VIDYAJYOTHI

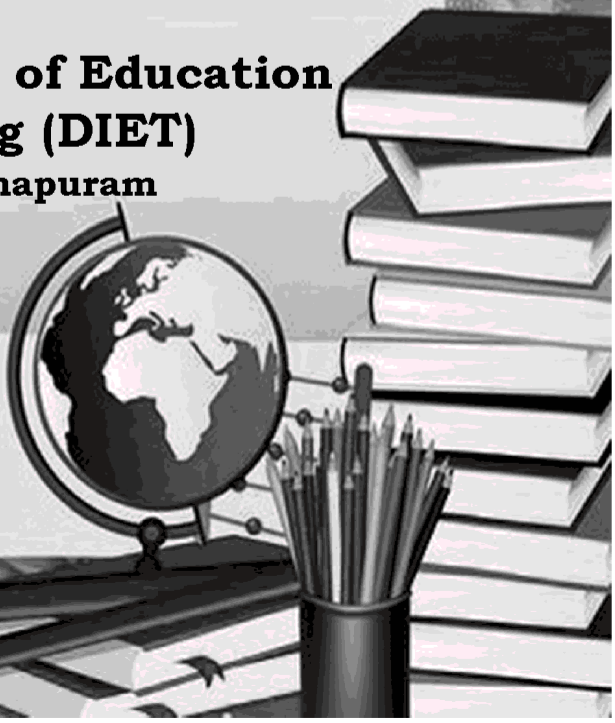
(2021 - 2022)

PHYSICS

WORKSHEET

CLASS X

District Institute of Education and Training (DIET)
Thiruvananthapuram



Vidyajyothi

Physics

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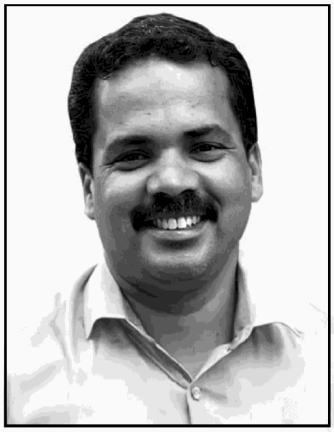
പ്രിയപ്പെട്ട കുട്ടികളേ,



തിരുവനന്തപുരം ജില്ല 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. തിരുവനന്തപുരം ജില്ലയിലെ 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. 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 ജില്ല പഞ്ചായത്ത്

സ്നേഹമുള്ള കുട്ടികളേ...

അറിവിന്റെ ശക്തി, അത് വാക്കുകൾക്കപ്പുറമാണ്. ഏതൊരുവനാണോ അവനിഷ്ടപ്പെട്ട വിദ്യയിൽ പരമാവധി ജ്ഞാനം നേടിയത്, പ്രാഗത്ഭ്യം തെളിയിച്ചത് ആ അറിവ് അവനെപ്പോഴും ഒരു രക്ഷാകവചമായി വർത്തിയ്ക്കും. ജില്ല പഞ്ചായത്ത് ഡയറ്റിന്റെ സഹായത്തോടെ നടപ്പിലാക്കുന്ന 'വിദ്യാജ്യോതി' എന്ന പദ്ധതി നമ്മുടെ കുട്ടികൾക്ക് ഒരു രക്ഷാകവചമായി മാറിക്കഴിഞ്ഞിരിയ്ക്കുന്നു. ഈ വർഷവും നമ്മുടെ സ്കൂളുകൾ ഉന്നത വിജയത്തിലെത്താൻ ഈ പദ്ധതിയെ പ്രയോജനപ്പെടുത്തേണ്ടതാണ്. കോവിഡ് സൃഷ്ടിച്ച ആശങ്കകളെ മാറ്റിനിർത്തി ഏകജാലക വിദ്യാഭ്യാസത്തിലൂടെ നമ്മുടെ കുട്ടികൾ പഠിയ്ക്കുന്ന ഈ സാഹചര്യത്തിൽ വിദ്യാജ്യോതി അവർക്ക് ഒരു വെളിച്ചമായി മാറുക തന്നെ ചെയ്യും. അതിനാൽ നമ്മുടെ സ്കൂളുകൾ ഉന്നത വിജയം കരസ്ഥമാക്കുന്ന സ്കൂളുകളായും മാറും. എല്ലാപേർക്കും അഭിനന്ദനങ്ങൾ, ആശംസകൾ....

വി.ആർ.സലൂജ
ചെയർപേഴ്സൺ
(ആരോഗ്യ വിദ്യാഭ്യാസ സ്റ്റാന്റിംഗ് കമ്മിറ്റി)

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. 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. ടി.ആർ.ഷീജാകുമാരി
പ്രിൻസിപ്പൽ (പൂർണ അധികചുമതല), ഡയറ്റ് തിരുവനന്തപുരം.

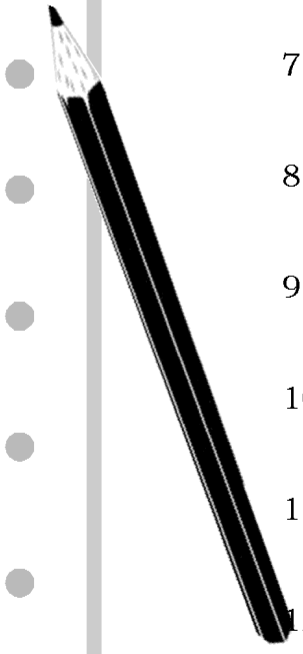
പ്രിയപ്പെട്ട കുട്ടികളേ...

പത്താംക്ലാസിലെ പഠനവും പരീക്ഷയും വലിയ പ്രാധാന്യത്തോടെയാണ് നാം കാണുന്നത്. മറ്റ് ക്ലാസുകളിലെ പഠനത്തിന് നൽകുന്ന പ്രധാന്യമേ പത്താം ക്ലാസ് പഠനത്തിനും നൽകേണ്ടതുള്ളൂവെങ്കിലും പൊതുപരീക്ഷയെ അഭിമുഖീകരിക്കുന്നുവെന്ന പ്രാധാന്യം പത്താംതര പഠനത്തെ വ്യത്യസ്തമാക്കുന്നുണ്ട്. ഉള്ളടക്കത്തെ സംബന്ധിച്ച കേവല ധാരണകൾക്കു പകരം വിവരവിശകലനവും നിഗമനവുമാകണം പഠനത്തിന് അടിസ്ഥാനമാകേണ്ടത്. വിക്ടേഴ്സ് ചാനൽ വഴിയുള്ള ക്ലാസുകളുടെ തുടർച്ചയായി നിങ്ങളുടെ പ്രിയപ്പെട്ട അധ്യാപകർ നടത്തുന്ന സംവാദാത്മക ക്ലാസുകൾ സംശയദുരീകരണത്തിനുള്ള അവസരമായി പ്രയോജനപ്പെടുത്തണം. ഓൺലൈൻപഠനത്തിന്റെ ശക്തിയും ദൗർബല്യവും തിരിച്ചറിഞ്ഞ് പഠനം അനുഭവാധിഷ്ഠിതമാക്കുന്നതിനുള്ള വ്യക്തിഗതശ്രദ്ധയുമുണ്ടാകണം. പത്താംതരം പാഠപുസ്തകത്തിലെ ഉള്ളടക്കത്തെ ലളിതമായി വിവിധ സങ്കേതങ്ങൾ വഴി അവതരിപ്പിക്കുകയാണ് വിദ്യാജ്യോതിയെന്ന ഈ പുസ്തകത്തിലൂടെ ചെയ്തിരിക്കുന്നത്. ഓരോ യൂണിറ്റിലെയും എല്ലാ ആശയങ്ങളും പരിഗണിച്ച് തയ്യാറാക്കിയിരിക്കുന്ന ഈ പ്രവർത്തനപുസ്തകം നിങ്ങളുടെ ആത്മവിശ്വാസം വർധിപ്പിച്ച് പഠനസന്നദ്ധത നിലനിർത്താൻ സഹായിക്കുന്ന വഴികാട്ടിയാണ്. സ്വയം വിലയിരുത്തലിനു വിധേയമാക്കി കൂടുതൽ കരുത്തോടെ പഠനപുരോഗതിയിലേക്ക് നയിക്കാൻ നിങ്ങളെ ഈ പുസ്തകം സഹായിക്കും. എല്ലാ യൂണിറ്റുകൾക്കും മതിയായ പ്രാധാന്യം നൽകിയാണ് ഇതിലെ പ്രവർത്തനങ്ങൾ തയ്യാറാക്കിയിരിക്കുന്നത്. ഓരോ പ്രവർത്തനത്തിലൂടെയും ശ്രദ്ധാപൂർവം കടന്നുപോവുകയും കുറിപ്പുകൾ തയാറാക്കി റഫറൻസായി പ്രയോജനപ്പെടുത്തുകയും ചെയ്യണം. എല്ലാ പ്രവർത്തനങ്ങളിലും നിങ്ങളെ സഹായിക്കാൻ അധ്യാപകരും രക്ഷിതാക്കളും ഒപ്പമുണ്ടാകും. 2021 – 2022 അക്കാദമിക വർഷത്തിലെ പൊതുപരീക്ഷയെ നേരിടുന്നതിന് നിങ്ങൾക്ക് കരുത്തുപകരാൻ ഈ പ്രവർത്തനപുസ്തകം സഹായകമാകുമെന്ന് വിശ്വസിക്കുന്നു. എല്ലാവർക്കും ഒരു നല്ല വിദ്യാലയവർഷം ആശംസിക്കുന്നു.

സ്നേഹത്തോടെ

ഗീതാനായർ
(അക്കാദമിക ചുമതല, വിദ്യാജ്യോതി)
സീനിയർ ലക്ചറർ, ഡയറ്റ് തിരുവനന്തപുരം

Members participated in the workshop



1. **Sri. Ajith V. R.**
   AKMHS 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
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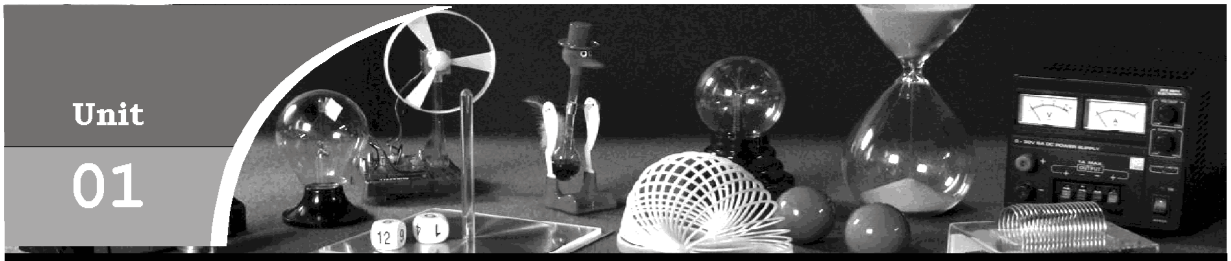


Unit

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 Mechanical energy	..... (d) .....
Storage battery (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 200 Ω 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

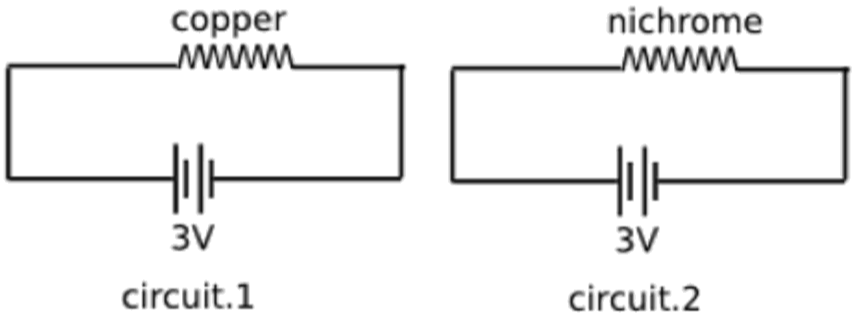
A heater coil is cut into two equal parts. One of them is then used as the coil in the same heater.

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

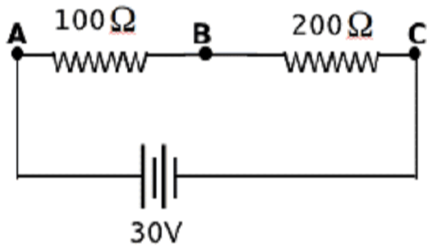
Arrange following statements in the given table.

- 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 .....
(100 Ω / 200 Ω)

d. More heat will be generated in .....
(100 Ω / 200 Ω)

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 690 Ω 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

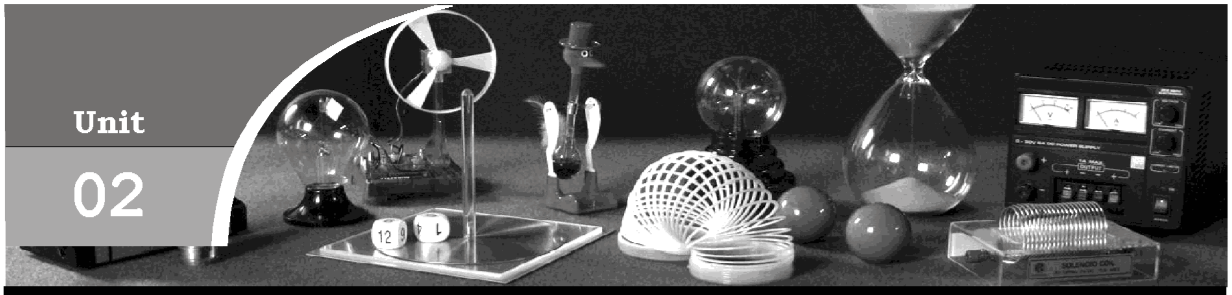
b) Parts of LED lamps are given in the table below, Write the functions of each part and complete the table.

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 to 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**

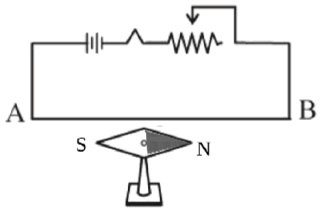
  Current flowing in clockwise direction – Magnetic flux lines will be pointing into the coil

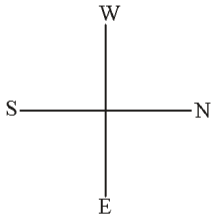
  Current flowing in anti clockwise direction – Magnetic flux lines will be pointing outwards the coil

- **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

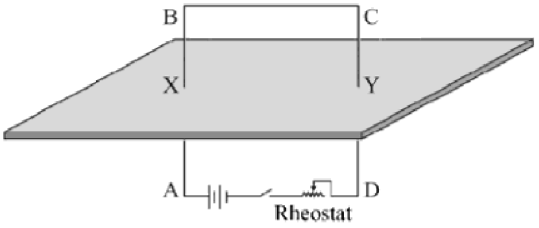
d. Name the law by which the magnetic field of current carrying conductor is determined?

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?

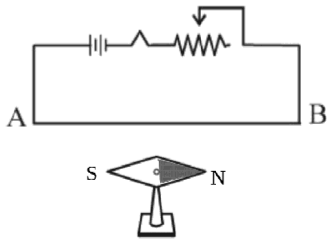
c. Is the direction of magnetic field developed at X and Y the same. Justify your answer.

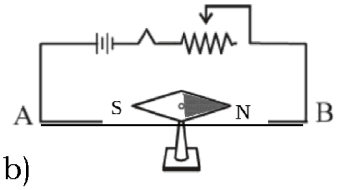
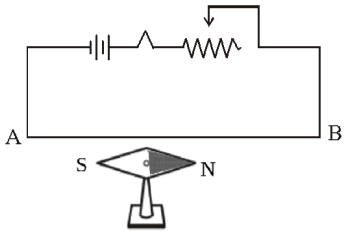
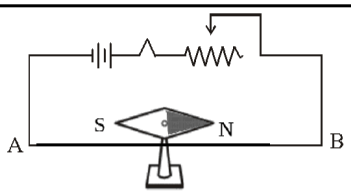
d. What is the nature of magnetic field and on which factor does the direction of magnetic field developed depends?

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

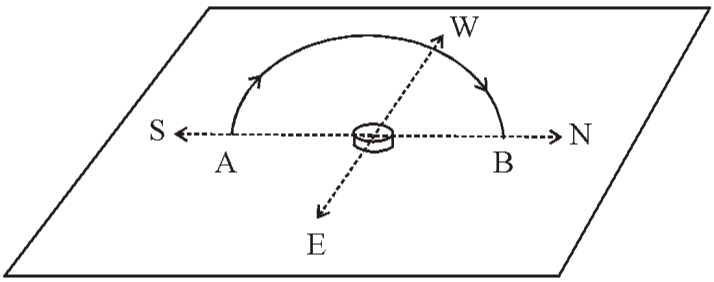
Activity 3

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?

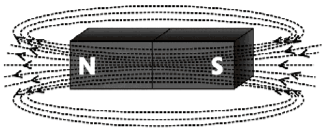
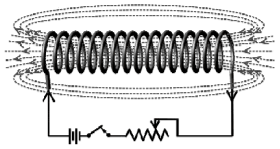
f. What is the reason for the deflection of the compass needle when current is passed through the conductor?

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

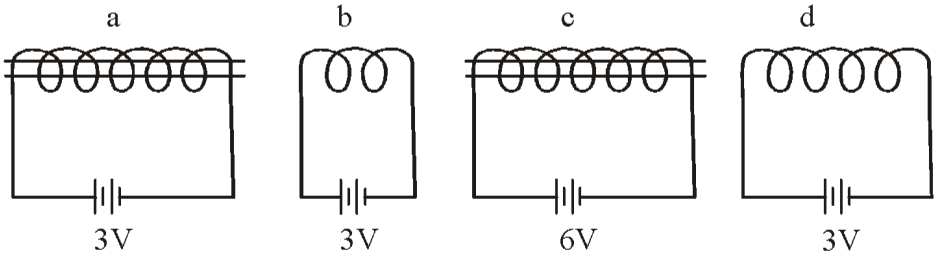
f. Bar magnet

g. Can change the magnetic strength

h. Cannot change the polartiy.

Activity 6

Given below are 4 structurally different solenoids



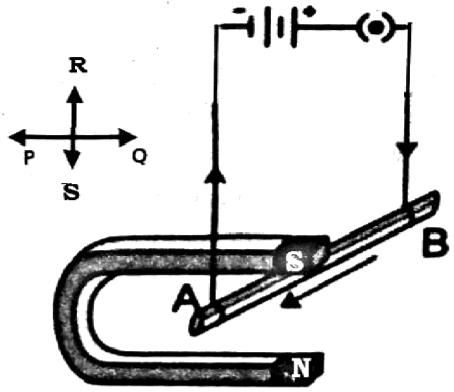
i. Choose the correct descending order of the magnetic strength of the solenoids when current is passed through it

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.

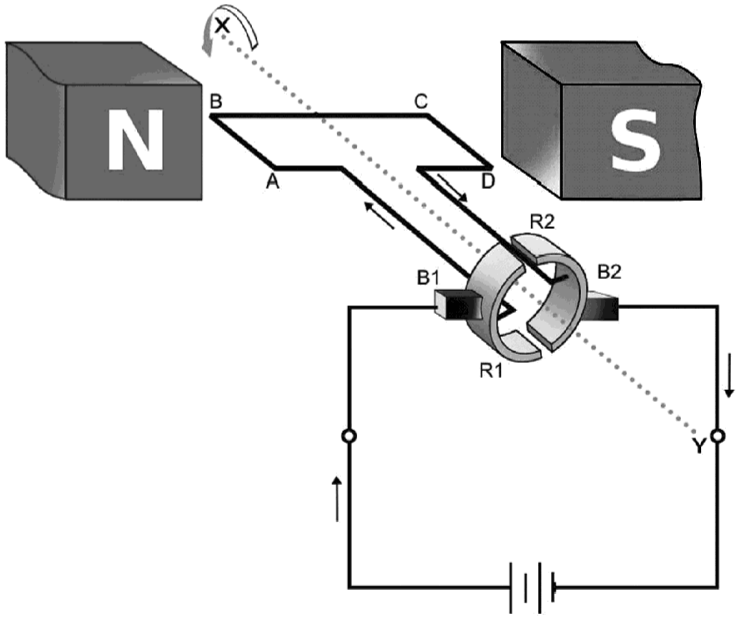
c) Name two devices that work based on this principle

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

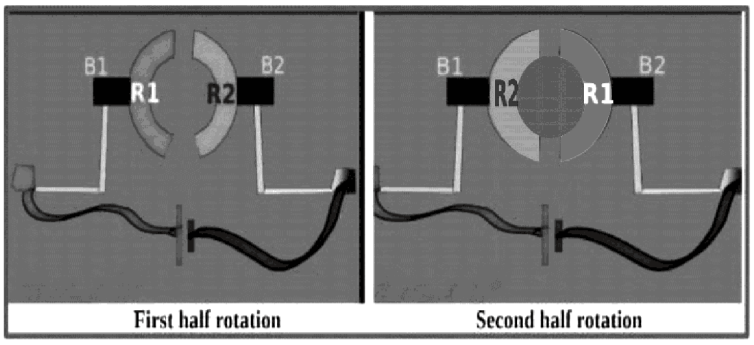
c) What is the result of these forces developed on the coil?

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?

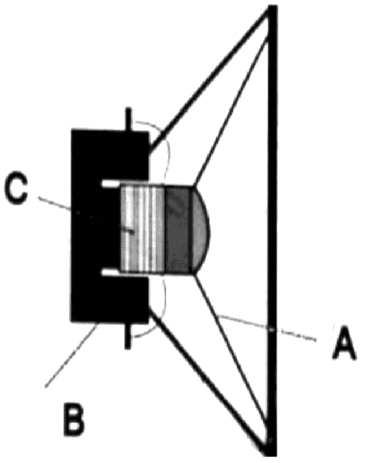
c) In the second half rotation which split ring is connected to which brush?

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

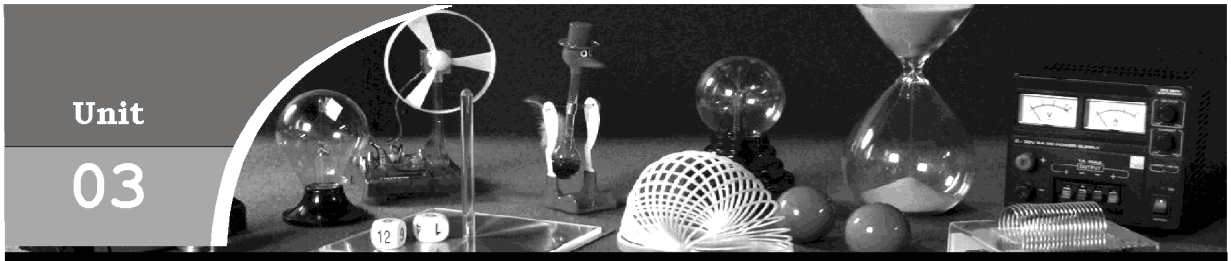


a) Identify the device shown in the figure

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 to 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.

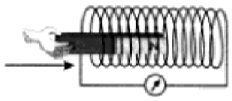
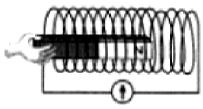
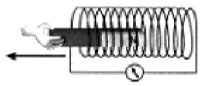
Watt hour meter - Used to measure electrical energy.

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

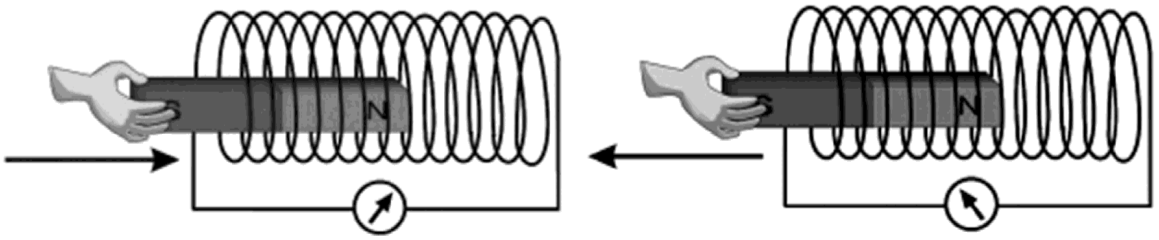
Three pin plug - To ensure safety three pin plugs are used in electrical appliances.

ACTIVITY

1. Fill the observation column suitably

Diagram	Activity	Observation (Deflection of galvanometer needle)
	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.

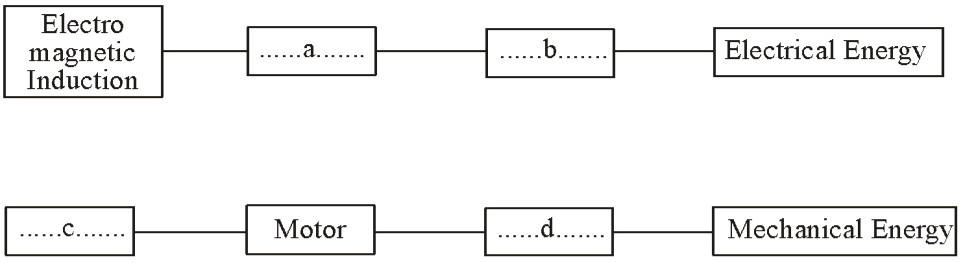
(a) Name the phenomenon behind the flow of current in the circuit.

(b) Write the name of the current produced in the circuit.

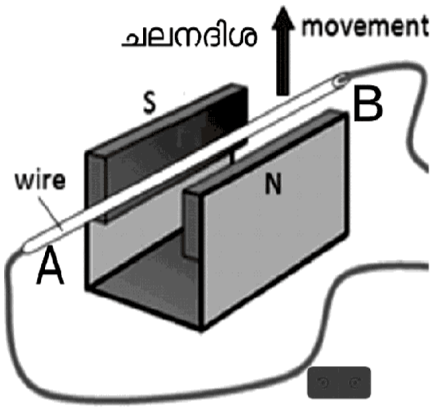
(c) Write the definition for this phenomenon.

(d) What are the factors influencing the increase in intensity of 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?

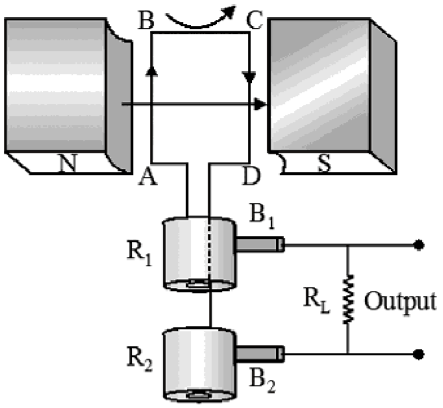
(A to B / B to A)

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.

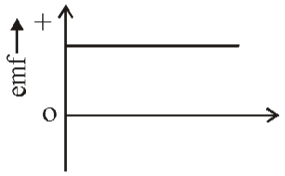
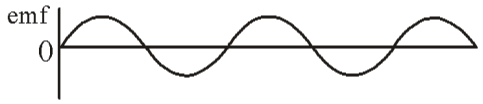
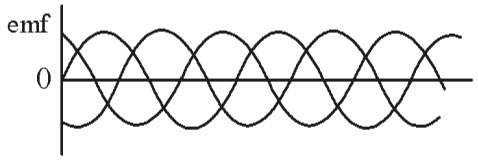


(a) Identify the device shown in the figure?

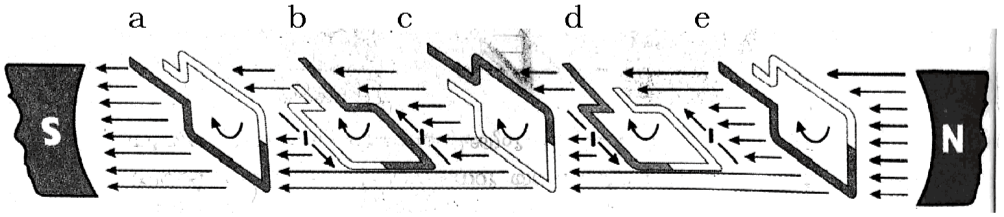
(b) State the working principle of this device?

(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	

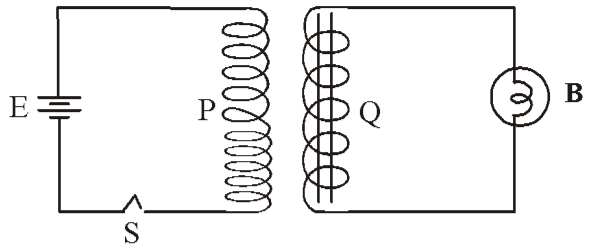
8. Observe the figure:



(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:



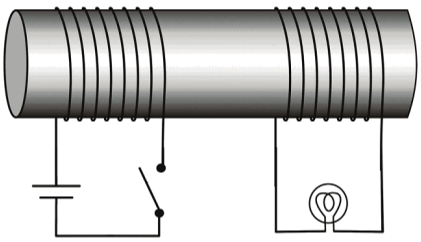
when the switch 'S' is turned on, the bulb suddenly glows and turns off

(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:



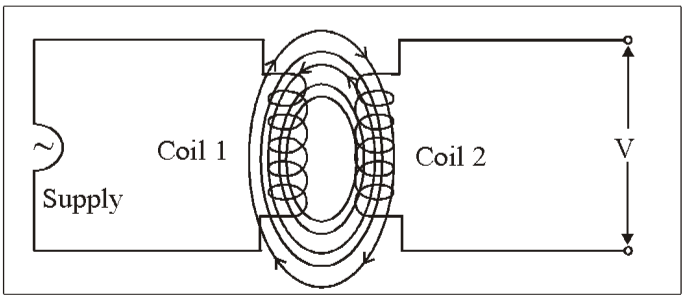
(a) Turn on and turn off the switch. What do you observe?

(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:

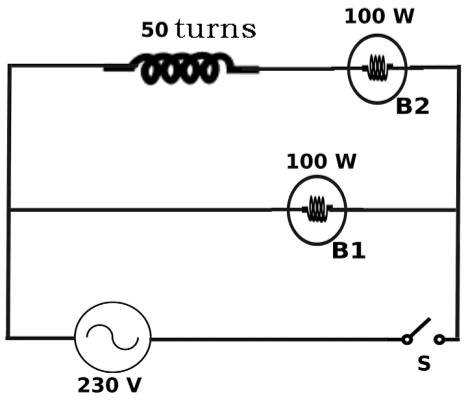
Vp	Np	Vs	Ns
20 V	400	(a)	1600
50 V	(b)	100 V	800
(c)	600	120 V	1800
100 V	3200	25 V	(d)

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,



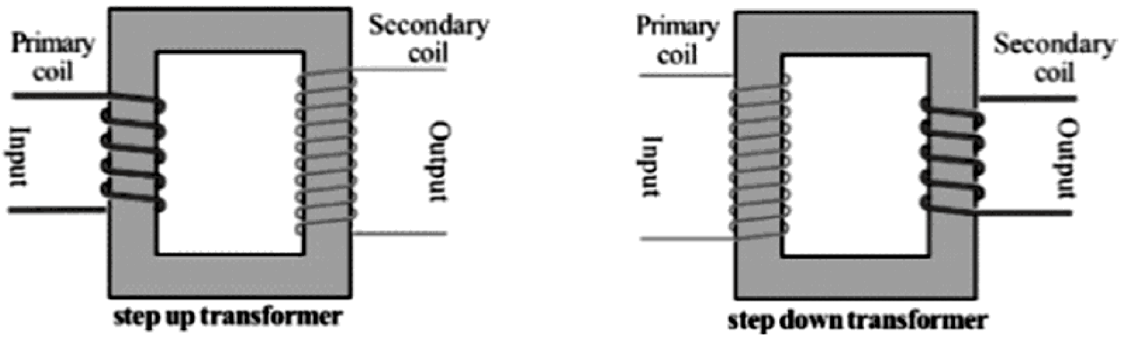
a) Which bulb give a light with high intensity?

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?

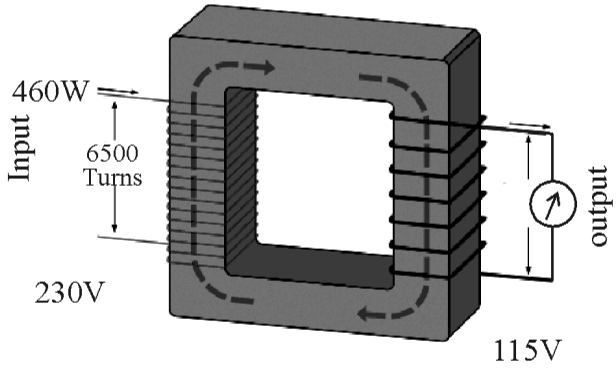
17. Observe the figures and answer the following,



(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?

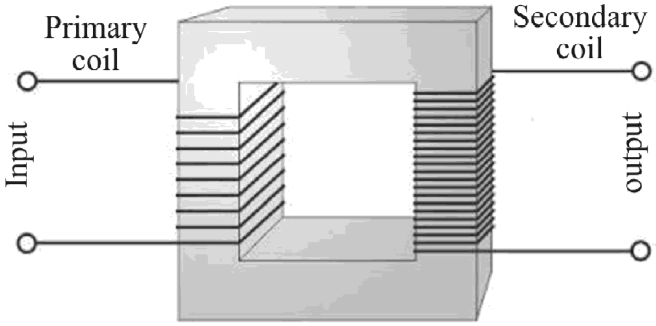
(b) Based on which principle transformer works?

(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

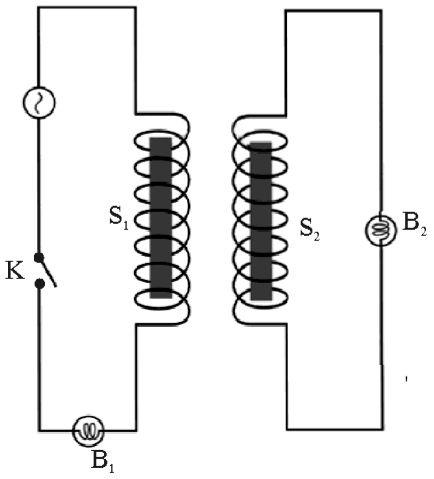
(d)Is>Ip (e)Ns/Np<1 (f)Ns/Np>1

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 increase the number of turns in 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.

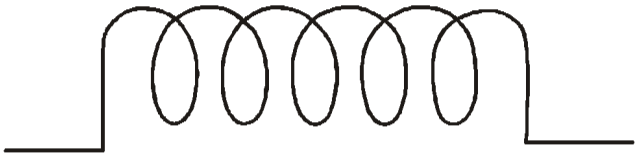
23. Inductor is a long conducting wire found in the form of a helix.

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

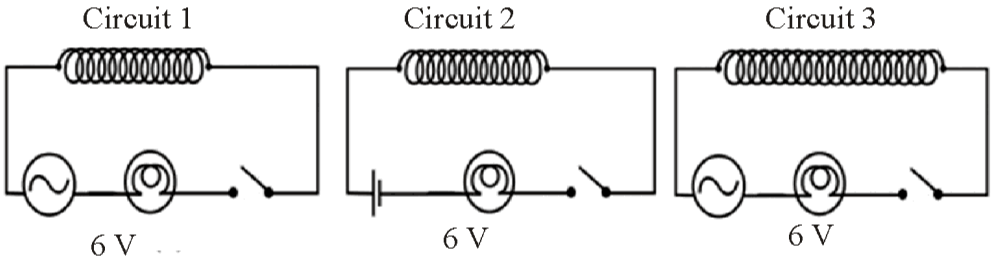
(b) What is the problem of using resistors instead of inductors in AC circuits?

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

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



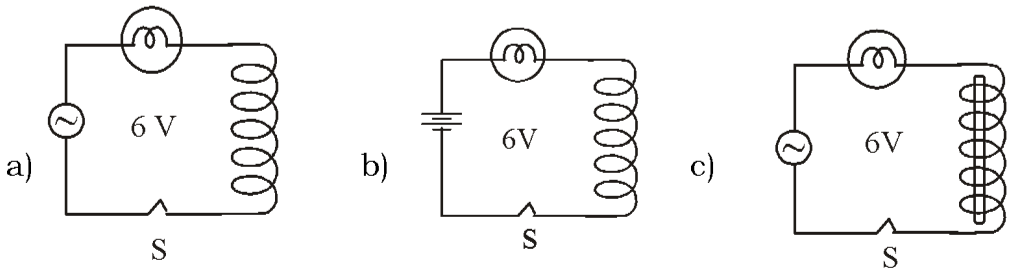
25. The following diagram shows the current carrying solenoids made of insulated copper wire.



(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.

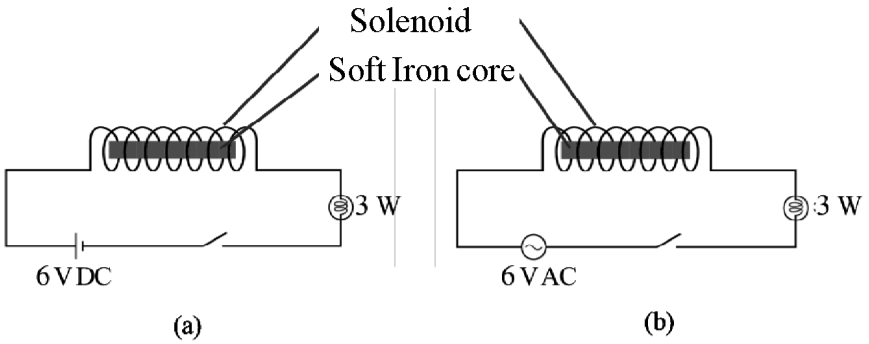


(a) Write the descending order of the intensity of bulbs in the circuits.

(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.

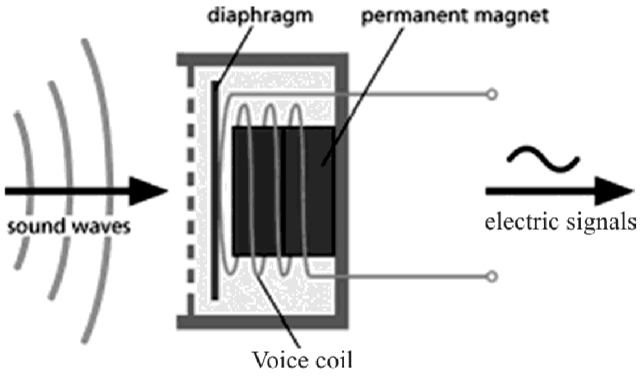


(a) In which circuit the intensity of light from the bulb is less?

(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:



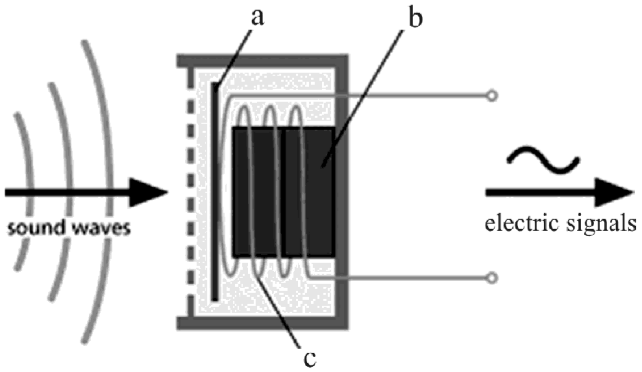
(a) Which is the device shown in the figure?

(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:



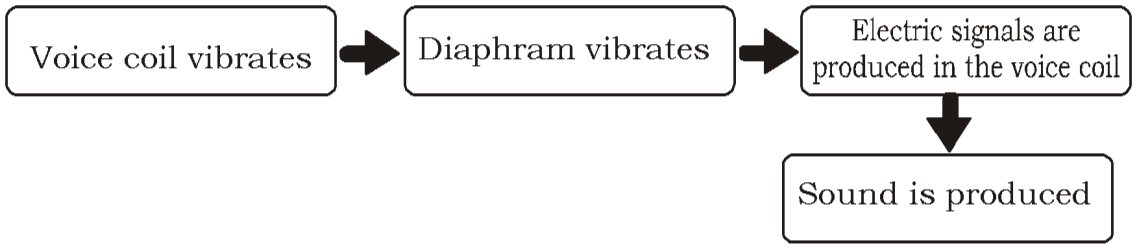
a) Name the parts a,b,c?

(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.

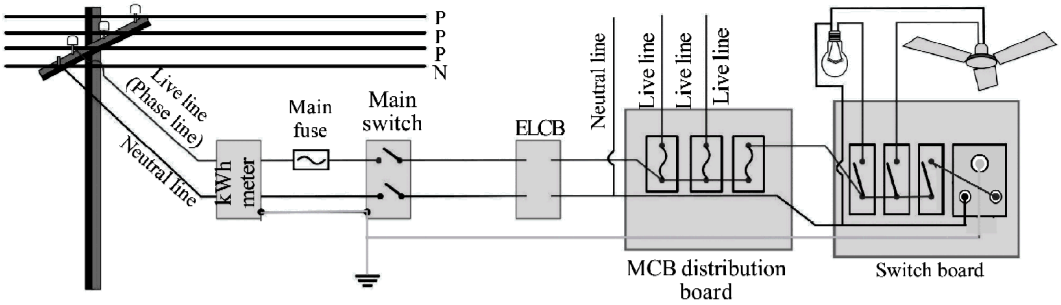
(i) Household consumers get electricity.

(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	.....

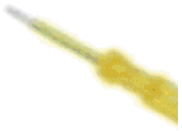
39. Fuse, MCB, ELCB / RCCB are some safety measures using in electrical circuit.
    (a) What is the advantage of MCB over a safety fuse?
    (b) What is the function of ELCB / RCCB in the circuit?
    (c) While using three pin plug in electrical appliances which part of the instrument is connected to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

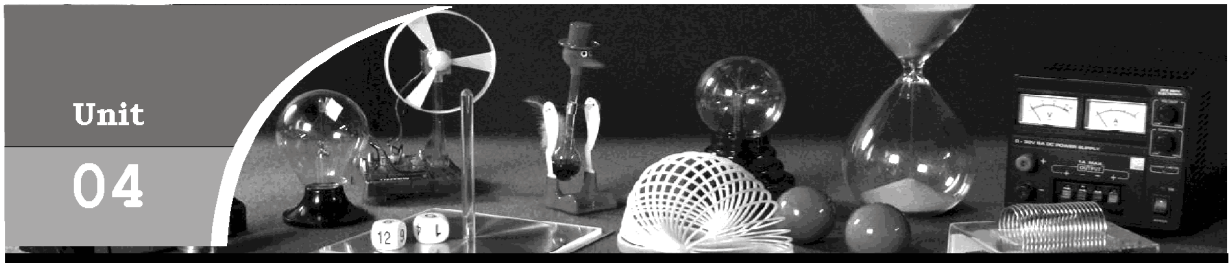
(d)

(e)

(f)

(g)

(h)



Unit

04

REFLECTION OF LIGHT

Points to 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) $\frac{360}{\theta}-1$ θ = Angle between mirrors

focal length, $f = \frac{uv}{u+v}$	u is always negative v is negative for real image and positive for virtual image 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, $m = \frac{hi}{ho}$ $m = \frac{-v}{u}$	hi- Height of the image ho- Height of the object

Activity 1

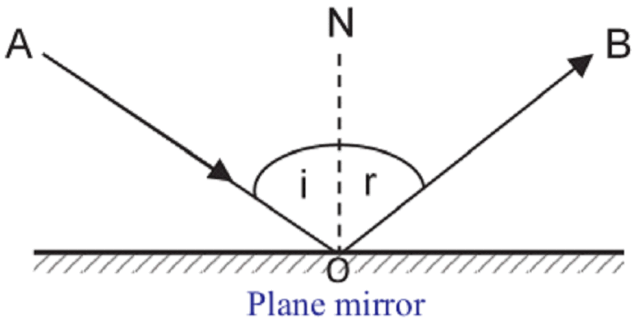
Choose the appropriate from the box for the following statements

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 ?

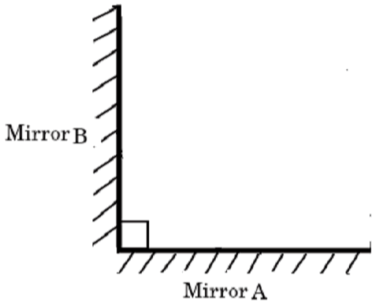
b) which is the reflected ray ?

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

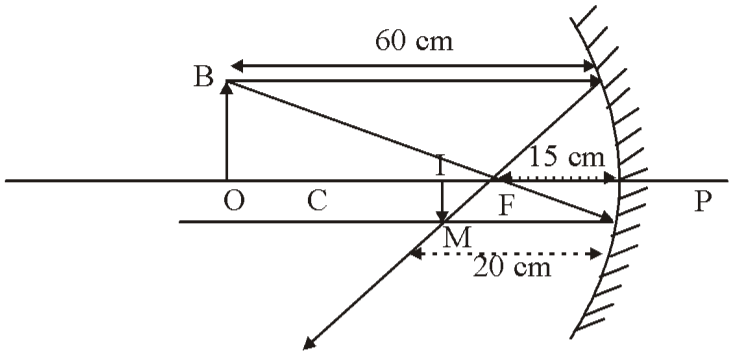
Activity 5

- 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?

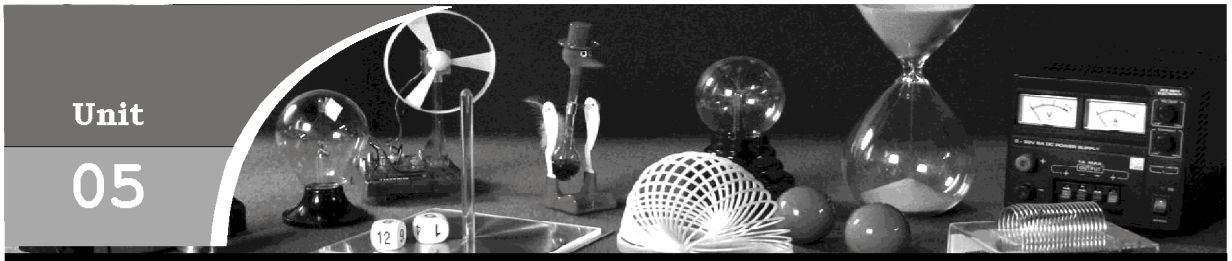
Activity 17

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?



Unit

05

REFRACTION OF LIGHT

Points to Remember

- The characteristics of each medium influence the speed of light that passes through the respective medium.
- Optical density is a measure that show how a medium influence the speed of light passing through it.
- As the optical density of the medium increases, the speed of light through it decreases.
- When a ray of light entering obliquely from one transparent medium to another, its path undergo deviation at the surface of separation. This is refraction.
- The angle of incidence, the angle of refraction and the normal to the point of incidence on the surface of separation of the two media will always be the same plane.
- The ratio of the sine of the angle of incidence to the sine of the angle of refraction $\left(\frac{\sin i}{\sin r}\right)$ will always be a constant. This in known as Snell's law.
- The constant from Snell's law is known as refractive index. This is indicated by the letter 'n'.
- Refractive index (n) = $\frac{\text{Speed of light in vacuum (c)}}{\text{Speed of light in medium (v)}}$
- The refractive index of one medium with respect to another is called relative refractive index.
- The refractive index of a medium with respect to vacuum is called absolute refractive index.
- When a ray of light passes from a medium of greater optical density to that of lower optical density, the angle of incidence at which the angle of refraction becomes 90^0 is the critical angle.
- When a ray of light passes from a medium of higher optical density to a medium of lower optical density at an angle of incidence greater than the critical angle, the ray is reflected back to the same medium

without undergoing refraction. This phenomenon is known as total internal reflection.

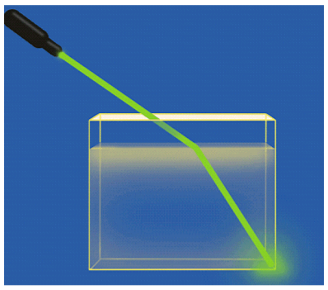
- The phenomenon of total internal reflection is applicable in medical field (Endoscope) and also in the field of telecommunication (Optical Fibre Cables)
- A lens is a transparent medium having spherical surface.
- Optic centre (P) is the midpoint of a lens.
- Centre of curvature (C) is the centre of the imaginary spheres of which the sides of the lens are parts.
- Principal axis is the imaginary line that passes through the optic centre joining the two centres of curvature.
- Light rays incident parallel and close to the principal axis after refraction converges to a point on the principal axis of a convex lens. This point is the principal focus of a convex lens.
- The principal focus of a convex lens is real.
- In concave lens light rays incident parallel and close to the principal axis diverge from one another after refraction. These rays appear to originate from a point on the same side. This point is the principal focus of a concave lens.
- The principal focus of a concave lens is virtual.
- Focal length (f) is the distance from the optic centre to the principal focus.
- Lens equation $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ $\qquad f = \frac{uv}{u-v}, \quad v = \frac{uf}{u+f}, \quad u = \frac{fv}{f-v}$

Convex lens	Concave lens
u $\rightarrow$ negative	u $\rightarrow$ negative
v $\rightarrow$ positive (real image) nagative (virtual image)	v $\rightarrow$ negative
f $\rightarrow$ positive	f $\rightarrow$ negative

- Power of a lens is the reciprocal of focal length expressed in metre

  p = $1/f$
- Unit of power is dioptre (D).
- Power of convex lens is positive and concave lens is negative.
- Magnification is the ratio of the height of the image to the height of the object. It shows how many times the image is larger than the object.
- Magnification m = hi/ho or m = v/u

1. Light from a laser torch passes through water in a beaker, is shown in the figure.



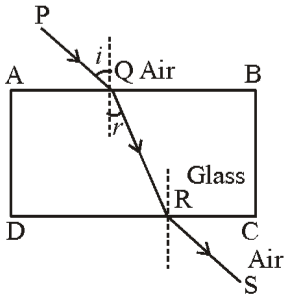
   a. What happens to the path of light?
   b. Which are the media involved here?
   c. Name the phenomenon responsible for the deviation of the path of light.
   d. Define this phenomenon.

2. Analyse the table and answer the following questions.

Medium	Speed of light (m/s)
Vacuum	3×10^8 m/s
Water	2.25×10^8 m/s
Glass	2×10^8 m/s (*approximately*)
Diamond	1.25×10^8 m/s

   a. Find the speed of light in water from the table?
   b. Which are the medium having highest and lowest velocity of light?
   c. What is meant by optical density?
   d. Arrange the media in the descending order of their optical density.
   e. What is the relation between optical density and velocity of light?

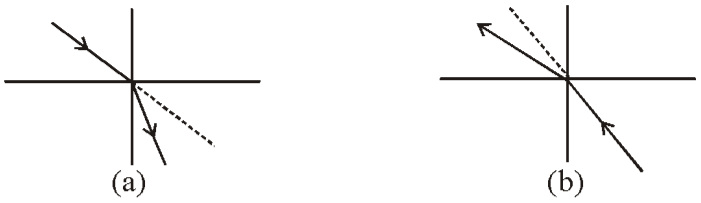
3. Observe the given figure.



   a. Find the incident ray on the surface of separation CD
   b. Which are the refracted rays?
   c. What are 'i' and 'r' here?

d. The angle between the incident ray and the normal is called the angle of incidence, if so what is meant by angle of refraction?

4. Observe the given figure.



a. Which figure indicates the path of light from air to water?

b. Which figure indicates the path of light from glass to water?

c. Which figure represents the refracted ray move away from the normal?

d. Which figure represent the refracted ray deviates towards the normal?

5. a. Consider a ray of light passing from air to glass. Sine value of the angle of incidence is 0.5, sine value of the angle of refracion is 0.33. Calculate refractive index of the medium.

b. Name the Law related to this?

c. State the Law.

d. What are the Laws of refraction?

6. Fill in the blanks.

a) Mirror : pole

Lens : .....

b) Convex lens : Real focus

Concave lens :.....

7. When light travels from glass to water obliquely at the plane of separation of medium. What happened to the refracted ray. Choose from the given.

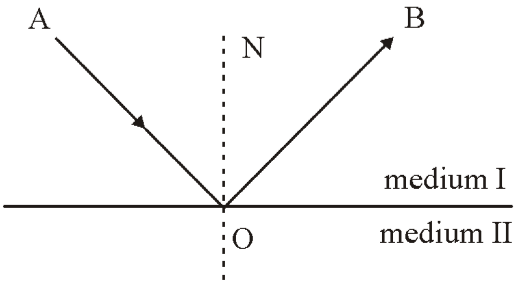
(a) proceeds undeviated.

(b) deviates towards the normal.

(c) deviates away from the normal.

(d) is reflected back.

8. The diagram shows total internal reflection.Classify the following statements into true or false.



a) angle AON is the angle of incidence

b) angle AON = angle NOB

c) angle AON must be the critical angle

d) the speed of light in medium II is greater than that in medium I

e) if the angle AON were increased,there would still be total internal reflection

9. Match the columns A, B and C together.

A	B	C
Refraction	Refracted ray grazes through the surface of the medium	Dioptre
Total internal reflection	Velocity of light	Optical density
Power	Virtual image	Endoscope
Critical angle	1/f	Image is not formed on the screen
Concave lens	Optical Fibre	Angle of incidence in the denser medium corresponding to the angle of refraction 90^0

10. The refractive index of glass and water is given.

Medium	Refractive index
Glass	3/2
Water	4/3

a) What do you mean by relative refractive index and absolute refractive index?

b) Choose the medium of highest optical density from the table.

c) Find the refractive index of glass with respect to water?

d) If the speed of light in glass is $2x10^8$ m/s,calculate the speed of light in vacuum?

11. Analyse the following table and write answer to the questions.

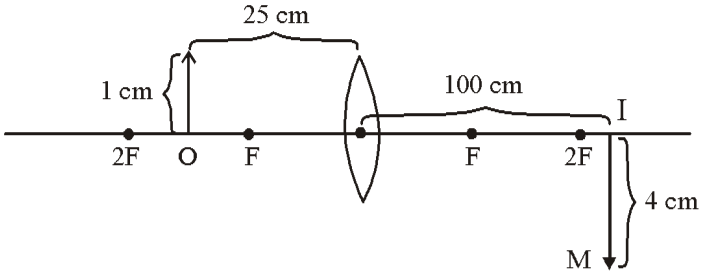
Medium	Speed of light(m/s)
Vacuum/Air	3×10^8
Water	2.25×10^8
Glass	2×10^8 (approximately)

a) Find out the medium which has highest optical density from the table?

b) Calculate the refractive index of glass with water?

c) What is absolute refractive index of a medium?

12. Write the measures given in the figures by New Cartesian Sign Convention.



a) Object distance(u)

b) Image distance(v)

c) Height of the object(OB)

d) Height of the image (IM)

e) Find magnification of image.

13. When an object of height 2 cm is placed at a distance 20 cm away from a lens, a real image is formed 40 cm away from the lens.

a) Find the height of the image?

b) Which type of lens is this?

c) What are the other characteristics of the image?

14. When an object of height 6 cm is placed in front of a lens of focal length 15 cm, a virtual image of height 2 cm is formed.

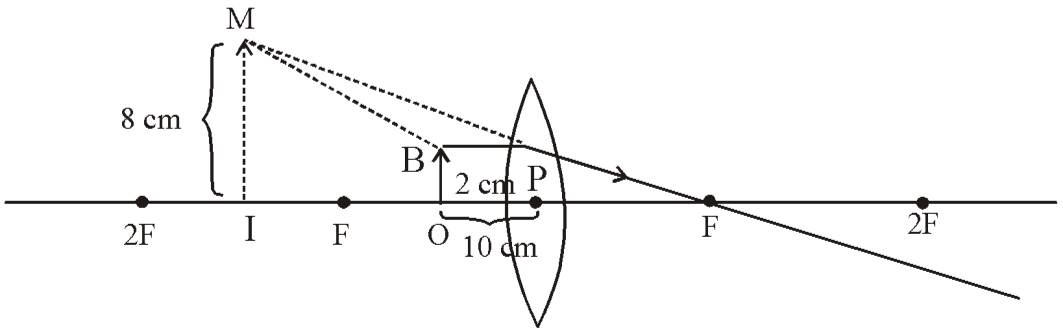
a) Find the magnification of the image?

b) Which type of lens is this?

c) Write any one use of such lens.

d) Find the other characteristics of the image?

15.



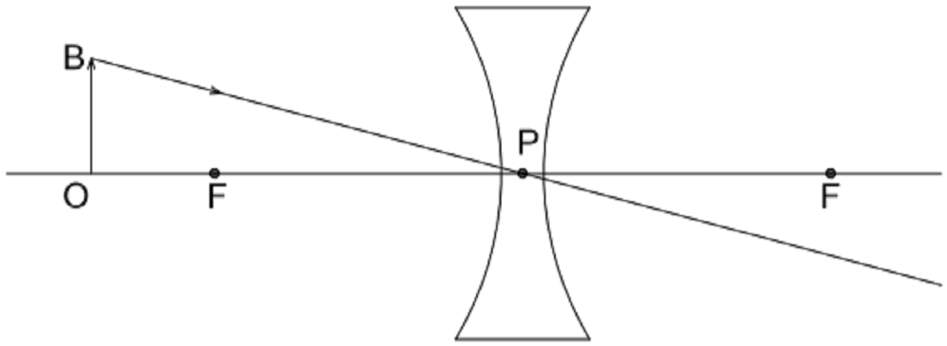
a) Observe the figure and find the magnification of the image.

b) Whether magnification is positive or negative?

c) Find the position of the image.

d) What are the other properties of the image?

16. a. Complete the ray diagram related to the image formation.



b. Which lens is shown in the figure ?

c. Where is the position of the image in this figure ?

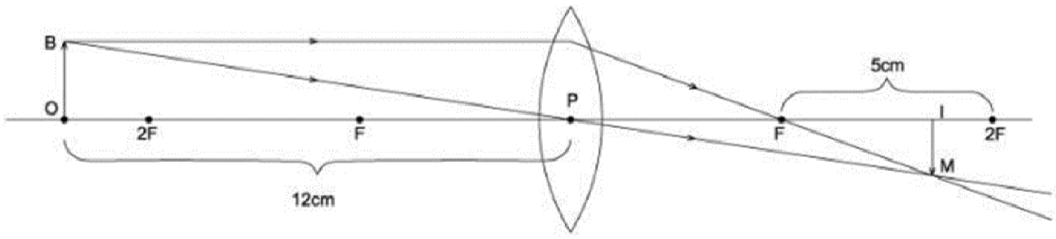
d. Write the characteristics of the image in this figure ?

e. Which lens form real image ?

f. Where should the position of the object be placed in front of a convex lens so as to obtain an image of the same size as that of the object ?

g. To get a virtual image in front of a convex lens, where should the object be placed ?

17. Analyse the following figure and answer the questions given below.



a. What is the focal length of the lens ?

b. Write the value of ' u' in the figure, including sign ?

c. Is the value of ' v' positive or negative. Why ?

d. Calculate the distance to the image ?

18. When an object is placed at a distance of 30 cm from a convex lens, a real image is formed at a distance of 60 cm.

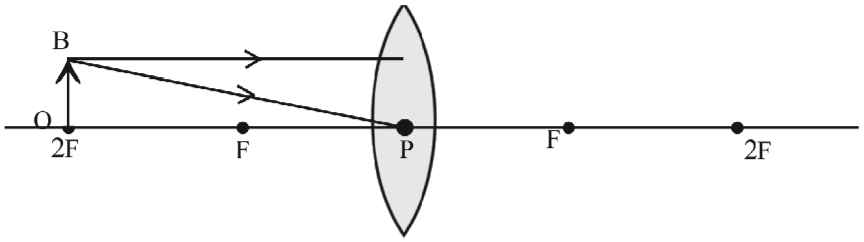
a. What is the focal length of the lens?

b. Find out the magnification of the image formed?

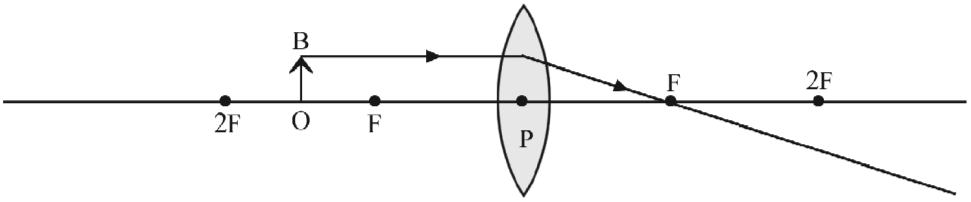
c. Calculate the power of the lens.

19. Complete the ray diagrams given below.

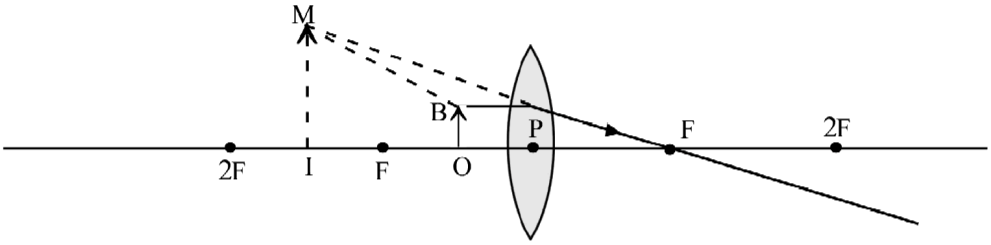
a.

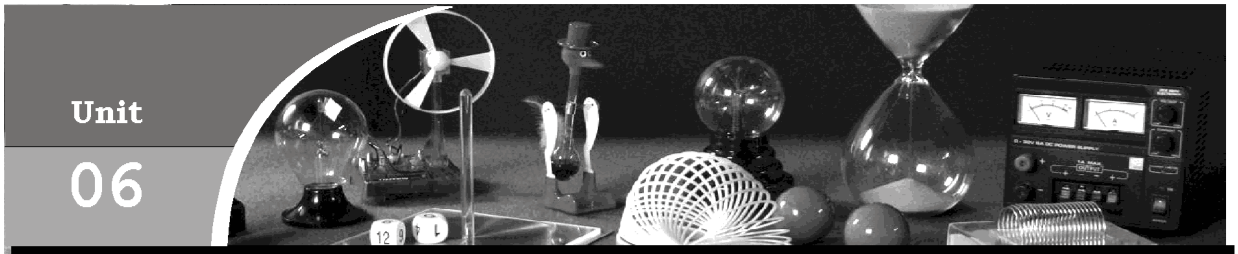


b.



c.





Unit

06

VISION AND THE WORLD OF COLOURS

Points to Remember

- **Near Point :** The nearest point at which the objects can be seen distinctly.
- **Far point :** The farthest point at which the object can be seen distinctly.
- **Power of accommodation :** The ability of the eye to form an image on the retina by adjusting the focal length of the lens in the eye, by varying the curvature of the lens, irrespective of the position of the object, is the power of accommodation.
- **Long-sightedness (Hypermetropia) :** Nearer objects cannot be seen clearly eventhough distant objects are clearly seen.
- **Near-sightedness :** Nearer object can be seen clearly but distant objects cannot seen clearly.
- **Presbyopia :** The condition of reducing power of accommodation due to the diminishing ability of the ciliary muscles.
- **Dispersion of light :** Splitting up of composite light into its constituent colours.
- **Rainbow :** Dispersion of light caused by the water droplets in the atmosphere.
- **Persistence of vision :** Image remains in the retina of the eye for a time interval of $\frac{1}{16}$ s after seeing it.
- **Scattering of light :** Change in direction brought out by the irregular and partial reflection of light.
- **Rate of scattering :** As wavelength increases rate of scattering decreases.
- **Tyndal effect :** When rays of light pass through a colloidal fluid or suspension, the tiny particles get illuminated due to scattering.
- **Light pollution :** The use of light in excess in a non-judicious manner.

Visible spectrum in the ascending order of wavelength - VIBGYOR

Characteristics	High	Low
Wavelength	Red	Violet
Rate of scattering	Violet	Red

Defect of eye	Reason for the Defect	Remedy
Long sightedness	• Smaller size of the eye ball • Low power of eye lens	Convex lens of suitable power
Near sightedness	• Larger size of the eye ball • High power of eye lens	Concave lens of suitable power
Presbyopia	• Diminishing ability of ciliary muscles	Convex lens of suitable power.

ACTIVITIES

1. Check whether the following statements are true or false. If false correct it.

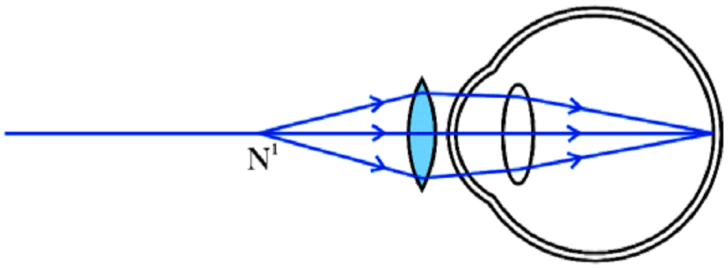
   (a) The near point of an eye with healthy vision is 35 cm.

   (b) Far point is the farthest point at which the objects can be seen distinctly.

   (c) When we look at nearer objects, the ciliary muscles are relaxed, the curvature of the lens decreases and the focal length of the lens increases.

   (d) When we look at far objects, the ciliary muscles are relaxed, the curvature of the lens decreases and the focal length of the lens increases.

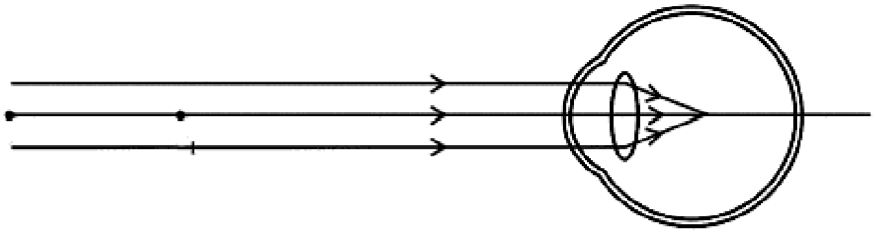
2. Observe the diagram.



   (a) Which defect of eye is rectified by using a convex lens of suitable power?

   (b) What may be the reasons behind this defect?

3. The following figure shows the image formed by a defective eye.



(a) Which defect of eye is represented by the above figure?

(b) What is the reason for this defect?

(c) Which type of lens is used to rectify the above defect of eye?

(d) Draw how does that lens correct near sightedness?

4. The doctor has written '+2 D' in his prescription,

(a) What does the letter 'D' stands for?

(b) Which type of lens is referred as +2 D?

(c) Which type of lens is used, if '-2 D' is mentioned?

(d) What peculiarity of the lens has been mentioned here? Define the term?

5. What is the distance to the near point of the human eye with normal vision?

6. For elderly people the distance to the near point is greater than 25 cm.

(a). Name the condition.

(b). Write down the reason for this condition?

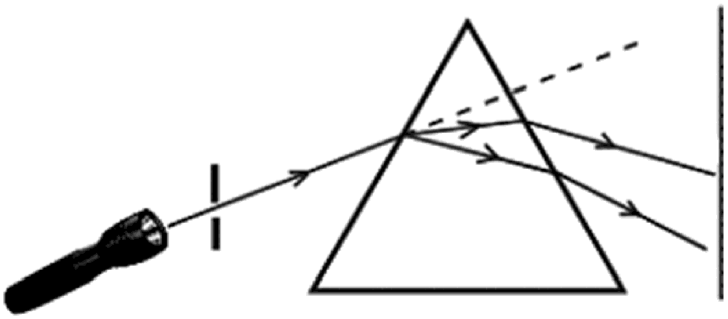
7. How can presbyopia be corrected?

8. Eye donation is one of the noblest donation. Through eye donation those who have closed their eyes forever can light up others lives.

(a) How many hours after death can eyes be donated?

(b) Which part of eye of the donor can be donated?

9. A beam of light is made to incident on a prism as shown in figure.



(a) What are the colours formed on the screen?

(b) Are they same as that from sunlight?

(c) What is this phenomenon known as?

(d) Which colour deviates more?

(e) Which colour deviates less?

(f) What is the relation between the deviation of colours through the prism and wavelength of colours?

10. The regular array of the component colours of white light is given. Write the colours a, b and c?

Violet, Indigo, (a)___, Green, (b)__, Orange, (c)____

11. When white light is passed through a prism visible spectrum is obtained.

(a) Which phenomenon of light causes this?

(b) Which colour has the highest wavelength?

(c). The following are some of the colours in the spectrum. Which of the following is correct.

(i) Blue – violet – red - green

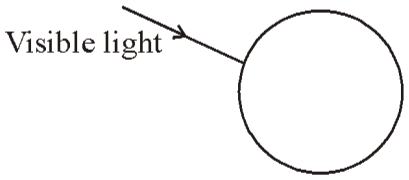
(ii) Violet – blue – yellow - red

(iii) Violet - Indigo - Green - Yellow

(iv) Green – yellow – orange - violet

(d). Explain the deviation of colours at the time of spectral formation based on their wavelength?

12. Dispersion occur when sunlight passes through the droplets of water.



(a) Complete the diagram.

(b) What happens to the sun light, when it passes through water droplets?

(c) Which colour is seen at the outer edge of rainbow?

(d) Watching from an aeroplane the rainbow will seen in which shape?

(e) When the rainbow is seen in the east, the Sun will be at which position?

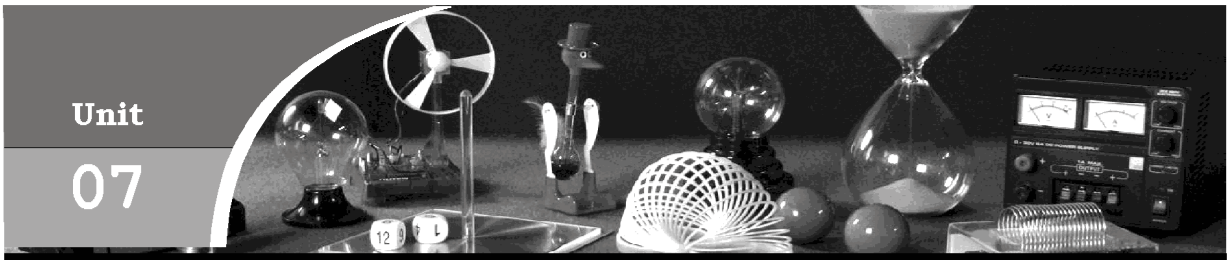
(f) Which colour is seen in the inner edge of rainbow?

13. The teacher asked to plan an experiment to prove the recombination of colours.

(a) Summarise the experimental steps.

(b) What will be your observations?

14. A glowing agarbathi when rotated fast we feel that there is a continuous glowing circle.
    (a) Name the phenomenon behind this?
    (b) Explain it?
15. The teacher asked to plan an experiment to prove the scattering of light.
    (a) List the materials needed to perform the test?
    (b) Summarise the test procedure.
16. Write the component colours in white light in ascending order of scattering rate?
17. Even though light travels in straight line, we get light in our rooms during day time. What is the reason?
18. Scattering of light causes the blue colour of sky.
    (a) Which are the occasions where sunlight has to travel greater distance through the atmosphere before reaching our eyes?
    (b) Explain why the colour of rising and the setting sun is red?
19. Put two or three drops of dettol in a beaker containing water. A beam of light is allowed to pass through the solution.
    (a) The path of the light become visible, what is the reason behind it?
    (b) How scattering is related to the size of the particle?
20. Write four methods to prevent light pollution?



Unit

07

ENERGY MANAGEMENT

Points to Remember

- When energy is transformed from one form to another, some part of it gets lost in other forms. Such a loss is the main cause of energy crisis.
- Fuels are substances that release plenty of heat energy on burning.
- Complete combustion causes less atmospheric pollution. Incomplete combustion causes atmospheric pollution.
- Nonrenewable energy sources.
  - Fossil fuels – Coal, Natural gas, Petroleum.
  - Nuclear fuel – Uranium
- Renewable energy sources – Wind, Solar Energy, Ocean energy, Geo thermal energy.
- Calorific value is the amount of energy released by the complete combustion of 1 kg of fuel.
- Green energy is produced from natural sources that does not cause environmental pollution.
- Brown energy is produced from nonrenewable energy sources which cause environmental pollution.
- Energy crisis is the consequence of increasing demand but decreasing availability.

ACTIVITIES

1. a. Classify the following fuels into solid, liquid and gas?

   Firewood, Petrol, Naphtha, Ammonia, Kerosene, Coke, LNG, Nuclear fuel, Biogas

   b. What are the major problems arises due to partial combustion of fuels?

2. Match the following.

LPG	Methane
CNG	Coke
Coal	Ethyl Mercaptan

3. Have you ever noticed the numbers and letters such as C 26 marked on a cooking gas cylinder.
   a. What does it mean?
   b. If it is marked as B 22, what will it indicates?
4. Bio waste generally named as biomass.
   a. Find the odd one in the list below and write the reason for it?
      (Fire wood, Petrol, Dried cow dung)
   b. What are the advantages of biogas over biomass?
   c. What are the major components of biogas?
5. Fuel efficiency is described in calorific value.
   a. What is meant by calorific value of the fuel?
   b. Which is the unit of calorific value?
   c. Which is the most efficient fuel based on its calorific value?
6. Which of the following is not a fossil fuel?
   (Coal, LPG, Hydrogen, Petroleum)
7. Hydrogen has very high calorific value.
   a. Where hydrogen is utilised to generate electricity?
   b. Hydrogen is a fuel with high calorific value, but it is not used as a domestic fuel. Why?
   c. Which are the instances where hydrogen is used as a fuel?
8. Write any 4 properties of a good fuel.
9. Which of the following is the correct operation of a thermal power station?
   A heat energy → mechanical energy → chemical energy → electrical energy.
   B chemical energy → heat energy → mechanical energy → electrical energy.
   C mechanical energy →heat energy → chemical energy → electrical energy.
   D heat energy → chemical energy → mechanical energy → electrical energy.
10. The source of all energy forms in earth is Sun.
    a. What are the energy forms obtained from the Sun?
    b. Write the names of instruments which make use of solar energy?
    c. What is the energy conversion in a solar panel?
    d. Write the situations when the energy conversion does not take place in a solar panel?
    e. Write the situations where only solar panels can be used?
    f. Name the phenomenon that is used in solar cells to convert solar energy into electrical energy.

11. The two specialities of solar cooker is given below. Write the functions of each?
    a) A box with blackened interior.
    b) A mirror outside the box.
12. Solar thermal power plant generates electricity using solar energy. Describe its working.
13. Write the merits and demerits of wind energy?
14. Tidal energy is not exploited in Kerala. Give reason?
15. What is meant by Ocean Thermal Energy Conversion Plants (OTEC Plants) ?
16. What is meant by hotspot ?
17. Why is it said that geothermal power plants are not possible in Kerala ?
18. Energy obtained from nucleus is called nuclear energy.
    a. What are the different methods by which the energy is produced from the nucleus?
    b. What are the process that takes place in nuclear power stations?
    c. Name the pollutions caused by the presence of radioactive substances and radiations in water, air and environment.
19. Write the precautions to face nuclear hazards.
20. Classify the following into "green energy" and "brown energy".

    Tidal energy

    Thermal power plant

    Windmill

    Hydroelectric power plant

    Nuclear power station

    Solar panel

    Diesel engines
21. Energy crisis is the consequence of increasing demand but decreasing availability. Write any four solutions to reduce energy crisis.
22. Write 3 devices that can be used at home to reduce energy consumption.
23. Match the following.

A	B	C
Hydro electric power station	Nuclear energy → electrical energy	Tarapur, Koodamkulam
Thermal power station	Potential energy → electrical energy	Moolamattam, Pallivasal
Nuclear power station	Chemical Energy → electrical energy	Neyveli, Kayamkulam

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

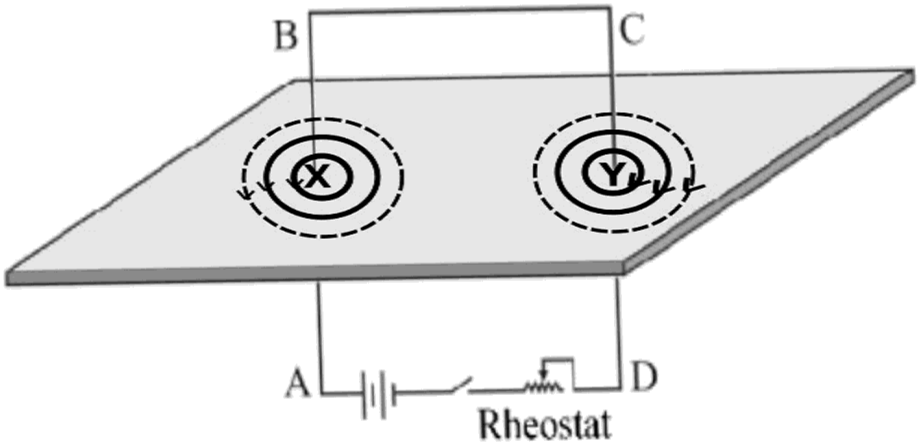
d. Right hand thumb rule

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

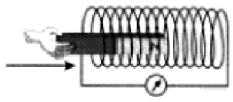
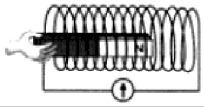
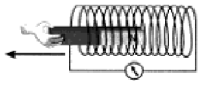
b. Motor principle

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

d. Electrical energy- Mechanical energy- Sound energy

3 ELECTRO MAGNETIC INDUCTION

1.

Diagram	Activity	Observation
	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.

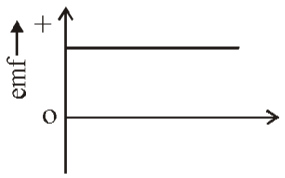
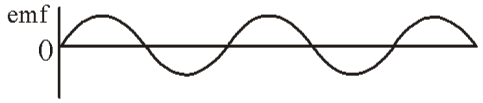
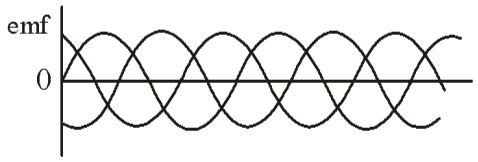
AC	DC
• The direction changes	• Used for household Electrification
• The direction does not change	• Obtained from the cell

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 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.

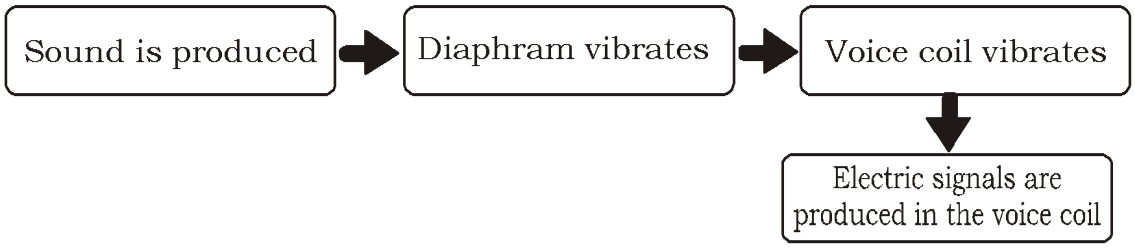
29. (a) a-Diaphram, b-permanent magnet, c-Voice coil.

(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

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

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

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

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

5 REFRACTION OF LIGHT

1. a. Path of light deviates
   b. Air, water
   c. Refraction
   d. When a ray of light entering obliquely from one transparent medium to another, its path undergoes deviation at the surface of separation. This is Refraction.
2. a. 2.25×10^8 m/s
   b. Highest velocity of light – air/vaccum
   Lowest-diamond
   c. Ability of a medium to influence the velocity of light
   d. Diamond, glass, water, air

e. When optical density increases velocity of light decreases(inversely proportional)

3. a. QR
   b. QR, RS
   c. i - angle of incidence
      r-angle of refraction
   d. The angle between the refracted ray and the normal

4. a. fig. (a)
   b. fig. (b)
   c. fig. (b)
   d. fig. (a)

5. a. Refractive index = sin i/sin r
      = 0.5/0.33 =1.5
   b. Snell's Law
   c. The ratio of sine of the angle of incidence to the sine of the angle of refraction (sin i/sin r)will always be a constant. This is known as Snell's Law
   d. (i) The angle of incidence, the angle of refraction and the normal at the point of incidence on the surface of separation of the two media will always be in the same plane.
      (ii) The ratio of sine of the angle of incidence to the sine of angle of refraction (sin i/sin r)will always be a constant.

6. a) Optic centre
   b) Virtual focus

7. c) Deviates away from the normal

8. a) True
   b) True
   c) False
   d) True
   e) False

9.

Refraction	**Velocity of light**	**Optical density**
Total internal reflection	Optical fibre	Endoscope
Power	1/f	Dioptre
Critical angle	Refracted ray grazes through the surface of the medium	Angle of incidence in the denser medium corrosponding to the angle of refraction 90^{o}
Concave lens	Virtual image	Image is not formed on the screen

10. a) The refractive index of one medium with respect to another is called relative refractive index.

The refractive index of a medium with respect to vacuum is called absolute refractive index.

b) Glass

c) Refractive index of water =4/3

Refractive index of glass =3/2

Refractive index of glass with respect to water

$$= \frac{\text{Refractive index of glass}}{\text{Refractive index of water}}$$

$$= (3/2) / (4/3)$$

$$= (3 \times 3) / (2 \times 4)$$

$$= 9/8$$

d) Speed of light in glass , $v = 2 \times 10^8$ m/s

Absolute refractive index of glass, n=3/2

$$\text{Absolut refractive index of glass} = \frac{\text{Speed of light in vacuum}}{\text{speed of light in glass}}$$

$$n = c/v$$

$$c = n \times v$$

$$c = (3/2) \times (2 \times 10^8)$$

$$= 3 \times 10^8 \text{ m/s}$$

11. a) Glass

b) Refractive index of glass with respect to water

$$= \frac{\text{Velocity of light in water}}{\text{Velocity of light in glass}}$$

$$= (2.25 \times 10^8) / (2 \times 10^8)$$

$$= 1.125$$

c) The refractive index of a medium with respect to vacuum is called absolute refractive index

12. a) u = –25 cm

b) v = +100 cm

c) OB = +1 cm

d) IM = – 4 cm

e) m = v/u = 100/–25 = –4

13. a) u = –20 cm

v = +40 cm

h_o = 2 cm

Magnification, m=v/u=40/-20= -2

M = hi/ho

–2 = hi/2

h_i = 2 × – 2 = – 4 cm

b) Here the magnification is negative and the image is real. So it is a convex lens.

c) (i) Larger than the object (magnified)

(ii) Inverted

(iii) real

14. a) h_o = +6 cm

h_i = +2 cm

$m = h_i/h_o$ = +2/+6 = +1/3

b) Since the value of magnification is +ve and less than 1, it is a concave lens.

c) This lens is used to rectify myopia or near -sightedness

d) ● Image is smaller than the object (diminished)

● Erect

15. a) h_o = +2 cm

h_i = +8 cm

$m = h_i/h_o$ = +8/+2 = +4

b) Magnification is positive

c) m = +4

u = –10

m = v/u

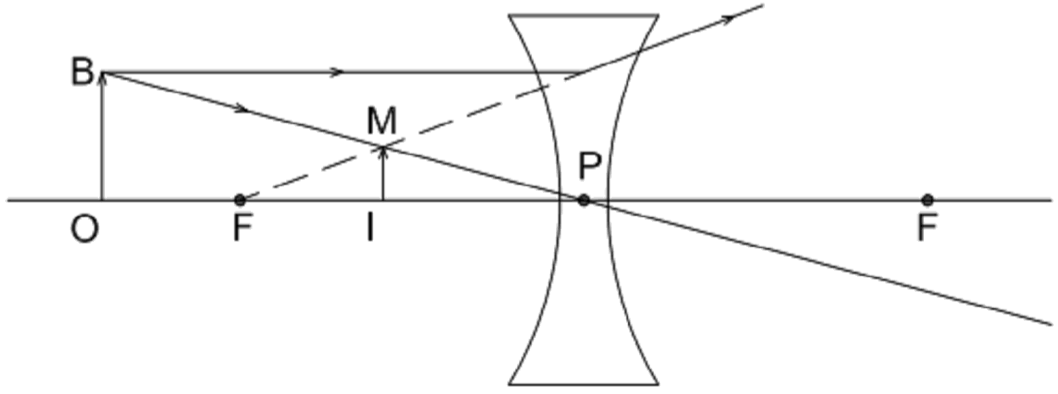
+4 = v/–10

v = +4 × –10 = – 40 cm

The image is 40 cm away from the lens

d) Larger than the object, erect, virtual

16. a.



b. Concave

c. Between F and P

d. Diminished, erect,virtual

e. Convex

f. At 2F

g. Between F and P

OR

Between F and lens

17. a. +5 cm

b. u = –12 cm

c. Value of 'v' is positive. Because the distance measured along the direction of incident light is taken as positive.

d. u = –12 cm

f = +5 cm

v = ?

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

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

$$\frac{1}{v}=\frac{1}{+5}+\frac{1}{-12}$$

$$\frac{1}{v}=\frac{1}{5}-\frac{1}{12}$$

$$\frac{1}{v}=\frac{12-5}{12\times5}$$

$$\frac{1}{v}=\frac{7}{60}$$

$$v=\frac{60}{7}$$

ie, v = 8.57 cm

18. a. u = –30 cm

v = 60 cm

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

$$f=\frac{uv}{u-v}=\frac{-30\times60}{-30-60}$$

$$=\frac{-30\times60}{-90}$$

= + 20 cm

b. $m = \frac{v}{u}$

$= \frac{60}{-30}$

m = –2

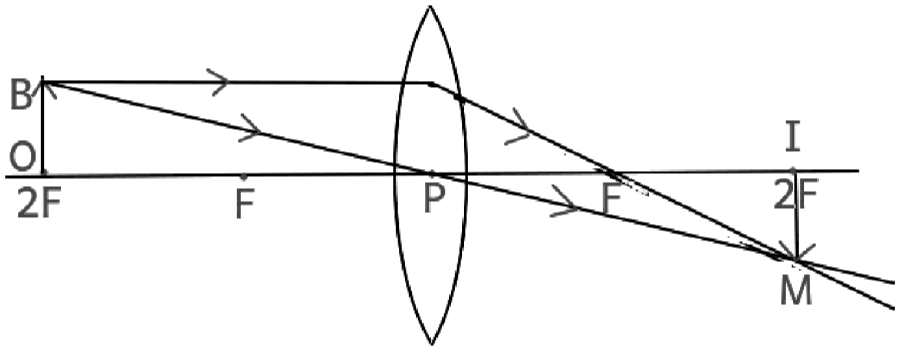
c. $p = \frac{1}{f}$

$= \frac{1}{+20 \times 10^{-2}}$

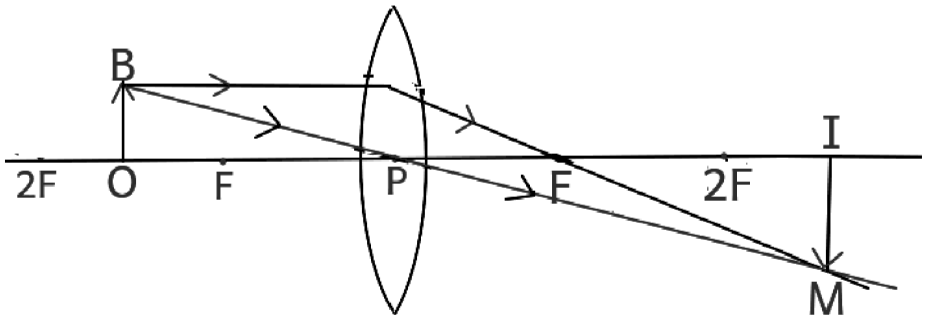
$= \frac{100}{+20}$

p = 5 D

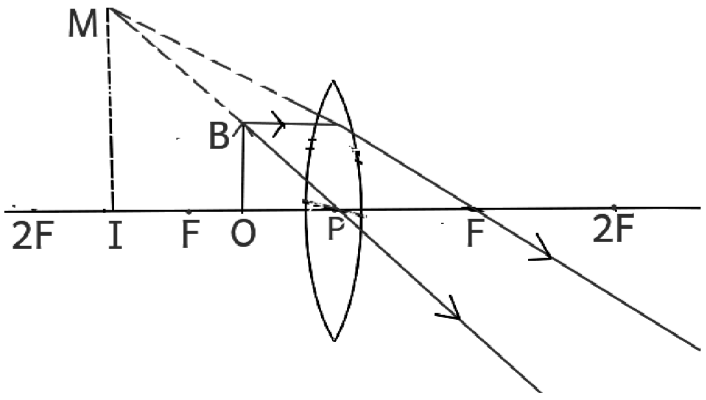
19. a.



b.



c.



6 VISION AND THE WORLD OF COLOURS

1. (a) False.

   The near point of an eye with healthy vision is 25 cm.

   (b) True

   (c) False

   When we look at nearer objects, the ciliary muscles are contracted, the curvature of the lens increases and the focal length of the lens decreases.

   (d) True

2. (a) Long - sightedness or Hypermetropia.

   (b) 1. Smaller size of the eye ball.

   2. Low power of lens / high focal length of eye lens.

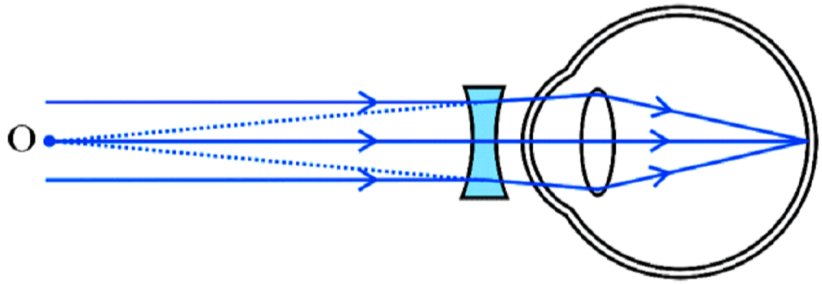
3. (a) Near - sightedness (Myopia)

   (b) 1. The power of the eye lens is more.

   2. The length of the eye ball is more.

   (c) Concave lens.

   (d)



4. (a) Dioptre (D)

   (b) Convex lens

   (c) Concave lens

   (d) Power

   Power is the reciprocal of focal length expressed in metre.

5. 25 cm

6. (a) Presbyopia.

   (b) This is due to the diminishing ability of the ciliary muscles. For such people the power of accommodation will be less.

7. By using a convex lens of suitable power.

8. (a) The cornea of the donor should be harvested within six hours of death.

   (b) Cornea of the donor can be donated.

9. (a) Violet, Indigo, Blue, Green, Yellow, Orange, Red

   (b) Yes

   (c) Dispersion of light

   (d) Violet

   (e) Red

   (f) When wavelength increases deviation of colours decreases.

10. (a) Blue

    (b) Yellow

    (c) Red

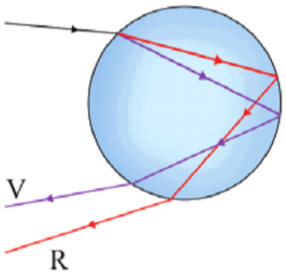
11. (a) Dispersion

    (b) Red

    (c) Violet - Indigo - Green - Yellow

    (d) For colours with higher wavelengths, the deviation is less.

12. (a)



    (b) Sunlight undergoes refraction twice and internal reflection once.

    (c) Red

    (d) Circle

    (e) West

    (f) Violet

13. (a) Allow white light to pass through a prism and obtain the constituent colours on a screen. A prism similar to the first is placed in inverted position, adjacent to the first.

    (b) When the white light is passed through the first prism, it is dispersed into seven colours. But when the second prism is placed near the first prism the colour of light coming out from the second prism is white.

14. (a) Persistence of vision

    (b) When an object is viewed by a person, its image remains in the retina of the eye for a time interval of 0.0625 second (1/16 s) after seeing it. This phenomenon is called persistence of vision. If more than one scene is viewed within 0.0625 s, the effect of all these scenes will be felt by the eye simultaneously.

15. (a) Beaker, Water, Torch, Sodium thiosulphate, Hydrochloric acid, Screen.

(b) Dissolve sodium thiosulphate in water taken in a beaker. Add two drops of hydrochloric acid to it. Observe the change in light in the solution and on the screen. From this we can understand the scattering of light.

16. Red, Orange, Yellow, Green, Blue, Indigo, Violet.

17. Due to the scattering of light.

18. (a) During sunrise and sunset.

(b) During sunrise and sunset light reaching us from the horizon has to travel long distance through the atmosphere. During this long journey colours of shorter wavelength would be almost fully lost due to scattering. Then the red light having more wavelength less amount of scattering only reaches our eyes.

19. (a) Tyndal effect

(b) As the size of the particle increases the rate of scattering also increases.

20. 1. Use shades in light sources.

2. Restrict usage of light beyond a specific period during night.

3. Dim the headlights.

4. Make people aware of light Pollution.

7 ENERGY MANAGEMENT

1. a)

Solid	Liquid	Gas
Firewood	Naphtha	LNG
Nuclear fuel	Petrol	Biogas
Coke	Kerosene	Ammonia

b) Fuel wastage.

Creates atmospheric pollution due to the release of smoke, soot and carbon monoxide.

2.

LPG	Ethyl Mercaptan
CNG	Methane
Coal	Coke

3. a) It denotes the expiry date.

b) B indicates the expiring month is from April to June and 22 indicates the expiring year of the cylinder is 2022.

4. a) Petrol, All others are biomass

   b) 1. Biogas has high calorific value.

   2. Low atmospheric pollution

   3. The slurry from the plant is a good manure.

   c) Methane, Carbon dioxide

5. a) The amount of heat liberated by the complete combustion of 1kg of fuel is its calorific value.

   b) kilojoule/kilogram (kJ/kg)

   c) Hydrogen

6. Hydrogen

7. a) Hydrogen fuel cell

   b) Hydrogen is highly inflammable and explosive. It is also difficult to store and transport.

   c) In rockets and space vehicles

8. 1. Easily available

   2. Low cost

   3. Have a high calorific value

   4. Cause minimum atmospheric pollution.

9. B chemical energy $\rightarrow$ heat energy $\rightarrow$ mechanical energy $\rightarrow$ electrical energy

10. a) Heat energy, Light energy,

    b) Solar panel, solar water heater, solar cooker, solar power plant, solar cell etc.

    c) Light energy (Solar) $\rightarrow$ Electrical energy

    d) In cloudy seasons and at night.

    e) In artificial satellites, space and in isolated islands where electricity is not accessible.

    f) Photo voltaic effect

11. a) The black colour of the vessel lets it to absorb more heat.

    b) The plane mirror will reflect maximum sun rays in to the cooker.

12. Concave reflectors are used to focus the sun rays on the blackened pipes filled with water. As a result water boils and vapourises. The steam rotates the steam turbine, so that the generator attached to the turbine produces electrical energy.

13. **Merits**

- Renewable
- Environment friendly
- Production of electricity doesn't incur any recurring expenditure

Demerits

- This can be established only at those places where wind is available for most time of the year.
- We may require storage systems to use electricity when there is no wind.
- The expense to establish a windmill is very high.
- For repairing it in the event of damages caused by natural calamities is very high.

14. The rise in water due to high tide is less than a metre in Kerala.
15. The surface of Ocean is relatively hot due to solar radiations. But the temperature will be very low at the deep levels. OTEC plants produce energy, making use of this difference in temperature.
16. The interior part of the earth is still in the molten form. Magma, which is at a higher temperature, comes out of the core through its softer regions. Such places are known as hotspot.
17. There is no hotspots in Kerala
18. a) Nuclear fission, Nuclear fusion.

    b) In a nuclear reactor, nuclear energy is used to heat water to make steam at high temperature and pressure. The force of steam is used to turn the turbine to generate electricity.

    c) Nuclear pollution.
19. - Shift out to safe place.
    - Strictly follow the directions from the concerned authorities.
    - Observe the symbols showing nuclear radiations and behave accordingly.
    - Reduce the density of population in place likely to experience nuclear pollution.
    - Consume potassium iodide tablet or take food rich in iodine, if necessary.
20. **Green energy**

    Tidal energy

    Windmill

    Hydro electirc power plant

    Solar panel

    Brown energy

    Thermal power station

    Nuclear energy

    Diesel engine

21. A (1) Judicious utilisation of energy.

(2) Maximum utilisation of solar energy.

(3) Minimising the wastage of water.

(4) Making use of public transportation as far as possible.

(5) Construction and beautifying of houses and roads in a scientific manner.

(6) Controlling of the street lamps with LDR.

(7) Timely maintenance of machines.

(8) Limiting the size of newly constructed buildings.

(9) Ensuring of maximum efficiency of the machines used.

(10) Reduce the use of fossil fuels and increase the use of renewable sources of energy.

Write any four from the above list.

22. (1) Hot box

(2) Pressure cooker

(3) Energy efficient oven

23.

Hydro electric power station	Potential energy → electrical energy	Moolamattom, Pallivasal
Thermal power station	Chemical energy → electrical energy	Neyveli, Kayamkulam
Nuclear power station	Nuclear energy → electrical energy	Tarapur, Koodamkulam