# VIDYAJYOTHI

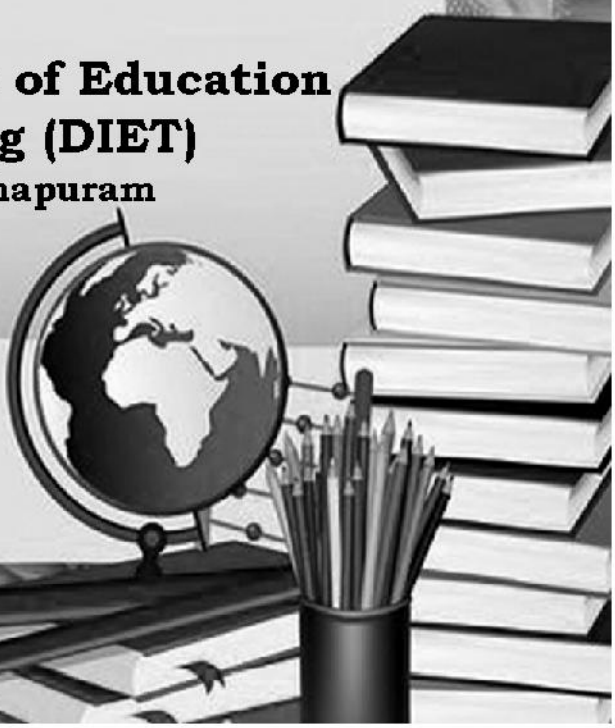
(2020 - 2021)

# PHYSICS

## WORKSHEET

## CLASS X

**District Institute of Education and Training (DIET)**
Thiruvananthapuram



# Vidyajyothi

## Physics

**(Worksheet )**

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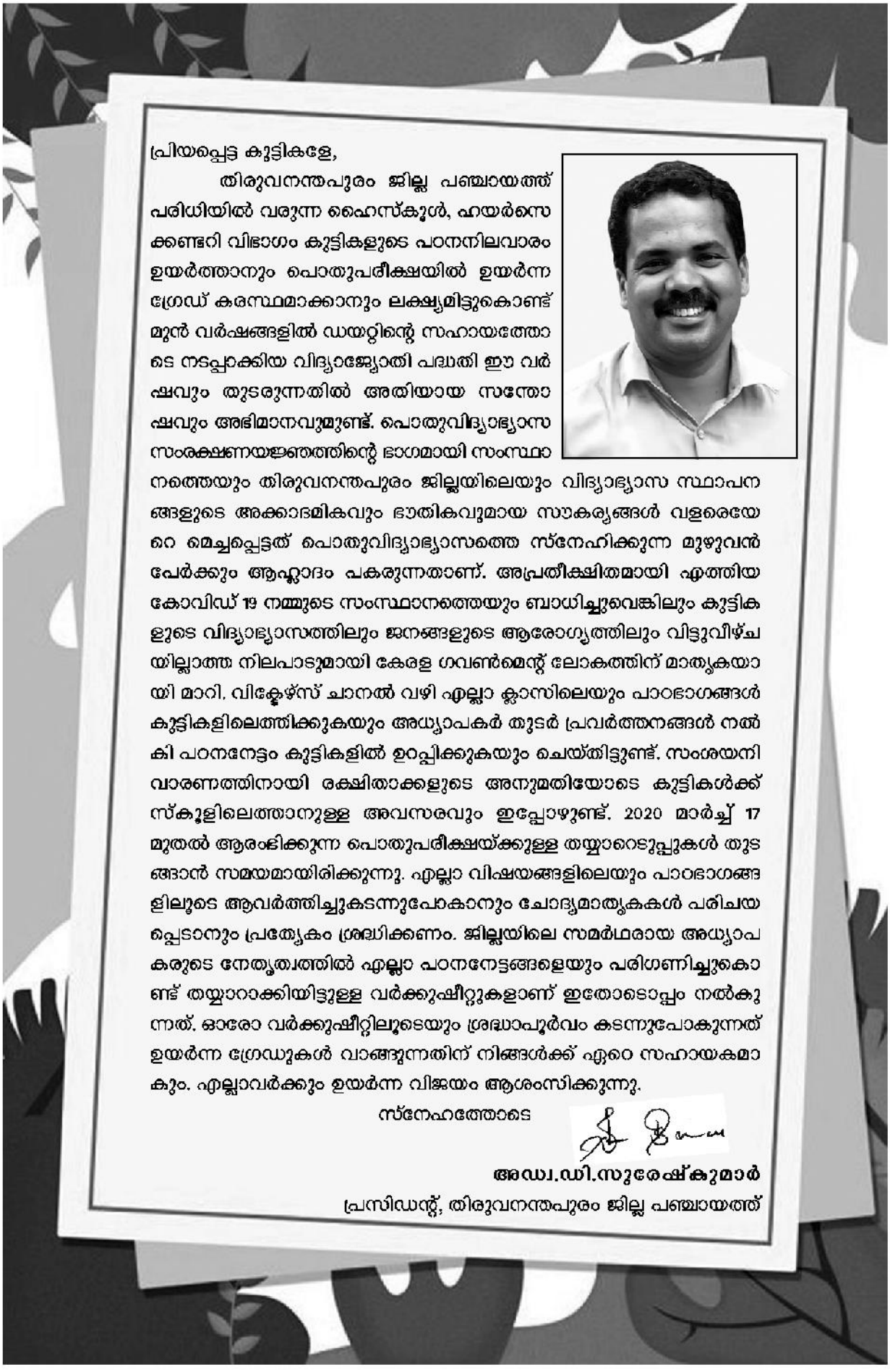

പ്രിയപ്പെട്ട കുട്ടികളേ,



തിരുവനന്തപുരം ജില്ലാ പഞ്ചായത്ത് പരിധിയിൽ വരുന്ന ഹൈസ്കൂൾ, ഹയർസെക്കണ്ടറി വിഭാഗം കുട്ടികളുടെ പഠനനിലവാരം ഉയർത്താനും പൊതുപരീക്ഷയിൽ ഉയർന്ന ഗ്രേഡ് കരസ്ഥമാക്കാനും ലക്ഷ്യമിട്ടുകൊണ്ട് മുൻ വർഷങ്ങളിൽ ഡയറ്റിന്റെ സഹായത്തോടെ നടപ്പാക്കിയ വിദ്യാജ്യോതി പദ്ധതി ഈ വർഷവും തുടരുന്നതിൽ അതിയായ സന്തോഷവും അഭിമാനവുമുണ്ട്. പൊതുവിദ്യാഭ്യാസ സംരക്ഷണയജ്ഞത്തിന്റെ ഭാഗമായി സംസ്ഥാനത്തെയും തിരുവനന്തപുരം ജില്ലയിലെയും വിദ്യാഭ്യാസ സ്ഥാപനങ്ങളുടെ അക്കാദമികവും ഭൗതികവുമായ സൗകര്യങ്ങൾ വളരെയേറെ മെച്ചപ്പെട്ടത് പൊതുവിദ്യാഭ്യാസത്തെ സ്നേഹിക്കുന്ന മുഴുവൻ പേർക്കും ആഹ്ലാദം പകരുന്നതാണ്. അപ്രതീക്ഷിതമായി എത്തിയ കോവിഡ് 19 നമ്മുടെ സംസ്ഥാനത്തെയും ബാധിച്ചുവെങ്കിലും കുട്ടികളുടെ വിദ്യാഭ്യാസത്തിലും ജനങ്ങളുടെ ആരോഗ്യത്തിലും വിട്ടുവീഴ്ചയില്ലാത്ത നിലപാടുമായി കേരള ഗവൺമെന്റ് ലോകത്തിന് മാതൃകയായി മാറി. വിക്ടേഴ്സ് ചാനൽ വഴി എല്ലാ ക്ലാസിലെയും പാഠഭാഗങ്ങൾ കുട്ടികളിലെത്തിക്കുകയും അധ്യാപകർ തുടർ പ്രവർത്തനങ്ങൾ നൽകി പഠനനേട്ടം കുട്ടികളിൽ ഉറപ്പിക്കുകയും ചെയ്തിട്ടുണ്ട്. സംശയനിവാരണത്തിനായി രക്ഷിതാക്കളുടെ അനുമതിയോടെ കുട്ടികൾക്ക് സ്കൂളിലെത്താനുള്ള അവസരവും ഇപ്പോഴുണ്ട്. 2020 മാർച്ച് 17 മുതൽ ആരംഭിക്കുന്ന പൊതുപരീക്ഷയ്ക്കുള്ള തയ്യാറെടുപ്പുകൾ തുടങ്ങാൻ സമയമായിരിക്കുന്നു. എല്ലാ വിഷയങ്ങളിലെയും പാഠഭാഗങ്ങളിലൂടെ ആവർത്തിച്ചുകടന്നുപോകാനും ചോദ്യമാതൃകകൾ പരിചയപ്പെടാനും പ്രത്യേകം ശ്രദ്ധിക്കണം. ജില്ലയിലെ സമർഥരായ അധ്യാപകരുടെ നേതൃത്വത്തിൽ എല്ലാ പഠനനേട്ടങ്ങളെയും പരിഗണിച്ചുകൊണ്ട് തയ്യാറാക്കിയിട്ടുള്ള വർക്കുഷീറ്റുകളാണ് ഇതോടൊപ്പം നൽകുന്നത്. ഓരോ വർക്കുഷീറ്റിലൂടെയും ശ്രദ്ധാപൂർവം കടന്നുപോകുന്നത് ഉയർന്ന ഗ്രേഡുകൾ വാങ്ങുന്നതിന് നിങ്ങൾക്ക് ഏറെ സഹായകമാകും. എല്ലാവർക്കും ഉയർന്ന വിജയം ആശംസിക്കുന്നു.

സ്നേഹത്തോടെ

**അഡ്വ.ഡി.സുരേഷ്കുമാർ**

പ്രസിഡന്റ്, തിരുവനന്തപുരം ജില്ലാ പഞ്ചായത്ത്

## Members participated in the workshop

1. **Sri. Ajith V. R.**
   AKMHSS Kudavoor
2. **Sri. Biju S.**
   GHSS Elampa
3. **Smt. Bindu T.**
   GVHSS Njekkad
4. **Sri. Manoj S.**
   SSPBHSS Kadakkavoor
5. **Sri. Shaji K.V.**
   GHS Vazhamuttom
6. **Sri. Jyothis P.S.**
   GHS Kattachakonam
7. **Smt. Pamela R. David**
   St. Roch's HS Thope
8. **Smt. Preetha Antony**
   St. Philomina's HSS Poonthura
9. **Sri. Saji Y**
   New HSS Nellimoodu
10. **Sri. Sanal Kumar S.A.**
    JPHSS Ottasekharamangalam
11. **Smt. Sreedevi S.S.**
    GVHSS Kottukal
12. **Smt. Brija B.C.**
    GVHSS Parassala

## Message

പ്രിയപ്പെട്ട കുട്ടികളേ

വളരെ വ്യത്യസ്തമായ ഒരു അധ്യയനവർഷത്തിലൂടെയാണ് നാം കടന്നുപോകുന്നത്. കോവിഡ് 19 സൃഷ്ടിച്ച ആശങ്കകൾക്കിടയിലും പഠനം മുടങ്ങാതിരിക്കാനുള്ള എല്ലാ മുൻകരുതലും കേരള സർക്കാരും വിദ്യാഭ്യാസവകുപ്പും സ്വീകരിച്ചിട്ടുണ്ട്. വിക്ടേഴ്സ് ചാനൽ വഴി പ്രക്ഷേപണം ചെയ്യുന്ന ക്ലാസുകൾക്ക് വലിയ സ്വീകാര്യതയാണ് ലഭിക്കുന്നത്. വിവരവിനിമയ സാങ്കേതികവിദ്യയുടെ ഉപയോഗം വിദ്യാഭ്യാസപ്രക്രിയയ്ക്ക് കൂടുതൽ കരുത്ത് പകർന്നിട്ടുണ്ട്. പത്താംക്ലാസ്, ഹയർസെക്കണ്ടറി വിഭാഗം കുട്ടികളുടെ വിജയശതമാനം ഉയർത്താൻ ലക്ഷ്യം വച്ചുകൊണ്ട് തിരുവനന്തപുരം ജില്ലപഞ്ചായത്തും ഡയറ്റും മുൻവർഷങ്ങളിൽ നടപ്പാക്കിയ വിദ്യാജ്യോതി പദ്ധതി ഈ വർഷവും തുടരുകയാണ്. പാഠഭാഗങ്ങളുടെ ഉള്ളടക്കത്തെ ലളിതമായ ആശയങ്ങളാക്കി മാറ്റി എല്ലാ കുട്ടികൾക്കും എളുപ്പത്തിൽ ഗ്രഹിക്കാൻ കഴിയുന്ന വിധം വർക്കുഷീറ്റുകൾ തയാറാക്കി നൽകാനാണ് ഇപ്പോൾ തീരുമാനിച്ചിട്ടുള്ളത്. ഇതിനായി എല്ലാ വിഷയങ്ങളുടെയും വർക്കുഷീറ്റുകൾ തയാറായിട്ടുണ്ട്. പാഠപുസ്തകത്തെ രണ്ട് ഭാഗങ്ങളാക്കിയാണ് വർക്കുഷീറ്റ് നിർമാണം പുരോഗമിക്കുന്നത്. ആദ്യഘട്ടം വർക്കുഷീറ്റുകൾ ഇതോടൊപ്പം ചേർക്കുന്നു. എല്ലാ വർക്കുഷീറ്റിലൂടെയും ശ്രദ്ധാപൂർവം കടന്നുപോകണം. എല്ലാവർക്കും മികച്ച വിജയം ആശംസിക്കുന്നു.

സ്നേഹത്തോടെ

**സന്തോഷ്കുമാർ.എസ്.**

വിദ്യാഭ്യാസ ഉപഡയറക്ടർ, തിരുവനന്തപുരം

## Message

പ്രിയപ്പെട്ട കുട്ടികളേ,

അപ്രതീക്ഷിതമായി എത്തിയ കോവിഡ് 19 വിദ്യാഭ്യാസമേഖലയിൽ വലിയ വെല്ലുവിളിയാണ് ഉയർത്തിയത്. രോഗവ്യാപനസാഹചര്യത്തിലും വിദ്യാഭ്യാസം സുഗമമാക്കുന്നതിന് വിദ്യാഭ്യാസവകുപ്പും സമൂഹവും ഒന്നുചേർന്ന് പ്രവർത്തിക്കുകയുണ്ടായി. കോവിഡിനെ അതിജീവിക്കാനായി സ്വീകരിച്ച ഓരോ വഴിയും പിന്നീട് സൗകര്യമായും ശീലമായും മാറുമോയെന്ന് ആശങ്കപ്പെടേണ്ടതുണ്ട്. ഓരോന്നിനെയും അതിന്റെ മേന്മ നോക്കി സ്വീകരിച്ചാൽ ഈ പ്രശ്നം പരിഹരിക്കാൻ കഴിയും. ഒരു കാര്യം ഉറപ്പാണ്. മനുഷ്യരാശി കോവിഡിന്റെ പിടിയിൽനിന്ന് മുക്തരാകും. പക്ഷേ കോവിഡിനു മുമ്പുള്ള സാമൂഹ്യസാഹചര്യത്തിലേയ്ക്ക് തിരികെപ്പോകാൻ കഴിയാതെ വന്നേക്കും. എങ്കിലും നമുക്ക് ശുഭപ്രതീക്ഷയാണുള്ളത്. തിരുവനന്തപുരം ജില്ല പഞ്ചായത്തും ഡയറ്റും ചേർന്ന് നടപ്പാക്കുന്ന വിദ്യാജ്യോതി പദ്ധതി ഏറ്റവുമധികം ശ്രദ്ധയാകർഷിച്ച പരിപാടിയാണ്. മുൻവർഷങ്ങളിൽ ആറ് വിഷയങ്ങൾക്കുമാത്രമാണ് പഠനസഹായി തയാറാക്കിയത്. ഈ വർഷം എല്ലാ വിഷയത്തിന്റെയും ഉള്ളടക്കമേഖലകളെ ലളിതമായി വ്യാഖ്യാനിച്ച് കുട്ടികളുടെ മുമ്പിൽ വർക്കുഷീറ്റുകളായി എത്തിക്കാനാണ് ലക്ഷ്യമിട്ടിട്ടുള്ളത്. ഉയർന്ന വിജയം കരസ്ഥമാക്കാൻ ഈ വർക്കുഷീറ്റുകൾ സഹായകമാകും. പരിചയസമ്പന്നരായ അധ്യാപകരാണ് ഓരോ വിഷയത്തിന്റെയും വർക്കുഷീറ്റുകൾ തയാറാക്കുന്നതിന് നേതൃത്വം നല്കിയത്. എല്ലാ വർക്കുഷീറ്റുകളിലൂടെയും കടന്നുപോയി ഉയർന്ന വിജയത്തിലെത്താൻ മുഴുവൻ കുട്ടികൾക്കും കഴിയട്ടെയെന്ന് ആശംസിക്കുന്നു.

വിശ്വസ്തതയോടെ

**ഡോ.ഷീജാകുമാരി**

പ്രിൻസിപ്പൽ ഇൻ ചാർജ്, ഡയറ്റ് തിരുവനന്തപുരം.

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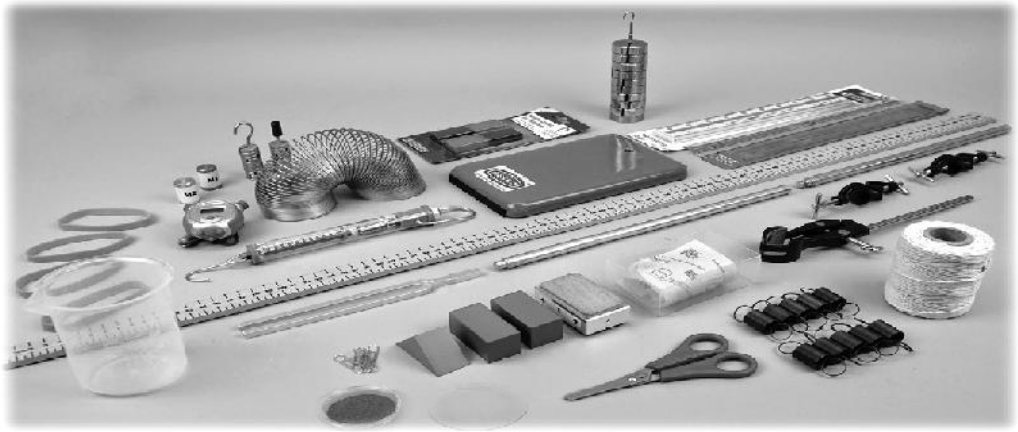
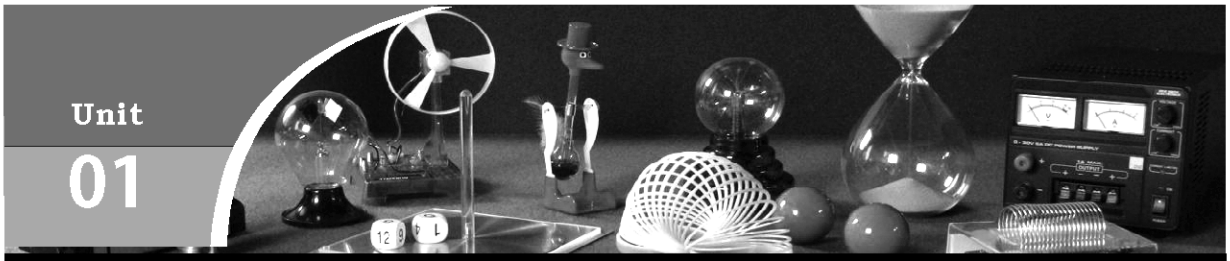




Unit
01

# EFFECTS OF ELECTRIC CURRENT

## Points to Remember

- Heating Effect – Joule's Law
  Heating appliances
  Safety fuse
- Lighting Effect – Incandescent lamp
  Discharge lamp
  Fluorescent lamp
  CFL
  LED
- Arrangement of resistors- Parallel, Series
- Electric Power
- **Heating Effect**

  **Joules Law** – The heat generated in a current carrying conductor is directly proportional to the product of the square of the current (I) in the conductor, the resistance of the conductor(R) and the time of flow of current

  $H = \frac{V^2 t}{R}$

  $H = IVt$

  $H = I^2 Rt$

**Arrangement of resistors**

| **Resistors in Series** | **Resistors in Parallel** |
|---|---|
| Effective resistance $R = R_1 + R_2 + R_3$ | Effective resistance $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$ |
| Effective resistance is greater than the highest resistance | Effective resistance is lower than the lowest resistance |
| Current is same through all the resistors | Current is different through each resistor $I = I_1 + I_2 + I_3$ That is $I = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$ |
| Voltage is different in each resistor $V = V_1 + V_2 + V_3$ That is $IR = IR_1 + IR_2 + IR_3$ | Voltage is same through all resistors |

**Note:**

In parallel connection if the resistors have same value, the flow of current through each resistor will be the same then current will be shared equally through each resistor.

If the resistors have different values, more current will flow through the resistor having least value.

- If only two resistors are connected in parallel then the effective resistance

$$R = \frac{R_1 R_2}{R_1 + R_2}$$

If 'n' number of resistors of the same value are connected in parallel then

Effective resistance $R_p = \frac{r}{n}$, where 'r' is the value of the resistance

If 'n' number of resistors of the same value are connected in series then

Effective resistance $R_s$ = rxn

- $\frac{R_s}{R_p} = n^2$

- **Devices that makes use of heating effect of current**
  - * Soldering Iron
  - * Electric Iron
  - * Electric room heater
  - * Electric heater
  - * Electric Stove
  - * Electric kettle

- **Energy Change**

  Electric energy $\rightarrow$ Heat energy

- **Main part of Heating appliance is the Heating coil**

  Electric energy is converted to heat energy in this heating coil.

  Heating coil is made up of Nichrome

  Nichrome is an alloy of Nickel, Chromium and Iron

- **Properties of heating coil**
  - i) High resistivity
  - ii) High melting point
  - iii) Remains red hot for a long time

- **Safety Fuse** – Heating Effect

  Fuse wire – It is made up of an alloy of tin and lead

  **Properties of fuse wire**

  Low Melting point

  High resistivity

  It is connected in series to the circuit

  Situations where excess current flows through the circuit -

  Overloading, Short circuit

- **Electric Power**

$$P = \frac{W}{t}, \quad P = \frac{H}{t}, \quad P = I^2R, \quad P = \frac{V^2}{R}, \quad P = VI$$

**Lighting Effect**

- **Incandescent lamp**

  Filament - Tungsten

**Properties**

High resistivity, High ductility, High melting point, It can emit white light in the white hot condition

**Disadvantage** : Major part of electric energy is wasted as heat enegy

- Discharge lamp, Fluorescent lamp, CFL- Light energy is produced due to the discharge of electricity through the gases
- LED- Low power, No loss of energy in the form of heat, It is not harmful to the environment, Low power consumption, High efficiency

**Activity 1**

Fill suitably

| Device | Energy Change | Effect of Electricity |
|---|---|---|
| Electric bulb | .....(a)..... | Lighting Effect |
| Electric kettle | ..... (b)..... | ..... (c) ..... |
| Mixer grinder | Electrical Energy<br>Mechanical energy | ..... (d) ..... |
| Storage battery<br>(While charging) | ..... (e)..... | ..... (f)..... |

**Activity 2**

An electric heater of 1000 Ω works on 230 V supply.

a) Write down the energy change taking place in the electric heater.

b) State the law related with its working

c) Calculate the electrical energy consumed when heater works for two hours.

**Activity 3**

0.2 A current flows through a resistor of resistance 100 Ω for 2 minute.

a. Calculate the heat generated.

b. What will be the heat if resistance is changed to 200Ω keeping current and time remains the same?

c. What will be the heat if current is doubled keeping resistance and time remains the same?

**Activity 4**

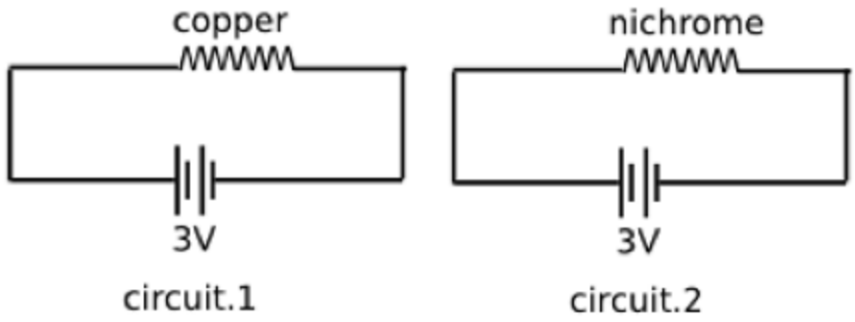
A heater coil is cut into two equal parts. One of them is then used as the coil in the same heater.

a) What happens to the resistance to the coil?

b) What happens to the heat produced?

**Activity 5**

A copper wire and nichrome wire of same length and cross section area are connected in two circuits as shown.




a. Identify the circuit having more current.

b. Find out the wire in which more heat is generated. Give reason

c. If these two wires are connected parallel to the 3 V battery, which wire will be heated more? Give reason

d) If these two wires are connected seies to the 3 V battery, which wire will be heated more? Give reason

**Activity 6**

10 resistors each of 2 Ω are connected in parallel.

a) Calculate the effective resistance.

b) Calculate the effective resistance if the resistors are connected in series

**Activity 7**

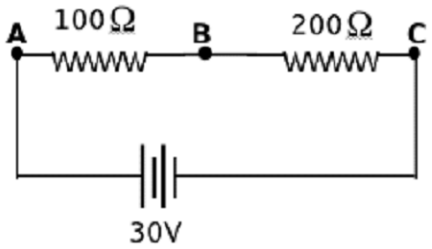
Arrange following statements in the given table.

- When the number of resistors increases current also increases.
- When number of resistors increases effective resistance decreases.
- Same amount of current passes through all the resistors.
- Potential difference is same for all the resistors.
- High resistor gets heated more.
- Applied voltage will be split among the resistors.
- Effective resistance is minimum.

| Series connection | Parallel Connection |
|---|---|
| | |

**Activity 8**

See the circuit.




a. The resistors are connected in .....

(series/parallel)

b. What is the effective resistance in the circuit?

c. High voltage is dropped across .....

(100Ω / 200Ω)

d. More heat will be generated in .....

(100Ω / 200Ω)

e. Identify the resistor through which greater current passes.

f. If potential difference between 100 Ω is 10 V, how much work is done by the battery to move one coulomb charge from A to B?

**Activity 9**

Safety fuse is a device that protect circuit and appliances from danger due to excess current flow through the circuit.

a. Which effect of current is used in safety fuse?

b. How is the fuse connected in a circuit? (in parallel/series)

c. What must be the major feature of the substance used to make fuse wire?

d. Briefly explain how does a safety fuse ensure the safety of circuit and appliances ?

e. What is your opinion about using thick wire as fuse wire?

**Activity 10**

An electric appliance designed to work at 230 V has 690Ω resistance. Find its power.

**Activity 11**

The marking on an electrical appliance is 800 W, 200 V.

a. If it works on 100 V, what will be the consumed power?

b. What is the power when it works on 50 V?

**Activity 12**

Filament lamps are also called incandescent lamps.

a. What is the meaning of the word "incandescent"?

b. Name the substance used for making filament?

c. What are the features of this substance?

d. What is the advantage of filling the bulb with nitrogen instead of air ?

e. What is the major limitation of filament lamp?

**Activity 13**

Bulb will glow if the broken filament will be connected together

a) What happens to the length of the filament ,increase/decrease

b) What happens to the resistance of the filament, increase /decrease

c) What happens to the brightness of bulb, Justify your answer

**Activity 14**

Statements related to the working of discharge lamps are given below. Arrange them in order.

a) Ionised atoms move at high speed

b) Excited atoms came back to their original states for attaining stability. During this process the energy stored in them will be radiated as light.

c) Ionised atoms collide with unionised atoms and excite them to higher energy states.

d) When discharge lamp is connected to a source of electricity, the gas between the electrodes gets ionised due to the applies potential difference.

**Activity 15**

Find the relation and fill up suitably

a) Electric current : Ampere ; Electric power : .....

b) Electric bulb : Lighting Effect; Safety Fuse: .....

c) Heating Coil : High melting point; Fuse wire:....

d) Electric bulb : Lighting Effect; Battery charging: .....

e) Ammeter : Electric Current; Rheostat : .....

f) Ampere : coulomb/second ; Watt : .....

**Activity 16**

LED lamps are now a days used to save electrical energy.

a) What are the advantages of LED lamps

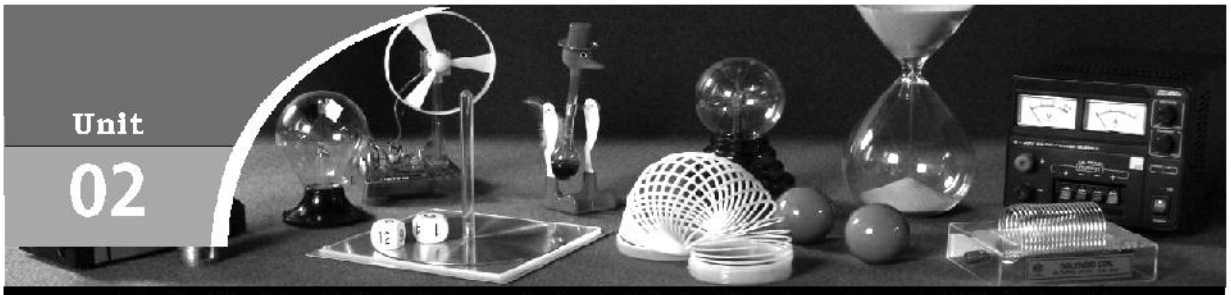
b) Parts of LED lamps are given in the table below, Write the functions of each part and complete the table.

| **Part of LED Bulb** | **Function** |
|---|---|
| Heat sink | |
| Power supply board | |
| Printed circuit board | |
| Base unit | |

**Activity 17**

Match the following

| **A** | **B** | **C** |
|---|---|---|
| Fuse wire | Watt | $R=R_1+R_2+R_3$ |
| Incandescent lamp | Decrease in effective resistance | $I^2R$ |
| Heating element | tungsten | $\frac{1}{R}=\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}$ |
| Resistors in series | Low melting point | Electric energy into heat energy |
| Power | Increase in effective resistance | Tin and Lead |
| Resistors in parallel | nichrome | Nitrogen |



Unit

02

# MAGNETIC EFFECT OF ELECTRIC CURRENT

## Points Remember

- **Scientists**
  1. Hans Christian Oersted – A magnetic field is developed around a straight current carrying conductor.
  2. James Clark Maxwell – Right Hand Thumb Rule The direction of magnetic field developed around a current carrying conductor.

     Also known as Right Hand Screw Rule
  3. Fleming – Left Hand Rule. Direction of motion (direction of Force ) of a conductor placed in a magnetic field.
- **Devices**
  1. Electric motor

     Energy change - Electric energy → mechanical energy

     working principle – motor principle – A current carrying conductor placed in a magnetic field experiences a force.
  2. Moving coil loud speaker

     Energy change - Electric energy → mechanical energy → Sound energy

     working principle – motor principle – A current carrying conductor placed in a magnetic field experiences a force.
- **Magnetic needle placed above a straight current carrying conductor**
  1. Direction of current S → N

     North pole of the magnetic needle deflects towards → West (Anticlockwise)
  2. Direction of current N → S

     North pole of the magnetic needle deflects towards → East (Clockwise)

- **A current carrying solenoid**

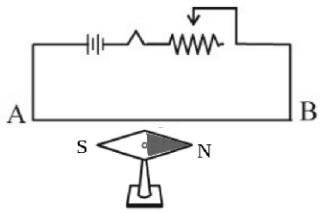
  Current flowing in clockwise direction – Magnetic flux lines will be pointing into the coil

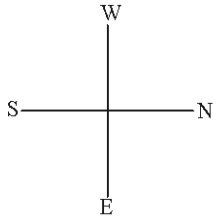
  Current flowing in anti clockwise direction – Magnetic flux lines will be pointing outwards the coil

- **Solenoid** - A current carrying solenoid behaves as a bar magnet. Its polartiy can be changed by changing the direction of current. The strength of magnetic field developed also can be changed by increasing the current flow or inserting a soft iron core into the coil.
- **Bar magnet** - Polartiy of bar magnet cannot be changed. Magnetic field developed is permanent
- **Strength of an electromagnet depends on :**
  1. Intenstiy of eletcric current
  2. Number of turns of the coil
  3. Soft iron core
  4. Area of cross section of the core

**Activity 1**

A straight conductor AB is arranged parallel to a magnetic needle as shown in the figure. When switch is off, no current pass through the circuit and the magnetic needle remains parallel in the NS direction.




a. When switch on, which direction does the current flow?

   i) A to B ii) B to A

b. What happens to the magnetic needle? What is the reason?

c. In which direction does the north pole of the magnetic needle deflect?

   i) East ii) West

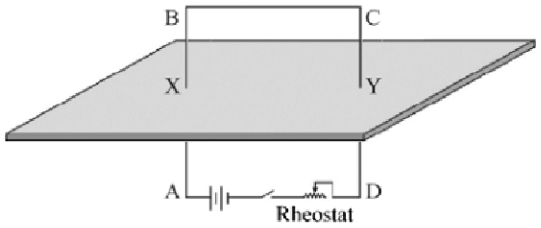
d. Name the law by which the magnetic field of current carrying conductor is determined?

e. How can you reverse the direction of deflection of the magnetic needle?

f. What change will you observe when intenstiy of current is increased ?

**Activity 2**

A conductor is inserted through a cardboard and kept in a vertical position as shown in the figure. The portions passing through the cardboard are marked as X and Y.




a. Draw the pattern of magnetic field lines around X and Y and mark their direction.

b. On the basis of which rule did you find the direction of magnetic field?

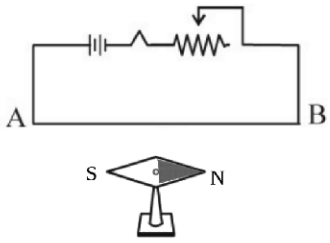
c. Is the direction of magnetic field developed at X and Y the same. Justify your answer.

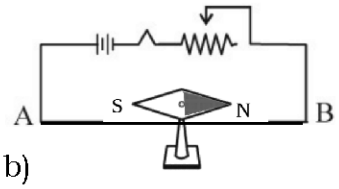
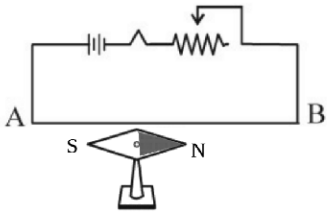
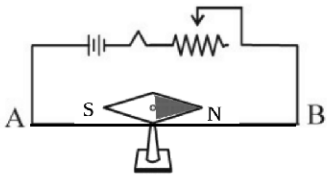
d. What is the nature of magnetic field and on which factor does the direction of magnetic field developed depends?

e. State the law which determines the direction of magnetic field around a current carrying conductor. Also give another name for the rule

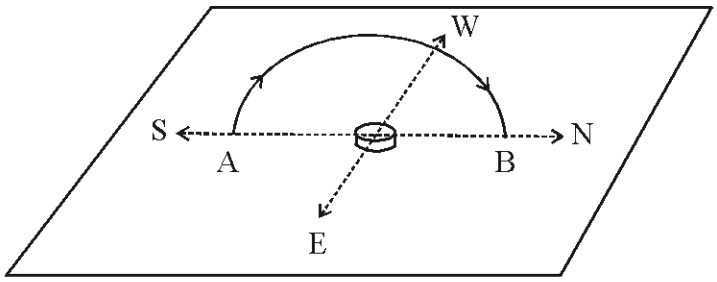
**Activity 3**

Identify the direction of deflection of the north pole of the magnetic needle when electric current is passed through the circuit and complete the table given below.

| Circuit | Direction of electric current (A toB B toA | Position of conductor (Below the magentic needle/ Above the magentic needle | Deflection of the magnetice needle (Clockwise Anticlockwise) |
|---|---|---|---|
| a)   | _____ | _____ | _____ |

| | | | |
|---|---|---|---|
| b)   | _____ | _____ | _____ |
| c)   | _____ | _____ | _____ |
| d)   | _____ | _____ | _____ |

**Ativity 4**




AB is part of a conductor with electric current. A magnetic compass is placed under the conductor. When magnetic compass moves to east or west direction, the needle does not deflect after a certain point.

a. To which terminal of the battery is the end A of the conductor connected to?

b. In which direction will the north pole of the magnetic compass needle deflect when current is passed from A to B

c. How will the magnetic field lines appear when the coil is viewed in such away that the current is in the clockwise direction?

d. Name the law which helped you to get the above conclusion?

e. Write the practical definition of this law?

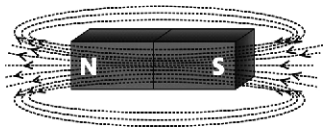
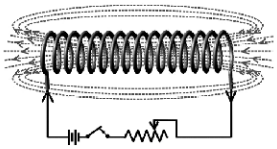
f. What is the reason for the deflection of the compass needle when current is passed through the conductor?

g. Suggest any two changes required for the deflection of the compass needle beyond a certain point.

h. What will be the magnetic pole of the viewing side of the coil when the coil is viewed in such a way that the current is in the clockwise direction?

**Activity 5**

Complete the table by using the given statements and terms.

| | A | B |
|---|---|---|
| |   |  |
| 1. | | |
| 2. | | |
| 3. | | |
| 4 | | |

a. The magnetism is temporary

b. Cannot change the magnetic strength

c. Can change the polartiy

d. The magnetism is permanent

e. Solenoid

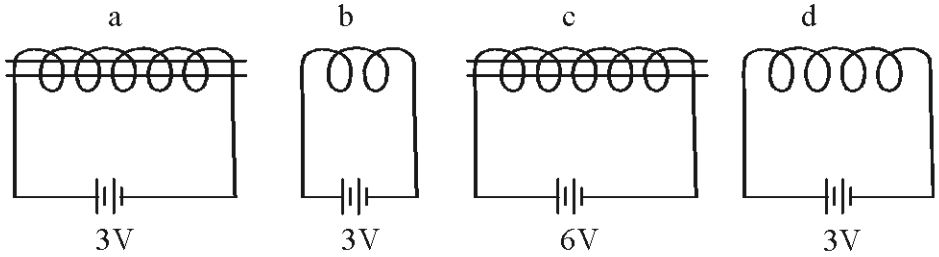
f. Bar magnet

g. Can change the magnetic strength

h. Cannot change the polartiy.

**Activity 6**

Given below are 4 structurally different solenoids



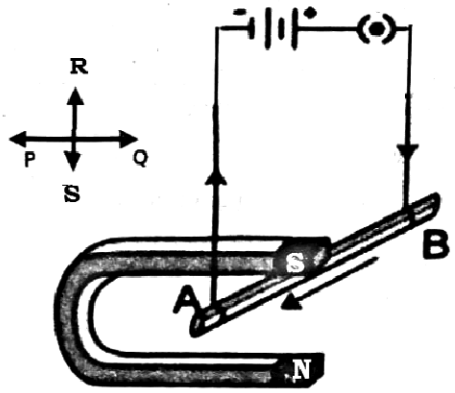

i. Choose the correct descending order of the magnetic strength of the solenoids when current is passed through it

a>b>c>d, d>c>b>a, b>c>a>d, c>a>d>b

ii. What are the factors which brought you to this conclusion?

**Activity 7**

Figure shows a straight conductor AB wchich is placed in the magnetic field of strong U magnet.




a) When switch on the circuit,the conductor AB moves. Give reason

b) Name the principle related to it.

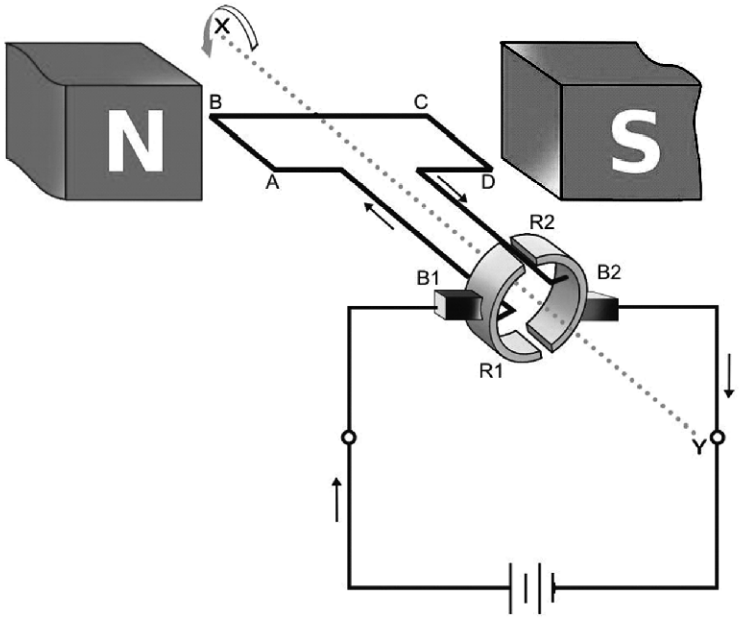
c) Name two devices that work based on this principle

d) When switch on the circuit, in which direction will the conductor AB move?

e) State the law which help you to find the direction of motion of the conductor

f) Which are the factors that affect the direction of motion of the conductor?

**Activity 8**




a) Write down the main parts of the above device

b) Find out the direction of force experienced on the sides AB and CD of the coil

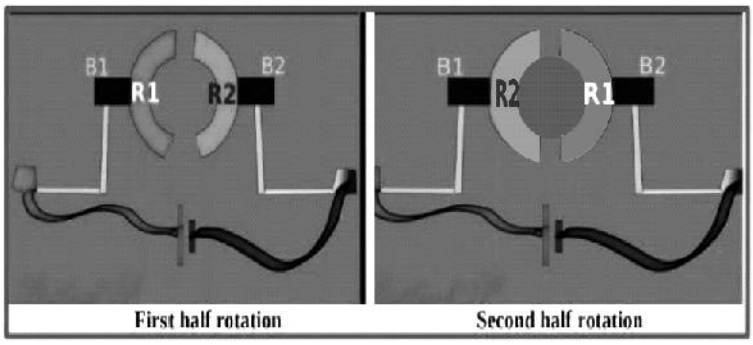
c) What is the result of these forces developed on the coil?

d) Name the law which helps you to find out the direction of force.

e) If the battery is connected such as to reverse the direction of current, what will be the result of the forces developed?

**Activity 9**

Observe the figures which shows the split rings and the brushes of an eletcric motor




a) In the first half rotation which split ring is connected to which brush?

b) What is the direction of current in the first half cycle?

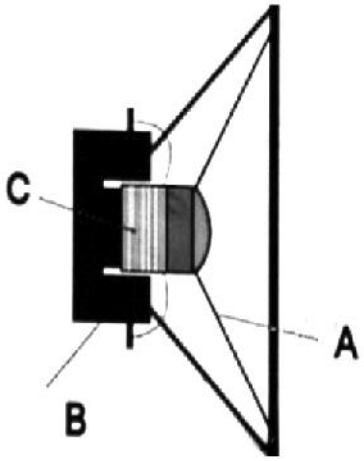
c) In the second half rotation which split ring is connected to which brush?

d) What is the direction of current in the second half rotation?

e) How do split rings change the direction of current in the armature?

f) Why split ring is called split ring commutator?

**Activity 10**

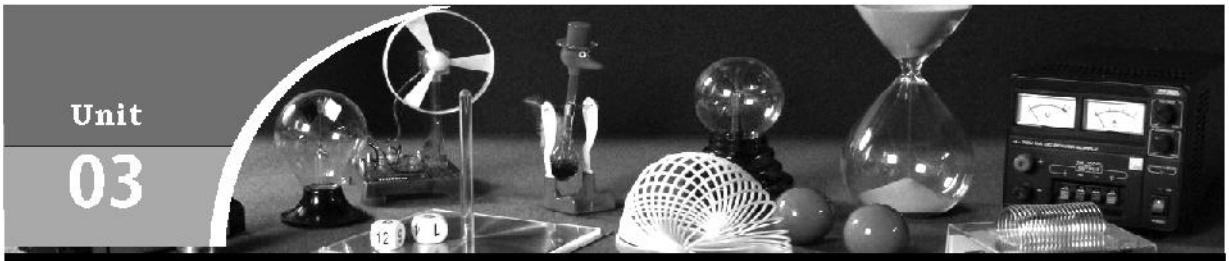



a) Identify the device shown in the figure

b) What is the working principle of this device?

c) Observe the figure and name the parts A,B and C

d) Write the energy change in this device?



Unit
03

# ELECTRO MAGNETIC INDUCTION

## Points Remember

**Important Equations**

$$\frac{Vs}{Vp} = \frac{Ns}{Np}$$

$P = V \times I$

$Vp \times Ip = Vs \times Is$

$Vp = Np \times E$

$Vs = Ns \times E$

Vs – Secondary Voltage.

Vp – Primary Voltage.

Ns - Number of turns in secondary

Np - Number of turns in primary

P - Power

V - Voltage

I - Intensity of electricity

E - emf in one turn

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

**Full forms**

MCB - Miniature Circuit Breaker

ELCB - Earth Leakage Circuit Breaker

RCCB - Residual Current Circuit breaker

AC - Alternating Current

DC - Direct Current

**Devices and It's Use**

**Generator** – Device which converts mechanical energy into electrical energy by making use of electromagnetic induction.

**Transformer** – It is a device for increasing and decreasing AC voltage without any change in its power.

**Inductor** –Inductor is an insulated copper wire wounded in a helical shape used to oppose changes in electric current in a circuit.

**Microphone** - Device which converts mechanical energy into electrical energy by making use of electromagnetic induction.

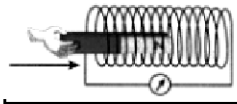
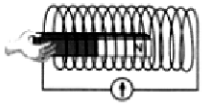
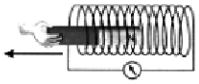
**Watt hour meter** - Used to measure electrical energy.

**Safety Fuse** – Safety fuse is a device which protects us and the appliances from danger when an excess current flows through the circuit.

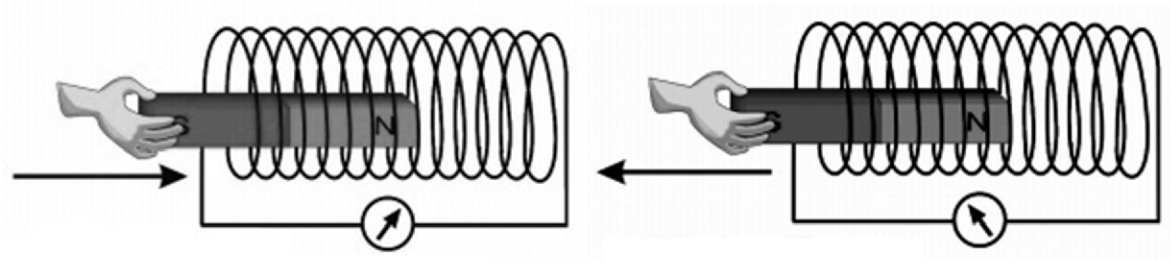
**Three pin plug** - To ensure safety three pin plugs are used in electrical appliances.

## ACTIVITY

1. Fill the observation column suitably

| Diagram | Activity | Observation |
|---|---|---|
|  | Magnet is moved in to the solenoid | ..... |
|  | Magnet is stationary inside the solenoid | ..... |
|  | Magnet is moved out of the solenoid | ..... |

2. Observe the figure:




Electric current is produced in the circuit when an experiment is setup as shown in figure.

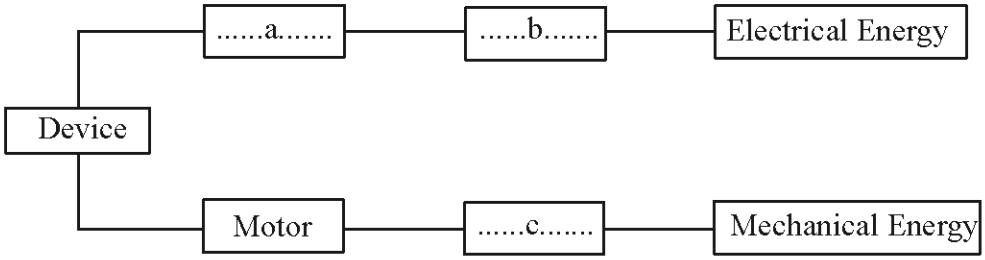
(a) Name the phenomenon behind the flow of current.

(b) Write the name of the current produced in the coil

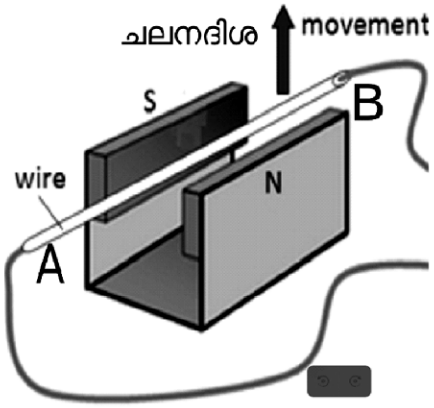
(c) Write the definition for this phenomenon.

(d) What are the factors influencing the intensity current?

3. Complete the flowchart given below:




4. Observe the figure:




What is the direction of current flowing through the conductor according to Fleming's Right hand rule?

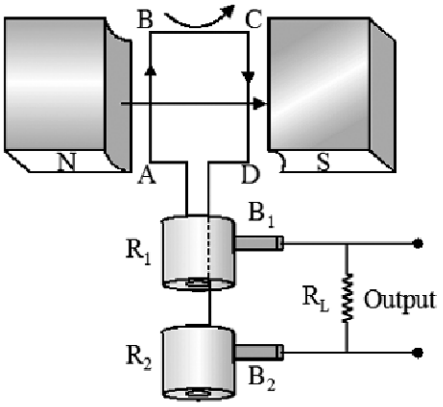
(A to B / B to A)

5. List the following statements appropriately:

- Direction changes.
- Direction does not change.
- Obtained from the cell.
- Used for household electrification.

| AC | DC |
|---|---|
| | |

6. The diagram of a device which were used at the time of power failure during the inaugural ceremony of school science club is shown below.

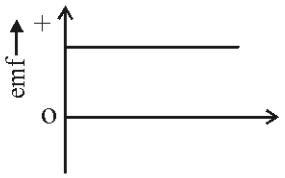
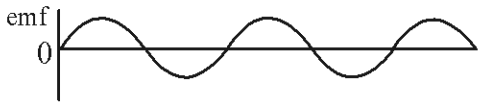
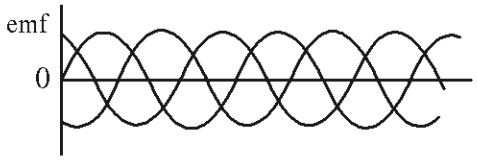



(a) Identify the device shown in the figure?

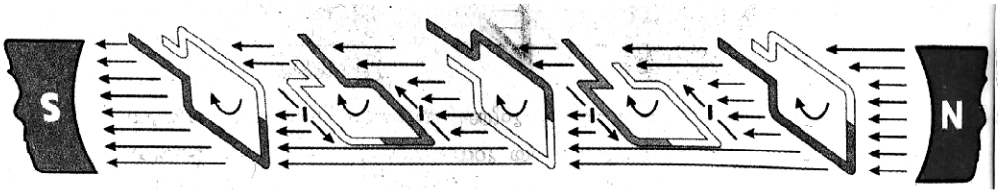
(b) State the working principle of this device?

(c) From the figure name the part labelled as $B_1$? Also write its function.

7. Match the following:

| Source | Graph |
|---|---|
| Single Phase Generator |   |
| Three Phase Generator |   |
| Cell, Batery |   |

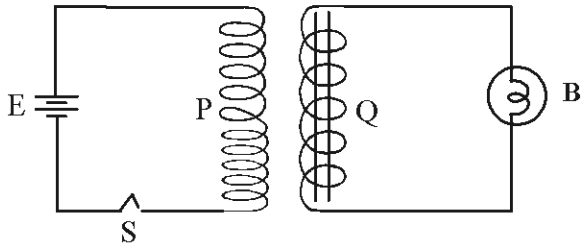
8. Observe the figure:




(a) Find out the positions of the armature in the figure which have zero induced current when it rotate in a magnetic field.

(b) What is the frequency of AC generated in our country for distribution.

9. Observe the figure:



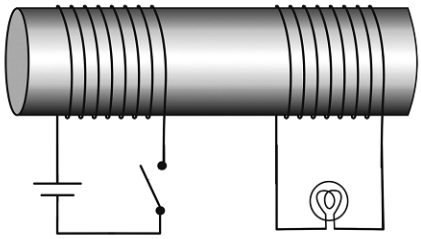

when the switch 'S' is turned on, the bulb suddenly glows and turns off

(a) Name and explain the phenomenon by which electricity passed through the second coil.

(b) Suggest a method for the continuous glowing of bulb.

(c) Name the coil P and Q in the circuit?

10. Observe the figure:



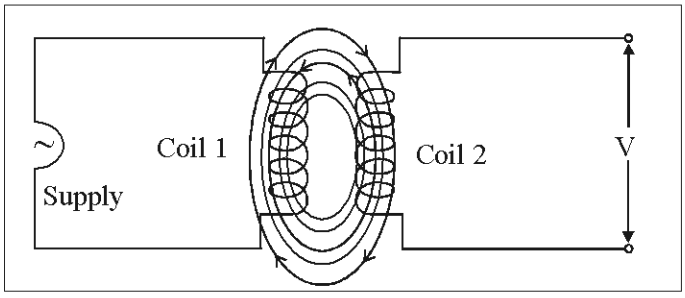
(a) Turn on and turn off the switch. What do you observe?

(b) If the switch is kept in the 'ON' position what do you observe?

(c) On what occasion do the flux change?

(d) Can you suggest a method by which change can be brought in magnetic flux without switching on and off continuously?

11. Observe the figure:




(a) AC supply is given in..... (primary/secondary)

(b) The output obtained is .....(AC/DC)

(c) The output voltage depends on the rate of change of magnetic flux in.....

(primary/secondary)

12. Fill in the table related with Power generator:

| | | |
|---|---|---|
| RotatingPart | ..... | Field magnet |
| Stationary part | Stator | ..... |

13. Transformer is a device used to change the voltage without changing the power.

Differentiate the statements given below suitable to the step-up and step-down transformers.

(a) Number of turns in primary coil is lesser than that of secondary coil.

(b) Number of turns in primary coil is greater than that of secondary coil.

(c) Input voltage is greater than output voltage.

(d) Output voltage is greater than input voltage.

(e) Thickness of primary coil is greater than that of secondary coil.

(f) Thickness of secondary coil is greater than that of primary coil.

(g) Input current is greater than output current.

(h) Output current is greater than input current.

14. Complete the following table:

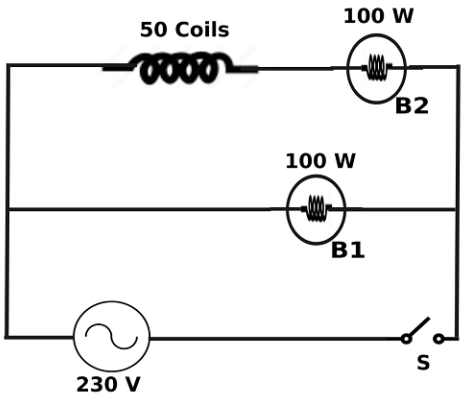
| Vp | Np | Vs | Ns |
|---|---|---|---|
| 20 V | 400 | (a) | 1600 |
| 50 V | (b) | 100 V | 800 |
| (c) | 600 | 120 V | 1800 |
| 100 V | 3200 | 25 V | (d) |

15. Find out the relation of the first pair and complete the second pair,

(a) AC generator : Electromagnetic induction

Transformer : .....

16. Examine the following circuit. When the circuit is kept switched on,



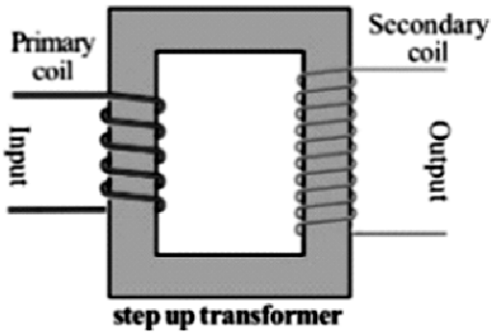
a) Which bulb give a light with high intensity?

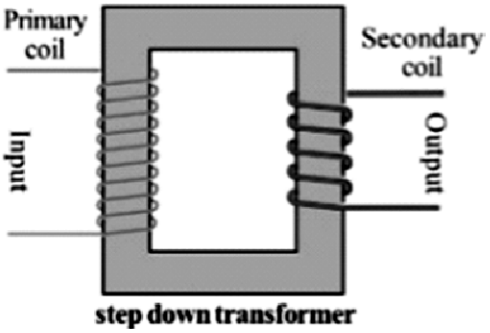
b) Which bulb give a light with low intensity? Why?

c) Suggest a way to dim that bulb again?

d) What is the name of the coil used in this circuit?

17. Observe the figures and answer the following,

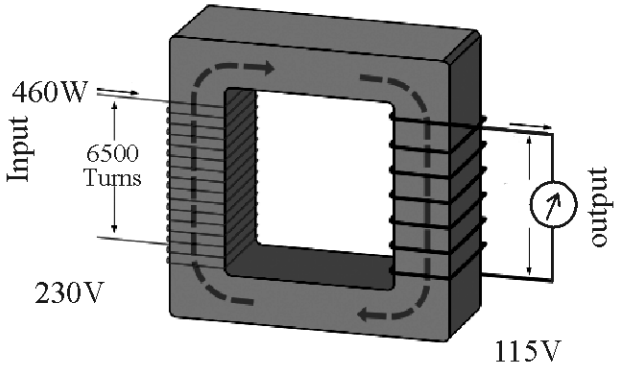



(a) Write the peculiarities of wires used in the primary and secondary of the above depicted transformers and what is the reason for that?

(b) Calculate the primary voltage and current of a stepdown transformer having 2500 primary turns,500 secondary turns secondary voltage is 40 V and secondary current is 5 A?

18. Observe the figure and answer the following questions.




(a) Which type of transformer is this?

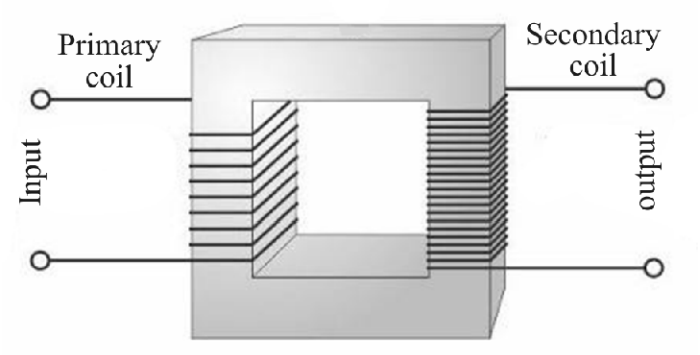
(b) Based on which principle transformer works?

(c) What is the power in the secondary? Justify your answer.

(d) What is the relation between the voltage and number of turns in a transformer?

(e) Find out the number of turns in the secondary and current flowing through it?

19. Observe the figure:




(a) Which type of transformer is shown in the figure?

(b) Can you increase the electric power using this transformer. Explain the reason?

20. Categorise the following relation suitably for step-up and step-down transformers.

(a)Vs>Vp (b.)Vs<Vp (c) Is<Ip

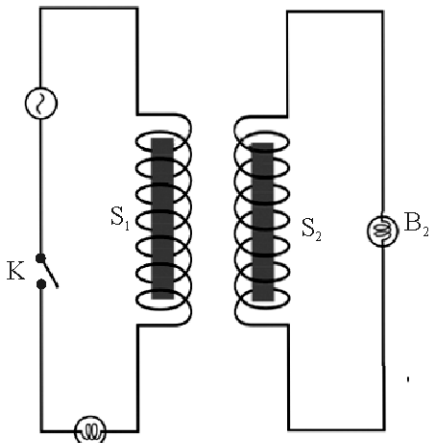
(d)Is>Ip (e)Ns/Np<1 (f)Ns/Np>1

| Step-up transformer | Step-down transformer |
|---|---|
| | |
| | |
| | |

21. Complete the table:

| Sl No | Ip | Vp | Is | Vs |
|---|---|---|---|---|
| 1 | 5 A | (a) | 1 A | 50 V |
| 2 | 5 A | 100 v | (b) | 25 V |
| 3 | (c) | 40 V | 1 A | 120 V |
| 4 | 25 A | 240 V | 5 A | (d) |

22. Observe the figure:



(a) Bulb $B_2$ glows when the switch K is in 'ON' Position. Why?

(b) What change would you observe in the brightness of bulbs when a soft iron core is inserted into the solenoid $S_1$?

1) Bulb $B_1$.....  2) Bulb $B_2$.....

(c) Suggest a method for increasing the brightness of the bulb $B_2$.

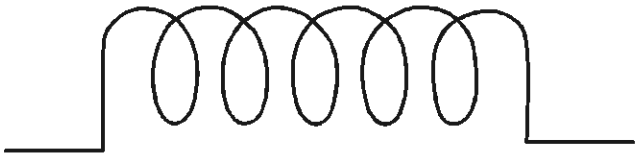
23. Inductor is a long conducting wire found in the form of a helix.

(a) Inductors are widely used in electronic circuits. What is its necessity?

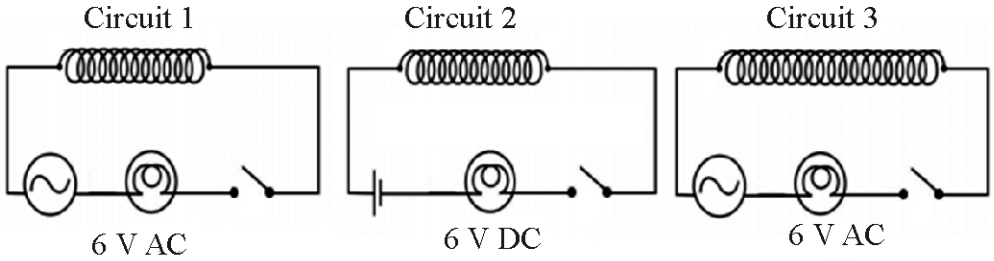
(b) What is the problem of using resistors instead of inductors in AC circuits?

(c) Inductors are not used in DC circuits. What is the reason?

24. (a) What does the below shown symbol indicates?



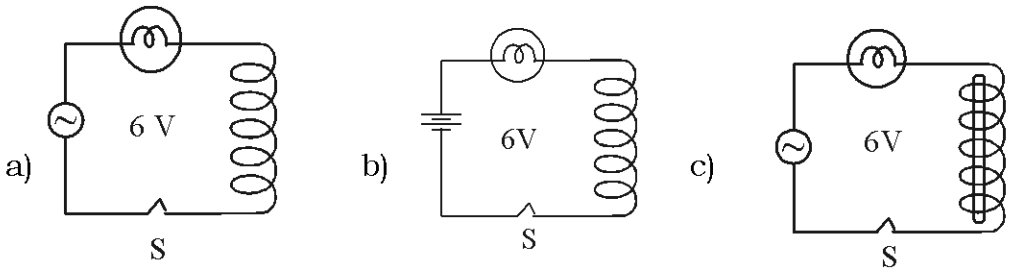
25. The following diagram shows the current carrying solenoids made of insulated copper wire.




(a) Which bulb will glow with less intensity, when it is switched on? Justify your answer.

(b) Which bulb will not show any change in light intensity, when identical soft iron cores are inserted into the solenoid? Justify your answer.

26. Given are the pictures of experiments done by a student using insulated copper wire of equal length and bulbs of equal power.

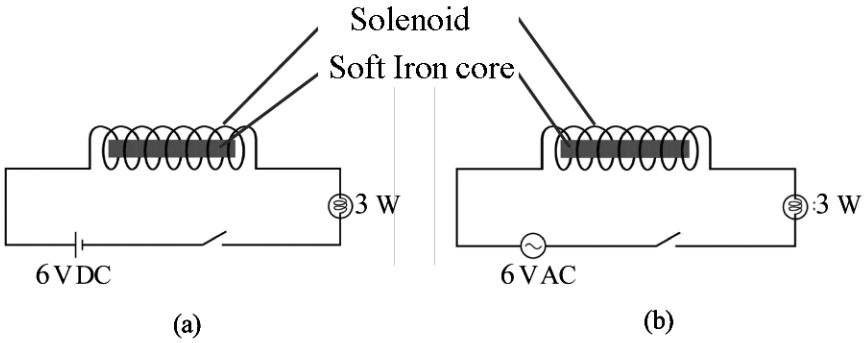



(a) Write the descending order of the intensity of bulbs in the circuits.

(b) Why do the bulbs have different intensity even though they have same power.

(c) Which is the phenomenon that cause the decrease in intensity of bulbs.

27. Observe the following electric circuits and answer the following questions.

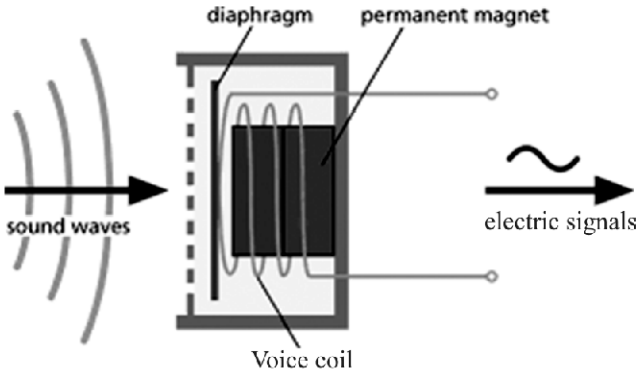



(a) In which circuit the intensity of light from the bulb is less?

(b) Will a magnetic field be developed around the solenoids in both the circuits?

(c) In which of these two solenoids, a back emf induced continuously?

28. Observe the figure:



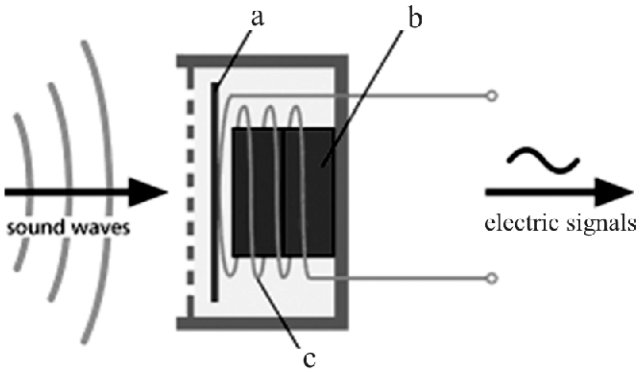

(a) Which is the device shown in the figure?

(b) Which are the moving parts in it?

(c) Write the working principle of the given device?

(d) Write the energy change in this device?

29. Observe the figure:



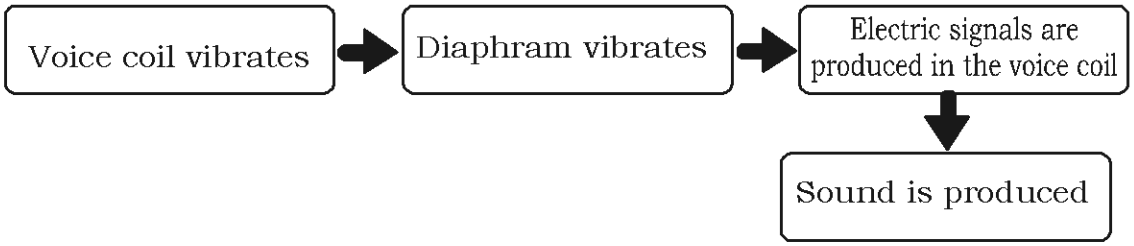
a) Name the parts a,b,c?

(b) Which is the device used to strengthen the signal produced from this device?

30. Write the similarities and differences between a moving coil microphone and moving coil loud speaker?

| | **Moving coil microphone** | **moving coil loudspeaker** |
|---|---|---|
| Similarities | | |
| Differences | | |

31. In connection with the working of a microphone,a flowchart is given below. Rearrange the chart in the correct order.




32. Complete the table:

| **Power station** | **Energy change** |
|---|---|
| Hydroelectric power station | Potential energy → Electrical energy |
| Thermal power station | ..... |
| Nuclear power station § | ..... |

33. Power stations are the places where electricity is generated on large scale for the purpose of distribution.

(a) How many volts does electricity generate in our country?

(b) What is the problem related to the transmission of electricity to distant places? How can it be reduced?

(c) Different steps related to generation and transmission of power are given below. Write them in the correct order.

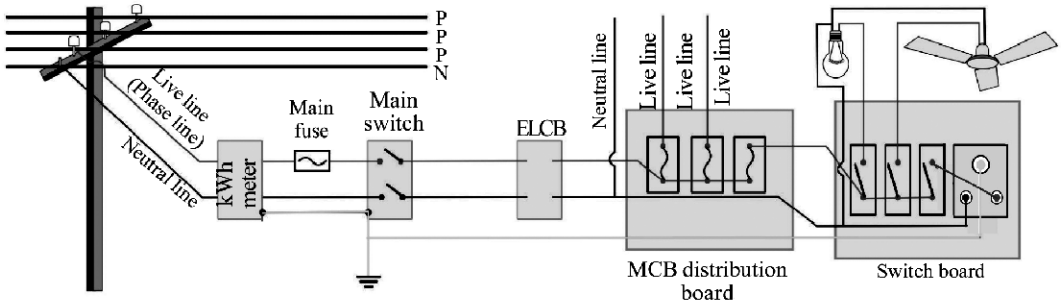
(i) Household consumers get electricity.

(ii) Distribution transformer converts 11kV to 230 Volt.

(iii) Electricity is generated at 11 kV.

(iv) Power transmission starts at 220 kV from the power station.

34. Figure shows a household electric circuit.




(a) In which line is the switches and fuse connected.

(b) What are the speciality observed by you in connecting the devices.

(c) Give the reasons for connecting the appliances in parallel in a household circuit.

35. A safety device used in electric device is given.

(a) Which device is this?

(b) Name the longest pin in it?

(c) This pin is thicker and longer than others.

What are the advantages of these features?

36. "Electricity is precious and should not be wasted."

(a) What is the commercial unit of electrical energy?

(b) Convert 1 kilowatt hour into watt hour?

(c) Name the device used to measure electric energy?

(d) At which part of the circuit is the above device connected?

(e) Why this device is placed at this position?

37. Give reasons:

(a) The birds sitting on the phase line do not get electric shock. Why?

(b) If a person standing on the earth touches a phase line, gets an electric shock.

(c) Neutral line is earthed.

(d) Touching neutral line from earth do not get electric shock.

38. Table shows the power and time of working of some electrical appliances.

Calculate the energy consumed in kilowatt hour and complete the table.

| Sl No. | Appliance | Number | Power(watt) | Time of working (hr) | Energy in kwh |
|---|---|---|---|---|---|
| 1 | Bulb | 4 | 100 | 3 | ..... |
| 2 | Bulb | 3 | 60 | 4 | ..... |
| 3 | CFL | 5 | 18 | 5 | ..... |
| 4 | Fan | 4 | 75 | 6 | ..... |
| 5 | Motor | 1 | 1500 | 1 | ..... |

39. Fuse, MCB, ELCB / RCCB are some safety measures using in electrical circuit.
    (a) What is the advantage of MCB over a safety fuse?
    (b) What is the function of ELCB / RCCB in the circuit?
    (c) While using three pin plug in electrical appliances which part of the instrument is connected to the earth line?
    (d) How can safety be ensured by using a three pin plug?

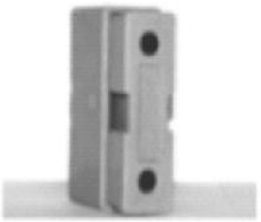
40. Electricity is highly useful, at the same time it is a dangerous form of energy.
    If somebody gets an electric shock,
    (a) What will you do?
    (b) Write any two first aids which are to be given to a person who gets an electric shock?
    (c) Give any two precautions to be taken to avoid electric shock?

41. Identify the devices used in household electrification and write one of their uses ?

(a)

(b)

( c )



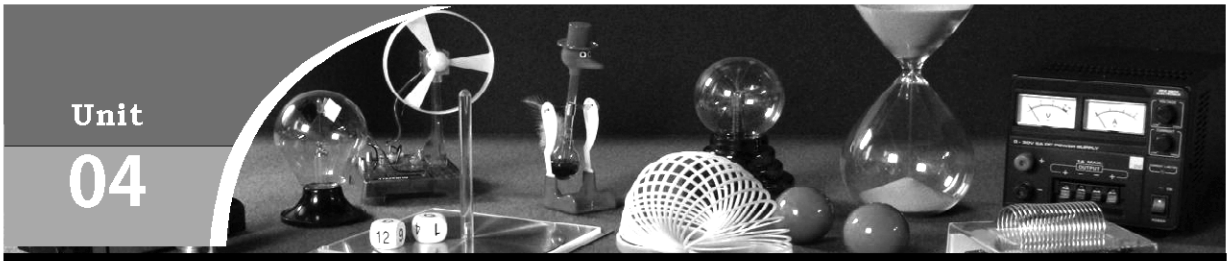
(d)

(e)

(f)

(g)

(h)



Unit
04

# REFLECTION OF LIGHT

## Points Remember

- Laws Of Reflection
- Regular Reflection
- Scattered Reflection
- Multiple Reflection – Equation Formation
- Field Of View
- Uses Of Mirrors
- Focal Length
- Mirror Equation
- New Cartesian Sign Convention
- Magnification

**Laws Of Reflection**

- When light is reflected from a smooth surface, the angle of incidence and angle of reflection are equal.
- The incident ray, the reflected ray and the normal to the surface are in the same plane.
- When light falls on a smooth surface, it undergoes a regular reflection.
- When light falls on a rough surface, it undergoes an irregular reflection.
- After regular reflection the light rays travel parallel.
- The field of view of a mirror is the maximum range of the vision through the mirror.

**New Cartesian Sign Convention**

- In all experiments related to lens and mirrors the distances are measured in the same way as in graphs.
- Distance are measured considering the pole of the mirror as the origin.
- Those measured to the right from O are positive and those in the opposite direction are negative.
- Distance measured upwards from X axis are positive and those downwards are negative.

- The incident ray is to be considered as travelling from left to right.
- For a concave mirror f and R negative
- For a convex mirror f and R positive
- **Magnification**
- The ratio of the height of the image to the height of the object is magnification.
- Magnification = 1, Size of the image = Size of the object
- Magnification > 1, Size of the image > Size of the object
- Magnification < 1, Size of the image < Size of the object
- Magnification Positive – Image erect and virtual
- Magnification Negative – Image inverted and real

**Important Equations**

Number of images (n) $\frac{360}{\theta}-1$

$\theta$ = Angle between mirrors

| | |
|---|---|
| focal length, $f = \frac{uv}{u+v}$ | u is always negative<br>v is negative for real image and positive for virtual image<br>f is negative for concave mirrors and positive for convex mirrors |

$\frac{1}{f}=\frac{1}{u}+\frac{1}{v}$

f- focal length,
u- Distance to object from the mirror,
v- Distance to image from the mirror

Magnification, $m = \frac{hi}{ho}$ hi- Height of the image
ho- Height of the object

$m=\frac{-v}{u}$

**Activity 1**

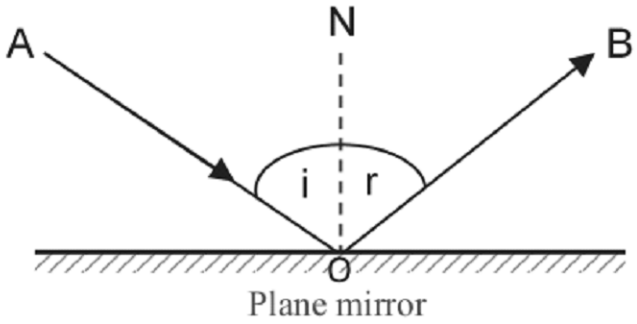
Choose the appropriate from the box for the following statements

Convex mirror, Concave mirror, Plane mirror

a) Used for observing the face
b) Used as rear view mirror in vehicles.
c) Used in solar furnace
d) Used in the search lights
e) Used by the dentist for observing the teeth.

**Activity 2**

Picture related to the reflection of light is given below, observe the picture and answer the questions




a) which is the incident ray ?

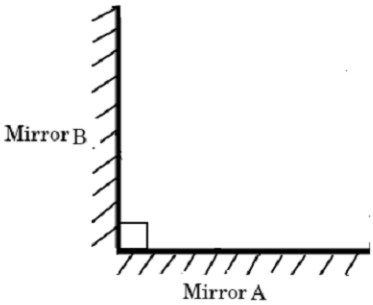
b) which is the reflected ray ?

c) what is the relation between the angle of incidence and angle reflection ?

d) write down the laws of reflection ?

**Activity 3**

Two plane mirrors A,B are arranged as follows ?




a) What is the angle between the mirrors ?

b) Is there any relation between the number of images formed and the angle between the mirrors? If yes write the relation ?

c) How many images are formed if the angle between the mirrors is 40°

d) How many images are formed if the angle between the mirrors is $60^0$.

e) write the features of the images formed by a plane mirror ?

**Activity 4**

Some information related to the image formation by the concave mirrors are given. Match the following appropriately.

| A | B | C |
|---|---|---|
| Object between C and F | Image at C | Virtual magnified image |
| Object beyond C | Image inside the mirror | Real Image of the same size as the object |
| Object at C | Image beyond C | Real magnified image |
| Object between F and P | Image between F and C | Real diminished image |

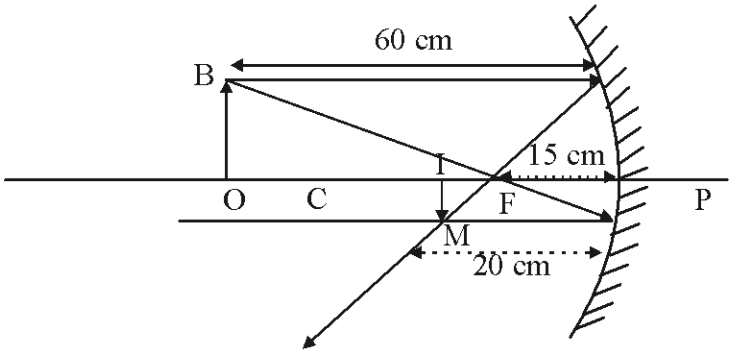
**Activity 5**

- Choose the correct statement from the following with respect to the plane mirrors.

- Virtual image is formed.
- Real image is formed.
- Magnified image is formed.
- The distance to image and the distance to the object from the mirror will be equal.

**Activity 6**

Observe the figure




- Identify the type of mirror.
- From the figure find out u,v and f.
- Determine the magnification

**Activity 7**

The magnification of the image formed by a concave mirror is -1.

a) What will be the position of the object?

b) What will be the position of the image?

c) Write the characteristics of the image

**Activity 8**

An object is placed in front of a concave mirror of focal length 12 cm at a distance 30 cm from the mirror. Find the position and nature of the image.

**Activity 9**

The image of a vehicle appear in a rear view mirror of a car at a distance 12 m behind the mirror. The actual distance of the vehicle from the rear view mirror of the car is 20 m.

a) Identify the type of mirror?

b) Why is such mirrors used as the rear view mirrors?

c) What is the focal length of the mirror?

d) Find the magnification of the image?

**Activity 10**

Identify the relation and fill suitably,

To observe face: Plane mirror

Rear view mirror: .....

**Activity 11**

When an object is placed in front of a concave mirror at a distance 20 cm, a virtual image of double size of the object is formed. Find out the position of the image?

**Activity 12**

When an object of 6 cm height is placed at a distance 8 cm in front of a concave mirror, a real image is formed 16 cm away from the mirror.

a) What will be the height of the image?

b) Determine the magnification of the image?

**Activity 13**

A mirror forms a diminished virtual image of an object. Then,

a) Which type of mirror is this?

b) Write any two uses of this type of mirrors

**Activity 14**

An object is placed 30 cm away from a concave mirror of focal length 10 cm. Find the position and properties of the image.

**Activity 15**

Match the following.

| A | B |
|---|---|
| • When magnification is 1 | a) Concave mirror |
| • When magnification is less than 1 | b) Magnification is positive |
| • When magnification is greater than 1 | c) Size of the image and size of the object are equal |
| • Real image | d) Convex mirror |
| • Virtual image | e) Size of the image is greater than the object |
| • Magnification of the mirror always than 1 | f) Size of the image is smaller less than the object |
| | g) Magnification is negative |

**Activity 16**

When an object of height 3 cm is placed at a distance of 30 cm from a mirror, a real image is formed at a distance of 60 cm. Find out the height of the image?

**Activity 17**

An image is formed 5 cm away from a convex mirror of focal length 10 cm.

a) What is the distance of the object from the convex mirror?

b) If the height of the object is 3 cm, what will be the height of the image?

c) What are the other characteristics of the image?


# 1 EFFECTS OF ELECTRIC CURRENT

**Activity 1**

a) Electrical energy → Light Energy

b) Electrical energy → Heat Energy

c) Heating effect

d) Mechanical effect

e) Electrical energy → Chemical Energy

f) Chemical effect

**Activity 2**

a) Electrical energy → Heat Energy

b) **Joule's Law**- The heat generated in a current carrying conductor is directly proportional to the product of the square of the current in the conductor, the resistance of the conductor and the time of flow of current.

c) $H = V^2t / R$

$V = 230$ V

$R = 1000\ \Omega$

$t = 2 \times 60 \times 60 = 7200$ s

$$H = \frac{(230)^2 \times 7200}{1000}$$

$= 380880$ J

**Activity 3**

a. $H = I^2Rt = 0.2 \times 0.2 \times 100 \times 2 \times 60 = 480$ J

b. $H = 0.2 \times 0.2 \times 200 \times 2 \times 60 = 960$ J

c. $H = 0.4 \times 0.4 \times 100 \times 2 \times 60 = 1920$ J.

When current is doubled, the heat is increased by four times

**Activity 4**

a. Decreases

b. Increases

**Activity 5**

a. As resistance of copper wire is less than that of nichrome wire, more current will flow through circuit. 1

b. For the same voltage heat is inversely proportional to resistance.($H=V^2t/R$). So more heat will be produced in copper as its resistance is small.

c. Here voltage is constant. For the same voltage heat is inversely proportional to resistance.($H=V^2t/R$). So more heat will be produced in copper as its resistance is small.

d. Here current (I) is constant. For the same current heat is directly proportional to resistance($H=I^2Rt$). So more heat will be produced in nichrome as its resistance is high.

**Activity 6**

a) $R = r/n$

$= 2/10 = 0.2\ \Omega$

b) $R = r \times n$

$= 2 \times 10 = 20\ \Omega$

**Activity 7**

| Series connection of resistors. | Parallel connection of resistors. |
|---|---|
| Same amount of current passes through all the resistors. | When number resistors increases current also increases. |
| Applied voltage will be split among the resistors. | When number of resistors increases effective resistance decreases. |
| High resistor gets heated more. | Potential difference is same for all the resistors. |
| | Effective resistance is minimum. |

**Activity 8**

a. Series.

b. 300 Ω ( $R = R_1+R_2$ )

c. 200 Ω ( When resistors are connected in series more voltage is dropped across high resistor)

d. 200 Ω (When resistors are connected in series more heat is generated in resistor having high resistance)

e. Same current passes through both resistors. ( When resistors are connected in series same current passes through all the resistors)

f. 10 J ( If potential difference between two point is V volt, V joule of work

is to be done to move one coulomb charge from one point to other).

**Activity 9**

a. Heating effect.

b. In series

c. Low melting point.

d. Melting point of fuse wire is low. When excess current flows through the circuit due to short circuit or over loading, the fuse gets heated. As its melting point is low, it melts and the circuit is broken.

e. If we use thick wire, it may not melt and break while excess flow of current. So it is not good to use thick wire as fuse wire.

**Activity 10**

Power $P = V^2/R$

$$= \frac{230 \times 230}{690} = 76.7 \text{ W}$$

**Activity 11**

a. Resistance of the appliance,

$R = V^2/P$

$$= \frac{200 \times 200}{800} = 50\ \Omega$$

Power when it is worked on 100 V,

$P = V^2/R$

$$= \frac{100 \times 100}{50} = 200 \text{ W.}$$

b. Power when it is worked on 50 V,

$P = V^2/R$

$$= \frac{50 \times 50}{50} = 50 \text{ W}$$

**Activity 12**

a. glowing with heat.

b. Tungsten

c. ability to emit white light on being heated, high melting point, high resistivity, high ductility.

d. prevent oxidation and vaporisation of filament.

e. Major portion (above 60%) of electrical energy consumed is lost in the form of heat.

**Activity 13**

a. Decreases

b. Decreases

c. The intensity of light increases. Since resistance decreases current increases and thus the power increases.

**Activity 14**

d) When discharge lamp is connected to a source of electricity, the gas between the electrodes gets ionised due to the applied potential difference.

a) Ionised atoms move at high speed

c) Ionised atoms collide with unionised atoms and excite them to higher energy states.

b) Excited atoms came back to their original states for attaining stability. During this process the energy stored in them will be radiated as light.

**Activity 15**

a. Watt

b. Heating Effect

c. Low melting point

d. Chemical Effect

e. Regulate the intensity of electricity

f. joule/second

**Activity 16**

a) i) Work at low power.

ii) No energy loss in the form of heat as there is no filament.

iii) High longevity

iv) Not harmful to environment

b)

| | |
|---|---|
| Heat sink | It is an arrangement of absorbing heat. |
| Power supply board | Function of this is to convert AC to DC and supply necessary DC voltage. |
| Printed circuit board | LEDs are fixed on this board. In this positive and negative polarities are marked. |
| Base unit | Connects the bulb to the holder. |

**Activity 17**

| A | B | C |
|---|---|---|
| Fuse wire | Low melting point | Tin and Lead |
| Incandescend lamp | Tungsten | Nitrogen |
| Heating element | Nichrome | Electric energy intoheat energy |
| Resistors in series | Increase in effective resistance | $R=R_1+R_2+R_3$ |
| Power | Watt | $P=I^2R$ |
| Resistors in parallel | Decrease in Effective resistance | $\frac{1}{R}=\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}$ |

# 2 MAGNETIC EFFECT OF ELECTRIC CURRENT

**Activity 1**

a. A to B

b. Magnetic needle deflects, A magnetic field is developed around a current carrying

conductor. Due to the mutual action of the magnetic field of the current carrying

conductor and magnetic needle it gets deflected.

c. West

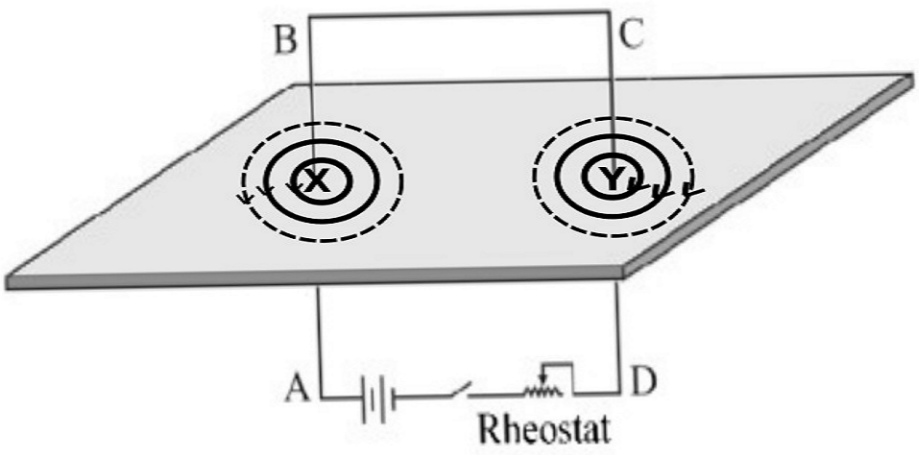
d. Right hand thumb rule

e. By reversing the connection of the battery

f. When intensity of current increases the deflection of magnetic needle also increases.

**Activity 2**

a.



b. Right hand thumb rule

c. X Y

No, At X direction is anticlockwise and at Y direction is clockwise.

d. A circular magnetic field is produced and direction of magnetic field depends on the direction of current

e. Imagine you are holding a current carrying conductor with the right hand in such a way that the thumb points in the direction of the current. The direction in which the other fingers encircle the conductor gives the direction of the magnetic field, Right hand screw rule.

**Activity 3**

| **Circuit** | **Direction of electric current** | **Position of the conductor magnetic needle** | **Deflection of the** |
|---|---|---|---|
| a | A to B | Below the magnetic needle | Clockwise direction |
| b | A to B | Above the magnetic needle | Anticlockwise direction |
| c | B to A | Below the magnetic needle | Clockwise direction |
| d | B to A | Above the magnetic needle | Anticlockwise direction |

**Activity 4**

a. Positive

b. Towards west/anticlockwise

c. Into the coil

d. Right hand thumb rule/right hand screw rule

e. TB page 36

f. The mutual action between the magnetic field of the magnetic needle and the magnetic field of the conductor.

g. Increase the number of turns. Increase the currenth.

h. South

**Activity 5**

A) b, d, f, h

B) a, c, e, g

**Activity 6**

i) c>a>d>b

ii) Increase the intensity of the current through the solenoid.

Increase the number of turns.

When soft iron core is used.

Increase the area of cross section of the soft iron core

**Activity 7**

a) A force is developed in a current carrying conductor placed in a magnetic field

b) Motor principle

c) Electric motor, Moving coil loudspeaker

d) P

e) Fleming's Left Hand Rule

Hold the forefinger, the middle finger and the thumb of the left hand in mutually perpendicular directions as shown inthe figure. If the forefinger indicates the direction of the magnetic field and the middle finger, the direction of thecurrent, then the thumb will indicate the direction of motion of the conductor.

f) Direction of current, direction of magnetic field

**Activity 8**

a) N S - Field magnetic

ABCD - Armature coil

R1, R2 - Split Rings

B1, B2 - Brushes

b) AB- perpendicularly downwards, CD- perpendicularly upwards

c) The coil begins to rotate in the anticlockwise direction

d) Fleming's Left Hand Rule

(e) The forces on the arms AB and CD get reversed and the coil begins to rotate in the opposite direction. ( clock wise)

**Activity 9**

a. Ring R1 is connected to Brush B1 and R2 is connected to Brush B2

b. R1 to R2

c. Ring R1 is connected to Brush B2 and R2 is connected to Brush B1

d. R2 to R1

e. After each half rotation the contact between the split rings and the graphite brushes are interchanged.

f. The split rings helps to change the direction of current through the coil after each half rotation

**Activity 10**

a. moving coil loud speaker

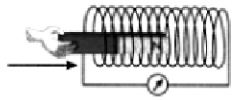
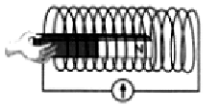
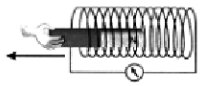
b. Motor principle

c. A- Diaphragm, B-Permanent magnet, C-Voice coil

d. Electrical energy- Mechanical energy- Sound energy

# 3 ELECTRO MAGNETIC INDUCTION

1. Diagram Activity Observation

| Diagram | Activity | Observation |
|---|---|---|
|  | Magnet is moved in to the solenoid | Galvanometer needle get deflected |
|  | Magnet is stationary inside the solenoid | No deflection |
|  | Magnet is moved out of the solenoid | Magnetic needle deflects in the opposite direction |

2. (a) Electromagnetic Induction.

   (b) Induced current.

   (c) Whenever there is a change in the magnetic flux linked with a coil, an emf is induced in the coil. This phenomenon is Electromagnetic induction.

   (d Increase the number of turns of the coil.

   Increase the strength of the magnet.

   Increase the movement of magnet or coil.

3. (a) - Generator

   (b) – Mechanical Energy

   (c) – Electrical Energy

4. B to A

5.

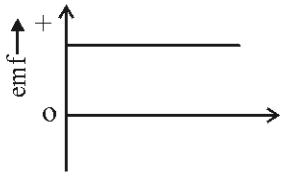
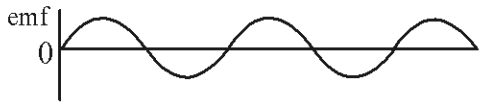
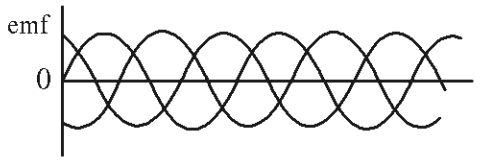
| AC | DC |
|---|---|
| • The direction changes | • Used for household Electrification |
| • The direction does not change | • Obtained from the cell |

6. (a) AC Generator

   (b) Electromagnetic Induction: Whenever there is a change in the magnetic flux linked with a coil, an emf is induced in the coil.

   (c) Brush : The current induced in the armature flows through the brushes to the external circuit.

7.

| Source | Graph |
|---|---|
| Cell, Batery |   |
| Single Phase Generator |   |
| Three Phase Generator |   |

8. (a) a, c, e
   (b) 50 Hz
9. (a) Mutual induction
   (b) Give AC instead of DC
   (c) P – Primary Coil Q – Secondary Coil
10. (a) The bulb lights up and goes out.
    (b) The bulb does not light up.
    (c) When the switch is turned on and off
    (d) Replace DC with AC in the primary.
11. (a) In the primary
    (b) AC
    (c) In the primary

12.

| | | |
|---|---|---|
| RotatingPart | Rotor | Field magnet |
| Stationary part | Stator | Armature |

13.

| | |
|---|---|
| Step-up | a, d, e, g |
| Step-down | b, c, f, h |

14.

| Vp | Np | Vs | Ns |
|---|---|---|---|
| 20 V | 400 | (a) 80 V | 1600 |
| 50 V | (b) 400 | 100 V | 800 |
| (c) 40 V | 600 | 120 V | 1800 |
| 100 V | 3200 | 25 V | (d) 800 |

15. Mutual induction.

16. (a) $B_1$

(b) $B_2$, As the AC circuit contain a coil, back emf is produced. So the effective emf for the bulb $B_2$ is decreased. (self induction).

(c) Insert a soft iron core in to the coil.

(d) Inductor

17. (a) In step up transformers thin wires are used in the secondary and in step down transformer thick wires are used in the secondary. In step up transformer current in the secondary is less than the primary. Since using thin wires we can increase the resistance and decrease the current.

(b) Np = 2500

Ns = 500

Vs = 40 V

Is = 5 A

Vp = ?

Ip = ?

$$\frac{Vs}{Vp} = \frac{Ns}{Np}$$

$$Vp = \frac{Vs \times Np}{Ns}$$

$$Vp = \frac{40 \times 2500}{500}$$

Vp = 200 V

Vp × Ip = Vs × ls

$$Ip = \frac{Vs \times Is}{Vp}$$

$$Ip = \frac{40 \times 5}{200}$$

Ip = 1 A

18. (a) 460 W, because the power remains constant in the primary and secondary coil.

(b) $$\frac{Vs}{Vp} = \frac{Ns}{Np}$$

(c) P = 460 W

Np = 6500

Vp = 230 V

Vs = 115 V

$$\frac{Vs}{Vp} = \frac{Ns}{Np}$$

$$Ns = \frac{6500 \times 115}{230}$$

$$= 3250$$

Is = ?

VpIp = VsIs

$$Is = \frac{460}{115}$$

$$= 4 \text{ A}$$

19. (a) Step up transformer.

(b) No. Transformer is used to increase or decrease the voltage without changing the power.

20.

| Step-up transformer | Step-down transformer |
|---|---|
| a | b |
| c | d |
| f | e |

21.

| Sl No | Ip | Vp | Is | Vs |
|---|---|---|---|---|
| 1 | 5 A | (a)10 V | 1 A | 50V |
| 2 | 5 A | 100 V | (b)20 A | 25 V |
| 3 | (c)3 A | 40 V | 1 A | 120 V |
| 4 | 25 A | 240 V | 5 A | (d)1200 V |

22. (a) Mutual induction

(b) $B_1$-Brightness decreases due to self induction.

$B_2$-Brightness increases due to mutual induction.

(c) To increase the number of turns of the coil or Insert a soft iron core.

23. (a) To reduce current without power loss.

(b) Power loss / electric energy is converted in the heat energy.

(c) Self induction does not occur.

24. Inductor.

25. (a) Phase line.

(b) Devices are connected in parallel connected between phase line and neutral.

(c) To control different devices by using different switches.

26. (a) b, a, c

(b) No back emf in 'b' so maximum intensity.

Highest back emf in 'c' so least intensity.

(c) Self-induction.

27. (a) Circuit b.

(b) Yes, Magnetic field is produced.

(c) Circuit b

28. (a) Microphone.

(b) Diaphram, Voice coil.

(c) Electromagnetic induction.

(d) Sound energy is converted into electrical energy.

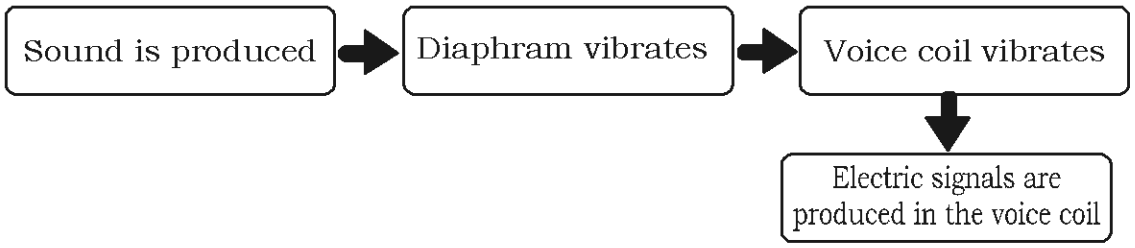
29. (a) a-Diaphram, b-permanent magnet, c-Voice coil.

(b) Amplifier.

30.

| | **Moving coil microphone** | **Moving coil loudspeaker** |
|---|---|---|
| **Similarities** | Diaphram, permanent magnet, Voice coil | Diaphram, permanent magnet, Voice coil. |
| **Differenc es** | Mechanical energy-Electrical energy. Electromagnetic induction. | Electrical energy-Mechanical energy.Motor principle. |

31.




32

| **Power station** | **Energy change** |
|---|---|
| Hydroelectric Powerstation | Potential energy → Electrical energy |
| Thermal powerstation | Chemical energy → Electrical energy |
| Nuclear Powerstation | Nuclear energy → Electrical energy |

33. (a) 11000 V / 11 kV

(b) Energy loss in the form of heat. Energy loss can be reduced by increasing the oltage in order to reduce the current.

(c) iii, iv, ii, i

34. (a) Phase line.

(b) Devices are connected in parallel connected between phase line and neutral.

(c) To control different devices by using different switches.

35. (a) 3 pin plug

(b) Earth pin

(c) As the earth pin is thicker, earthing becomes easy. Also as the size is different from other pins, it prevents the possibility of improper plugging. As the earth pin is longer than others, when the three pin is introduced into the socket, earth pin comes into contact with the circuit first and when it is unplugged, earth pin is the last to break the contact. So these features of earth pin make sure the protection from the beginning to the end.

36. (a) Kilowatt hour.

(b) 1000 watt hour.

(c) Watt hour metre.

(d) At the beginning.

(e) To measure electrical energy consumed.

37. (a) There will be no potential difference when touching a single line. A potential difference is required for the flow of electric current.

(b) When a person touches a phase line from earth, the potential difference felt is 230 Volt.

(c) The potential difference between earth and neutral line is zero.

(d) To maintain zero potential difference between neutral line and earth always.

38.

| Sl No. | Appliance | Number | Power(w) | Time of working (hr) | Energy in kwh |
|---|---|---|---|---|---|
| 1 | Bulb | 4 | 100 | 3 | 1.2 |
| 2 | Bulb | 3 | 60 | 4 | 0.72 |
| 3 | CFL | 5 | 18 | 5 | 0.45 |
| 4 | Fan | 4 | 75 | 6 | 1.8 |
| 5 | Motor | 1 | 1500 | 1 | 1.5 |

39 (a) MCB is a device that is used in the place of a fuse wire in branch circuits. MCB automatically breaks the circuit whenever there is an excess flow of current due to short circuit or over loading. After rectifying the problem we can switch on the MCB and make the circuit as it was.

(b) ELCB helps to break the circuit automatically whenever there is a current leak due to insulation failure or any other reason. Hence a person touching the electric circuit or a device does not get an electric shock.

(c) The metal body of electrical appliance is connected to the Earth Pin.

(d) In case the metal body of the electrical appliance comes in contact with an electric connection, electricity will flow to the earth through the earth pin of the three pin plug. Hence accidents due to electric shock can be avoided.

40. (a) Separate the victim from the electric wire or device using wooden object (insulators).

(b) Raise the temperature of the body by massaging.

Give artificial respiration.

(c) 1. Never handle electric equipments or operate switches when the hands are wet.

2. Wear rubber footwear while operating electric devices.

41. (a) Clamp ammeter. -To measure the current at any point in the circuit easily.

(b) Tester - To test the presence of electric current at a given point.

(c) ELCB - To detect current leakage and to protect humans and animals from electric shock.

(d) Kit kat fuse - It is a type of safety fuse..

(e) Watt hour metre - To measure the amount of electric energy consumed.

(f) Screw driver - To loosen and tighten screws.

(g) Two way switch - To control an equipment from two different points.

(h) Multimetre - To measure current, voltage and resistance.

# 4 REFLECTION OF LIGHT

**Activity 1**

a) Plane mirror

b) Convex mirror

c) Concave mirror

d) Concave mirror

e) Concave mirror

**Activity 2**

a) AO

b) OB

c) Equal

d) When light reflected from a surface the angle of incidence and angle of reflection are equal

The incident ray reflected ray and the normal to the surface are in the same plane

**Activity 3**

a) 90°

b) yes , Number of images, $n = \frac{360}{\theta} - 1$

c) 8

d) 5

e) Virtual image , Same size as that of the object

**Activity 4**

| A | B | C |
|---|---|---|
| Object between C and F | Image beyond C | Real magnified image |
| Object beyond C | Image between F and C | Real diminished image |
| Object at c | Image at C | Real Image of the same size as the object |
| Object between F and P | Image inside the mirror | Virtual magnified image |

**Activity 5**

a, d

**Activity 6**

a) Concave mirror

b) u= –60 cm

v = – 20 cm

f = –15 cm

c) Magnification, $m = \frac{-v}{u}$

$$= -\left(\frac{-20}{-60}\right) = -\frac{1}{3}$$

**Activity 7**

a) At C

b) At C

c) Image of the same size as object,inverted and real

**Activity 8**

u = –30 cm

f = –12 cm

$$\frac{1}{f}=\frac{1}{v}+\frac{1}{u}$$

$$\frac{1}{-12}=\frac{1}{v}+\frac{1}{-30}$$

$$v=\frac{-12\times30}{30+(-12)}=\frac{-360}{18}=-20\text{ cm}$$

v is negative hence image is real and inverted

v < u, hence diminished image

**Activity 9**

a) Convex mirror

b) Because the field of view is more,the image is errect and diminished

c) $f=\frac{uv}{u+v}=\frac{12\times-20}{-20+12}=\frac{-240}{-8}$ =30 m

d) $m=\frac{-v}{u}=\frac{-12}{-20}=0.6$

**Activity 10**

Convex mirror

**Activity 11**

m= +2

u= –20 cm

$$m=\frac{-v}{u}$$

$$2=\frac{-v}{20}$$

v = 2 × 20 = 40 cm

**Activity 12**

ho = 6 cm

v = –16 cm

a) Magnification, $m = \frac{-v}{u} = \frac{hi}{ho}$

$$hi = \frac{-v \times ho}{u} = \frac{-(-16) \times 6}{-8} = \frac{16 \times 6}{-8} = -12\text{cm}$$

b) $m = \frac{hi}{ho} = \frac{-12}{6} = -2$

**Activity 13**

a) Convex mirror

b) rear view mirror, mirrors placed at curved road

**Activity 14**

u = –30 cm

v = ?

f = –10 cm

$$v = \frac{uf}{u - f} = \frac{-30 \times -10}{-30 + 10} = \frac{300}{-20} = -15\text{cm}$$

v is negative hence image is real and inverted

u > v hence dimnished image

**Activity 15**

| A | B |
|---|---|
| 1. When magnification is 1 | • c) Size of the image and size of the object are equal |
| 2. When magnification is less than 1 | • f) Size of the image is smaller than the object |
| 3. When magnification is greater than 1 | • e) Size of the image is greater than the object |
| 4. Real image | • g) Magnification is negative |
| 5. Virtual image | • b Magnification is positive |
| 6. Magnification of the mirror always less than 1 | • d) Convex mirror |

**Activity 16**

u = – 30 cm

v= – 60 cm

$$m = \frac{-v}{u} = \frac{-(-60)}{-30} = -2$$

ho = 3 cm

$$\frac{hi}{ho} = -2$$

$$\frac{hi}{3} = -2$$

hi = 2 × 3 = 6 cm

**Activity 17**

a) v = 5 cm

f = 10 cm

$$u = \frac{vf}{v-f} = \frac{5\times10}{5-10} = \frac{50}{-5} = -10 \text{ cm}$$

ho = 3 cm

$$m = \frac{-5}{-10} = \frac{1}{2}$$

$$\frac{hi}{ho} = \frac{1}{2}$$

$$\frac{hi}{3} = \frac{1}{2}$$

$$hi = \frac{3}{2} = 1.5 \text{ cm}$$

b) Magnification, $m = \frac{-v}{u} = \frac{hi}{ho}$

c) Real, dimnished and errect image