V = 250 v
Time, t = 2 h
As, Energy, E = P × t
= 2.5 × 2 = 5 kwh
Cost per unit of energy = Rs. 5.40
Cost for 5 kwh of energy = 5.40 × 5 = Rs. 27

Solution 20:

Given,
Power of geyser, p = 1500 w
Voltage, v = 250 v
(i) Current, $I = \frac{P}{V}$

$$I = \frac{1500}{250} = 6A$$

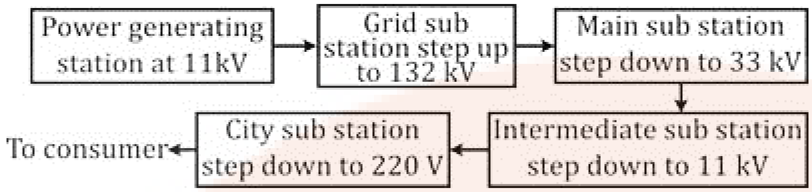
(ii) Time, t = 50 h
Energy, E = p × t
= 1500 × 50 = 75000wh = 75kwh
(iii) Cost per unit of energy = Rs. 4.20
Cost for 75 kwh of energy = 4.20 × 75 = Rs. 315

EXERCISE. 9 B

Solution 1:

The electric power is generated at 11 KV, 50Hz at the power generating station.

Solution 2:



At a power generating station, the electric power is generated at 11 kV. From here, the alternating voltage is transmitted to the grid sub-station and stepped up to 132 kV using a step-up transformer. It is then transmitted to the main sub-station where the voltage is stepped down to 33 kV using a step-down transformer and is then transmitted to the intermediate sub-station. At the intermediate sub-station, the voltage is stepped down to 11 kV using a step-down transformer and is transmitted to the city sub-station, where the voltage is further stepped down to 220 V and is supplied to our houses.

Solution 3:

Electric power from the generating station is transmitted at 11 kV because voltage higher than this causes insulation difficulties, while the voltage lower than this involves high current and loss of energy in form of heat (I^2Rt).

Solution 4:

At 220 V of voltage and 50 Hz of frequency, the a.c. is supplied to our houses.

Solution 5:

(a) Step-up transformer
(b) Step-down transformer

Solution 6:

(a) The three connecting wires used in a household circuit are:
  (i) Live (or phase) wire (L),
  (ii) Neutral wire (N), and
  (iii) Earth wire (E).
(b) Among them neutral and earth wires are at the same potential.
(c) The switch is connected in the live wire.

Solution 7:

Before the electric line is connected to the meter in a house, a fuse of rating (≈ 50 A) is connected in the live wire at the pole or just before the meter. This fuse is called the pole fuse. Its current rating is ≈ 50 A

Solution 8:

(a) After the company fuse, the cable is connected to a kWh meter and from this meter; connections are made to the distribution board through a main fuse and a main switch.
(b) Main fuse is connected in the live wire and in case of high current it gets burnt and cut the connections to save appliances.
(c) Main switch is connected in the live and neutral wires. It is used to cut the connections of the live as well as the neutral wires simultaneously from the main supply.

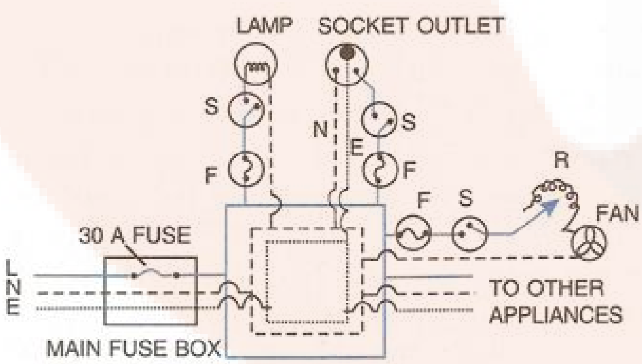
Solution 9:

The electric meter in a house measures the electrical energy consumed in kWh.
Its value in S.I. unit is 1kwh = 3.6×10^6J

Solution 10:

The main fuse in a house circuit is connected on the distribution board, in live wire before the main switch.

Solution 11:

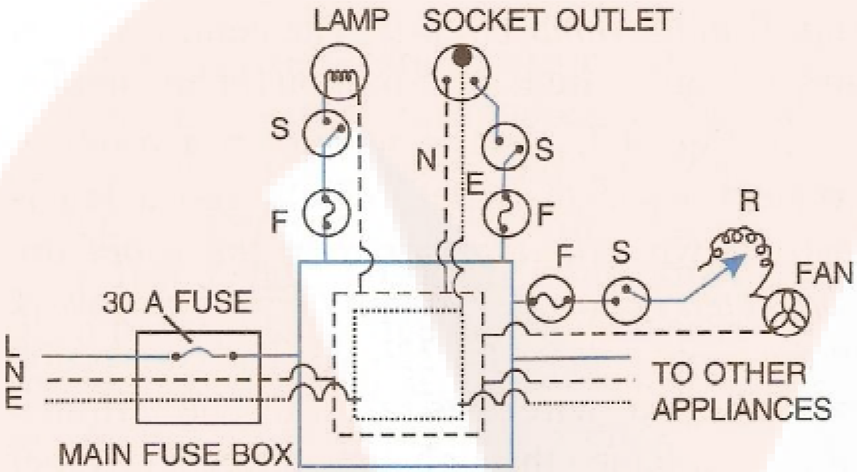


Ring system of house wiring

Advantages of ring system over tree system
(i) In a ring system the wiring is cheaper than tree system.
(ii) In ring system the sockets and plugs of same size can be used while in a tree system sockets and plugs are of different size.

(iii) In ring system, each appliance has a separate fuse due to which if there is a fault and the fuse of one appliance burns it does not affect other appliances; while in a tree system when fuse in one distribution line blows, it disconnects all the appliances connected to that distribution circuit.

Solution 12:



These appliances are connected to the mains in a parallel arrangement.

Solution 13:

All the electrical appliances in a building should be connected in parallel at the mains, each with a separate switch and a separate fuse connected in the live wire so that the switching on or off in a room has no effect on other lamps in the same building.

Solution 14:

The two arrangements are (a) series arrangement, and (b) parallel arrangement.
In a household circuit we will prefer the second circuit i.e., (b).
In circuit (b) each appliance has same voltage of 220 V. Since all the appliances that we use have voltage rating of 220 V in our country, so each bulb works normally.

Solution 15:

In set A, the bulbs are connected in series. Thus, when the fuse of one bulb blows off, the circuit gets broken and current does not flow through the other bulbs also.
In set B, the bulbs are connected in parallel. Thus, each bulb gets connected to its voltage rating (= 220 V) and even when the fuse of one bulb blows off, others remain unaffected and continue to glow.

MULTIPLE CHOICE TYPE:

Solution 1:

The main fuse is connected in live wire.
Hint: The main fuse is connected in live wire so that if the current exceeds its rating, the fuse melts and breaks the circuit; thus, preventing the excessive current from flowing into the circuit.

Solution 2:

Electrical appliances in a house are connected in parallel.
Hint: On connecting the electrical appliances in parallel, each appliance works independently without being affected whether the other appliance is switched on or off.

Solution 3:

Energy
Hint: The electric meter in a house records the amount of electrical energy consumed in a house.

EXERCISE. 9 (C)

Solution 1:

An electric fuse is a safety device, which is used to limit the current in an electric circuit. The use of fuse safeguards the circuit and appliances connected in that circuit from being damaged. An alloy of lead and tin is used as a material of fuse because it has low melting point and high resistivity.

Solution 2:

An electric fuse is a safety device, which is used to limit the current in an electric circuit. The use of fuse safeguards the circuit and appliances connected in that circuit from being damaged. An alloy of lead and tin is used as a material of fuse because it has low melting point and high resistivity.

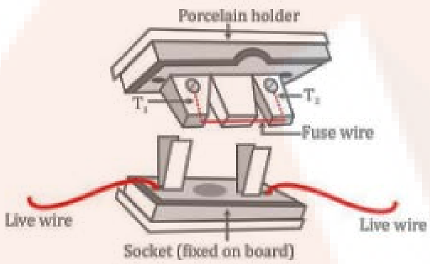
Solution 3:

(a) A fuse is a short piece of wire of material of high **resistivity** and low **melting point.**
(b) A fuse wire is made of an alloy of **lead** and **tin.** If the current in a circuit rises too high, the fuse wire **melts**
(c) A fuse is connected in **series** with the **live** wire.

Solution 4:
The fuse wire is fitted in a porcelain casing because porcelain is an insulator of electricity.

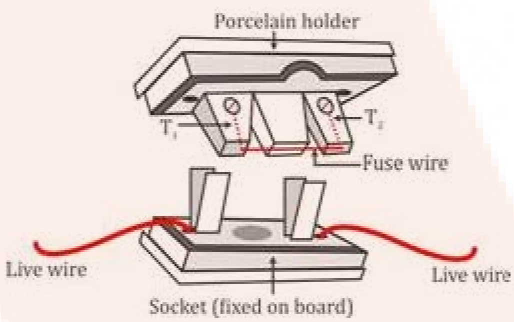
Solution 5:

The fuse wire is stretched between the two metallic terminals T_1 and T_2 in a porcelain holder (since porcelain is an insulator of electricity). This holder fits into a porcelain socket having two metallic terminals to which the live wires of the circuit are connected. The figure below is showing the fuse arrangement.



A fuse is connected with each electrical appliance to safeguard it from the flow of excessive current through it.

Solution 6:



The figure above shows the most common fuse arrangement in which the fuse wire is stretched between the two metallic terminals T_1 and T_2 in a porcelain holder. This holder fits into a porcelain socket having two metallic terminals to each of which the live wire of the circuit is connected.
A fuse must not be replaced with a copper wire because copper has very low resistivity and high melting point.

Solution 7:

The fuse wire is always connected in the live wire of the circuit because if the fuse is put in the neutral wire, then due to excessive flow of current when the fuse burns, current stops flowing in the circuit, but the appliance remains connected to the high potential point of the supply through the live wire. Now if a person touches the appliance, he may get a shock as the person will come in contact with the live wire through the appliance.

Solution 8:

The 20 A fuse wire will be thicker so that its resistance be low.

Solution 9:

It means that the line to which this fuse is connected has a current carrying capacity of 5 A.

Solution 10:

The safe limit of current which can flow through the electrical appliance is I = P/V = 5000/200 = 25 A; which is greater than 8 A. So, such fuse cannot be used.

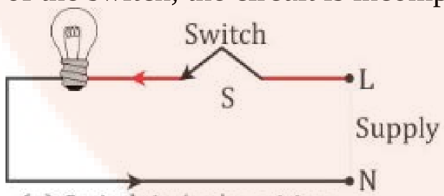
Solution 11:

Yes, this kettle can be used in a circuit which contains a 13 A fuse because safe limit of current for kettle is,

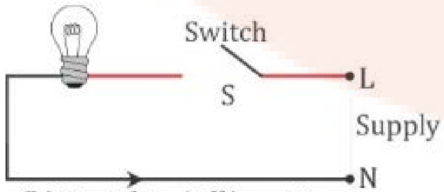
$$I = \frac{3000W}{250V} = 12\,A$$

Solution 12:

A switch is an on-off device for current in a circuit (or in an appliance). The switch should always be connected in the live wire so that the appliance could be connected to the high potential point through the live wire. In this position the circuit is complete as the neutral wire provides the return path for the current. When the appliance does not work i.e., in off position of the switch, the circuit is incomplete and no current reaches the appliance.

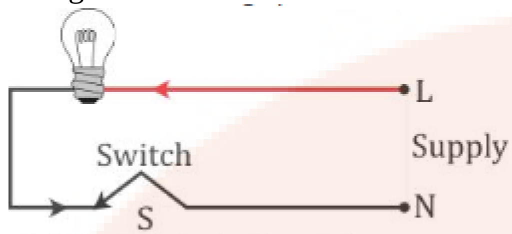


(a) Switch in 'on' position.

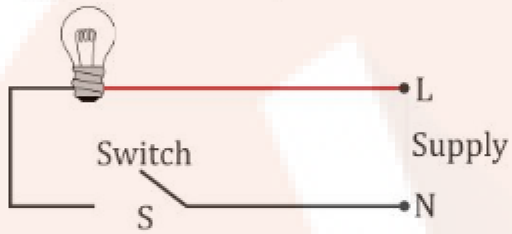


(b) Switch in 'off' position.

On the other hand, if switch is connected in the neutral wire, then in 'off' position, no current passes through the bulb. But the appliance remains connected to the high potential terminal through the live wire.



(a) Switch in 'on' position.



(b) Switch in 'off' position.

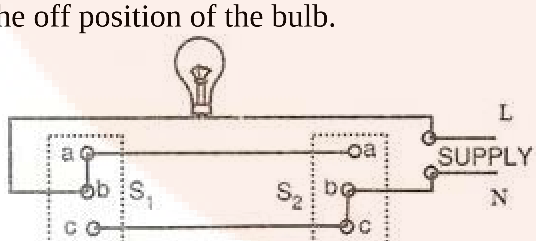
Thus, if the switch is connected in the neutral wire, it can be quite deceptive and even dangerous for the user.
Precaution while handling a switch: A switch should not be touched with wet hands.

Solution 13:

A switch should not be touched with wet hands. If water reaches the live wire, it forms a conducting layer between the hand and the live wire of the switch through which the current passes to the hand and the person may get a fatal shock.

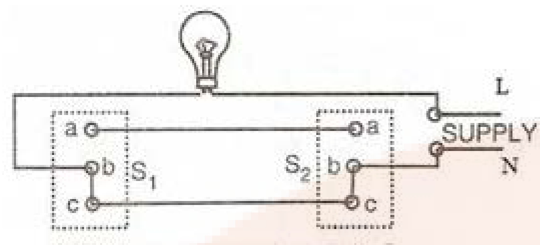
Solution 14:

Let a switch S_1 be fitted at the bottom and a switch S_2 at the top of the staircase. Fig. (a) shows the off position of the bulb.



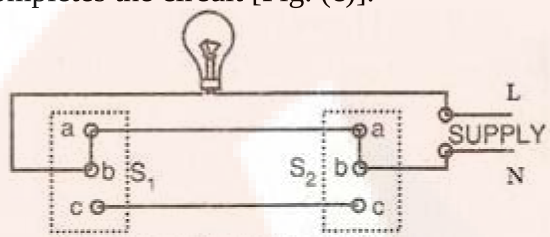
(a) Bulb off

The bulb can now be switched on independently by either the switch S_1 or the switch S_2. If the switch S_1 is operated, the connection 'ab' is changed to 'bc', which completes the circuit and the bulb lights up [Fig. (b)].



(b) Bulb on through switch S_1

Similarly, on operating the switch S_2, the connection 'bc' changes to 'ba', which again completes the circuit [Fig. (c)].

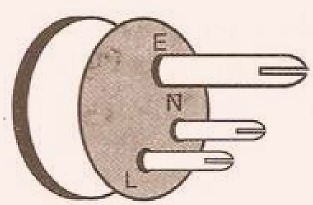


(c) Bulb on through switch S_2

Similarly if the bulb is in on position as shown in Fig. (b) or (c), one can switch off the bulb either from the switch S_1 or the switch S_2.

Solution 15:

The three pins in the plug are labelled as



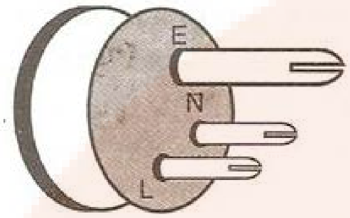
Here E signifies the earth pin,
L is for live wire, and
N is for neutral wire.

(a) The earth pin is made long so that the earth connection is made first. This ensures the safety of the user because if the appliance is defective, the fuse will blow off. The earth pin is thicker so that even by mistake it cannot be inserted into the hole for the live or neutral connection of the socket.

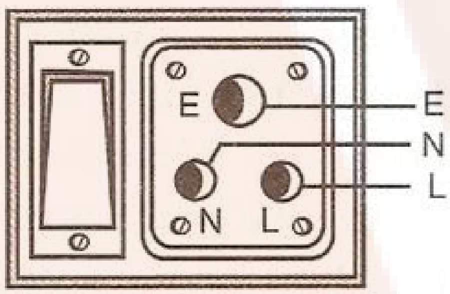
(b) The pins are splitted at the end to provide spring action so that they fit in the socket holes tightly.

Solution 16:

All electrical appliances are provided with a cable having a plug at one end to connect the appliance to the electric supply.
In this three way pin plug, the top pin is for earthing (E), the live pin (L) in on the left and the neutral pin (N) is on the right.



Solution 17:



E: for earth pin
N: for neutral wire pin
L: for live wire pin.

Solution 18:

(a) 1 – Earth, 2 – Neutral, 3 – Live
(b) Terminal 1 is connected to the outer metallic case of the appliance.
(c) The fuse is connected to live wire joined to 3 so that in case of excessive flow of current fuse melts first and breaks down the circuit to protect appliances.

Solution 19:

Local earthing is made near kWh meter. In this process a 2 - 3 metre deep hole is dug in the ground. A copper rod placed inside a hollow insulating pipe, is put in the hole. A thick copper plate of dimensions 50 cm × 50 cm is welded to the lower end of the copper rod and it is buried in the ground. The plate is surrounded by a mixture of charcoal and salt to make a good earth connection.
To keep the ground damp, water is poured through the pipe from time to time. This forms a conducting layer between the plate and the ground. The upper end of the copper rod is joined to the earth connection at the kWh meter.

Solution 20:

If the live wire of a faulty appliance comes in to direct contact with the metallic case due to some reason then the appliance acquires the high potential of live wire. This may results in shock if any person touches the body of appliance. But if the appliance is earthed then as soon as the live wire comes in to contact with the metallic case, high current flows through the case to the earth. The fuse connected to the appliance will also blows off, so the appliance get disconnected.

Solution 21:

(a) The fuse must be connected in the live wire only. If the fuse is in the neutral wire, then although the fuse burns due to the flow of heavy current, but the appliance remains at the supply voltage so that on touching the appliance current flows through the appliance to the person touching it.

(b) Metallic case of the appliance should be earthed.

Solution 22:

The paint provides an insulating layer on the metal body of the appliance. To make earth connection therefore, the paint must be removed from the body part where connection is to be made.

Solution 23:

According to new international convention

(a) Live wire is brown in colour.

(b) Neutral is light blue and

(c) Earth wire is yellow or green in colour.

Solution 24:

(a) The three wires are: Live wire, Earth wire and Neutral wire.

(b) The heating element of geyser should be connected to live wire and neutral wire.

(c) The metal case should be connected to earth wire.

(d) The switch and fuse should be connected to live wire.

Solution 25:

One may get an electric shock from an electrical gadget in the following two cases:

(i) If the fuse is put in the neutral wire instead of live wire and due to fault, if an excessive current flows in the circuit, the fuse burns, current stops flowing in the circuit but the appliance remains connected to the high potential point of the supply through the live wire. In this situation, if a person touches the faulty appliance, he may get an electric shock as the person will come in contact with the live wire through the appliance.

Preventive measure: The fuse must always be connected in the live wire.

(ii) When the live wire of a faulty appliance comes in direct contact with its metallic case due to break of insulation after constant use (or otherwise), the appliance acquires the high potential of the live wire. A person touching it will get a shock because current flows through his body to earth.

Preventive measure: Proper *'earthing'* of the electric appliance should be done.

Solution 26:

Power circuit carries high power and costly devices. If there is some unwanted power signal (noise) in the wire it can damage the device. To reduce this effect earth is necessary.
Lighting circuit carries low power (current). So, we ignore the earth terminal.

Solution 27:

A high tension wire has a low resistance and large surface area.

Solution 28:

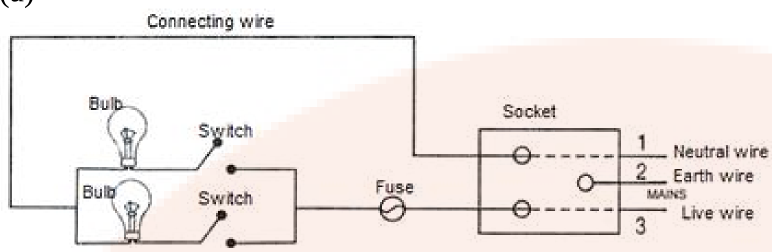
To carry larger current, the resistance of the wire should be low, so its area of cross section should be large. Therefore 15 A current rated wire will be thicker.

Solution 29:

(a) Switches 2 and 3.
(b) The lamps are connected in series.

Solution 30:

(a)



(b)

Wire no.	Wire name	Colour (Old convention)	Colour (New convention)
1	Neutral wire	Black	Light blue
2	Earth wire	Green	Green or yellow
3	Live wire	Red	Brown

(c) The bulbs are joined in parallel.

MULTIPLE CHOICE TYPE:

Solution 1:

5 A

Hint: The electric wiring for light and fan circuit uses a thin fuse of low current rating (= 5 A) because the line wire has a current carrying capacity of 5 A.

Solution 2:

A switch must be connected in live wire.

Explanation: A switch must be connected in live wire, so that when it is in 'off' position, the circuit is incomplete and no current reaches the appliance through the live wire.