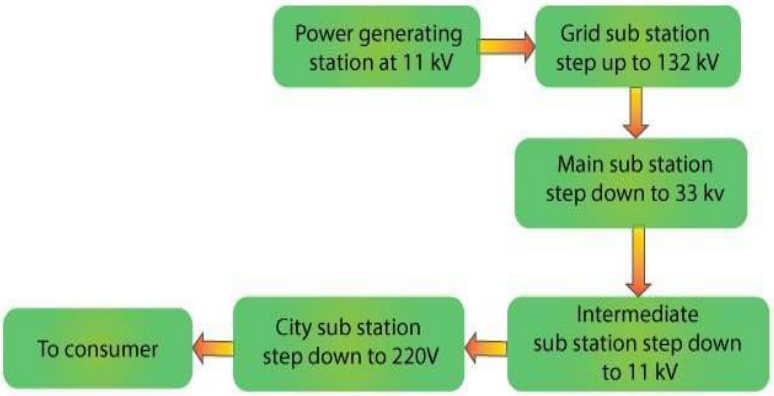
EXERCISE 9(A)

Solution:
The electric power generated at the power generating station at 11 kV and 50 Hz respectively.

Solution:
(a) Generation at voltage higher than 11 kV causes insulation difficulties, while generation at voltage lower than 11 kV involves a very high current. Hence, electric power from the generating station is transmitted at 11 kV.
(b) Alternating current (AC) is the nature of current transmitted from the power station

Solution:
Usually at 11 kV, power generated at generating stations which is very high. This power is to be transmitted across far away distances from the generating stations. A lot of energy is lost in the transmission line wires in the form of heat during transmitting the 11 kV power. Hence, using the step up transformer the voltage of power generated at the stations is stepped up from 11 kV to 132 kV. This process is applicable only for alternating current since direct current cannot be raised.

Solution:



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

Solution:
The a.c. is supplied to our houses at 220 V of voltage and 50 Hz of frequency.

Question: 6
Name the device used to (a) Increase the voltage at the generating station (b) Decrease the voltage at the sub-station for its supply.
Solution:
(a) Step-up transformer is used to increase the voltage at the generating station
(b) Step-down transformer is used to decrease the voltage at the sub-station for its supply.

Question: 7
(a) Name the three connecting wires used in a household circuit.
(b) Which two wires mentioned in part (a) are at the same potential?
(c) In which of the wire stated in part (a) the switch is connected?
Solution:
(a) Live wire, neutral wire and earth wire are the three connecting wires used in household circuit

(b) Neutral wire and earth wire are at the same potential
(c) Live wire is the wire in which the switch is connected

Question: 8
What is the pole fuse? Write down its current rating.
Solution:
Before connecting the cable from pole to the meter in a house, first a fuse of high rating is connected in the live wire at the pole or just before the meter. This fuse is called the pole fuse. The current rating of pole fuse is ≈ 50 A.

Question: 9
State the function of each of the following in a house circuiting:
(a) kWh meter, (b) main fuse, and (c) main switch
Solution:
(a) After the company fuse, the cable is connected to a kWh meter. From this meter, connections are made to a main switch and to a main fuse in the distribution box.
(b) Main fuse is connected only in the live wire and in case of high current it gets burnt and the cut the connections to save appliances.
(c) Main switch is connected in both the live and neutral wires. It is used to break the connections of the live as well as the neutral wires simultaneously from the main supply.

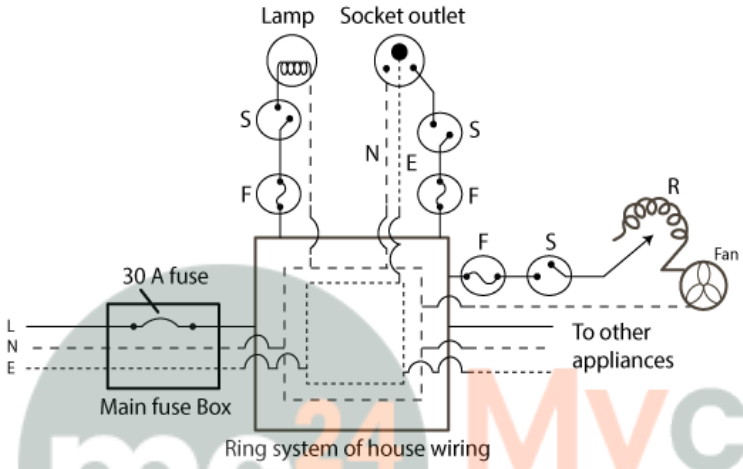
Question: 10
In what unit does the electric meter in a house measure the electrical energy consumed? What is its value in S.I. unit?
Solution:
The electric meter in a house measure the electrical energy consumed in kWh.
1 kWh = 3.6×10^6 J is its value in S.I. unit.

Question: 11
Where is the main fuse connected in a house circuit?
Solution:
The main fuse is connected in series only in the live wire before the main switch in the distribution board of a house circuit

Question: 12
State one advantage of using the main switch in house wiring.
Solution:
The main switch is a double pole switch and has an iron covering. The advantage of

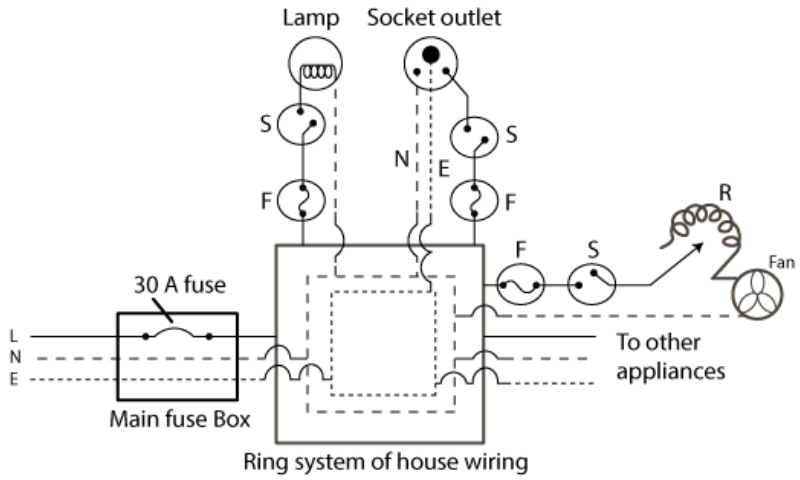
using the main switch is that it can break both the connection of the live and the neutral wires at the same time. This protects the electrical appliances from accidental damage due to electrical faults.

Question: 13
Draw a circuit diagram to explain the ring system of house wiring. State two advantages of it.
Solution:



Advantages of a ring system over tree system
(i) The wiring is cheaper in a ring system than in tree system
(ii) The sockets and plugs of same size can be used in a ring system while sockets and plugs are of different size in a tree system
(iii) Each appliance has a separate fuse in a ring system. Therefore if due to some fault, the fuse of one appliance burns, it does not affect the operation of the other appliances while in a tree system when fuse in one distribution line blows, it disconnects all the appliances connected to that distribution circuit.

Question: 14
Draw a labelled diagram with the necessary switch, regulator, etc. to connect a bulb and a fan with the mains. In what arrangement are they connected to the mains: series or parallel?
Solution:



The appliances are connected in a parallel arrangement to the mains

Question: 15

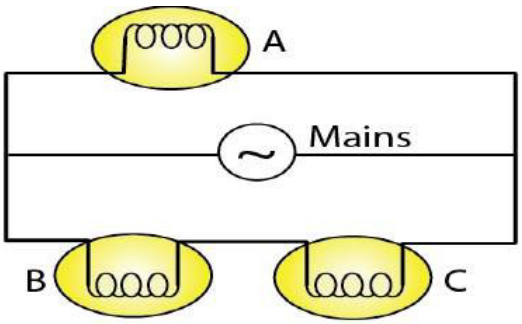
How should the several electric lamps be connected with the mains so that the switching on or off a lamp has no effect on the operation of other lamps?

Solution:

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

Question: 16

Fig.9.12 shows three bulbs A, B and C each of rating 100 W, 220 V connected to the mains of 220 V. Answer the following:



(a) How is the bulb A connected with the mains? At what voltage does it glow?

(b) How are the bulbs B and C connected with the mains? At what voltage does the bulb B glow?

(c) How is the glow of bulbs A and C affected if bulb B gets fused?

(d) How is the glow of bulbs B and C affected if bulb A gets fused?
Solution:
(a) Bulb A is connected with the mains in parallel. The bulb A glows when the voltage applied across the bulb is 220 V
(b) Bulbs B and C are connected in series with the mains. The voltage at which they glow will be divided by two from the mains supply voltage due to the series connection with the mains. Thus bulb B will glow at 110 V
(c) If bulb B gets fused, bulb C will not glow which is connected in series with the bulb B. This will not affect the glow of bulb A as it is connected in parallel with the mains.
(d) The glow of bulbs B and C will not be affected if bulb A gets fused.

Question: 17
Two sets A and B each of four bulbs are glowing in two separate rooms. When one of the bulbs in set A is fused, the other three bulbs also cease to glow. But in set B, when one bulb fuses, the other bulbs continue to glow.
(i) Explain the difference in the two sets,
(ii) Which set of arrangement is preferred in housing circuit and why?
Solution:
(i) In set A, all the three bulbs are in series connection. The voltage of source gets divided connected in series in all the three bulbs and they operate at the same time. None of the bulb can be operated independently and thus when one bulb fuses the other two bulb also ceases to glow
In set B, all the three bulbs are in parallel connection. Therefore even when one of the bulbs ceases to glow, the others continues to glow. So, each bulb operates independently.
(ii) Set B arrangement that is all the bulbs connected in parallel is preferred in housing circuit because each appliances gets connected to 220 V supply for its normal working and each appliance operates independently without being affected whether the other appliance is switched on or off.

MULTIPLE CHOICE TYPE
Question: 1
The main fuse is connected in:
(a) Live wire
(b) Neutral wire
(c) Both the live and earth wires
(d) Both earth and the neutral wire.
Solution:
The main fuse is connected in live wire

Question: 2
The electrical appliances in a house are connected in:
(a) Series
(b) Parallel
(c) Either in series or parallel
(d) Both in series and parallel
Solution:
The electrical appliances in a house are connected in parallel

Question: 3
The electrical meter in a house records the consumption of:
(a) Charge
(b) Current
(c) Energy
(d) Power
Solution:
The electrical meter in a house records the consumption of energy.