UNIT 3

Electromagnetic Induction

09/11/2020 – Class 28

Assignment Answer

1)

1. In which line is the switches and fuses connected? **Phase line.**
2. What are the specialities observed by you in connecting devices in household circuit? **Devices are connected in parallel between phase and neutral lines.**
3. Give the reasons for connecting devices in parallel?
   Can provide same potential difference.
   Can control different devices by using different switches.

2) Fuse, MCB and ELCB are some safety devices used in electric circuits.

1.What are the differences between MCB and an electric fuse?

Fuse works on the basis of heating effect of current, MCB works on the basis of heating effect and magnetic effect of current.

2.What is the advantage of MCB over an electric fuse? **MCB automatically break the circuit whenever there is an excess flow of current due to short circuit and overloading**

Activity 1

Discussion

- Which devise is connected at the beginning of the household electrical circuit? **Watt-hour meter**.
- Why this devise is connected at the beginning of the circuit? **To measure the whole electrical energy consumption in that circuit.**
- Which equation we studied in the first chapter, to calculate the electrical energy consumption? **E = Pxt**

Activity 2

An electrical appliance of power 100 W works one hour per day. Calculate the energy consumption, in one month?

P = 100 W, t = 1 hour = 3600 s

E = Pt = 100 X 3600 X 30 =**10800000 J**

Discussion

- Is it practical to use joule as the commercial unit of electrical energy? Why? **No, joule is a small unit.**
- What is the commercial unit of electrical energy? **kilowatt hour (kWh) or Unit**

1 unit electrical energy = 1 kWh

The commercial unit of electrical energy is **kilowatt hour (kWh)**. A device of power 1000 watt (1 kW), when used for one hour (1h), consumes one unit of electrical energy (1 kWh).

1 kWh = 1000 X 60 X 60 = 3600000 J

Equation to calculate electrical energy consumption in kWh

$$\text{Energy in kilowatt hour} = \frac{\text{Power in watt} \times \text{time in hour}}{1000}$$

- Why the above equation is divided by 1000? **To convert to kilowatt hour.**

Activity 3

An electric iron of power 1200 W works for one hour. Calculate the energy consumed?

Power (P) = 1200 W, Time (t) = 1 hour

Energy consumed by electric iron = P X t / 1000 = 1200 X 1/1000 = **1.2 unit.**

Activity 4

An electric bulb of power 100 W works for one hour. Calculate the energy consumed?

Power (P) = 100 W, Time (t) = 1 hour

Energy consumed by electric bulb = P X t / 1000 = 100 X 1/1000 = **0.1 unit.**

Activity 5

A CFL of power 15 W works for one hour. Calculate the energy consumed?

Power (P) = 15 W, Time (t) = 1 hour

Energy consumed by CFL = P X t / 1000 = 15 X 1/1000 = **0.015 unit.**

Inference

Electrical appliances having low power consumes less electrical energy.

Activity 6

How to calculate the time required to work an electrical appliance, for the consumption of one unit electrical energy?

We have,

$E = (P \times t) / 1000$

$E \times 1000 = P \times t$

$$t = (E \times 1000) / P$$

Activity 7

A 100 W bulb is given. How many hours it should be works for consuming one unit electrical energy?

E = 1 unit, P = 100 W

Time, t = (E X 1000) / P = 1 X 1000/100 = **10 hour**

Activity 8

A 15 W CFL is given**.** How many hours it should be works for consuming one unit electrical energy?

E = 1 unit, P = 15 W

Time, t = (E X 1000) / P = (1 X 1000) /15 **= 66.66 hour**

Activity 8

A 9 W LED lamp is given**.** How many hours it should be works for consuming one unit electrical energy?

E = 1 unit, P = 9 W

Time, t = (E X 1000) / P = (1 X 1000) /9 = 111.11 hour

Inference

Electrical appliances having low power consumes one unit of electrical energy, only after working more hours.

Activity 9

In a house, 5 CF lamps each of 20 W, works for 4 hours, 4 fans each of 60 W work for 5 hours and a TV of 100 W works for 4 hours in a day. What will be the daily consumption shown by the watt hour meter?

Power of CFL = 20 W, Power of Fan = 60 W, Power of TV = 100 W

Electrical energy consumed by the CFL in kWh = (P X t) / 1000

= (20 X 5 X4) / 1000 = 400 / 1000 = **0.4 unit**

Electrical energy consumed by the 4 Fan in kWh = (P X t) / 1000
= (60 X 4 X5) / 1000 = 1200 / 1000 **= 1.2 unit**

Electrical energy consumed by TV in kWh = (P X t) / 1000
= (100 X4) / 1000 = 400 / 1000 **= 0.4 unit**

Total energy consumption = 0.4 + 1.2 + 0.4 = **2 unit**
Energy consumed in one month = 2 X 30 = **60 unit**

Assignment

Find the power of each electrical appliance in your home and how many hours it takes for each appliance to use one unit of electrical energy?